

083

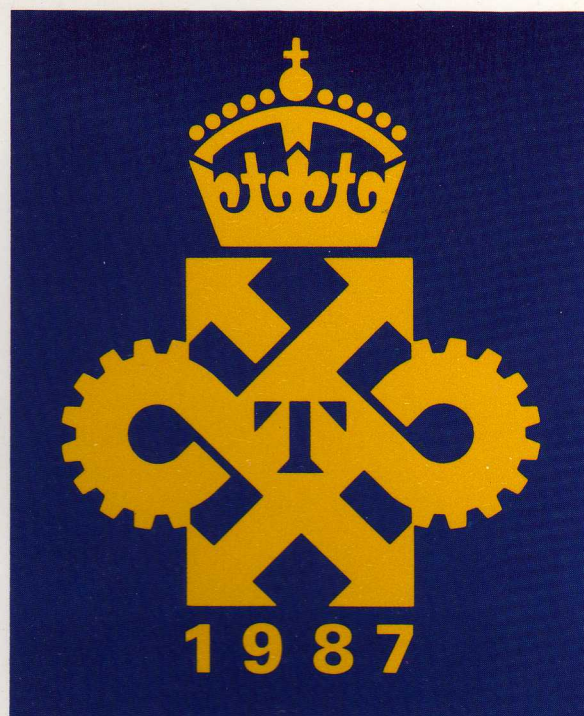
EEV

ELECTRON TUBES 1988/89



ABRIDGED DATA AND EQUIVALENTS INDEX





WHICHEVER WAY YOU LOOK AT IT ... IT'S A CONSIDERABLE ACHIEVEMENT

Winning two Queen's Awards for Technological Achievement is an honour of which we are justifiably proud. Both awards were given jointly to EEV in association with the Detector Research Division, Royal Signals and Radar Establishment of the Ministry of Defence. EEV's Light Conversion Devices Division won the first award for the development of Third Generation Image Intensifiers for night vision applications. The second presented in recognition of the work by the Electronics Division. This involved the development of Pyroelectric Vidicon Thermal Imaging Tubes and the highly acclaimed Thermal Imaging Camera.

EEV Electron Tubes

UK: EEV, Waterhouse Lane, Chelmsford, Essex CM1 2QU, England Telephone: (0245) 493493 Telex: 99103 Fax: (0245) 492492

USA: EEV Inc, 4 Westchester Plaza, Elmsford, NY 10523, USA Telephone: (914) 592 6050 Telex 6818096 Fax: (914) 592 8342

CANADA: EEV Canada Ltd, 67 Westmore Drive, Rexdale, Ontario M9V 3Y6 Telephone: (416) 745 9494 Telex: 06 989363 Fax: (416) 745 0618

FRANCE: EEV Département Tubes Electroniques de GEC Composants,
2 Rue Henri Bergson, 92600 Asnières, (France) Telephone: 1 40 80 54 00 Telex: 610471 Fax: Paris (331) 4733 1131

Subsidiary of the General Electric Company plc of England

GEC

EEV ABRIDGED DATA 1988/9

This book gives characteristics of more than 1300 types of electron tubes, accessories and related products manufactured by EEV. Since the 1986/87 catalogue was issued, more than 280 new types have been introduced as a result of our continuing programme of research and development. Also included are those types formerly manufactured by M-OV and now available from EEV

How to Use the Book

Entries are grouped by product section, each section having its own index tab for easy access. Within each section the product range is divided into different classes of device and, where necessary, subdivided by application, frequency range or cooling system for example. The comprehensive Equivalents Index shows all the tubes for which EEV offers replacements, the place of manufacture (Chelmsford, Witham or Lincoln) and the page on which data for our replacement appears.

Overseas orders or enquiries should be addressed to the appropriate office, distributor or representative in the territory.

UK orders or enquiries should be addressed to Chelmsford, Witham or Lincoln as indicated.

You may wish to use the postcards provided at the end of this book – these are post-free in the UK. Full data sheets are available on request. We can also add your name to our free mailing service.

Enquiries for Non-Listed Products

We welcome all enquiries you may have for products not shown in this new catalogue. At the present time, as stated, we have a very large development program and we would be more than pleased to consider developing a product specifically for your individual needs.

Whatever your requirements you may be assured of high level customer service at all times.

EEV

Waterhouse Lane, Chelmsford,
Essex, CM1 2QU
Telephone: (0245) 493493
Telex: 99103
Facsimile: (0245) 492492

EEV

Freebournes Road, Witham,
Essex, CM8 3TS
Telephone: (0376) 517101
Telex: 987935
Facsimile: (0376) 518170

EEV

Carholme Road, Lincoln
LN1 1SF
Telephone: (0522) 26352
Telex: 56114
Facsimile: (0522) 45140

EEV ABRIDGED DATA 1988/9

Power Devices	Ignitrons <i>IMJ</i> High Vacuum Rectifiers Hydrogen Thyratrons, Glass Envelope Hydrogen Thyratrons, Ceramic Envelope Hydrogen Thyratrons, Metal Envelope Hydrogen Thyratrons for Gas Laser Switching	page 3
Transmitting Tubes	Power Triodes, Glass Envelope Power Triodes, Forced-air Cooled Power Triodes, Water Cooled Power Triodes, Vapour Cooled Power Tetrodes, Glass Envelope	Pulse Tetrodes, Glass Envelope Laser Control and Switching Tubes Power Tetrodes, Forced-air Cooled Power Tetrodes, Water Cooled Power Tetrodes, Vapour Cooled <i>Non-Hil.</i>
Vacuum Capacitors	Variable Capacitors, Glass Envelope Variable Capacitors, Ceramic Envelope Variable Capacitors, Forced-air Cooled Variable Capacitors, Water Cooled Fixed Capacitors, Glass Envelope Fixed Capacitor, Water Cooled Fixed Capacitors, Ceramic Envelope	9 15
Microwave Devices	Receiver Protection Filters R.F. Heads Ferrite Devices Terminations Couplers and Pressure Windows Waveguide Switches	Noise Generators Monitor Diodes Amplifier Klystrons Duplexers Magnetrons Travelling Wave Tubes 21
Electro-optical Devices	Leddicons Vidicons Image Isocons Focus and Deflection Yokes Shutter Tubes Storage Tubes Thermal Imaging Cameras	Image Intensifiers C.C.D. Cameras Cathode Ray Tubes LUCID Liquid Crystal Displays Character Display Tubes Glow Modulators Concentrated Arc Lamps 55
Special Products	Spark Gaps Triggered Vacuum Gaps Transient Protection Units (TPU) Ozotron	Combustible Gas Detector Elements Portable Gas Detection Instruments Electrometer Triode Vacuum and Gas-filled Relays 77
Starvision		83
Equivalents Index		85

Abridged Data

The following pages give abridged data for the current range of EEV tubes, devices and accessories.

Comprehensive data sheets giving operating conditions, characteristic curves, and outline drawings are available on request.

Certain types listed in this catalogue may not be available from current production and their supply may be subject to a minimum order quantity. Enquiries for special tubes not included in the catalogue are welcome.

Caractéristiques Abrégées

Dans les pages suivantes sont données les caractéristiques abrégées pour la gamme courante de tubes, dispositifs et accessoires EEV.

Des fiches de caractéristiques établissant les conditions de fonctionnement, les courbes et les schémas d'ensemble sont disponibles sur demande.

Certains types mentionnés dans ce catalogue peuvent ne pas être disponibles parmi les produits de production courante et leur livraison peut être sujette à la commande d'une quantité minimum. Nous répondons également aux demandes de renseignements pour les tubes spéciaux non mentionnés dans ce catalogue.

Kurzgefaßte Daten

Auf den folgenden Seiten finden Sie kurzgefaßte Daten für das gegenwärtige Herstellungsprogramm von EEV Röhren, Geräten und Zubehör.

Ausführliche Datenblätter mit Betriebsbedingungen, Leistungskurven und Maßzeichnungen sind auf Anfrage erhältlich.

Es ist möglich, daß sich einige der in diesem Katalog angeführten Positionen nicht im gegenwärtigen Produktionsprogramm befinden und daß daher deren Lieferung von einer Bestellung von Mindeststückzahlen abhängig gemacht werden muß. Anfragen wegen Spezialröhren, die nicht in diesem Katalog enthalten sind, bearbeiten wir gerne.

Resumen Informativo de Datos

En las páginas siguientes aparece un resumen informativo de datos correspondientes a la nueva gama de lámparas, dispositivos y accesorios EEV.

Tendremos sumo gusto en facilitar, a solicitud de las partes interesadas, hojas con los datos completos, incluyendo condiciones de funcionamiento, curvas de característica y planos acotados.

Es posible que ciertos tipos detallados en este Catálogo no puedan obtenerse dentro de la línea normal de producción actual y su suministro puede estar sujeto a un pedido mínimo. Sírvanse solicitar información relativa a lámparas especiales, no incluidas en este Catálogo.

Dati Abbreviati

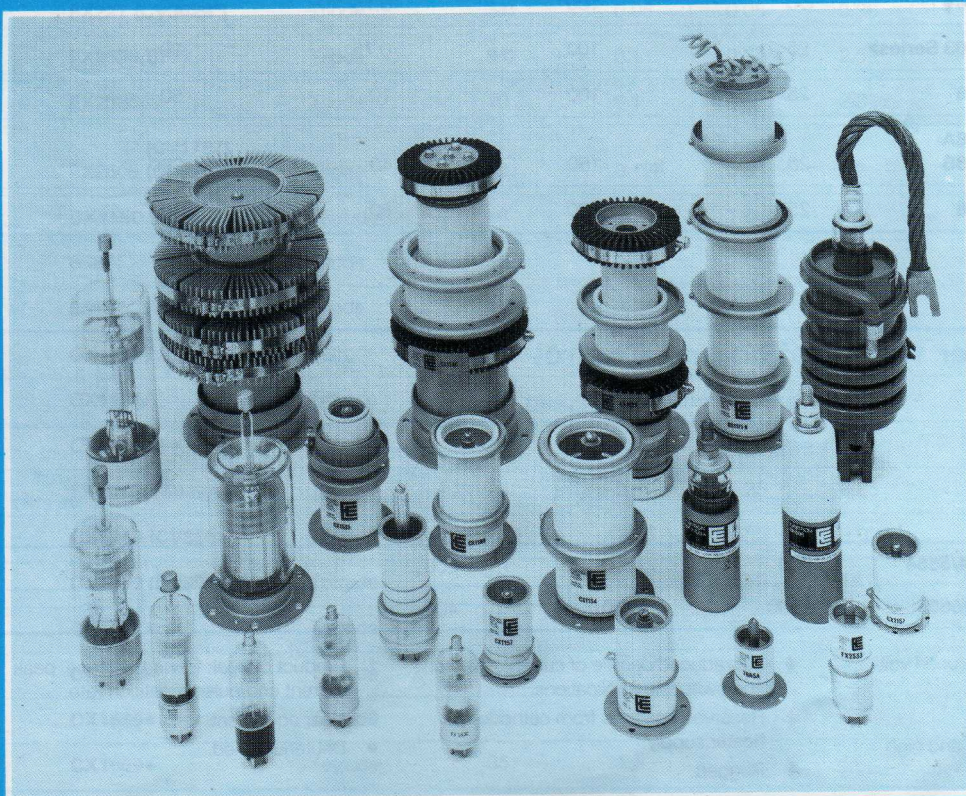
Alle pagine seguenti figurano dati abbreviati inerenti la presente serie di valvole, dispositivi ed accessori EEV.

Le pubblicazioni tecniche più approfondite, contenenti le condizioni di funzionamento, curve delle caratteristiche e disegni del contorno, vengono fornite su richiesta.

Alcuni modelli elencati nel presente catalogo non sono disponibili nella normale produzione e la relativa fornitura può essere subordinata all'ordinazione di un quantitativo minimo. Nel caso di valvole speciali non incluse nel presente testo, il cliente è pregato di interpellarci.

POWER DEVICES

Ignitrons	page 4
High Vacuum Rectifiers	5
Hydrogen Thyratrons, Glass Envelope	5
Hydrogen Thyratrons, Ceramic Envelope	6
Hydrogen Thyratrons, Metal Envelope	7
Hydrogen Thyratrons for Gas Laser Switching	8



Ignitrons – A.C. Resistance Welding

International letter size	Type	Single phase service			3-phase (frequency changing) service		
		Maximum demand (kVA)	Corresponding average anode current (A)	Maximum average anode current (A)	Maximum peak current (at 1500 V peak) (A)	Corresponding average anode current (A)	Maximum average current (at 1500 V peak) (A)
A	BK66/5550	300	12.1	22.4	–	–	–
B	BK448/5551A	600	30.2	56	480	4.0	18
B	BK492/7669	As BK448/5551A but with coaxial cathode terminal flange					
Uprated B	BK502	1000	43	75	–	–	–
C	BK484/5552A	1200	75.6	140	–	–	–
C	BK494/7671	As BK484/5552A but with coaxial cathode terminal flange					
C	BK5822A	–	–	–	1200	16	56
Uprated C	BK544	2300	110	180	–	–	–
Uprated C	BK518	As BK544 but with coaxial cathode terminal flange					
D	BK486/5553B	2400	192	355	2400	32	112
D	BK498/7673	As BK486/5553B but with coaxial cathode terminal flange					
Uprated D	BK482	3225	210	400	–	–	–

Ignitrons – Capacitor Discharge, Pulse Duty

International letter size	Type	Peak forward anode voltage max (kV)	Peak anode current max (kA)	Average anode current max (A)	Ampere-seconds per pulse max (A.s)
A	BK472 ◆	20	100	0.75	20
A	BK474 ▼	20	100	0.75	20
A	BK476 ■	20	100	0.75	20
A	BK508 ▶	50	100	0.75	20
A	BK514 ◆	50	100	0.75	20
	BK7703 Series ▶	25	100	0.75	30
C	BK506	25	100	10	50
D	BK488A BK488B	25	150	40	200
E	BK496	25	200	80	400

Ignitrons – Power Rectification and Control

International letter size	Type	Maximum ratings (at 900 V peak)			Ignitor requirements	
		Peak anode current (A)	Average continuous current (A)	Average current 1 minute (A)	Voltage required to fire (min) (V)	Current required to fire (min) (A)
C	BK504/5554	900	100	200	450	45
D	BK46/5555	1800	200	400	450	45

- ▼ For current reversal at reduced voltage and current.
- For zero current reversal.
- ▶ For use with high voltage and high current reversal.

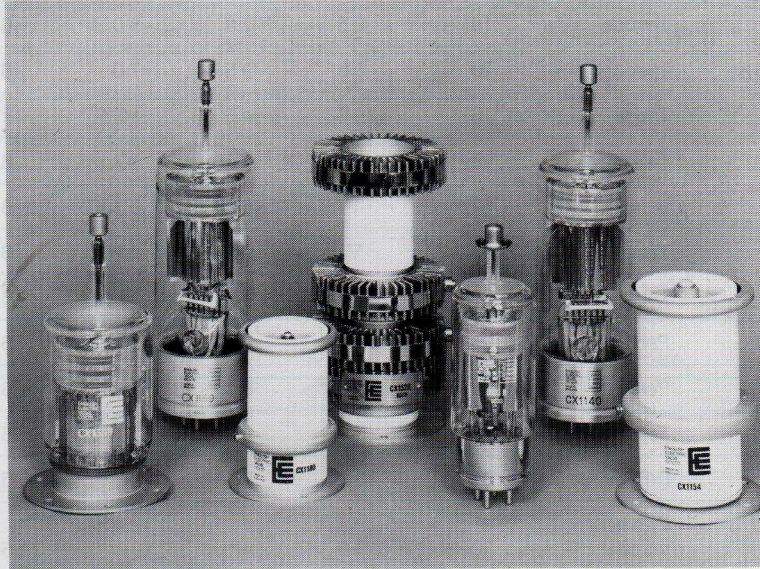
- ◆ For reduced degree of current reversal and switching applications.
- ‡ Reservoir operates from cathode heater supply.
- § Rugged.

- † Product of peak forward voltage, peak current and pulse repetition rate.
- * Near equivalent.
- Deuterium filled.

High Vacuum Rectifiers

Peak inverse voltage max (kV)	Type	Average anode current max (mA)	Peak anode current max (A)	Filament or heater		Base
				Voltage (V)	Current (A)	
20	3B24W (CV2858)	60	0.3	2.5/5.0	6.0/3.0	B4G
45	(CV2160) A207 (CV8051)	350	1.1	4.0	12	G.E.S.
65	A237 (CV482)	250	1.5	4.0	12	G.E.S.

A Group of Hydrogen Thyratrons



Hydrogen Thyratrons – Glass Envelope

Peak anode current max (A)	Type	Description	Peak forward voltage max (kV)	Average anode current max (A)	Peak output power (MW)	Heating (P _D) factor x 10 ⁹ max†	Reservoir voltage/current (V/A)	Heater voltage/current (V/A)
40	(CV372) FX227 (CV3629*)	Triode	3.0	0.05	0.06	0.36	‡	6.3/2.7
85	FX2530/6777	Triode	8.0	0.1	0.34	2.5	‡	6.3/3.0
100	FX2535§	Triode	10	0.1	0.5	2.8	‡	6.3/6.1
100	(CV1787) FX2505 (CV5247)	Triode	10	0.125	0.5	2.8	‡	6.3/6.1
200	CX1550	Tetrode	16	0.2	1.6	3.0	‡	6.3/6.1
325	6587§	Triode	16	0.225	2.0	3.9	‡	6.3/10.6
325	8503 (CV6022)§	Triode	16	0.25	2.6	3.9	‡	6.3/10.6
400	CX1191§	Tetrode	16	0.4	3.2	5.0	‡	6.3/12.5
500	CX1191A§	Tetrode	25	0.5	6.25	6.25	‡	6.3/12.5
500	CX1191D§•	Tetrode	35	0.5	8.0	8.0	‡	6.3/12.5
500	FX2519A/5949A	Triode	25	0.5	6.25	6.25	4.5/3.0	6.3/18.5
1000	CX1140 (CV8563)	Tetrode	25	1.25	12.5	9.0	‡	6.3/22
1000	CX1159 (CV9080)•	Tetrode	33	1.25	16.5	14	‡	6.3/22
1000	CX1551•	Tetrode	33	1.25	16.5	14	‡	6.3/22
1500	CX1559•	Tetrode	35	1.5	17.5	14	6.3/8.0	6.3/21.5
5000	CX1569•	Tetrode	35	1.25	–	14	‡	6.3/22
5000	CX1659•	Tetrode	35	1.5	–	14	6.3/8.0	6.3/21.5

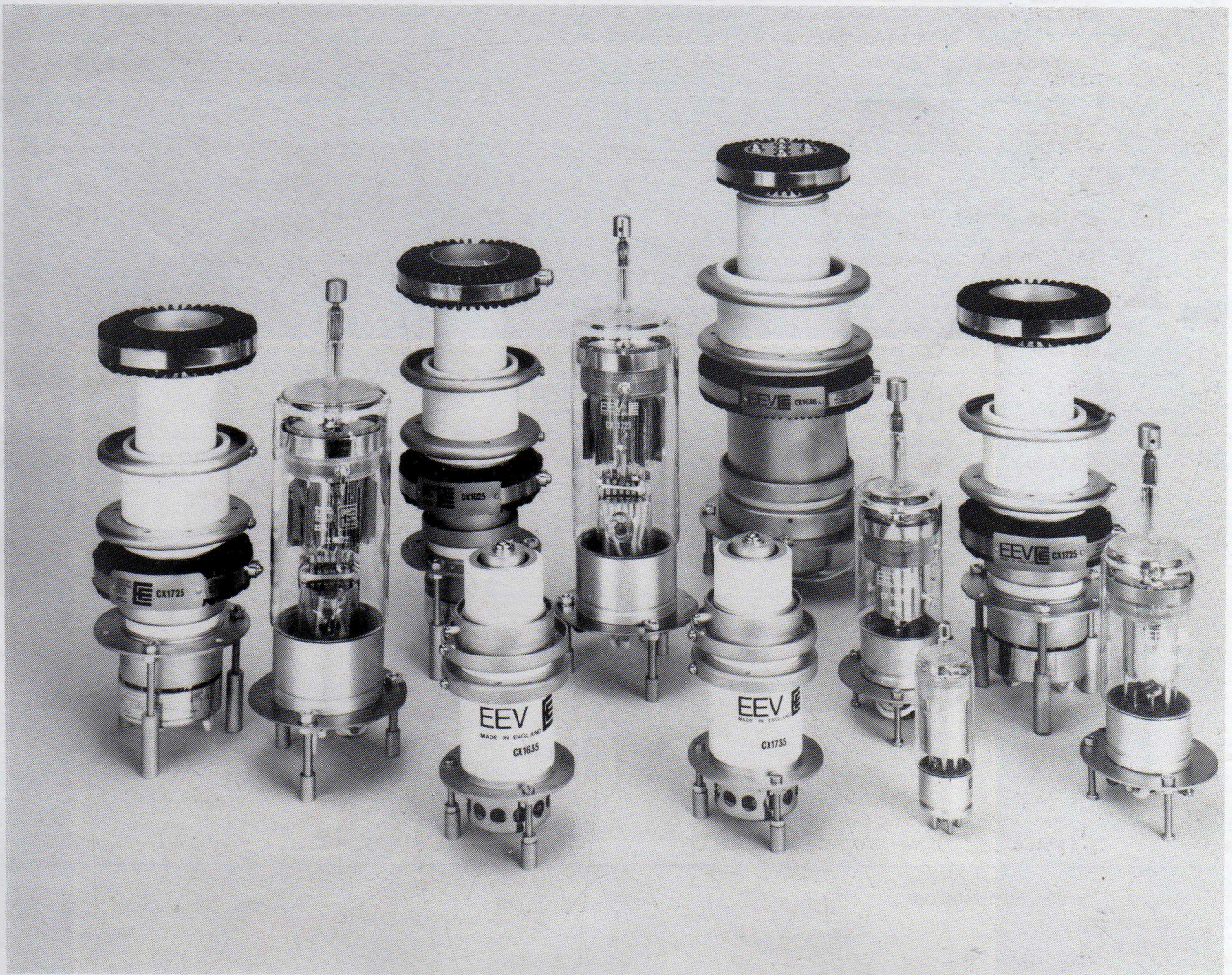
Hydrogen Thyratrons – Ceramic Envelope

Peak anode current max (A)	Type	Description	Peak forward voltage max (kV)	Average anode current max (A)	Peak output power (MW)	Heating (P _b) factor x 10 ⁹ max†	Reservoir voltage/current (V/A)	Heater voltage/current (V/A)
350	CX1164 §	Tetrode	12	0.5	2.1	7.0	6.3/1.5	6.3/7.5
350	FX2534/8765 §	Triode	12	0.2	2.1	4.0	‡	6.3/5.8
350	FX2533/HY61 §	Triode	16	0.5	4.0	5.0	‡	6.3/6.5
350	7665 §	Triode	16	0.5	4.0	5.0	6.3/2.0	6.3/4.3
350	7665A §	Triode	16	0.5	4.0	5.0	6.3/2.0	6.3/4.3
350	CX1621 §	Tetrode	16	0.5	2.8	5.0	6.3/2.0	6.3/4.3
350	CX1157 (CV6241) §	Tetrode	20	0.5	3.5	7.0	6.3/1.5	6.3/7.5
500	FX2522/8613 §	Triode	16	0.5	4.0	10	‡	6.3/10.6
500	CX1530 •	Tetrode	25	0.5	6.25	10	6.3/2.0	6.3/12
1000	CX1599	Tetrode	12.5	∇	6.25	0.125	6.3/1.5	6.8/8.5
1000	CX1588	Tetrode	25	∇	10	0.25	6.3/1.5	6.8/8.5
1000	CX1180 •	Tetrode	25	1.25	12.5	12.5	6.3/6.0	6.3/12
1000	CX1535	Pentode	25	1.0	12.5	500	6.3/6.0	6.3/16
1000	CX1535A	Pentode	18	1.0	8.0	15	6.3/6.0	6.3/16
3000	CX1154 •	Tetrode	40	3.0	50	30	5.0/7.0	6.3/21.5
3000	CX1154B •	D/E tetrode	35	3.0	50	30	5.0/7.0	6.3/21.5
3000	CX1668 •◇	Two gap tetrode	70	1.0	–	–	5.0/7.0	6.8/25
3000	CX1168 •	Two gap tetrode	80	3.0	100	70	5.0/7.0	6.3/21.5
3000	CX1168B •	D/E two gap	70	3.0	88	60	5.0/7.0	6.3/21.5
3000	CX1671 •◇	Three gap tetrode	105	1.0	150	70	5.5/7.0	6.8/25
3000	CX1671D •◇	Three gap tetrode	105	1.0	–	–	5.5/7.0	6.8/25
3000	CX1171 •	Three gap tetrode	120	3.0	150	70	5.0/7.0	6.3/21.5
3000	CX1171B •	D/E three gap	105	3.0	130	60	5.0/7.0	6.3/21.5
3000	CX1199 •	Four gap tetrode	160	3.0	200	70	5.0/7.0	6.3/21.5
3000	CX1199B •	D/E four gap	140	3.0	175	60	5.0/7.0	6.3/21.5
6000	CX1174 •	Tetrode	40	6.0	120	60	5.0/10	6.3/40
6000	CX1174B •	D/E tetrode	35	6.0	100	60	5.0/10	6.3/40
6000	CX1175 •	Two gap tetrode	80	6.0	200	140	5.0/10	6.3/40
6000	CX1175B •	D/E two gap	70	6.0	175	120	5.0/10	6.3/40
6000	CX1192 •	Three gap tetrode	120	6.0	360	140	5.0/10	6.3/40
6000	CX1192B •	D/E three gap	105	6.0	260	120	5.0/10	6.3/40
6000	CX1193 •	Four gap tetrode	160	6.0	400	140	5.0/10	6.3/40
6000	CX1193B •	D/E four gap	140	6.0	350	120	5.0/10	6.3/40
6000	CX1194B •	D/E five gap	160	6.0	–	–	5.0/10	6.3/40

Hydrogen Thyratrons – Metal Envelope – Pulse Service

Peak anode current max (kA)	Type	Cooling	Description	Peak forward voltage max (kV)	Average anode current max (A)	Peak output power (MW)	Heating (P _b) factor x 10 ⁹ max†	Reservoir voltage/current (V/A)	Heater voltage/current (V/A)
↔5.0	CX1526●	Oil	Tetrode	40	5.0	80	70	6.3/7.0	6.3/37.5
5.0	CX1528●	Air	Tetrode	40	5.0	80	70	6.3/7.0	6.3/37.5
5.0	CX1525●	Oil	Two gap tetrode	70	5.0	150	100	6.3/7.0	6.3/37.5
5.0	CX1525A●	Air	Two gap tetrode	50	5.0	100	100	6.3/7.0	6.3/37.5
10	CX1547●	Oil	Tetrode	40	15	200	200	6.3/7.0	6.3/90
10	CX1549●	Air	Tetrode	40	15	200	200	6.3/7.0	6.3/90
10	CX1536●	Oil	Two gap tetrode	70	10	350	300	6.3/7.0	6.3/90
10	CX1536A●	Air	Two gap tetrode	50	10	250	300	6.3/7.0	6.3/90
↔10	CX1736●◇	Oil	Two gap tetrode	70	10	250	300	6.3/7.0	6.3/90
↔10	CX1736A●◇	Air	Two gap tetrode	50	10	250	300	3.6/7.0	6.3/90

Hydrogen Thyratrons for Gas Laser Switching



† Product of peak forward voltage, peak current and pulse repetition rate.
● Deuterium filled.

‡ Reservoir operates from cathode heater supply.
§ Rugged.
◆ D/E indicates double ended.

▽ High rate of rise tube for Pockel cell applications.
↔ New type.
◇ Hollow anode.

Hydrogen Thyratrons for Gas Laser Switching

Typical peak anode current (kA)	Type	Description	Peak forward voltage max (kV)	Rate of rise of current (A/s)	Typical jitter (ns)	Typical pulse repetition rate (p.p.s.)	Reservoir voltage/current (V/A)	Heater voltage/current (V/A)
1.0	CX1635	Oil cooled metal/ceramic type for metal vapour lasers	20	10^{11}	3.0	6000	6.3/6.0	6.6/16
1.0	CX1735 ◇	Oil cooled metal/ceramic type for metal vapour lasers	20	10^{11}	3.0	6000	6.3/6.0	6.6/16
1.0	CX1735A ◇	Air cooled metal/ceramic type for metal vapour lasers	20	10^{11}	3.0	6000	6.3/6.0	6.6/16
4.0	CX1571 ◇	Ceramic type for N ₂ /CO ₂ lasers	20	10^{11}	1.0	100	6.3/2.0	6.3/12
5.0	CX1572 ◇	Ceramic type for N ₂ /CO ₂ lasers	25	10^{11}	1.0	100	6.3/6.0	6.3/12
5.0	CX1585	Glass type for small CO ₂ lasers	35	5×10^{10}	1.0	50	‡	6.8/12.5
5.0	CX1585A	Glass type for small CO ₂ lasers	40	5×10^{10}	1.0	50	‡	6.8/12.5
5.0	CX1622	Glass type for CO ₂ lasers	35	5×10^9	1.0	100	‡	6.3/22
5.0	CX1685	Glass type for small CO ₂ lasers	35	5×10^{10}	5.0	50	6.3/2.0	6.8/12
5.0	CX1685A	Glass type for small CO ₂ lasers	40	5×10^{10}	5.0	50	6.3/2.0	6.8/12
5.0	CX1722 ◇	Glass type for CO ₂ lasers	35	5×10^{10}	1.0	50	‡	6.3/22
5.0	CX1825	Oil cooled metal/ceramic type for metal vapour lasers	35	10^{10}	1.0	10 ⁴	6.3/7.0	6.6/37.5
10	CX1573C ◇	Ceramic type for excimer lasers	35	$>2 \times 10^{11}$	1.0	100	5.5/7.5	6.8/25
10	CX1666	Glass type for CO ₂ lasers	40	5×10^{10}	5.0	100	5.0/3.0	6.3/25
15	CX1625 ◇	Oil cooled high power metal/ceramic type for Cu vapour/excimer lasers	35	10^{11} for excimer 10^{10} for Cu vapour	1.0	500 for excimer 10^4 for Cu vapour	6.3/7.0	6.6/37.5
15	CX1625A ◇	High power metal/ceramic type for Cu vapour/excimer lasers	35	10^{11} for excimer 10^{10} for Cu vapour	1.0	500 for excimer 10^4 for Cu vapour	6.3/7.0	6.6/37.5
15	CX1574C ◇	Oil cooled ceramic type for excimer lasers	35	$>2 \times 10^{11}$	1.0	250	5.0/9.0	6.6/40
15	CX1725 ◇	Oil cooled metal/ceramic type for excimer lasers	70	$>3 \times 10^{11}$	1.0	5000	6.3/7.0	6.6/37.5
20	CX1636 ◆	Oil cooled metal/ceramic type for high power excimer lasers	35	10^{11}	2.0	10 ⁴	6.3/7.0	6.3/90

‡ Reservoir operates from cathode heater supply.

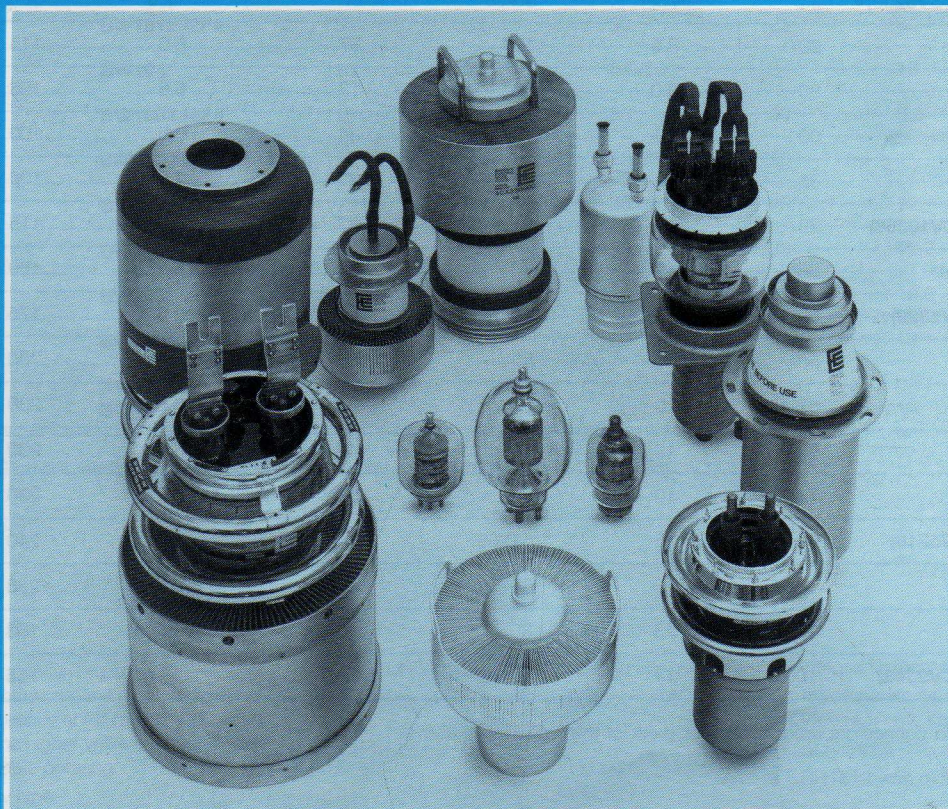
◇ Hollow anode.

◆ New type.

TRANSMITTING TUBES

Power Triodes, Glass Envelope	10
Power Triodes, Forced-air Cooled	10
Power Triodes, Water Cooled	11
Power Triodes, Vapour Cooled	12
Power Tetrodes, Glass Envelope	12
Pulse Tetrodes, Glass Envelope	13
Laser Control and Switching Tubes	13
Power Tetrodes, Forced-air Cooled	14
Power Tetrodes, Water Cooled	14
Power Tetrodes, Vapour Cooled	14

Transmitting
Tubes



Power Triodes – Glass Envelope

Anode dissipation max (W)	Type	Output power (kW)§	Anode voltage max (kV)	Frequency (MHz)★	Amplification factor	Filament ratings		Base
						(V)	(A)	
350	B1135● B1135A● ◊	1.2	4.0	100/150	25	5.0	14.1	B5F
500/1000‡	B1152●	1.5/2.4‡	5.0	50	24	5.0	32.5	Special 4-pin
800/1500‡	B1153●	2.7/4.6‡	6.0	50	22	6.3	32.5	Special 4-pin
800/1500‡	B1153B●	2.7/4.6‡	6.0	50	22	6.3	32.5	Ceramic 4-pin
800/1500‡	B1565●	2.7/4.6‡	7.0	50	41	6.3	32.5	Special 4-pin
800/1500‡	B1565A●	2.7/4.6‡	7.0	50	41	6.3	32.5	Ceramic 4-pin

Power Triodes – Forced-air Cooled

Anode dissipation max (kW)	Type	Output power (kW)§	Anode voltage max (kV)	Frequency (MHz)★	Amplification factor	Filament ratings	
						(V)	(A)
1.0	BR1167	—	2.0	30	12	6.0	10
1.5	BR1512● BR1512F● ◻ BR1512A● ◊ BR1512AF● ◊◻	2.7	5.5	250	20	6.3	33
2.5	BR1195● BR1195F● ◻	4.6	7.2	85/160 85	20	6.3	33
2.5	BR1587●	5.6	7.2	85/160	20	6.3	33
5.0	BR1160C (CV8730)	6.9	6.0	75/220	32	12.6	33
5.0	BR1165C (CV3926)	6.9	6.0	75/220	32	12.6	33
5.0	BR1196● BR1196F● ◻	8.8	7.2	85	20	6.3	66
5.0	BR1589F● ◻	8.8	7.2	85	20	6.3	66
5.0	BR1630F● ◻	8.8	7.2	85/150	20	6.3	66
6.0	BR1162C (CV5239)●	9.5	7.2	30/85	32	12.6	33
10	BR1124●	20	8.5	100	37	6.0	115
10	BR1610F● ◻	30	9.0	30	13	6.6	103
10	BR1606F● ◻	30	10	30	24	6.6	100
10	BR1607F● ◻	35	10	30	23	7.5	100
10	BR1122 (CV10368)	29	12	5.0/110	37	6.0	115
10	BR1617F● ◻	38	10	30	23	6.3	160
15	BR161 (CV2322)△	50	12	30/50	45	9.0	175
15	BR1121●	50	10	50	38	6.6	230
15	BR1182●	52	10	50	38	6.6	230
20	BR1102●	53	12	50	42	8.2	230
20	BR1183●	74	10	50	38	8.2	230
27	BR189 (CV5218)	80	15	5.0/50	34	9.0	240
30	BR1601F	100	13	30	40	8.2	238
30	BR1608F	100	13	30	40	12	163
35	BR1161 (CV9343)	100	14	10/30	90	11	155

Note Filament leads and grid connectors are available for most of the types listed above.

Power Triodes – Water Cooled

Anode dissipation max (kW)	Type	Output power (kW)§	Anode voltage max (kV)	Frequency (MHz)★	Amplification factor	Filament ratings		Cooler
						(V)	(A)	
2.5	BW1195●	4.6	7.2	85/160	20	6.3	33	BW4088A
	BW1195J3●			85/160				Integral
	BW1195J3F●□			85				Integral
5.0	BW1196●	8.8	7.2	85/150	20	6.3	66	BW4088B
	BW1196J3●			85/150				Integral
	BW1196J3F●□			85				Integral
	BW1196J3F1●□			85				Integral
6.0	BW1165CJ3	6.9	6.0	75/220	32	12.6	33	Integral
6.0	BW1162CJ3●	10	7.2	30/85	32	12.6	33	Integral
10	BW1124●	20	8.5	100	37	6.0	115	BW4029
	BW1124J1●							Integral
	BW1124J2●							Integral
10	BW1122	29	12	5.0/110	37	6.0	115	BW4070
15	BW1610J2F●□	30	9.0	30	13	6.6	100	Integral
15	BW1606J2F●□	30	10	30	24	6.6	100	Integral
15	BW1607J2F●□	35	10	30	23	7.5	100	Integral
15	BW1617J2F●□	38	10	30	23	6.3	160	Integral
15	BW1121●	50	10	50	38	6.6	230	BW4034
	BW1121J1●							Integral
	BW1121J2●							Integral
15	BW1182J1●	52	10	50	38	6.6	230	Integral
	BW1182J2●							
20	BW1102●	53	12	50	42	8.2	230	BW4028
	BW1102J2●							Integral
20	BW1176J2●	82	10	20	38	8.2	230	Integral
20	BW1515J2F●□	78	10	20	18.5	8.2	230	Integral
35	BW189■	80	15	5.0/50	34	9.0	240	BW4050
40	BW1183J2S●	74	10	50	38	8.2	230	Integral
40	BW1605J2F●□	70	10	30	20.5	8.2	230	Integral
40	BW1612J2F●□	75	12	30	25	8.2	240	Integral
50	BW194	115	15	5.0/30	34	13	240	BW4027
50	BW1601J2F●□	115	13	30	40	8.2	238	Integral
50	BW1161	120	14	10/30	90	11	155	BW4215
50	BW1608J2F●□	115	13	30	40	12	163	Integral
80	BW1184J2●	150	14.4	30	30	12.2	255	Integral
120	BW1185J2●	240	16.8	30	41	12.6	380	Integral
200	BW1602J2F●□	400	18	30	35	18	330	Integral
200	BW1609J2●	400	17	30	35	16	440	Integral
	BW1609J2F●□							

Note Filament leads and grid connectors are available for most of the types listed above.

★ Frequency: The lower value indicates the maximum operating frequency at full rating. Operation at the higher value is possible with suitable derating.

■ New type.

§ Under Class C unmodulated conditions.

◇ Increased anode-grid capacitance.

● Recommended for industrial heating service.

□ Integral filament leads.

△ Maintenance type, not recommended for use in new equipment.

‡ Duty factor 0.2, averaging time 5 s.

◆ BR1512 with mounting flange.

Power Triodes – Vapour Cooled

Anode dissipation max (kW)	Type	Output power (kW)§	Anode voltage max (kV)	Frequency (MHz)★	Amplification factor	Filament ratings		Cooler
						(V)	(A)	
10	BY1124	20	8.5	100	37	6.0	115	BY4048A‡
10	BY1122	29	12	5.0/110	37	6.0	115	BY4048A‡
18	BY1121■	50	10	50	38	6.6	230	BY4063‡
25	BY1102	53	12	50	42	8.2	230	Separate
35	BY189A■	80	15	5.0/50	34	9.0	240	Separate
50	BY194■	115	15	5.0/30	34	13	240	BY4049‡
60	BY1161	120	14	10/30	90	11	155	Separate
80	BY1184J●	120	14.4	30	30	12.2	255	Integral
125	BY1144L□	200	14	27	34	9.6☆	290☆	BY4060‡

Note Filament leads and grid connectors are available for most of the types listed above.



Power Triodes BR1601F (left), B1153B (centre) and BR1196 (right)

Power Tetrodes – Glass Envelope

Anode dissipation max (W)	Type	Output power (W)§	Anode voltage max (V)	Frequency (MHz)★	Amplification factor (g1-g2)	Filament or heater		Base
						(V)	(A)	
2 x 10	C1134 (CV2799)††	48◆	600	150/600	8.0	12.6 6.3	0.65 1.3	B7A
2 x 10	C1534††	48◆	600	150/600	8.0	28 14	0.3 0.6	B7A
2 x 20	C178A/ 5894 (CV2797)††	90◆	600	250/500	8.0	12.6 6.3	0.9 1.8	B7A
125	C1108 (CV2130)	375	3000	120/200	6.2	5.0	6.5	B5F
250	C1112 (CV2131)	1000	4000	75/120	5.1	5.0	14.1	B5F
400	C1136 (CV5959)	1100	4000	110	5.1	5.0	14.5	B5F

★ Frequency: The lower value indicates the maximum operating frequency at full rating. Operation at the higher value is possible with suitable derating.

§ Under Class C unmodulated conditions.

■ Made to special order only.

▲ Higher power levels can be achieved with positive grid drive.

†† VHF double beam tetrode.

◆ With 2 sections in push-pull.

◇ Improved X-ray shielding.

▼ Equivalent to 4PR60C.

➤ New type.

● Recommended for industrial heating service.

‡ Single unit, separate condenser required.

□ Integral filament leads.

☆ Per section.

Pulse Amplifier Tetrodes – Glass Envelope

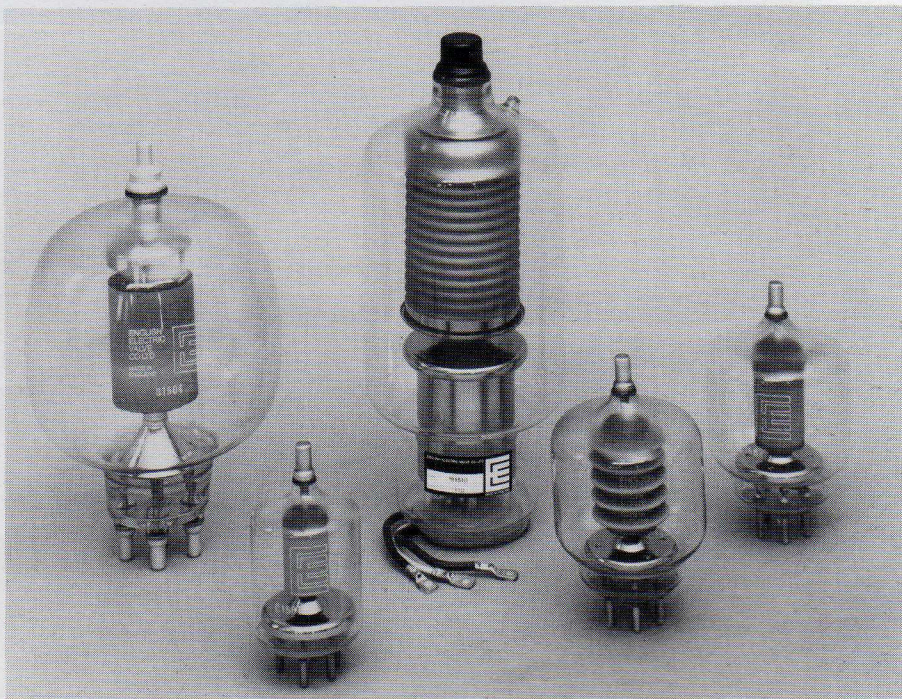
Pulse output power (kW)	Type	Anode dissipation max (W)	Anode voltage max d.c. (kV)	Pulse anode current max (A)	Heater ratings		Base
					(V)	(A)	
130	C1148	40	14	12	6.3	5.0	B5F
205	C1150/1 (CV427)	60	17.5	15	26	2.15	B4A
205	C1166 (CV10404)	60	17.5	15	6.3	9.0	B5F
330	C1149/1 (CV6131)	60	20	18	26	2.15	B4A
330	C1149A ◊	60	20	18	26	2.15	B4A
330	C1149B ▼	60	20	18	26	2.15	B4A

Laser Control and Switching Tubes

Triodes and tetrodes for laser control, high voltage switching for X-ray tubes, electron beam welding etc.

Anode dissipation max (W)	Type	Description	Typical power to load ▲		Anode voltage max d.c (kV)	Filament ratings		Base
			100% duty (kW)	10% duty (kW)		(V)	(A)	
125	C1581	Tetrode	0.16	2.4	12	5.0	6.5	B5F
250	C1582	Tetrode	0.34	5.1	20	5.0	14.1	B5F
400	C1583	Tetrode	0.70	8.9	20	5.0	14.5	B5F
500	C1583A	Tetrode	0.80	14	30	5.0	14.5	B5F
500	B1634A	Triode	0.80	7.0	30	5.0	14.5	B5F
800	B1584	Triode	2.0	2.0	25	6.3	32.5	4-pin
1000	C1632	Tetrode	4.0	51	35	7.5	20	5-pin special
	C1632A		4.0	51	45			
1000	B1592	Triode	–	–	100	12.6	29	Coaxial
1200	B1510	Triode	–	–	70	5.5–10	27–35	Flying leads
1200	B1510A	Triode	–	–	80	10	18.5	Flying leads
2500	BR1629	Triode	5.75	–	30	6.3	33	Flying leads

A Group of Laser Control Tubes



Power Tetrodes – Forced-air Cooled

Anode dissipation max (kW)	Type	Output power (kW)§	Anode voltage max (kV)	Frequency (MHz)★	Amplification factor (g1-g2)	Filament ratings		Cooler
						(V)	(A)	
1.5	CR1502	2.4▽	4.0	260	16	4.2	53	–
4.5	CR2327	0.5¶	5.0	1000	7.0	6.0	34	–
4.5	CR2347	0.5¶	5.0	1000	7.0	6.0	34	–
5.0	4CX5000A (CV8295)	16	7.5	30/110	4.5	7.5	75	–
5.0	4CX5000R/8170W	16	7.5	100/110	4.5	7.5	75	–
6.0	CR1613	10.5▽	8.5	260	7.5	6.3	120	–
10	4CX10,000D (CV6184)	16	7.5	30/110	4.5	7.5	75	–
12	4CX10,000J	10	7.5	100	4.5	7.5	103	–
12	CR1501	13▽	9.0	260	8.5	8.0	120	–
12.5	CR2382	5.25¶	6.5	1000	7.5	4.0	125	–
15	4CX15,000A	36.5	10	110	4.5	6.3	160	–
35	4CX35,000C (CV11107)	82.5	20	30	4.5	10	300	–

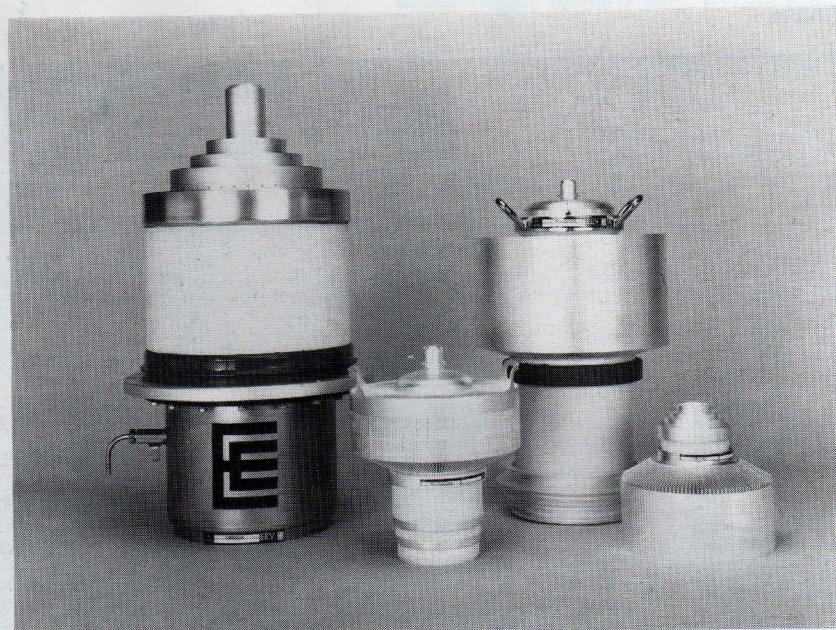
Power Tetrodes – Water Cooled

10	4CW10,000A	16	7.5	30/110	4.5	7.5	75	Integral
25	4CW25,000A	36.5	10	110/225	4.5	6.3	160	Integral
75	CW1600J2	82.5	15	30	4.5	10	300	Integral
300	CW1603J2	305*	15	100	4.3	18	430	Integral

Power Tetrodes – Vapour Cooled

75	CY1170J	82.5	15	30	4.5	10	300	Integral
100	CY1637	82.5	20	30	4.5	10	300	Separate
150	CY1172	220*	15	30	4.0	20	340	CY4120

Power Tetrodes, including CW1603J2 (left) and CR2382 (right)



★ Frequency: The lower value indicates the maximum operating frequency at full rating. Operation at the higher value is possible with suitable derating.

§ Under Class C unmodulated conditions.

* Class C, anode and screen modulated.

☛ New type.

▽ Class B service.

¶ Linear amplifier, TV transmitter or translator.

VACUUM CAPACITORS

Variable Capacitors, Glass Envelope	page 16
Variable Capacitors, Ceramic Envelope	18
Variable Capacitors, Forced-air Cooled	19
Variable Capacitors, Water Cooled	19
Fixed Capacitors, Glass Envelope	19
Fixed Capacitor, Water Cooled	19
Fixed Capacitors, Ceramic Envelope	20



High Vacuum Variable Capacitors – Glass Envelope

Capacitance range (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (A.r.m.s.)	Shaft turns in range	Mounting flange	Overall diameter max. (mm)
5.0–30	U30/15/20	15	20	10.4	Integral	54.1
8.0–50	U50/15/30	15	30	10.4	Integral	69.9
4.0–50	U50/20/40	20	40	22	MA52, MA164	83.8
6.0–60	U60/30/75	30	75	35	MA54, MA125A	109.5
4.0–75	U75/15/40	15	40	22.5	MA52, MA164	83.8
16–80	U80/15/40	15	40	10.4	Integral	83.8
16–90	U90/15/40	15	40	10.4	Integral	83.8
7.0–100	U100/20/40	20	40	22.5	MA52, MA164	83.8
8.0–100	U100/25/75	25	75	35	MA54, MA125A	109.5
7.0–150	U150/15/40	15	40	23.5	MA52, MA164	83.8
10–150	U150/25/75	25	75	36	MA54, MA126	130.2
5.0–200	U200/10/40	10	40	23.5	MA52, MA164	83.8
7.0–200	U200/15/40	15	40	24	MA52, MA164	83.8
7.0–200	U200/15/40A	15	40	24	MA52, MA125	83.8
10–200	U200/20/75	20	75	35.5	MA54, MA125A	109.5
5.0–250	U250/10/40J	10	40	Pull rod	Integral, MA125A	90.7
5.0–250	U250/10/40JA	10	40	22.5	MA52, MA125	90.7
10–250	U250/15/75J	15	75	25	MA126, MA522☆	108.3
7.0–300	U300/10/40	10	40	23	MA52, MA164	83.8
10–300	U300/15/40	15	40	22.5	MA52, MA164	95.3
11–300	U300/20/75	20	75	36	MA54, MA126	130.2
11–300	U300/20/75A	20	75	36	MA54, MA126	130.2
7.0–400	U400/10/40	10	40	23.5	MA52, MA164	83.8
7.0–400	U400/10/40A	10	40	23.5	MA52, MA164	83.8
5.0–500	U500/3/40J	3.0	40	19	Integral, MA281	62.3
5.0–500	U500/5/40J	5.0	40	19	Integral, MA281	62.3
10–500	U500/10/40	10	40	23.5	MA52, MA164	83.8
10–500	U500/10/40A	10	40	23.5	MA52, MA125	83.8
12–500	U500/15/75	15	75	36	MA54, MA125A	109.5
12–500	U500/15/75A	15	75	36	MA54, MA125	109.5
12–500	U500A/10/40J	10	40	22.5	MA52, MA125	90.7
12–500	U500A/10/40JA	10	40	22.5	MA52, MA125	90.7
12–500	U500A/10/40JB	10	40	Pull rod	Integral, MA125A	90.7
15–500	U500A/15/75J	15	75	25.5	2 MA126☆	130.0
12–600	U600/10/40	10	40	23.5	MA52, MA164	95.3
5.0–650	U650/3/40	3.0	40	19	Integral, MA281	62.3
5.0–650	U650/3/40A	3.0	40	Pull rod	Integral, MA281	60.3
15–750	U750/10/40	10	40	23	MA52, MA164	95.3
15–750	U750/10/40A	10	40	35.5	MA52, MA164	95.3
15–770	U750/10/40B	10	40	36.5	MA52, MA125	95.3
10–750	U750/10/75J	10	75	27	MA54, MA125A	114.3
20–750	U750/15/75	15	75	36.5	MA54, MA126	130.2

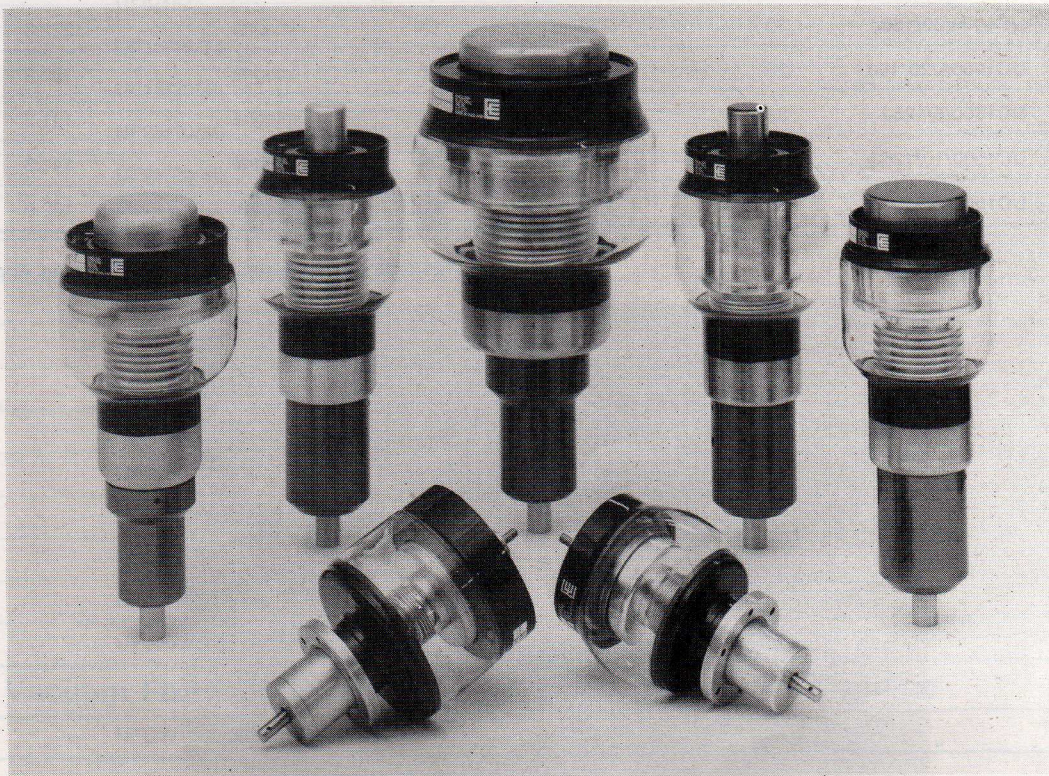
☆ Supplied with the capacitor.

† 21 turns over extended range.

High Vacuum Variable Capacitors – Glass Envelope continued

Capacitance range (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (A.r.m.s.)	Shaft turns in range	Mounting flange	Overall diameter max. (mm)
7.0–1000	U1000/3/40	3.0	40	15.5	MA52, MA296	77.8
7.0–1000	U1000/3/40A	3.0	40	15.5	MA52	77.8
7.0–1000	U1000/3/40C	3.0	40	15.5	MA52, MA296	77.8
20–1000	U1000/10/75J	10	75	36	MA54, MA125A	101.6
7.0–1000	U1000A/3/40JB	3.0/6.0	58	18	MA52, MA296	77.8
7.0–1000	U1000A/3/40JD	3.0/6.0	58	18†	MA52, MA296	77.8
7.0–1000	U1000A/3/40JE	3.0	58	Pull rod	Integral, MA296	77.8
7.0–1000	U1000A/3/40JF	3.0/6.0	58	18†	MA52, MA296	77.8
12–1000	U1000A/10/75J	10	75	31	MA54, MA125A	114.3
15–1200	U1200/10/75J	10	75	35	MA54, MA125A	114.3
15–1200	U1200/10/75JB	10	75	Pull rod	Integral, MA125A	114.3
25–1500	U1500/8/75	8.0	75	36	MA54, MA126	130.2
10–2000	U2000/3/40	3.0	40	32	MA52, MA125	77.8
10–2000	U2000/3/40B	3.0	40	Pull rod	MA100, MA125	77.8
11–2000	U2000/3/40C	3.0	40	32	MA52, MA125	77.8
50–2000	U2000/8/75J	8.0	75	33	MA54, MA126	130.2
50–2000	U2000/8/75JA	8.0	75	35	MA54, MA126	130.2
50–2000	U2000B/8/75JC	8.0	75	Pull rod	Integral, MA126	131.8
50–2100	U2100/8/75	8.0	75	33.5	MA54, MA126	130.2
12–3000	U3000/3/40J	3.0	40	27	MA52, MA125	90.5
15–3000	U3000/3/40JA	3.0	40	Pull rod	MA100A, MA125	90.5
12–3000	U3000/3/40JB	3.0	40	27	Integral, MA125A	90.5

Vacuum Capacitors

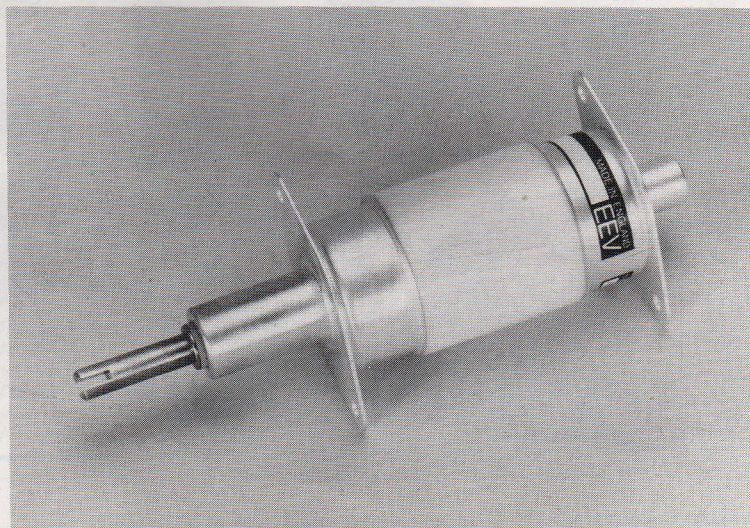


A group of Glass Envelope Variable Capacitors

High Vacuum Variable Capacitors – Ceramic Envelope

Capacitance range (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (A.r.m.s.)	Shaft turns in range	Mounting flange	Overall diameter max. (mm)
3.0–30	UC30/10/20♦	10	20	16	–	34.0
25–90	UC90/5/25♦	5.0	22	13	Integral	54.0
5.0–125	UC125/5/25♦	5.0	25	15.5	Integral	54.0
5.0–125	UC125/5/25B♦	5.0	25	15.5	–	34.0
5.0–125	UC125/5/25C♦	5.0	25	15.5	Integral	54.0
4.0–250	UC250/5/40J♦	5.0	40	15.5	Integral	54.0
15–250	UC250/25/125J	25	125	26	Integral	141.3
10–250	UC250/30/150J	30	150	55	Integral	193.0
10–250	UC250/30/150JD	30	150	55	Integral	193.0
25–450	UC450/25/125J	25	125	37	Integral	141.3
25–450	UC450/30/150J	30	150	42	Integral	193.0
25–450	UC450A/30/150	30	150	52	Integral	193.0
5.0–500	UC500/3/45J♦	3.0	45	20	Integral	61.0
5.0–500	UC500/3/45JA♦	3.0	45	29	Integral	61.0
5.0–500	UC500/5/45J♦	5.0	45	20	Integral	61.0
5.0–500	UC500/5/45JA♦	5.0	45	29	Integral	61.0
30–650	UC650/30/150J	30	150	56	Integral	193.0
20–750	UC750/20/150J	20	207	44.5	Integral	182.9
20–750	UC750/20/150JA	20	207	Pull rod	Integral	182.9
24–1000	UC1000/10/125J	10	125	24	Integral	115.9
30–1000	UC1000/15/125	15	125	39.5	Integral	141.3
35–1000	UC1000/20/150J	20	150	50	Integral	182.9
35–1000	UC1000/20/150JA	20	150	Pull rod	Integral	182.9
40–1000	UC1000/30/150J	30	270	64	Integral	222.0
60–1000	UC1000A/20/150	20	150	56	Integral	182.9
35–1500	UC1500/8/125J	8.0	125	24	Integral	141.3
35–1500	UC1500/10/125J	10	125	24	Integral	141.3
100–1500	UC1500/20/150J	20	240	63	Integral	182.9

Capacitor UC125/5/25 for Magnetic Resonance Imaging Applications



High Vacuum Variable Capacitors – Ceramic Envelope continued

Capacitance range (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (A.r.m.s.)	Shaft turns in range	Mounting flange	Overall diameter max. (mm)
100–2000	UC2000/20/150J	20	253	65	Integral	208.3
50–2300	UC2300/8/125J	8.0	125	35	Integral	141.3
50–2300	UC2300/8/125JB	8.0	125	Pull rod	Integral	141.3
50–2300	UC2300/10/125J	10	125	35	Integral	141.3
◆ 50–3000	UC3000/3/125J	3.0	125	19	Integral	115.9
50–5000	UC5000/6/200	6.0	200	46	Integral	182.9

High Vacuum Variable Capacitors – Forced-air Cooled, Ceramic Envelope

35–1000	UCA1000/20/250	20	280	50	Integral	182.9
100–2000	UCA2000/20/275	20	462	Pull rod	Integral	208.3
50–5000	UCA5000/6/230	6.0	230	Pull rod	Integral	182.9

High Vacuum Variable Capacitors – Water Cooled, Ceramic Envelope

10–250	UCW250/30/500	30	666	55	Integral	183.0
30–650	UCW650/30/500	30	800	52	Integral	193.0
◆ 30–870	UCW870/30/500	30	690	Pull rod	Integral	222.0
85–1000	UCW1000/30/500A	30	700	25.4	Integral	222.0
◆ 85–1000	UCW1000/30/500C	30	700	25.4	Integral	222.0
30–1200	UCW1200/20/500	20	800	52.3	Integral	182.9

High Vacuum Fixed Capacitors – Glass Envelope

Capacitance (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (A.r.m.s.)	Mounting flange	Overall diameter max. (mm)
6.25	UF6/15/7	15	7.0	–	34.9
10	UF10/15/7J	15	7.0	–	34.9
12	UF12/20/40	20	40	MA281 or MA282	58.9
25	UF25/10/40	10	40	MA164	57.2
25	UF25/20/40	20	40	MA281 or MA282	58.9
50	UF50/10/40	10	40	MA164	57.2
50	UF50/20/40	20	40	MA281 or MA282	58.9
75	UF75/10/40	10	40	MA164	57.2
100	UF100/10/40	10	40	MA164	57.2
150	UF150/10/40	10	40	MA164	57.2
250	UF250/8/40	8.0	40	MA164	57.2
300	UF300/10/50	10	50	MA125	88.9
300	UF300/15/75	15	75	MA125	101.6
500	UF500/10/50	10	50	MA125	88.9
750	UF750/8/75	8.0	75	MA125	101.6
1000	UF1000/8/75	8.0	75	MA125	101.6

High Vacuum Fixed Capacitor – Water Cooled, Ceramic Envelope

1000	UFCW1000/30/375	30	560	Integral	193.0
------	------------------------	----	-----	----------	-------

◆ New type.

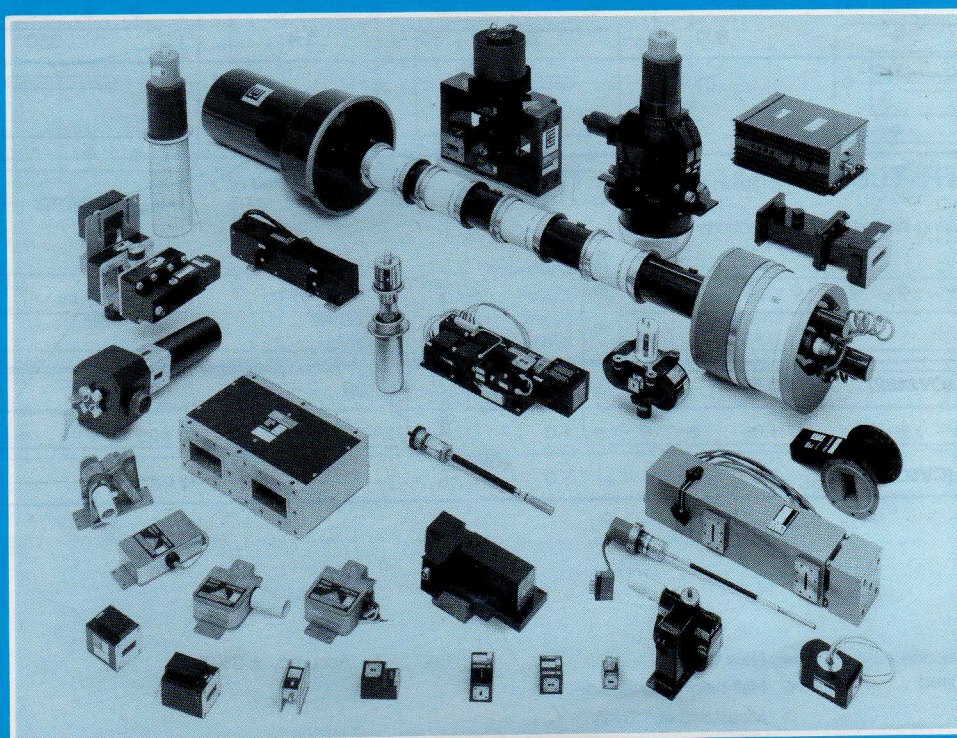
◆ Made from non-magnetic materials; suitable for M.R.I. applications.

High Vacuum Fixed Capacitors – Ceramic Envelope

Capacitance (pF)	Type	Peak r.f. working voltage max. (kV)	R.F. current max. (Ar.m.s.)	Mounting flange	Overall diameter max. (mm)
6.5	UFC6/30/140J	30	140	Integral	72.2
12	UFC12/30/140J	30	140	Integral	72.2
12	UFC12/32/100	32	100	—	61.7
12	UFC12/36/140J	36	140	Integral	72.2
16	UFC16/32/100	32	100	—	61.7
18.5	UFC18/30/140J	30	140	Integral	72.2
25	UFC25/30/140J	30	140	Integral	72.2
25	UFC25/32/100	32	100	—	61.7
25	UFC25/36/140J	36	140	Integral	72.2
28	UFC28/36/140J	36	140	Integral	72.2
30	UFC30/36/140J	36	140	Integral	72.2
34	UFC34/30/140J	30	140	Integral	72.2
40	UFC40/30/140J	30	140	Integral	72.2
43	UFC43/30/140J	30	140	Integral	72.2
50	UFC50/30/140J	30	140	Integral	72.2
50	UFC50/32/100	32	100	—	61.7
50	UFC50/36/140J	36	140	Integral	72.2
76	UFC76/30/120J	30	120	Integral	90.5
100	UFC100/24/100	24	100	—	61.7
100	UFC100/30/120J	30	120	Integral	90.5
150	UFC150/15/140	15	140	Integral	72.2
350	UFC350/15/125J	15	125	Integral	115.8
450	UFC450/12/125J	12	125	Integral	115.8
450	UFC450/15/125J	15	125	Integral	115.8
450	UFC450/30/200J	30	200	Integral	152.4
500	UFC500/12/125J	12	125	Integral	115.8
500	UFC500/15/125J	15	125	Integral	115.8
700	UFC700/15/125	15	125	Integral	141.3
750	UFC750/15/125	15	125	Integral	141.3
1000	UFC1000/15/125	15	125	Integral	141.3
1000	UFC1000/20/200	20	200	Integral	182.3
1000	UFC1000/30/200J	30	340	Integral	193.0
1000	UFC1000A/12/125J	12	125	Integral	115.8
1000	UFC1000A/15/125J	15	125	Integral	115.8
1300	UFC1300/20/200	20	200	Integral	182.9
1500	UFC1500/20/200	20	200	Integral	182.3
2000	UFC2000/20/200J	20	200	Integral	208.3

MICROWAVE DEVICES

Receiver Protection	page 22
Filters	32
R.F. Heads	33
Ferrite Devices	35
Terminations	35
Couplers and Pressure Windows	36
Waveguide Switches	37
Noise Generators	38
Monitor Diodes	39
Amplifier Klystrons	40
Dupletrons	42
Magnetrons	42
Travelling Wave Tubes	50



Broadband Solid State Devices

Frequency (GHz)	Type	Bandwidth (MHz)	Peak power (kW)	Mean power (W)	Attenuation (dB)	Insertion loss (dB)	V.S.W.R.	Recovery period to -1 dB (ns)
Coaxial PIN Switches								
↔ 0.3-0.6	B3CP98-- ▽	100	2.0	50	40	0.3	1.5	-
↔ 0.6-1.0	B3CP98-- ▽	100	2.0	50	20	0.2	1.5	-
↔ 1.0-2.0	B3CP98-- ▽	15%	2.0	10	30	0.2	1.5	-
Microstrip PIN Switches								
↔ 1.0-4.0	B3SP9801	-	-	5.0	60	1.0	1.7	100
↔ 2.0-18	B3SP9802	-	-	3.5	60	2.5	2.0	100
Microstrip S.T.C. PIN Attenuators								
↔ S-Band	B3SP9803	15%	-	5.0	0-60*	1.2	1.5	150

Solid State Two-way Switches

Frequency	Bandwidth	Peak power (kW)	Mean power (W)	V.S.W.R.	Switching time (μs)	Leakage (mW)	Insertion loss (dB)
↔ S-Band	10%	10	30	1.4	1.5	50	0.6
↔ C-Band	10%	10	20	1.4	1.0	50	0.7
↔ J-Band	5%	1.0	10	1.4	60ns	100	0.8
↔ Q-Band	5%	1.0W	0.1	1.5	50ns	1.0	1.8

Integrated Microwave Packages

Frequency	Type	Bandwidth	Peak power		Mean power		R.F. leakage (mW)	V.S.W.R.	Insertion loss (dB)	Recovery period to -1 dB (ns)
			Active (W)	Passive (W)	Active (W)	Passive (W)				
↔ X-Band	B3IM16-- ▽	7%	400k	10k	200	5.0	2.0	1.4	1.0	0.08
↔ J-Band	B3IM1830	5%	-	800	-	6.0	20	1.4	1.2	350

Broadband Pre-TR Tubes

Low loss, plug-in tubes requiring no external connections

Frequency range (MHz)	Type	Maximum peak power (MW)	Maximum mean power (kW)	Maximum breakdown power (kW)	Maximum recovery period to -3 dB (μs)
2000-12000	BS838 (CV2482)	0.5	0.5	20	8.0
2000-12000	BS138	1.0	1.0	20	25
2000-12000	BS834 (CV6028)	2.5	3.0	20	25

▽ The full type number will depend on the characteristics required.
 †† Twin tube.

↔ New type.
 ☆ Half height waveguide.
 □ Measured at 1.0 kW.

* Accuracy ± 3%.

L-Band Primerless Pre-TR and Protector Tubes

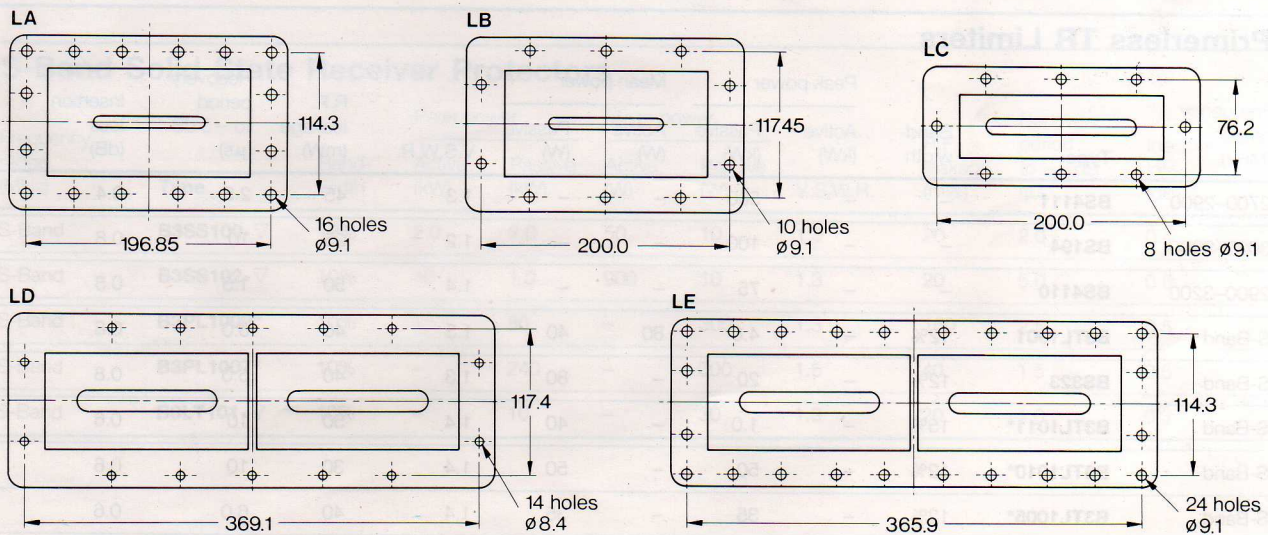
Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)	Length (mm)	Flanges (see below)
			Spike (nJ/pulse)	Total (W)					
1215-1370	BS874	1000	700	1.7	1.25	0.4	5.0□	160	LA
1230-1365	BS876	10	23000	30	1.25	0.7	10	Coaxial	Type N
1250-1350	BS128 ☆	2500	2000	20	1.25	0.4	20	160	LC
1250-1350	BS875	1000	700	1.7	1.25	0.4	5.0	160	LA
1250-1350	BS910 ††	2500	100	0.3	1.3	0.5	20	160	LE
1240-1365	BS872	10	700	1.7	1.25	0.3	20	160	LB
1240-1370	BS870	2500	-	-	1.25	0.4	35	160	LB
1200-1415	BS854	15	1000	2.0	1.4	0.4	20	160	LB
1315-1370	BS4912 ††	5000	100	0.02	1.2	0.35	25	88.9	LD

L-Band Solid State Receiver Protectors

Frequency range (MHz)	Type	Peak power		Mean power		R.F. leakage (mW)	V.S.W.R.	Insertion loss (dB)	Recovery period to -1 dB (μ s)
		Active (kW)	Passive (kW)	Active (W)	Passive (W)				
1250-1350	B3LT0601	-	500	-	500	100	1.25	0.4	2.0
1250-1350	B3LT0602	-	12	-	500	40	1.25	0.4	2.0
1250-1350	B3SS0610 ☆	20	-	1000	-	100	1.25	0.3	4.0
1250-1350	B3SS0605 ☆	2.0	10	200	1.0	50	1.25	0.3	1.0
1250-1350	B3PN0603	20	-	1000	-	100	1.25	0.3	4.0

Drive circuitry is normally integrated within the device and can include built-in test (BITE) facilities, if required.

L-Band Flanges



S-Band Receiver Protectors

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)	Length (mm)	Flanges (see page 25)
			Spike (nJ/pulse)	Total (mW)					
Primerless Pre-TR and Protector Tubes									
2700-3100	BS824	250	600	900	1.25	0.4	15	51.3	SA
2700-3100	BS832	250	600	900	1.25	0.4	15	51.3	SF
2700-3100	BS846	250	600	900	1.25	0.4	15	51.3	SG
2700-3100	BS916^{††}	2000	10	20	1.25	0.4	20	50.0	SM
2700-3100	BS848	250	600	900	1.25	0.4	15	50.8	SB
2700-3100	BS4172	150	2000	2500	1.3	0.4	10	76.2	SC
2700-3200	BS172	250	600	900	1.25	0.4	15	50.8	SC
2700-3300	BS833	250	600	900	1.25	0.4	15	50.8	SF
2900-3230	BS990^{††}	1300	-	-	-	0.6	90	42.0	SN
3100-3500	BS171	250	600	900	1.25	0.4	15	50.8	SC

Primed TR Tubes

2700-2900	BS324	1250	25	100	1.2	1.0	25	128.9	SA
2750-2860	BS104 (CV2181)	1250	25	100	1.2	1.0	25	128.9	SA
2670-2960	BS58	500	30	70	1.3	0.5	15	167.9	SI/J
2840-3100	BS800	1250	25	100	1.2	0.8	15	113.4	SA
2925-3075	BS390 (CV9442)	1250	25	100	1.33	1.0	25	113.5	SG
2900-3200	BS110	100	30	130	1.35	1.0	5.0	139.5	SI/J

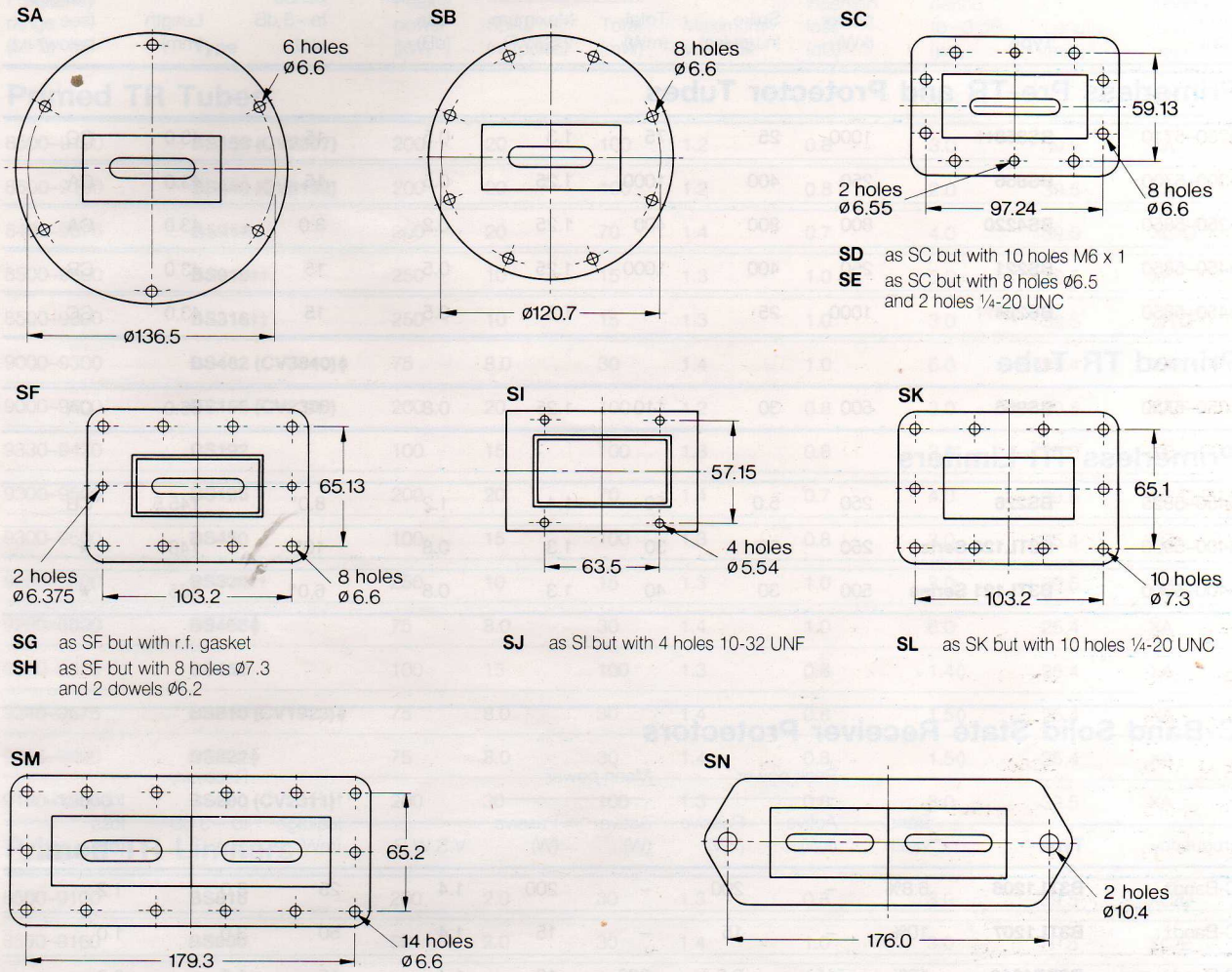
Primerless TR Tubes

3020-3080	BS894^{◆●}	1000	15	60	1.2	0.5	10	55.0	SK
3020-3080	BS994^{◆●}	1000	10	60	1.2	0.8	10	55.0	SK

Primerless TR Limiters

Frequency range (MHz)	Type	Bandwidth	Peak power		Mean power		V.S.W.R.	R.F. leakage (mW)	Recovery period to -3 dB (μ s)	Insertion loss (dB)
			Active (kW)	Passive (kW)	Active (W)	Passive (W)				
2700-2900	BS4111	-	-	500	-	-	1.3	45	2.5	0.4
3020-3080	BS194	-	-	100	-	-	1.2	25	10	0.8
2900-3200	BS4110	-	-	75	-	-	1.4	50	1.5	0.8
S-Band	B3TL1001	12%	-	4.0	80	40	1.3	40	6.0	0.8
S-Band	BS323	12%	-	20	-	80	1.3	40	6.0	0.8
S-Band	B3TL1011*	15%	-	1.0	-	40	1.4	50	10	0.6
S-Band	B3TL1010*	12%	-	50	-	50	1.4	30	10	0.6
S-Band	B3TL1005*	12%	-	35	-	35	1.4	40	6.0	0.6
S-Band	B3TL1012[☆]	4%	-	800	-	800	1.4	100	10	0.5

S-Band Flanges (Where input and output differ, the input is given first in the tables)



S-Band Solid State Receiver Protectors

Frequency range (MHz)	Type	Band-width	Peak power		Mean power		V.S.W.R.	R.F. leakage (mW)	Recovery period to -3 dB (μs)	Insertion loss (dB)
			Active (kW)	Passive (kW)	Active (W)	Passive (W)				
↖ S-Band	B3SS100 -∇	12%	2.0	2.0	50	10	1.3	20	2.0	0.4
↖ S-Band	B3SS102 -∇	10%	40	1.0	900	10	1.3	20	5.0	0.6
↖ S-Band	B3PL1002 *	10%	-	80	-	300	1.3	150	2.5	0.5
↖ S-Band	B3PL1007 *	10%	-	240	-	300	1.5	40	1.5	0.5
↖ S-Band	B3LT101 -∇	10%	-	10	-	30	1.3	20	1.0	0.3

†† Twin tube.

↖ New type.

◆ Tunable marine radar.

● Primerless.

* Sensitivity time control (S.T.C.).

☆ Measured on a T-junction.

∇ The full type number will depend on the characteristics required.

C-Band Receiver Protectors

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)	Length (mm)	Flanges (see below)
			Spike (nJ/pulse)	Total (mW)					
5250-5710	BS858 ††	1000	25	75	1.3	0.5	15	43.0	CC
5300-5700	BS856	250	400	1000	1.25	0.5	15	43.0	CA
5250-5850	BS4220	800	200	400	1.25	0.2	3.0	43.0	CA
5450-5850	BS221	250	400	1000	1.25	0.5	15	43.0	CB
5450-5850	BS224 ††	1000	25	-	1.3	0.5	15	43.0	CC

Primed TR Tube

5250-5750	BS966	500	30	110	1.25	0.8	10	65.0	CA
-----------	--------------	-----	----	-----	------	-----	----	------	----

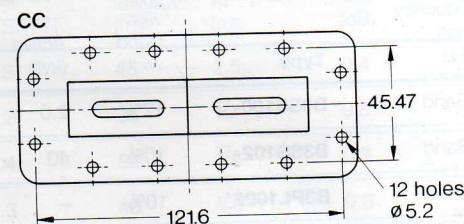
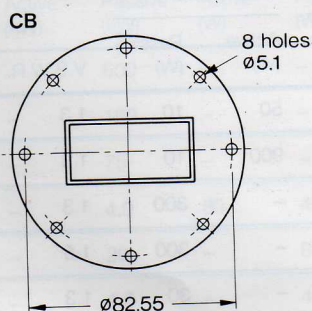
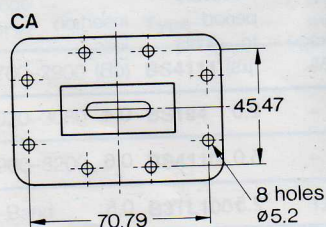
Primerless TR Limiters

5450-5825	BS226	250	5.0	50	1.4	1.2	8.0*	145.5	CB
5400-5900	B3TL120 Series	250	30	30	1.3	0.8	10*	146	★
5400-5900	B3TL121 Series	500	30	40	1.3	0.8	6.0*	165	★

C-Band Solid State Receiver Protectors

Frequency	Type	Bandwidth	Peak power		Mean power		V.S.W.R.	R.F. leakage (mW)	Recovery period to -3 dB (μ s)	Insertion loss (dB)
			Active (kW)	Passive (kW)	Active (W)	Passive (W)				
C-Band†	B3TL1206	6.8%	-	200	-	200	1.4	25	8.0	1.2
C-Band†	B3TL1207	10%	-	15	-	15	1.4	50	3.0	1.0
C-Band†	B3PS1210	10%	15‡	0.5	360	12	1.4	15	5.0	0.8
C-Band	B3PL12-- ∇	13%	-	100	-	400	1.25	20	1.5	0.4
C-Band	B3SS12-- ∇	10%	12‡	12	150	50	1.25	20	0.7	0.6
C-Band	B3LT12-- ∇	13%	-	2.0	-	50	1.25	10	0.5	0.4

C-Band Flanges



†† Twin tube.

‡‡ Twin tube, E-plane.

** Two primers.

★ Available with various flanges.

◇ To -6 dB.

▣ New type.

◆ Tunable marine radar.

† Preset to customers' requirements.

∇ The full type number will depend on the characteristics required.

* Sensitivity time control (S.T.C.).

‡ Fault powers of up to 10 dB in excess of these levels can occur. A reverse power trip can be specified for these devices, to interrupt a TWT transmission or to prevent transmission in the case of a magnetron system. Drive circuitry is normally integrated within the device and can include built-in test (BITE) facilities, if required.

X-Band Receiver Protectors

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)	Length (mm)	Flanges (see page 29)
			Spike (nJ/pulse)	Total (mW)					
Primed TR Tubes									
8500-9100	BS158 (CV2307)	200	20	100	1.2	0.8	3.0	39.5	XA
8500-9100	BS440 (CV6132)	200	20	100	1.2	0.8	2.0	39.5	XA
8490-9578	BS914	200	20	70	1.4	0.7	4.0	39.5	XC/D
8500-9600	BS918^{††}	250	10	15	1.3	1.0	3.0	39.5	XF
8500-9600	BS316^{††}	250	10	15	1.3	1.0	3.0	39.5	XF/G
9000-9300	BS462 (CV3840)♦	75	8.0	30	1.4	1.0	6.0	25.4	XA
9000-9600	BS156 (CV2306)	200	20	100	1.2	0.8	3.0	39.5	XA
9330-9420	BS192	100	15	100	1.3	0.8	3.0	26.8	XC
9300-9500	BS196	200	20	70	1.4	0.7	4.0	39.5	XC/D
9300-9500	BS450	100	15	100	1.3	0.8	3.0	25.4	XC
9200-9600	BS320^{††}	250	10	15	1.3	1.0	3.0	39.5	XH
9200-9600	BS466♦	75	8.0	30	1.4	1.0	6.0	25.4	XA
9310-9510	BS452	100	15	100	1.3	0.8	1.4◊	25.4	XA
9245-9575	BS810 (CV1923)♦	75	8.0	30	1.4	0.8	1.5◊	25.4	XA
9405-9690	BS822♦	75	8.0	30	1.4	0.8	1.5◊	25.4	XA
9180-10000	BS200 (CV2311)**	200	30	100	1.3	0.8	3.0	39.5	XA

Primed TR Limiters

8500-9100	BS816	200	2.0	30	1.3	0.8	3.0	39.5	XC/D
8590-9160	BS950	50	2.0	30	1.4	1.0	3.0	39.5	XC/E
9000-9500	BS969	50	3.0	30	1.3	1.0	3.0	50.0	XC/D
9000-9500	BS975^{‡‡}	150	3.0	30	1.3	1.0	3.0	50.0	XJ/K
9000-9500	BS977	Matched pair of BS969 and BS975 for use in monopulse radars.							
9300-9390	BS882	20	5.0	50	1.4	0.8	4.0	39.5	XC
9000-9700	BS814	200	2.0	30	1.3	0.8	3.0	39.5	XC/D
9345-9405	BS962	200	2.0	30	1.3	0.8	3.0	39.5	XC/B
9300-9500	BS830	200	2.0	30	1.3	0.7	3.0	39.5	XC/D
9250-9550	BS908♦	75	2.0	20	1.4	1.0	6.0	39.5	XC
9310-9510	BS454	200	2.0	30	1.3	0.8	3.0	39.5	XA/D
9500-9700	BS826 (CV6207)	200	1.2	30	1.3	0.8	3.0	39.5	XC

Primerless Pre-TR and Protector Tubes

8950-9350	BS228	250	600	1000	1.4	0.5	2.0	25.0	XC
7000-11500	BS956	0.1	-	300	-	0.5	70	20.0	XA
8500-10000	BS928	200	600	1000	1.4	0.8	2.0	25.0	XC
8500-10000	BS930^{††}	200	5.0	20	1.4	0.8	2.0	25.0	XI
8500-10000	BS970^{‡‡}	150	5.0	30	1.4	0.8	2.0	25.0	XJ

X-Band Receiver Protectors continued

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)	Attenuation (dB)	Length (mm)	Flanges (see page 29)
			Spike (nJ/pulse)	Total (mW)						
Primerless TR Limiters										
MARINE BAND										
9300-9500	BS206	100	10	30	1.4	1.0	3.0	-	39.5	XC/D
9300-9500	BS256	100	5.0	20	1.4	0.8	1.5	-	53.4	XC/D
9300-9500	BS260	100	5.0	20	1.4	0.8	1.5	-	53.4	XC
9300-9500	BS262	100	5.0	20	1.4	0.8	1.5	-	53.4	XA/E
9300-9500	BS958	100	5.0	20	1.4	0.8	1.5	-	53.4	XA/C
9300-9500	BS260D	100	3.0	20	1.4	1.2	1.5	-	53.4	XC
9300-9500	BS958D	100	3.0	20	1.4	1.2	1.5	-	53.4	XA/C
9300-9500	BS951	100	3.0	20	1.4	1.2	1.5*	0-28 min	53.4	XA/C
9300-9500	BS4120	100	3.0	20	1.4	0.8	1.5	-	34.8	XC
9300-9500	BS4121	100	3.0	20	1.4	0.8	1.5*	0-28 min	34.8	XC
9300-9500	BS4122	100	3.0	20	1.4	0.8	1.5	-	39.5	XC
9300-9500	BS4123	100	3.0	20	1.4	0.8	1.5	-	39.5	XC/D
9300-9500	BS4124	100	3.0	20	1.4	0.8	1.5	-	39.5	XD/C

BROADBAND - Bandwidths up to 1.5 GHz in the band 8.5 - 10.5 GHz are available to customer specification.

8500-9600	BS4150	50	2.0	20	1.4	0.7	1.0	-	39.5	XD
8500-9600	BS4151 ††	100	2.0	20	1.4	0.7	1.0	-	39.5	XG
8500-9600	BS4160	200	10	50	1.4	0.8	1.0	-	39.5	XE
8500-9600	BS4161 ††	400	10	50	1.4	0.8	1.0	-	39.5	XL
8500-9600	BS4162	200	2.0	20	1.4	0.8	1.0	-	54.0	XE
8500-9600	BS4163 ††	400	2.0	20	1.4	0.8	1.0	-	54.0	XL

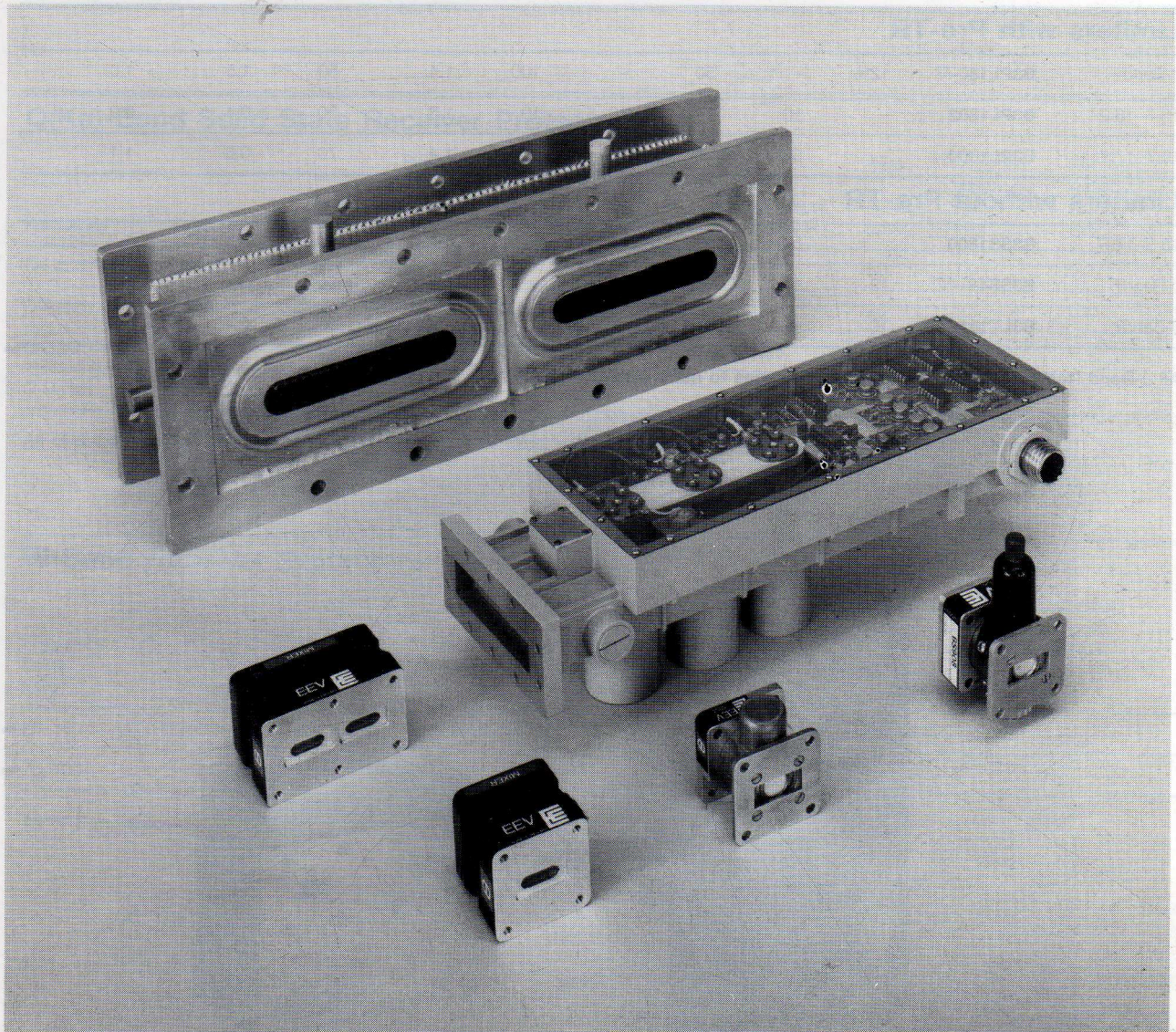
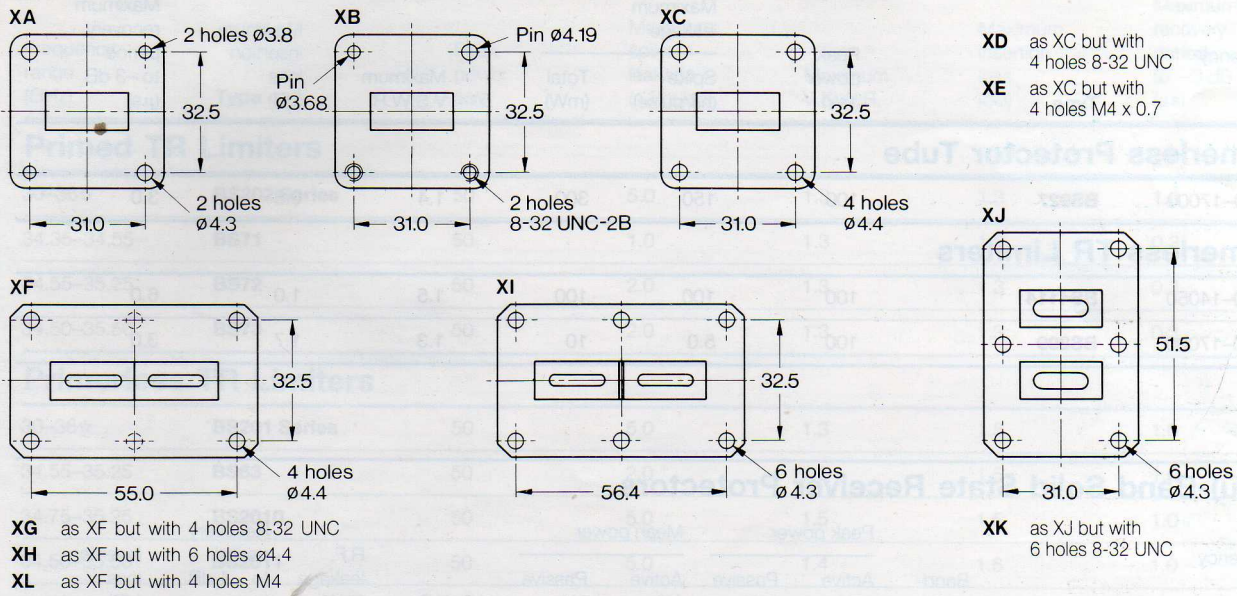
S.T.C. PRECISION STEP ATTENUATORS

8900-9400	BS4106 ☆	200	2.0	20	1.4	1.2	1.0	0-45	83.8	XD
8900-9400	BS4306 ☆	200	2.0	20	1.4	1.0	1.0	0-60	83.8	XD
9345-9405	BS4107	200	2.0	20	1.4	1.0	1.0	0-45	58.0	XD
9000-9500	BS4108	50	2.0	20	1.4	1.0	1.0	0-60	71.0	XC/E

Solid State X-Band Receiver Protectors

Type	Bandwidth	Peak power		Mean power		V.S.W.R.	R.F. leakage (mW)	Recovery period to -3 dB (μ s)	Insertion loss (dB)	Length (mm)
		Active (kW)	Passive (kW)	Active (W)	Passive (W)					
B3LT16 --∇	12%	-	10	-	30	1.4	50	1.0	0.7	50.8
B3PL160 -∇	12%	-	100	-	100	1.4	50	1.0	0.7	67
B3PL1601	12%	-	12	-	500	1.4	20	0.7	0.7	67
B3SS1616	7%	2.0	0.1	400	1.0	1.4	5.0	0.25	0.8	60
B3SS165 -∇	7%	10	10	50	10	1.4	20	0.7	0.7	50
B3SS166 -∇	5%	5.0	0.1	200	1.0	1.4	5.0	0.2	0.8	60

X-Band Flanges (where input and output differ, the input is given first in the tables)



A Group of Receiver Protectors

- * Sensitivity Time Control (S.T.C.).
- ▣ New type.
- ☆ Integral noise source.
- ▽ The full type number will depend on the characteristics required.
- †† Twin tube, H-plane.

Microwave Devices

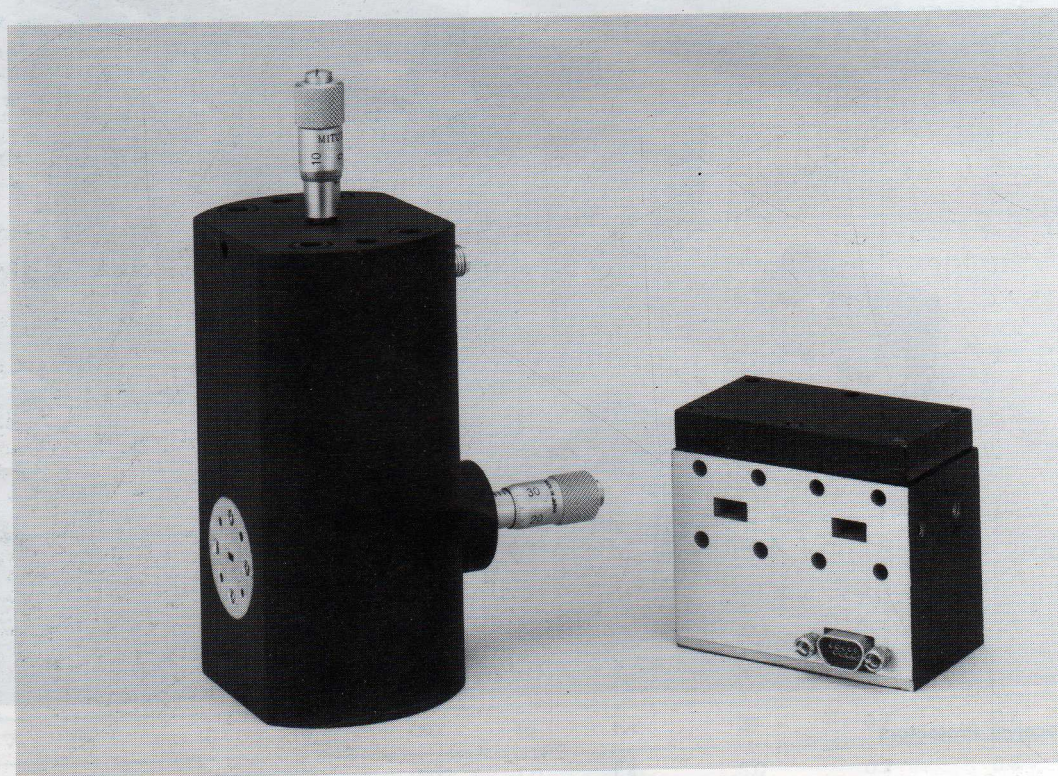
J(Ku)-Band Receiver Protectors

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)
			Spike (nJ/pulse)	Total (mW)			
Primerless Protector Tube							
16000-17000	BS927	100	150	300	1.4	0.8	3.0
Primerless TR Limiters							
13650-14050	BS4114	100	100	100	1.5	1.0	6.0
16500-17000	BS299	100	5.0	10	1.3	1.7	3.0

J(Ku)-Band Solid State Receiver Protectors

Frequency range (GHz)	Type	Band-width	Peak power		Mean power		V.S.W.R.	R.F. leakage (mW)	Recovery period to -1 dB (μ s)	Insertion loss (dB)
			Active (kW)	Passive (kW)	Active (W)	Passive (W)				
Limiters with Pre-TR										
J-Band†	B3PL180-∇	12%	-	50	-	100	1.4	50	1.5	1.0
15.7-16.2	B3PL1802	-	10	10	10	10	1.3	50	0.4	0.9
15.7-17.7	B3PL1800	-	5.0	5.0	5.0	5.0	1.4	70	0.5	1.1
Limiters without Pre-TR										
15.5-17.5	B3SS1800	-	3.0	500	75	5.0	1.4	50	0.3	1.2
J-Band†	B3SS18--∇	12	10	-	150	-	1.4	50	0.75	1.0
J-Band†	B3LT181-∇	10	-	1.0	-	10	1.4	50	0.4	1.0

All J-Band Receiver Protectors have plain flanges to mate with UG-419/U.



W-band Gunn Oscillator (left)
Q-band Solid State Dual Receiver Protector (right)

Q(Ka)-Band Receiver Protectors

Frequency range (GHz)	Type	Peak power (kW)	Maximum spike leakage (nJ/pulse)	Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)
Primed TR Limiters						
30-36☆	BS202 Series	50	5.0	1.3	1.3	1.0
34.35-34.55	BS71	50	1.0	1.3	1.3	0.3
34.55-35.25	BS72	50	2.0	1.3	1.3	0.3
34.50-35.50	BS73	50	2.0	1.3	1.3	0.3
Primerless TR Limiters						
30-36☆	BS201 Series	50	5.0	1.3	1.5	1.0
34.55-35.25	BS63	50	2.0	1.5	1.5	1.0
34.75-35.25	BS2010	50	5.0	1.5	1.5	1.0
34.50-35.50	BS2011	50	5.0	1.4	1.6	1.0
34.50-35.50	BS2012	50	5.0	1.5	1.5	1.5

Q(Ka)-Band Solid State Receiver Protectors

Frequency	Type	Band-width	Peak power		Mean power		Maximum V.S.W.R.	Peak r.f. leakage (mW)	Maximum insertion loss (dB)	Recovery period to -3 dB (μ s)
			Active (kW)	Passive (W)	Active (W)	Passive (W)				
Q-Band†	BS66	3%	-	1000	-	10	1.2	50	1.0	0.2
Q-Band†	BS68	3%	10	100	12	2.0	1.4	25	1.5	0.4
Q-Band†	BS75	2%	10‡	-	100	-	1.25	50	1.3	0.1
Q-Band†	B5SS222-∇	10%	1.0‡	-	100	-	1.4	100	2.5	0.1

All Q-Band Receiver Protectors have plain flanges to mate with UG-599/U.

W-Band Receiver Protectors

Frequency range (GHz)	Type	Peak power (kW)	Maximum spike leakage (nJ/pulse)	Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to -3 dB (μ s)
75-100☆	BS209-∇	2.0	0	1.5	2.0	0.1
75-100☆	BS2095	6.0	10	1.5	2.5	0.4

All W-Band Receiver Protectors mate with UG-387/U.

∇ The full type number will depend on the characteristics required.

† Preset to customers' requirements.

☆ Bandwidth 1 GHz.

➤ New type.

‡ Fault powers of up to 10 dB in excess of these levels can occur. A reverse power trip can be specified for these devices, to interrupt a TWT transmission or to prevent transmission in the case of a magnetron system. Drive circuitry is normally integrated within the device and can include built-in test (BITE) facilities, if required.

Tunable Cavity Filters

Frequency range (MHz)	Type	Waveguide size	Q factor	Used with tube type
S-Band	B7FR1052	WG10	—	Any
9255–9565	BS888	WG16	240	BS810

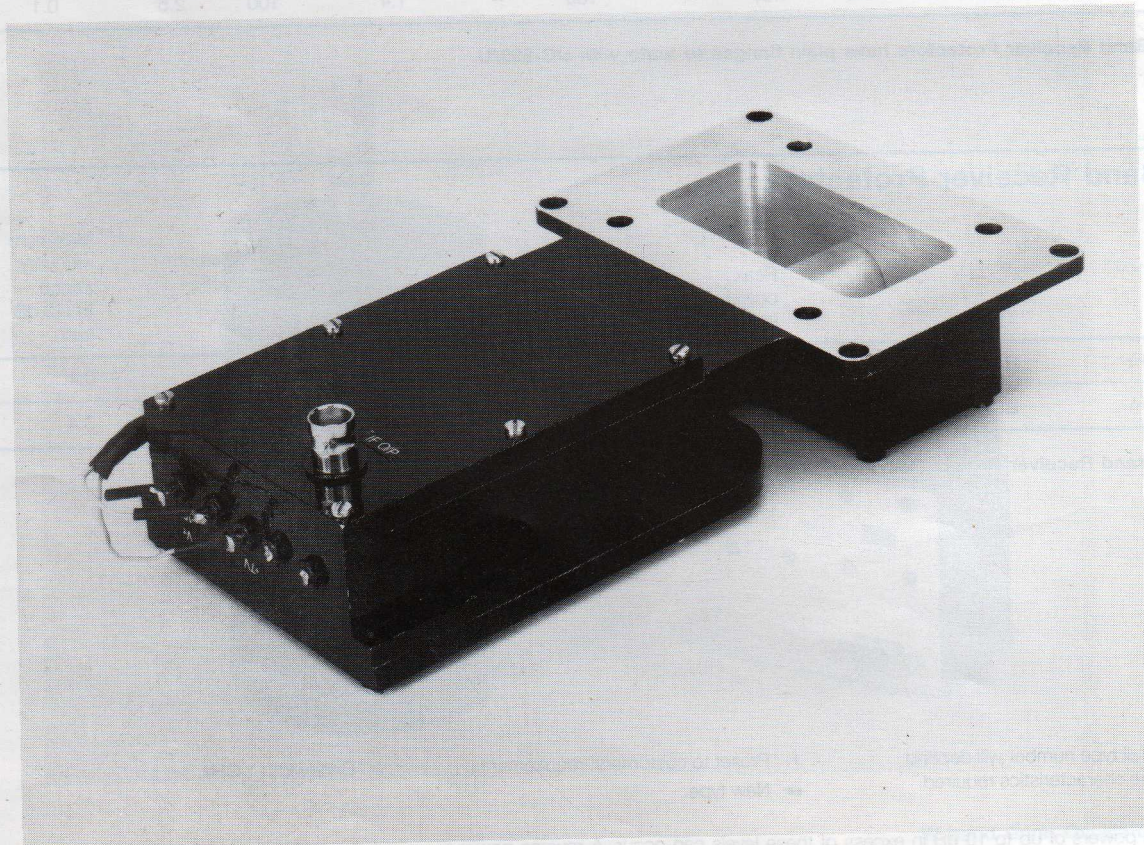
Low Pass Filters

Pass band (MHz)	Type	Waveguide size	Rejection band (MHz)	Typical rejection (dB)
2700–3100	B7FR1001	WG10	5400–11000	50
5200–5900	B7FR1201	WG12	10000–18000	50
8500–9000	B7FR1601	WG16	9800–18000	20
9000–9600	B7FR1602	WG16	10800–13000	50

Band Pass Filters

Frequency range	Bandwidth	Waveguide size	Insertion loss (dB)	Minimum rejection (dB)
S-Band	up to 10%	WG10	< 1.0	30
C-Band	up to 10%	WG12	< 1.0	30
X-Band	up to 10%	WG16	< 1.0	30
J-Band	up to 10%	WG18	< 1.0	30

S-band Low Noise Receiver B7RX1000



R.F. Heads

EEV supplies a range of compact r.f. heads in the frequency range 1.0 to 18 GHz, for applications ranging from marine radar to sophisticated military systems. The r.f. head can be supplied complete with magnetron, duplexer (conventional 'T', balanced or circulator), TR limiter or solid state protector, balanced or single-ended mixer, local oscillator (Gunn diode or transistor, depending on frequency) and i.f. amplifier. A.F.C. and a.g.c. facilities can be included if required. Waveguide and coaxial output are available.

All systems are designed by EEV to meet customers' specific requirements and are delivered fully assembled and tested.

High Power R.F. Heads

Frequency	Type	Peak power (kW)	Maximum pulse duration (μ s)	Maximum duty cycle
S-Band	BS1008	700	1.0	0.001
C-Band	BS1009	700	1.0	0.001
X-Band	BS1024	200	1.0	0.001

Marine R.F. Heads

Typical noise figures of 9 dB can be obtained with point contact mixer diodes. Low noise mixer diodes can give noise figures down to 7.5 dB.

Frequency (MHz)	Type	Magnetron	Power (kW)	Duplexer	TR tube	Limiter	Mixer	Local oscillator
3040-3060	BS1002	MG5223	30	BS748	BS894	BS169	BS583	BS305
3040-3060	B3RH1000 series	MG5223	30	BS1074	solid state protector		BS589	BS311
9300-9500	B3RH1600 series	up to 25 kW	up to 25	waveguide or coaxial	solid state protector	*	*	B3LO1600 series

Marine Duplexer Limiters

Frequency (MHz)	Type	Magnetron	Power (kW)	Duplexer	Protector
9300-9500	B3DL1600 series	up to 25 kW	up to 25	waveguide or coaxial	solid state

Low Noise Receiver Systems

Low noise receiver systems, suitable for use with marine and other radars, have been developed at S-, C- and X-band.

A typical S-band unit consists of a waveguide input feeding a coaxial low pass filter, followed by a two-stage active or passive limiter, then a low noise GaAs FET amplifier. A double balanced image rejection mixer and an electronically tunable local oscillator complete the assembly. The i.f. output at 60 MHz typically has a noise figure of 2.5 dB, overall gain of 6 dB and input gain compression point of -5 dBm.

Low Noise Receivers with I.F. Pre-amplifiers, Logarithmic Amplifiers and A.F.C.

Complete front end systems including i.f. preamplifier, logarithmic amplifier with up to 100 dB dynamic range and a.f.c., are being developed as integrated assemblies. The a.f.c. is a digital design capable of locking within 1 MHz on pulses containing as few as two cycles of i.f. waveform, and with a low noise output even on pulse durations down to 50 ns. Lock indication is also provided, which can be used as a tuning indicator if the a.f.c. is not used. The complete system can offer a noise figure of less than 3 dB; i.f. preamplification and bandwidth specifications can be tailored to customer requirements.

☛ New type.

* The duplexer, TR tube, limiter and mixer are integral units.

Marine Local Oscillators

Centre frequency (MHz)	Type	Output power max (mW)	Tuning range		Input supplies		Temp. coefficient (kHz/°C)	Flange (see page 29)
			Mechanical (GHz)	Electrical (MHz)	L.O. (V)	Varactor (V)		
9370	B3LO1642	10	9.32–9.42	±55	–10.5	–1 to –12	–450	Special
9400	B3LO1610	15	9.2–9.7	±50	+9.0	+5 to +45	–300	XC
9470	B3LO1601	10	9.2–10.0	±50	+9.0	+1 to +12	–300	Special
9470	B3LO1602	10	9.2–10.0	±50	+9.0	+1 to +12	–300	Special

Marine Limiters

Frequency range (MHz)	Type	Peak power (kW)	Maximum leakage		Maximum V.S.W.R.	Maximum insertion loss (dB)	Maximum recovery period to –3 dB (μs)	Length (mm)	Flanges (see pages 25 & 29)
			Spike (nJ/pulse)	Total (mW)					
3030–3080	B3LT1003	25	10	50	1.4	1.0	–	100	SK/H
3030–3080	BS169	25*	4.0	50	1.4	0.5	–	32.9	SK/H
8800–9200	B3LT1608	8.0	5.0	50	1.4	1.0	1.0	53.4	XC
8825–9225	B3LT1630	30	10	50	1.5	1.0	1.0	66.7	XC
9300–9425	B3LT1605	10	5.0	25	1.4	0.8	2.0	39.5	XC
9345–9405	B3LT1623	30	10	50	1.3	1.0	1.0	53.4	XC
9300–9500	B3LT1601	25	5.0	50	1.4	1.0	1.0	53.4	XC
9300–9500	B3LT1602	25	5.0	50	1.4	1.0	1.0	53.4	XC
9300–9500	B3LT1610	5.0	10	50	1.4	1.0	0.5	35.0	XC
9300–9500	B3LT1625	25	5.0	50	1.4	1.0	1.0	53.4	XC

Local Oscillators

Centre frequency (MHz)	Type	Output power max (mW)	Input supplies		Tuning range		Current max (mA)	Oscillator type
			L.O. max (V)	Varactor (V)	Mechanical (MHz)	Electrical (MHz)		
2990	B3LO9801	20	–24	0 to –12	±25	±10	60	Transistor
2990	B3LO9803	20	–24	0 to –12	±50	±100	60	Transistor
3110	B3LO9802	20	+12	0 to +12	±25	±10	60	Transistor
3110	B3LO9804	20	+12	0 to +12	±50	±100	60	Transistor
9200–9500	B3LO9810	20	+10	0 to +10	–	±150	150	Gunn
13000	B3LO1803	5.0	+7.0	–	±100	–	150	Gunn
13700	B3LO1801	20	+9.5	+1.0 to +8.5	–	±70	400	Gunn
13700	B3LO1804	40	+9.5	+1.0 to +8.5	–	±25	450	Gunn
13700	B3LO1805	5.0	+7.0	+1.0 to +14	–	±100	200	Gunn

☛ New type.

* When used with BS894 TR tube.

† Lightweight isolator with integral 5 W load. All circulators listed are available with additional loads if required.

☆ Lightweight, 4-port circulator, also available with similar specification anywhere within J-band frequency range. High peak power versions also available.

★ The power handling capability quoted is for unpressurized waveguide with fan assisted cooling or with heat sink. Higher power handling capability is possible with improved cooling.

‡ Return loss typically improves by 3 dB over temperature range 0 °C to +50 °C.

Ferrite Devices

A range of junction circulators is available, designed for high power applications. Mechanical features can be modified to accommodate specific customer requirements and they are available as isolators, 4-port circulators or integrated with other r.f. components to perform various functions. The following table illustrates typical performance of individual components, measured at room temperature, which can be maintained in an integrated assembly.

Frequency range (GHz)	Type	Bandwidth (%)	Peak power (kW)	Mean power (W)	Insertion loss max (dB)	Return loss min (dB)‡	Operating temperature range (°C)
2.9–3.2	B7JC1010	10	30	750	0.3	25	–30 to +55
2.9–3.1	B7JC1013	7.0	100	750	0.3	22	–30 to +55
5.2–5.7	B7JC1210	10	30	500	0.3	21	–30 to +55
8.9–9.7	B7JC1619	9.0	100	300	0.3	21	–45 to +85
9.3–9.5	B7JC1622	3.0	100	300	0.25	25	–45 to +85
9.5–9.7	B7JC1625	3.0	100	300	0.25	25	–45 to +85
9.0–10	B7IS1602†	10	100	100	0.25	21	–45 to +85
10.0–10.5	B7JC1615	5.0	100	300	0.25	25	–45 to +85
13.5–14.5	B7JC1814	7.0	0.5	300	0.25	21	–45 to +85
13–15	B7JC1820☆	15	0.5	150	0.25	21	–45 to +85

X-Band Differential Phase Shift Circulators

These 4-port devices have been designed to handle higher levels of peak and mean power than junction circulators. Size, weight and insertion loss characteristics have been minimized. As with the junction circulators, the frequency of operation may be adapted to customer requirements.

9.3–9.6	B7PC1612	3.0	250	700★	0.4	25	–45 to +85
9.0–9.6	B7PC1621	6.0	250	700★	0.5	21	–40 to +70

Terminations

Typical performance of terminations currently manufactured. EEV will be pleased to advise for specific applications.

Frequency range (GHz)	Type	V.S.W.R.	Peak power (kW)	Mean power (W)	Length (mm)	Flange
2.7–3.1	B7LD103001	1.15	200	200	127	ULM32
2.7–3.5	B7LD10751	1.1	75	75	140	UDR32
2.7–3.5	B7LD98401	1.25	40	40	126	Coaxial
2.7–3.5	B7LD101201	1.15	100	120	155	UDR32
2.8–3.5	B7LD103002	1.2	200	300	155	UDR32
2.8–4.0	B7LD10200	1.2	200	200	175	UDR32
5.0–6.0	B7LD12751	1.15	50	75	40	PAR48
7.0–10	B7LD152501	1.1	200	250	163	UG-138/U
9.0–9.5	B7LD16501	1.2	50	50	32	UG-39/U
8.5–10	B7LD161001	1.1	100	100	140	UG-39/U
8.5–10	B7LD162001	1.1	100	200	141	UG-39/U
12.5–18	B7LD18501	1.2	50	50	100	UG-419/U
26–40	B5LD2251	1.07	30	5.0	75	UG-599/U
26–40	B5LD22201	1.07	50	20	75	UG-599/U
26–40	B5LD221001	1.07	50	100	125	UG-599/U
75–100	B5LD2731	1.2	6.0	3.0	40	UG-387/U

Waveguide Couplers

Loop couplers with type N output connectors.

EEV will be pleased to advise for specific applications (loop coupled, cross guide etc.).

Frequency band	Type ▽	Bandwidth (%)	Coupling factor (dB)	Directivity (dB)	Mean coupled power (W)
L-Band (1.2–1.7 GHz)	B7DC06--	15	>35	20	0.25
S-Band (2.8–4.0 GHz)	B7DC10--	15	>35	20	0.25
C-Band (4.0–6.0 GHz)	B7DC12--	10	>35	20	0.25

Transmission Line Pressure Windows

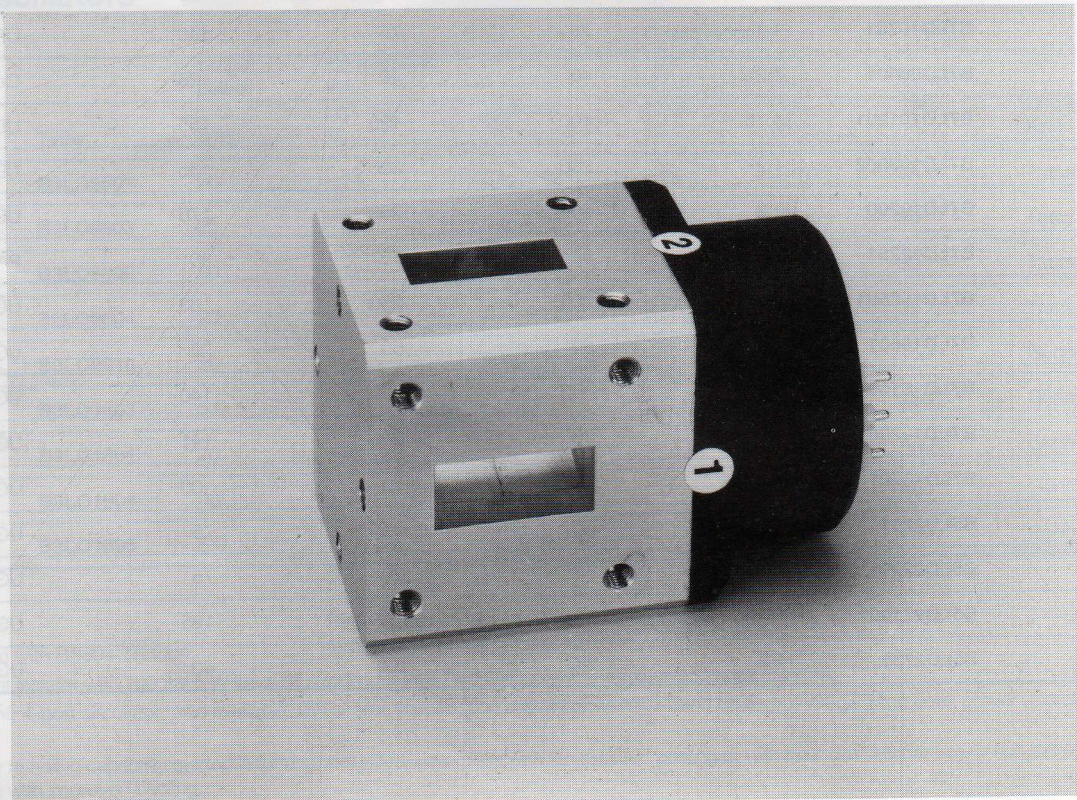
Glass-to-metal resonant windows as used in duplexer tubes can be supplied for application where a gas pressure differential is to be maintained in a waveguide system, with a high degree of transparency to microwave signals.

The windows listed below may be sealed into a socket with soft solder or a conducting epoxy resin. Windows required to be soldered will be supplied ready tinned to customer requirements on request.

The maximum peak power transmission capability of the window is dependent on the waveguide pressure differential. The maximum capability specified below applies to operation in air at atmospheric pressure. It increases considerably at higher pressure differentials.

Resonant frequency (MHz)	Type	Bandwidth at v.s.w.r. 1.2:1 (MHz)	Peak power max (kW)	Resonant frequency (MHz)	Type	Bandwidth at v.s.w.r. 1.2:1 (MHz)	Peak power max (kW)
1300	BS50L	60	500	8775	BS50XA	600	80
2425	BS50SA	120	150	9025	BS50XB	600	80
2790	BS50SB	50	50	9080	BS50XC	600	80
2935	BS50SC	80	150	9240	BS50XD	600	80
3000	BS50SD	120	150	9375	BS50XE	600	80
3005	BS50SE	120	150	9410	BS50XF	600	80
3085	BS50SF	80	150	9600	BS50XG	600	80
3200	BS50SG	120	150	9750	BS50XH	600	80
3285	BS50SH	80	150	9850	BS50XJ	600	80
3520	BS50SJ	80	150	Q-Band	BS50Q Series	1000	50
5550	BS50CA	180	100	W-Band	BS50W Series	1000	10
5700	BS50CB	180	100				

X-band Waveguide Switch B7SW1648



Waveguide Switches

EEV produces a range of rotary waveguide switches covering frequencies from 1.12 GHz through to 40 GHz. Options include two or three channel rotors, manual or automatic versions, remote indication of switch position (tell-back), latching or fail-safe and manual over-ride on automatic switches.

Applications include automatic and manual test systems; land based, marine and airborne radars; satellite earth stations.

Frequency range (GHz)	Type	Waveguide size	Peak power (kW) max	Mean power (kW) max	Isolation (dB) min	Insertion loss (dB)	V.S.W.R. max	Features†
1.12-1.70	B7SW0610	WG6	6000	50	90	0.01	1.05	A‡
	B7SW1011							M, C
	B7SW1012							M
	B7SW1013							M, K ₁
	B7SW1014							M, K ₂
	B7SW1015							A/M, K ₂
2.7-3.1	B7SW1016							A/M, K ₁
	B7SW1017	WG10	3000	4.0	116	0.01	1.1	A/M, N
	B7SW1210							M, B, T
	B7SW1211							M, C, T
	B7SW1212							M, T
	B7SW1213							M, K ₁ , T
	B7SW1214							M, K ₂ , T
3.95-5.85	B7SW1215							A/M, K ₂ , T
	B7SW1216							A/M, K ₁ , T
	B7SW1217	WG12	900	3.0	80	0.01	1.05	A/M, T, N
	B7SW1410							M, B, T
	B7SW1411							M, C, T
	B7SW1412							M, T
	B7SW1413							M, K ₁ , T
6.0-8.4	B7SW1414							M, K ₂ , T
	B7SW1415							A/M, K ₂ , T
	B7SW1416							A/M, K ₁ , T
	B7SW1417	WG14	500	4.0	80	0.01	1.04	A/M, T, N
	B7SW1648	WG16	30		60	0.1 max	1.08	A, T, N
	B7SW1601	WG16	300	3.0	100	0.01	1.04	M
	B7SW1610							M, B, T
8.2-12.4	B7SW1611							M, C, T
	B7SW1612							M, T
	B7SW1613							M, K ₁ , T
	B7SW1614							M, K ₂ , T
	B7SW1615							A/M, K ₂ , T
	B7SW1616							A/M, K ₁ , T
	B7SW1617	WG16	300	3.0	100	0.01	1.04	A/M, T, N
10-15	B7SW1701	WG17	300	6.0	100	0.01	1.05	M, N
	B7SW1710							M, B, T
	B7SW1711							M, C, T
	B7SW1712							M, T
	B7SW1713							M, K ₁ , T
	B7SW1714							M, K ₂ , T
	B7SW1715							A/M, K ₂ , T
10-15	B7SW1716							A/M, K ₁ , T
	B7SW1717	WG17	300	6.0	100	0.01	1.05	A/M, T, N
	B7SW1801	WG18	125	3.0	100	0.01	1.04	M, N
	B7SW1810							M, B, T
	B7SW1811							M, C, T
	B7SW1812							M, T
	B7SW1813							M, K ₁ , T
12.5-18	B7SW1814							M, K ₂ , T
	B7SW1815							A/M, K ₂ , T
	B7SW1816							A/M, K ₁ , T
	B7SW1817	WG18	125	3.0	100	0.01	1.05	A/M, T, N
	B7SW2201	WG22	25	0.4	85	0.01	1.05	M

† Features

- | | |
|-------------------------------------|-----------------------------------|
| A Automatic | K ₂ Two lock positions |
| B miniature housing | M Manual operation |
| C Special knob | N No lock position |
| K ₁ Single lock position | T Tell back |

All switches for automatic operation require a 28 V drive (except B7SW0610); alternative drives are available on request.

‡ Motor drive supply to be specified by the customer

▣ New type.

▽ The full type number will depend on the characteristics required.

Power Supplies for Solid State Noise Generators

These current stabilized power supplies operate from 50/60 Hz 110/240 volt mains input. EEV will be pleased to offer alternative inputs to meet specific requirements.

Type	Description
BS690A	An output current meter is incorporated and the unit is capable of pulsed operation when connected to a suitable pulse generator.
B3ED9902	The built in pulse generator has variable pulse duration and a variable delay from an external synchronising input. An external current meter can be connected.
B3ED9920	An output current meter is not incorporated, but an external meter can be connected.

Solid State Noise Generators – Waveguide

Frequency range (MHz)	Type	Excess noise ratio (dB)	Waveguide size 153 IEC-	Operating current (mA)	Typical voltage (V)	Transmission or terminated
2700-3100	BS774	9.0	R32	★	★	Terminated
3000-3500	BS754	21	R32	15	21	Transmission
5450-5825	BS756	15	R48	15	23	Transmission
6570-9990	B3NG1500†	15	R84	17	20	Transmission
8500-9100	BS660	16	R100	30	21	Transmission
8800-9200	BS658	16	R100	30	21	Transmission
9000-9600	BS662	16	R100	30	21	Transmission
9000-9600	BS750	20	R100	40	23	Transmission
9300-9700	BS640	16	R100	30	21	Transmission
9500-10000	BS764	15.5	R100	35	23	Terminated
8200-12500	B3NG1600†	15	R100	17	20	Transmission
34750-35250	BS758	25	R320	35	-34	Terminated

Solid State Noise Generators – Coaxial

Frequency range (MHz)	Type	Excess noise ratio (dB)	Output connector	Operating current (mA)	Typical voltage (V)	Transmission or terminated
1000-4000	BS644	27	N	15	21	Terminated
2990-3110	BS788	37 min	N	3.0	21	Terminated
2700-3500	BS762	32	N	10	21	Terminated
2900-3500	BS766	36	SMA	25 max	28	Terminated
3000-3500	BS698	27	N	15	21	Terminated
1000-10000	BS646	16	N	20	22	Terminated
9500-10000	BS752	36	SMA	30	22	Terminated

All EEV noise generators are calibrated against standards which are relatable to National Physical Laboratory Standards. Waveguide mounted units can be supplied with power monitoring capability for performance monitoring applications. Coaxial units can be supplied with a choice of r.f. connector; S.M.A., T.N.C., type N etc. Power supplies can be integrated within the noise generator and temperature compensated noise generators can be supplied for the most exacting requirements. EEV will be pleased to advise on the best choice of solid state noise generator for specific applications.

Noise Tubes and Mounts

Frequency range (MHz)	Mount type	Tube type	Excess noise ratio (dB)	Waveguide size 153 IEC-	Operating current (mA)	Typical voltage (V)	Power supply type
7000-10000	BS638	BS342	15.7	R84	125	79	BS610B
8500-10000	BS642	BS342	15.7	R100	125	79	BS610B
12400-18000	BS696	BS342	15.7	R140	125	79	BS610B
33000-36000	BS606	BS386	16.4	R320	100	48	BS610A
33000-36000	BS620*	-	16.4	R320	100	48	BS610A

EEV advises the purchase of tubes and mounts as integral units. BS610 series current stabilized power supply units have automatic filament pre-heat and starting circuits and incorporate an output current meter.

Monitor Diodes

Typical applications include the continuous monitoring of r.f. power, the direct viewing of r.f. power pulse envelopes and the detection of irregularities in magnetron or modulator performance.

Frequency range (MHz)	Type	Peak input power (max) (kW)	Mean input power (max) (W)	Pulse duration (max) (μ s)	Diode load (Ω)	V.S.W.R. (max)	Mount
2500-6500	BS510 (CV6107)	20	18	15	68	1.5	BS514, BS516 BS522, BS524 BS526, BS530 BS532, BS534
5200-5500	BS540	20	18	15	68	1.3	BS538
8500-9000	BS536	20	20	15	47	1.3	BS528
8500-10000	BS502 (CV6005)	20	18	2.0	68	1.3	BS512 BS546

Note Monitor diode power supplies type BS602A and BS602C, or power supply and indicator unit type BS600 are available for use with the above types.

Monitor Diode Kits

Type	Description
BS614	The kit is intended for field tests of X-band radar transmitter performance. It is based on a monitor diode and permits measurement of peak output power, pulse parameters and irregularities in the transmitter performance. The kit includes a calibrated monitor diode and mount assembly, power supply, directional couplers and accessories to suit the user's requirements, all packed in a fitted carrying case. An oscilloscope and mains power source are the only additional facilities needed.
BS504	Similar to BS614, with different ancillaries and with solid state noise generator for noise figure measurements.
BS611	The kit includes a calibrated monitor diode, mount assembly, power supply, 3 dB waveguide attenuator and accessories, packed in a fitted carrying case. It is intended for measurements on radars with peak output powers up to 30 kW in the frequency range 9200 to 9500 MHz.
BS615	Similar to BS611 but for peak power levels up to 60 kW.
BS612	The kit includes a calibrated monitor diode and mount assembly, power supply, directional couplers and accessories to suit the user's requirements, all packed in a fitted carrying case. It is intended for use on radars with peak output powers from 10 to 100 kW, in the frequency range 9200 to 9500 MHz.

- New type.
- ★ Integral power supply.

† A range of devices also providing power measurement.

- BS620 is supplied with noise tube BS386 but calibrated to an accuracy of ± 0.1 dB.

Amplifier Klystrons – CW Operation for Television Service

Output power□ (kW)	Type	Mechanical tuning range (MHz)	Cavities	Typical operation				Circuit assembly
				Drive power‡ (W)	Beam voltage (kV)	Beam current (A)	Cooling (see foot of page)	
11	K365 △	400–610	4, separate	10†	17.0	1.8	1,2	K4019A
11.5	K370 △	470–606	4, separate	1.0	12.5	2.8	1,3	K4145
11.5	K371 △	606–742	4, separate	1.0	12.5	2.8	1,3	K4146
11.5	K372 △	742–854	4, separate	1.0	12.5	2.8	1,3	K4147
5 to 15	K3153	470–860	4, separate	5–15	15.5–19	2.6–1.95	1	K4153
5 to 15	K3270BCD ◆◆	470–860	4, separate	5–15	15.5–19	2.6–1.95	1,3 1,2	K4275 K4275W
15 to 30	K3271BCD ◆◆	470–860	4, separate	10–30	19–25	3.8–2.6	1,3 1,2	K4276 K4276W
32	K3230BCD ◆	470–596	4, separate	5.0	19.0	4.2	1,2	K4204
32	K3231BCD ◆	590–704	4, separate	4.0	19.0	4.2	1,2	K4205
28 to 35	K376L △	470–610	4, separate	2.0	18–19	4.6–5.0	1,2	K4204
28 to 35	K377L △	590–720	4, separate	1.0–3.0	18–19	4.6–5.0	1,2	K4205
45	K3217HBCD ◆	470–590	4, separate	3.5	21.5	5.25	1,2,3	K4170
45	K3218HBCD ◆	590–702	4, separate	3.0	21.5	5.25	1,2,3	K4171
45	K3219HBCD ◆	702–860	4, separate	4.0	21.5	5.25	1,2,3	K4172
45	K3282BCD ◆	470–610	4, separate	1.0	22.0	6.2	1,2,3	K4170
45	K3283BCD ◆	590–720	4, separate	1.0	22.0	6.2	1,2,3	K4171
45	K3284BCD ◆	700–860	4, separate	1.0	22.0	6.2	1,2,3	K4172
40 to 58	K3272WBCD ◆	470–806	4, separate	5.0	22.5–25.5	6.5–5.7	1,2	K4251W
58	K3276HBCD ◆	470–596	4, separate	5.0	24.0	6.0	1,2	K4204
58	K3277HBCD ◆	590–710	4, separate	5.0	24.0	6.0	1,2	K4205
58	K3278HBCD ◆	702–860	4, separate	5.0	24.0	6.0	1,2	K4206
58	K3382BCD ◆	470–590	4, separate	3.5	23.5	6.15	1,2,3	K4170
58	K3383BCD ◆	590–702	4, separate	3.0	23.5	6.15	1,2,3	K4171
58	K3384BCD ◆	702–860	4, separate	4.5	24.0	6.0	1,2,3	K4172
40 to 58	K3572BCD ◆◆	470–810	4, separate	5–20	23.5–25.5	5.0–6.0	1,3 1,2	K4651 K4651W
40 to 58	K3573BCD ◆◆	470–860	4, separate	5–20	23.5–25.5	5.0–6.0	1,3 1,2	K4653 K4653W
40 to 64	K3672BCD ◆◆	470–810	4, separate	5–20	21–27	4.0–6.0	1,3 1,2	K4651 K4651W
40 to 64	K3673BCD ◆◆	470–860	4, separate	5–20	21–27	4.0–6.0	1,3 1,2	K4653 K4653W
40 to 74	K3773BCD ◆◆	470–860	4, separate	5–25	24.5–27.5	5.6–7.0	1,3 1,2	K4653 K4653W

Power Klystron Cooling

1. Forced-air cooled.
2. Water cooled.
3. Vapour cooled.

- ‡ Bandwidth 8 MHz.
- † Bandwidth 6 MHz.
- ◆ Collector may be either vapour or water cooled according to circuit assembly used.

- At klystron output flange.
- △ Maintenance type, not recommended for use in new equipment.
- ◆ Incorporates a Beam Control Device.
- New type.

Amplifier Klystrons – CW Operation for Tropospheric Scatter Service

Output power (kW)	Type	Mechanical tuning range (MHz)	Narrow band operation			Cooling (see foot of page 40)	Circuit assembly
			Drive power (W)	Beam voltage (kV)	Beam current (A)		
2.8	3K3000LQ	610–985	10	9.0	0.6	1	–
10.5	4KM50,000LQ	610–985	0.05	17	1.7	1,2	–
11.5†	K386	755–985	0.5	12	2.7	1,3	K4148M
12	4KM50,000LR	755–985	0.05	17	1.8	1,2	–

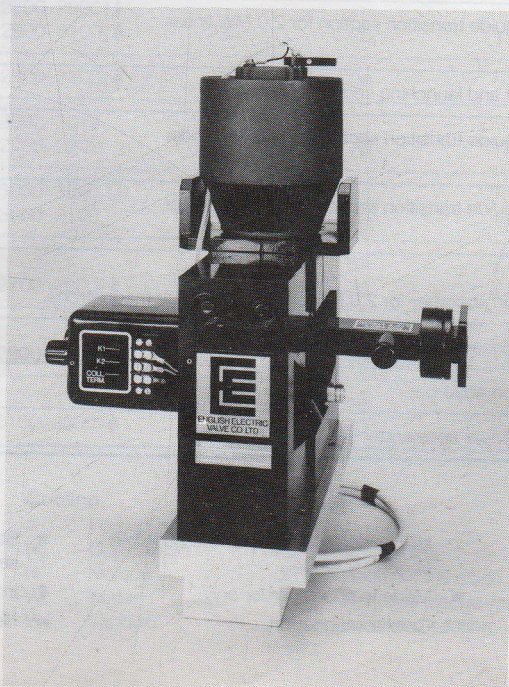
Amplifier Klystrons – CW Operation for Satellite Communications

Output power (kW)	Type	Mechanical tuning range (MHz)	Bandwidth (MHz)	Cavities	Typical operation			Cooling (see foot of page 40)	Focus (integral)
					Drive power (mW)	Beam voltage (kV)	Beam current (A)		
↔3.0	K3936G6	5925–6425	45	5, integral with 6 channel tuner	250	8.0	1.05	1	Permanent magnet
↔3.0	K3936G12	5925–6425	45	5, integral with 12 channel tuner	250	8.0	1.05	1	Permanent magnet
↔3.35	K3936L6	5925–6425	45	5, integral with 6 channel tuner	250	8.2	1.08	1	Permanent magnet
↔3.35	K3936L12	5925–6425	45	5, integral with 12 channel tuner	250	8.2	1.08	1	Permanent magnet
↔3.35	K3936L24	5925–6425	45	5, integral with 24 channel tuner	250	8.2	1.08	1	Permanent magnet

Amplifier Klystrons – Pulse Operation

Output power (peak) (kW)	Type	Mechanical tuning range (MHz)	Gain (dB)	Pulse duration (μs)	Pulse repetition rate (p.p.s.)	Beam voltage (peak) (kV)	Beam current (peak) (A)	Cooling (see foot of page 40)	Focus
600	K347A △ K347AC	580–615	33	6.0	400	75	20	1	Electro-magnet

Satellite Communications Klystron K3936G6



Dupletrons®

Lightweight, fixed frequency integrated units for marine radar, incorporating magnetron, duplexer and receiver protection.

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation				Leakage power (peak) (mW)	Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (µs)	Duty cycle		
4.0	MD5901	9380-9440	3.6	3.0	1.0	0.001	70	PBNG
7.0	MD5902	9380-9440	4.6	4.5	1.0	0.001	100	PBNG
11	MD5903	9380-9440	5.8	5.0	1.0	0.001	100	PBNG

Pulse Magnetrons for Linear Accelerators

All types tunable over their specified frequency ranges.

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation				Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (µs)	Duty cycle	
2000	M5125	2993-3002	43	100	4.2	0.001	SWX
2000	M5125X	2992-3001	43	100	4.2	0.00126	SWX
2600	M5167	2992-3001	47	110	4.2	0.00084	SWX
2600	M5193	2992-3001	47	110	4.2	0.0012	SWX
500	MG5260	2992-3002	25	50	4.2	0.0012	EWX
2600			46	110			
2900	MG5249	2992-3001	47	115	4.2	0.0012	EWX
1000	M5028	2852-2861	36.5	60	5.0	0.003	EWAZ
5500			51	240	2.3	0.00055	

Accessories and Magnets for Linear Accelerator Magnetrons

Type	Description	Used on
M4117	Circular to rectangular waveguide transition section for 2.0 MW linear accelerator magnetrons.	M5125, M5125X, M5167, M5193, MG5260
M4119	Circular to rectangular waveguide transition section for 2.0 MW linear accelerator magnetrons.	M5125, M5125X, M5167, M5193, MG5260
M4121	Water cooled electro-magnet and launching section.	M5028
M4152B	Circular to rectangular waveguide transition section for 2.0 MW linear accelerator magnetrons.	M5125, M5125X, M5167, M5193, MG5260
M4169	Circular to rectangular waveguide transition section for 2.0 MW linear accelerator magnetrons.	M5125, M5125X, M5167, M5193, MG5260
M4227	Microwave and X-ray radiation absorber for 2.0 MW linear accelerator magnetrons.	M5125, M5125X, M5167, M5193, MG5260
M4261	Electro-magnet for use with linear accelerator magnetron.	MG5260
MA761	Microwave and X-ray radiation absorber.	M5028
MG4253	Electro-magnet for use with linear accelerator magnetron.	MG5249

¶ Mechanically tuned over 15 MHz, centre frequency within this range.

☆ Encapsulated to reduce stray radiation.

◇ 30 kW under matched load conditions.

† Mechanically tuned over the specified frequency range.

■ Made to special order only.

** Coaxial magnetron.

★ See Magnetron Accessories section on page 49.

◆ Improved tuner mechanism.

➤ New type.

CW Magnetron

Fixed frequency type

Typical output power (kW)	Type	Frequency range (MHz)	Typical operation				Class (see foot-notes)
			Anode voltage (kV)	Anode current (A)	Load V.S.W.R. max		
25◇	BM25LG	915 ± 10	12.5	2.4	2.5:1	EWAZ	

Pulse Magnetrons – L-Band

Fixed frequency types except where otherwise indicated

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation				Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (μs)	Duty cycle	
1100	MG5263★	1250–1310†	30	90	5.0	0.001	SAG
1100	MG5283★	1250–1365†	30	90	5.0	0.001	SAG
2300	M5051★	1250–1310†	39	150	5.0	0.0015	SVAG
	M5052★	1305–1365†					
2600	M554■★	1295–1365	39	150	5.0	0.00125	SWX
	M586■★	1260–1300					
2600	M5169★	1295–1365¶	39	150	5.0	0.00125	SWX
5000	M565■	1215–1365	48	240	10	0.0025	EWAZ

Pulse Magnetrons – S-Band

Fixed frequency types except where otherwise indicated

4.9	MG5314	3040–3060	4.3	2.5	0.8	0.00064	PBNG
12	MG5315	3040–3060	5.8	5.0	0.8	0.00064	PBNG
26	MG5289	3025–3075	7.0	8.0	1.0	0.001	PANC
30	MG5223	3040–3060	8.0	8.0	0.55	0.00055	PANG
	MG5223F						
56	MG5267	3025–3075	9.0	15	0.55	0.00055	PANC
60	MG5240	3025–3075	9.3	15	0.55	0.00055	PAG
250	MG5344★	2700–2900†◇	23	26	1.0	0.0005	PAG
	MG5345★	2900–3100†◇					
600	MG5284**★	2900–3100†◇	32	38	5.5	0.003	PAG
900	4J43★	2992–3019	28	70	1.0	0.0005	SAC
	4J44★	2965–2992					
900	M577B (CV10210)★	3000–3040	28	70	1.0	0.0005	SAC
	M578B★	3060–3100					
1000	MG5236A★★	2700–2900†◇	29.5	54	1.0	0.0007	SAC
			31	70	1.5	0.0005	
735	MG5237A★★	2900–3100†◇	29.5	54	1.0	0.0007	SAC
1000			31	70	1.5	0.0005	
500	MG5299★★	3100–3300†◇	29	42	1.5	0.001	SAC
1000			31	70	1.5	0.0006	

CLASS

Magnetic Field

E Electro-magnet
P Packaged integral magnet
S Separate magnet

Cooling

A Forced-air
B Conduction
N Natural
W Water
V Vapour

Output

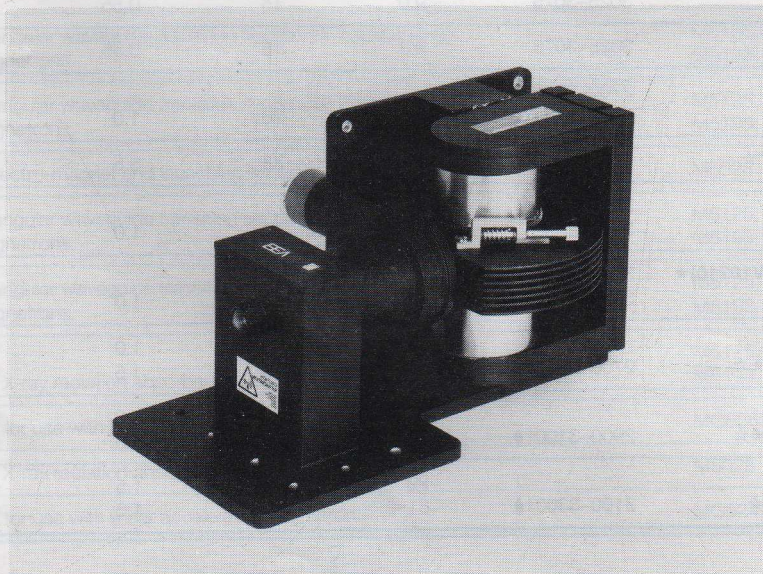
C Coaxial
G Waveguide
X Requires transition section
Z Requires electro-magnet with launching section

Pulse Magnetrons – S-Band continued

Fixed frequency types except where otherwise indicated

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation				Class (see footnotes page 43)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (μs)	Duty cycle	
1000	4J31 (CV1914)★	2860–2900	28	70	1.0	0.0005	SAC
	4J32★	2820–2860					
	4J33 (CV1916)★	2780–2820					
	4J34 (CV1897)★	2740–2780					
	4J35 (CV1898)★	2700–2740					
	4J53 (CV513)■★	2793–2813					
1000	5586 (CV3611)★	2700–2900†	30	70	1.0	0.0005	SAC
	5657 (CV3958)★	2900–3100†					
1000	M5030■	2900–3050†	31.5	70	2.0	0.002	PAG
	M5034■	3050–3200†					
1000	M5035 (CV11154)★	2900–3100†	30	70	1.0	0.0005	SAC
	M5114B★	2700–2900†					
	M5162☆☆	2700–2900†					
	M5170☆☆	2900–3100†					
1000	MG5202***	2700–2900†♦	32	70	3.0	0.0013	PAG
	MG5204***	2900–3100†♦					
	MG5206***	3100–3300†♦					
1000	MG5261**	2900–3100†♦	42	60	3.0	0.0013	PAG
1000	MG5282**	2700–2900†♦	32.5	60	1.3	0.001	PAG
	MG5298**☆	2700–2900†♦					
	MG5309**☆	2700–2900†♦					
1200	M5048■	2900–3000†	33	70	5.0	0.0015	PVAG
2500	M566★	2750–2860	38.5	145	5.0	0.0015	EWAZ
	M5133☆☆	2750–2860					
2500	M569★	2850–2960	40	140	5.0	0.0015	EWAZ
	M5134☆☆	2850–2960					
2500	M570★	2950–3060	40	140	5.0	0.0015	EWAZ
	M5135☆☆	2950–3060					
2500	M579 (CV8002)★	3050–3160	38.5	145	5.0	0.0015	EWAZ
	M5136☆☆	3050–3160					

250 kW S-band Tunable Magnetron MG5344



⊕ Quick heat cathode.

◀ Any spot frequency ±50 MHz within the range.

☆ Encapsulated to reduce stray radiation.

‡ Operable at high altitude.

† Mechanically tuned over the specified frequency range.

■ Made to special order only.

** Coaxial magnetron.

★ See Magnetron Accessories section on page 49.

♦ Improved tuner mechanism.

◆ New type.

Pulse Magnetrons – C-Band

Fixed frequency types

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation			Duty cycle	Class (see footnotes page 43)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (μ s)		
5.0	MG5297	5480–5520	4.5	3.0	1.0	0.001	PNG
840	M5032 M5033	5250–5350 5430–5530	34	60	5.0	0.0015	EWAZ

Miniature Pulse Magnetrons – X Band

Fixed frequency types except where otherwise indicated

0.2	MAGX111 ϕ	9000–11 000 \blacktriangleleft	0.8–0.95	3.0	0.05–10	0.025	PNC
0.2	MAGX113 ϕ	9000–10 000 \blacktriangleright	0.8–0.95	3.0	0.05–10	0.025	PNC
0.5	MAGX114 ϕ	9000–11 000 \blacktriangleleft	1.0–1.5	3.0	0.05–10	0.01	PNC

Pulse Magnetrons – X-Band

Fixed frequency types except where otherwise indicated

2.5	MAG23A ϕ MAG23B ϕ MAG23C ϕ MAG23D ϕ	9600–9675 9676–9750 9751–9825 9826–9880	2.25	3.0	0.25	0.001	PNG
4.0	MG5238A MG5238B	9415–9475	3.7	3.0	1.0	0.001	PNG
4.0	MG5243	9415–9475	3.7	3.0	1.0	0.001	PNG
4.0	MG5248	9380–9440	3.7	3.0	1.0	0.001	PNG
4.0	MG5251	9380–9440	3.7	3.0	1.0	0.001	PNG
4.0	MG5274	9210–9270	3.7	3.0	1.0	0.001	PNG
6.0	MG5232 MG5232F	9380–9440	4.5	3.5	0.6	0.001	PNG
6.0	MG5255	9380–9440	4.5	3.5	0.6	0.001	PNG
6.0	MG5259	9345–9405	4.5	3.5	0.6	0.001	PNG
6.0	MG5273	9380–9440	4.5	3.5	0.6	0.001	PNG
8.0	MG5233	9380–9440	4.4	5.0	0.75	0.0006	PNG
8.0	MG5234	9415–9475	4.4	5.0	0.75	0.0006	PNG
10	MG5253 \ddagger	9345–9405	5.5	4.5	2.5	0.001	PNG
12	MG5254 \ddagger	9355–9395	5.9	5.75	3.5	0.00035	PNG
12.5	MG5241 MG5241F	9380–9440	5.8	5.0	1.0	0.001	PNG
12.5	MG5244	9345–9405	5.8	5.0	1.0	0.001	PANG
12.5	MG5245	9345–9405	5.8	5.0	1.0	0.001	PNG
12.5	MG5256	9345–9405	5.8	5.0	1.0	0.001	PANG
12.5	MG5257	9380–9440	5.8	5.0	1.0	0.001	PANG
12.5	MG5258	9380–9440	5.8	5.0	1.0	0.001	PANG
20	6027H \ddagger	9345–9405	7.2	7.5	2.5	0.001	PAG

\blacktriangleright Tunable over 10 MHz about a centre frequency, within ± 50 MHz of any specified frequency.

Pulse Magnetrons – X-Band continued

Fixed frequency types except where otherwise indicated

Peak output power (kW)	Type	Frequency range (MHz)	Typical operation				Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (μs)	Duty cycle	
20	8356 (CV8505)‡	9345–9405	7.2	7.5	2.5	0.001	PANG
22.5	MG5286◊	9265–9315	8.2	8.0	0.5	0.001	PAG
25	M5068	9620–9680	8.2	8.0	1.0	0.0005	PANG
25	M5149	9380–9460†	8.2	8.0	1.0	0.001	PANG
25	M5187 M5187F	9380–9440	8.2	8.0	1.0	0.0005	PANG
25	MG5213	9330–9410†	8.2	8.0	1.0	0.001	PANG
25	MG5218	9380–9440	8.4	8.0	0.8	0.0007	PBNG
25	MG5222	9345–9405	8.2	8.0	1.0	0.001	PANG
25	MG5230	9140–9200	8.2	8.0	1.0	0.0005	PANG
25	MG5231	9460–9520	8.2	8.0	1.0	0.0005	PANG
25	MG5239	9350–9400	8.2	8.0	1.0	0.001	PANG
25	MG5242	9380–9440	8.2	8.0	1.0	0.0005	PANG
25	MG5264	9380–9440	8.2	8.0	1.0	0.0005	PANG
25	MG5271	9345–9405	8.4	8.0	0.8	0.0007	PBNG
25	MG5296	9345–9405	8.4	8.0	0.8	0.0007	PBNG
30	M5089	9415–9460	8.3	9.0	1.0	0.0005	PANG
30	M5199	9415–9475	8.3	9.0	1.0	0.0005	PANG
30	MG5265	9455–9495	8.3	9.0	1.0	0.0005	PANG
50	MG5226‡	9345–9405	13	12	4.0	0.0016	PAG
53	M5005 (CV9424)‡ M5005A‡	9345–9405	13	12	4.0	0.0016	PAG
80	4J52A (CV5018)	9350–9400	15.5	15	1.0	0.001	PAG
80	M575 M575A M575B	9345–9405 9300–9340 9440–9480	15	15	1.0	0.001	PAG
80	M5080 M5081	9210–9270 9345–9405	15.5	15	1.5	0.0012	PAG
80	M5157A M5157B M5157C M5157D	9510–9590◻ 9610–9690◻ 9510–9590+ 9610–9690+	15	15	1.0	0.001	PAG
95	M5188	9380–9440	15	16	1.0	0.00085	PAG
100	M5042S	9315–9375	15	17.5	5.0	0.001	PAG
130	MAG21A MAG21B MAG21C	9500–9590 9555–9645 9610–9700	17	20	0.25	0.001	PAG

CLASS

Magnetic Field

E Electro-magnet
P Packaged integral magnet
S Separate magnet

Cooling

A Forced-air
B Conduction
N Natural
W Water
V Vapour

Output

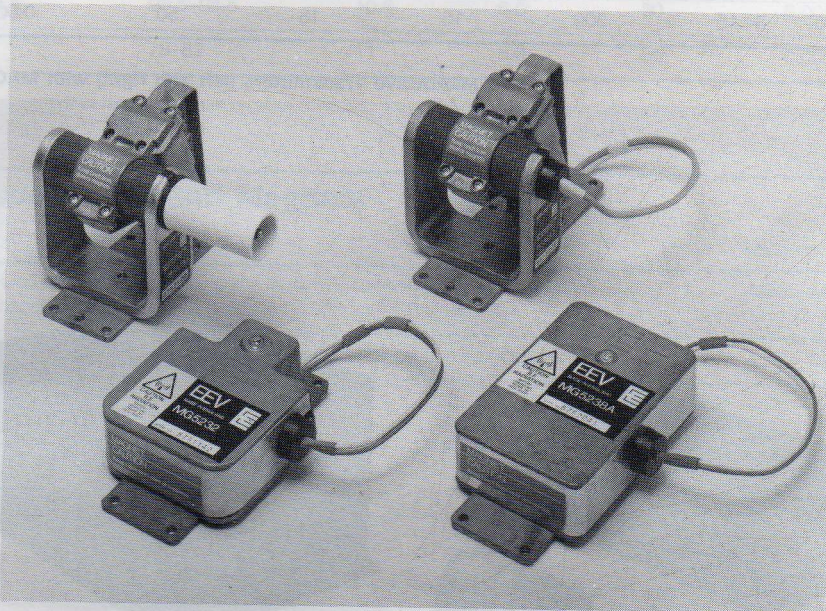
C Coaxial
G Waveguide
X Requires transition section
Z Requires electro-magnet with launching section

Microwave Transmitters – X-Band

A series of rugged, miniature, pulsed X-band transmitters. Some types operate at fixed pulse duration and pulse repetition frequency selected by the customer (EMPTX type numbers); others deliver a pulse burst (i.e. a train of pulses) controlled by an externally generated TTL (or compatible) input signal (EMBTX type numbers). The transmitters operate at fixed frequency unless otherwise stated and can be supplied to operate within 100 MHz or any specified frequency within the given ranges.

Type	Frequency range (GHz)	Output power (W)	Typical Operation			Weight (g)
			Duty cycle	Operating voltage (V)	Warm-up delay (s)	
EMPTX101	9.0–10.5	200	0.005	24	2.0	300
EMBTX104	9.0–10.5	200	0.005	24	2.0	300
EMBTX115	9.0–10.5	500	0.002	24	2.0	450
EMBTX123	9.0–10.0▶	200	0.005	24	2.0	330
EMBTX124	9.0–10.0▶	200	0.005	24	2.0	330
EMBTX135	9.0–10.0▶	250	0.002	24	2.0	450
EMBTX137	9.0–10.0▶	200	0.003	24	2.0	600
EMBTX138	9.0–10.0▶	200	0.002	24	2.0	600

▶ Tunable over 10 MHz about a centre frequency, within 100 MHz of any specified frequency.



A Group of 3rd Generation X-band Magnetrons

Pulse Magnetrons – J(Ku)-Band

Fixed frequency types except where otherwise indicated.

Peak output power (kW)	Type	Frequency range (GHz)	Typical operation				Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (μs)	Duty cycle	
35	EMAGJ108	16.35–16.65	11	10.5	0.5	0.001	PANG
35	MAG19♢	16.35–16.65	11	10.5	0.5	0.001	PANG
40	MG5323**§▲	16.2–17.4	12	10	0.6	0.001	PABG
50	MG5272♦**§	15–18	14	11	0.5	0.001	PABG

† Mechanically tuned over the specified frequency range.

♢ Quick heat cathode.

♦ Multipactor tuned.

‡ Operable at high altitude.

◆ Frequency agile

§ Rugged.

□ Preset tuning.

➤ New type.

** Coaxial magnetron.

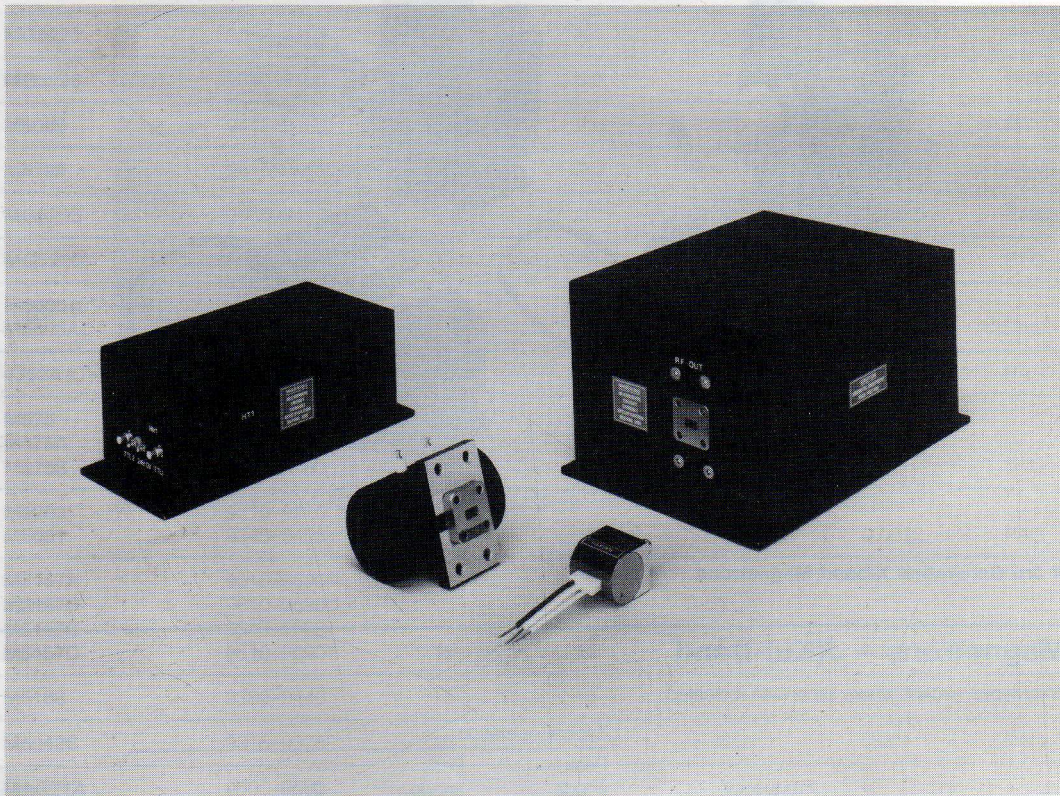
▲ Lightweight magnet.

Pulse Magnetrons – Q(Ka)-Band

Fixed frequency types except where otherwise indicated

Peak output power (kW)	Type	Centre frequency range (GHz)	Typical operation					
			Tuning range (MHz)	Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (ns)	Duty cycle	Class (see foot-notes)
1.3	M5154 §	33–37	–	4.0	1.5	400	0.0016	PBNG
1.3	MG5280 φ‡§	33–37	–	4.0	1.5	400	0.0016	PBNG
2.5	MG5340 §	34.8–35.2	–	3.7	3.0	100	0.001	PBG
10	MG5321 §	34.8–35.2	–	7.0	7.0	100	0.001	PBG
18	M5055 △	34.4–35.4	–	12	9.0	30	0.00045	PAG
40	M5168 △	34.75–35.25	500†	14	16	50	0.0004	PAG
46	MG5301 ▲	34.5–35.5	–	14.5	13	125	0.001	PAG
46	MG5302 ▲	35.0	300†	14.5	13	125	0.001	PAG
46	MG5303 ▲◇	35.0	300†	14.5	13	125	0.001	PAG
46	MG5304 ▲	35.0	300†	14.5	13	125	0.0005	PAG
50	MG5311 ‡	34.5–35.5	270◇	14.5	14.5	200	0.0004	PAG
60	MG5329 ▲◇	34.15	300	15	16	50	0.0004	PAG

Microwave Transmitters (left and right) with MAGX111 and EMBTQ139



Miniature Pulse Magnetrons – Q(Ka)-Band

Fixed frequency types, to operate within 100 MHz of any specified frequency.

0.5	MAGQ121	33–37	–	3.5	1.5	0.05–0.5	0.001	PNG
0.3	EMAGQ132	33–37	–	2.5	1.5	0.05–0.5	0.001	PNG

CLASS

Magnetic Field

P Packaged integral magnet.

Cooling

A Forced-air.
B Conduction
N Natural

Output

G Waveguide

Microwave Transmitters – Q-Band

Rugged, miniature, fixed frequency pulsed transmitters, delivering a pulse burst (i.e. a train of pulses) controlled by an externally generated TTL (or compatible) input signal. They can be supplied to operate within 100 MHz of any specified frequency within the range.

Type	Frequency range (GHz)	Output power (W)	Typical Operation			
			Duty cycle	Operating voltage (V)	Warm-up delay (s)	Weight (g)
◆ EMBTQ116	33–37	400	0.001	24	3.0	1200
◆ EMBTQ139	33–37	300	0.002	24	3.0	1000

Pulse Magnetrons – O/W-Band

Fixed frequency types

Peak output power (kW)	Type	Frequency range (GHz)	Typical operation				Class (see foot-notes)
			Peak anode voltage (kV)	Peak anode current (A)	Pulse duration (ns)	Duty cycle	
2.5	◆ MG5294▲	94.2–96	10.5	6.0	50	0.0005	PAG
2.5	◆ MG5295▲	93.5–94.5	10.5	6.0	50	0.0005	PAG
6.0	◆ M5057	78–82	11	5.0	50	0.0002	PAG

Magnetron Accessories and Magnets

Type	Description	Used on
M4011	Water cooled electro-magnet, including launching section M4017, for 2.5 MW S-band magnetrons.	M566, M569, M570, M579, M5133, M5134, M5135, M5136
M4016	Circular to rectangular waveguide transition section for L-band magnetrons.	M554, M586, M5169
MA228	Magnet for S-band fixed frequency magnetrons.	4J31–35, 4J43, 4J44, 4J53, M577B, M578B, M595B
MA244	Magnet for S-band tunable magnetrons.	5586, 5657, M5035, M5114B, M5162, M5170, MG5236, MG5237
MA297	Magnet for L-band magnetrons.	M5051, M5052, M5086, M5087, MG5201
MA297A	Magnet for L-band magnetrons.	M5051, M5052, M5086, M5087, MG5201
MA311	Thermal fuse for L-band magnetrons.	M5051, M5052, M5086, M5087, MG5201, MG5216, MG5263, MG5283
MA339	Magnet for tunable L-band magnetrons.	MG5216, MG5263, MG5283
MA406	Magnet for fixed frequency L-band magnetrons.	M554, M586, M5169
MA445	Current transformer for measuring pulse currents.	Types with up to 15 A peak anode current
MA924A	Thermal fuse for S-band coaxial magnetrons.	MG5202, MG5204, MG5206, MG5282, MG5284, MG5298, MG5309

◆ Frequency agile.

† Mechanically tuned over the specified frequency range.

△ Maintenance type, not recommended for use in new equipment.

§ Rugged.

‡ Pulsed anode.

φ Quick heat cathode.

** Coaxial magnetron.

▲ Lightweight magnet.

◇ Precision tuned.

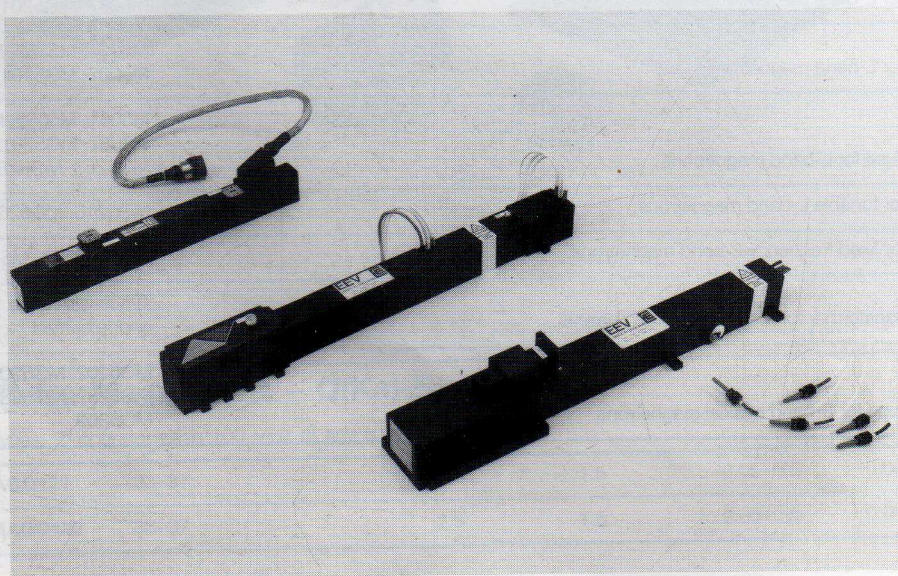
◆ New type.

Broadband C.W. Travelling Wave Tubes for ECM

Increased bandwidth, efficiency and gain are characteristic of recent additions to this range which extends from 2.5 to 40 GHz. The rugged construction of these tubes ensures stable performance with high reliability when operated under severe environmental conditions. Beam switching is achieved by means of a focus electrode or shadow grid.

Frequency range (GHz)	Type	Output power (W)	Gain (dB)	Helix voltage (kV)	Collector		Output connector	Weight (kg)
					Voltage (kV)	Current (mA)		
2.5-7.5	N10063**	120	38	4.7	3.4/2.0**	100/200**	TNC	3.5
4.5-10	N1078	1.5	37	2.0	2.0	25	SMA	0.9
4.5-10	N1077	100	27	5.8	3.2	210	TNC	3.6
7.0-11	N1080A	200	31	8.0	4.0	270	TNC	5.0
8.0-12	N1089	25	36	4.7	2.0	70	SMA	2.7
6.0-18	N10040	40	40	5.0	2.5	130	SMA	0.6
6.0-18	N10044	20	40	3.9	1.85	100	SMA	0.6
6.0-18	N10036	100	30	7.1	4.2	210	waveguide	3.4
6.0-18	N10053**	100	40	9.2	5.0/3.0**	45/185**	waveguide	3.0
6.0-18	N10042	160	30	8.7	4.5	270	waveguide	4.8
6.0-18	N10041	200	30	9.3	5.8	310	waveguide	4.8
8.0-16.5	N1081	100	30	7.1	4.2	210	waveguide	3.4
7.0-18	N1082	0.5	34	2.0	2.0	20	SMA	0.7
7.5-18	N10028	200	30	9.3	5.8	310	waveguide	4.8
8.0-18	N10024	2.0	40	2.5	2.5	22	SMA	0.7
8.0-18	N10033	160	30	8.7	4.5	270	waveguide	4.8
8.0-18	N10056**	160	30	8.7	4.5/3.0**	65/200**	waveguide	4.8
5.0-26.5	N10037	0.25	27	2.0	2.0	20	SMA	0.7
18-40	N10050	1.0	35	6.5	4.0	30	waveguide	1.2
18-40	N10043	20	40	9.3	5.0	55	waveguide	1.1

Broadband ECM Tubes N10043 (left), N10063 (centre) and N10053 (right)



➤ New type.

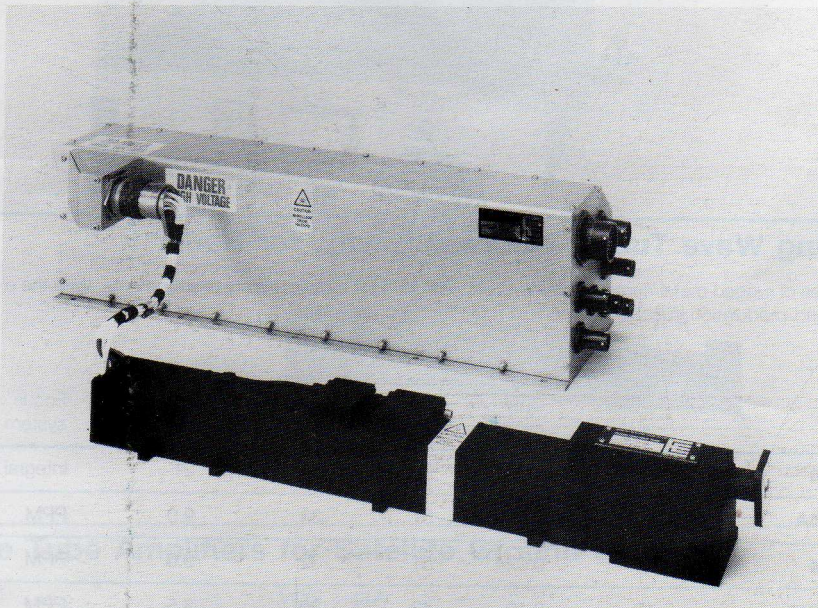
** High efficiency dual collector tube.

Broadband C.W. Travelling Wave Tube Chains for ECM

Each chain consists of two tubes combined with other microwave components to form a single high gain unit of relatively short length. A range of modulation facilities can be included. The use of a T.W.T. for the driver stage eliminates the need for high gain in the output tube, giving reduced noise output under certain operational conditions. Chains can be configured to provide optimum performance for specific customer requirements.

Frequency (GHz)	Type	Tubes	Output power (W)	Drive power (dBm)	Collector		R.F. connectors
					Voltage (kV)	Current (mA)	
4.5-10	N10500	N1078 driver N1077 output	- 150	-13 -	2.0 3.5	21 200	SMA input TNC output
7.5-16	N10534	N10024 driver N10028 output	- 250	-15 -	2.5 5.8	22 310	SMA input WG output
6.0-18	N10528	N1082 driver N10036 output	- 100	-6 -	2.1 4.2	16 210	SMA input WG output
6.0-18	N10532	N10024 driver N10042 output	- 160	-10 -	2.5 4.5	22 270	SMA input WG output
6.0-18	N10531	N10024 driver N10041 output	- 200	-5 -	2.5 5.8	22 310	SMA input WG output
8.0-16.5	N10501	N1082 driver N1081 output	- 150	-14 -	2.1 4.5	16 200	SMA input WG output
7.5-18	N10525	N10024 driver N10033 output	- 180	-10 -	2.5 4.5	22 270	SMA input WG output
7.5-18	N10542	N10024 driver N10056 output	- 180	-10 -	2.5 4.5/3.0**	22 65/200**	SMA input WG output
7.5-18	N10520	N10024 driver N10028 output	- 220	-5 -	2.5 5.8	22 310	SMA input WG output

Power Supply N4277 with TWT



Broadband Travelling Wave Tube Amplifiers for ECM

A range of amplifiers and sub-systems can be offered comprising various travelling wave tubes, power supplies and additional components to suit specific requirements. The types shown below provide an indication of existing standard types. Enquiries for amplifiers and sub-systems designed for individual applications are welcomed.

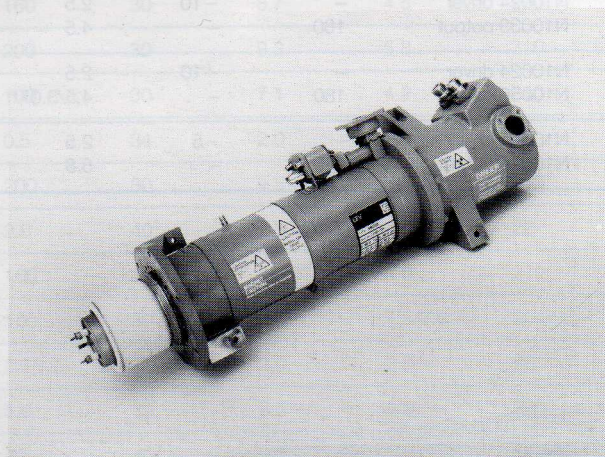
Type	Description
N4277	A rugged high voltage power supply designed for use with high efficiency travelling wave tubes such as the N10053 and N10063 covering the frequency range 2.5 to 18 GHz. A microprocessor-based control system provides extensive control and monitoring facilities. It is conduction cooled and is designed for use in very severe environments including airborne applications.
N4282	A broadband c.w. amplifier comprising a miniaturized travelling wave tube chain and power supply packaged into a single low volume unit. The r.f. output power is 100 W minimum over the frequency range 7.5 to 18 GHz with a gain in excess of 60 dB. The frequency range may be extended to 6.0 to 18 GHz with reduced output power. Prime power and cooling for the amplifier can be provided by an optional rechargeable battery pack and cooling unit. Features include - compact size, easily transportable; rugged construction; simple operation; low cost; optional battery pack.

Pulsed Travelling Wave Tubes, Helix and Ring-Bar, for Radar and ECM

Pulsing of the higher power tubes in this range is achieved by means of precision-manufactured shadow grids. Low close-to-carrier noise, essential in modern pulse Doppler radars, is ensured by rugged gun construction which maintains grid-cathode spacing within close limits under extreme operating conditions.

Frequency range (GHz)	Type	Peak output power (W)	Duty cycle	Gain (dB)	Collector		Output R.F. connector	Cooling
					Voltage (kV)	Current (mA)		
3.0-3.5	N10051	2500	0.11	45	6.5	1500	Type N	Forced-air
4.4-5.8	N1094	270	0.05	40	3.4	370	SMA	Conduction
9.0-10.5	N10011 □	850 220	0.5 1.0	51 30	5.5 5.5	740 300	Waveguide	Conduction
9.0-9.6	N10072	4000	0.05	60	8.0	1700	Waveguide	Conduction
8.0-16	N10052	2000	0.03	52	7.5	1400	TNC	Conduction
Ku-Band	N10074	700	0.1	55	7.0	800	TNC	Conduction
7.5-18	N10068	1000	0.1	43	7.0	1500	Waveguide	Conduction

High Efficiency, Dual Collector, Coupled Cavity TWT Type N10559



Pulsed Travelling Wave Tubes, Coupled Cavity, for Radar

The range consists of tubes of rugged metal/ceramic construction, designed for mobile military environments. With the exception of the N1061, they employ high μ shadow grid modulation suitable for modern multi-function radars.

Frequency range (GHz)	Type	Peak output power (kW)	Duty cycle	Gain (dB)	Beam voltage (kV)	Beam current (A)	Focus system	Cooling
S-Band	N10508	425	0.02	25	60	21	Integral solenoid	Liquid
5.45-5.85	N10524A	60	0.024	51	33	9.0	PPM	Liquid
5.4-5.9	N10524	50	0.024	51	32	9.0	PPM	Liquid
X-Band	N10559 **	10	0.10	43	20	3.5	PPM	Liquid
X-Band	N10543	15	0.035	55	24	3.8	PPM	Liquid
8.6-9.5	N10503C	28	0.01	50	25	6.0	PPM	Forced-air
8.6-9.5	N10560	50	0.02	50	31	7.5	PPM	Liquid
X-Band	N10502	50	0.015	42	31	7.5	PPM	Liquid
8.6-9.6	N10530	50	0.0015	42	32	7.5	PPM	Liquid
X-Band	N1061 *	900	0.005	33	100	31	Separate solenoid	Liquid
16.5-17.0	N10517 **	12	0.025	45	29.5	2.0	PPM	Liquid
35	N10544	4.5	0.035	48	37	1.25	PPM	Forced-air

☛ New type.

** High efficiency dual collector tube.

* Cathode pulsed.

□ Dual mode tube, pulsed and c.w.

Travelling Wave Tubes for Satellite Ground Stations

Rugged helix construction and conservative cathode ratings combine with other design features to give a range of tubes capable of long reliable life in both fixed and transportable systems.

Frequency range (GHz)	Type	Output power (W)	Gain (dB)	Noise Factor (dB)	Collector		R.F. connectors	Cooling
					Voltage (kV)	Current (mA)		
5.925-6.425	N10067	250	40	35	3.7	350	SMA, waveguide	Conduction
7.9-8.4	N10025**	60	34	28	2.1/1.5**	49/43**	SMA, waveguide	Conduction
7.9-8.4	N10077	160	35	33	3.5	230	SMA/TNC	Conduction
7.9-8.4	N10082	250	37	35	4.3	280	SMA/TNC	Conduction
7.9-8.4	N10080	650	37	40	5.5	550	SMA, waveguide	Conduction
14.0-14.5	N10081**	75	50	30	2.3/1.5**	69/56**	SMA, waveguide	Conduction
14-14.5	N10021	140	30	30	4.2	200	SMA, waveguide	Conduction
13-13.25	N10038	300	42	35	4.5	260	SMA, waveguide	Conduction
14-14.5		300	42					
17.3-18.1		250	37					
14-14.5	N10057	300	40	35	4.5	260	SMA, waveguide	Forced-air
27.5-30	N10078	5	35	35	4.0	30	Waveguide	Conduction
27.5-30	N10079	25	40	35	6.0	70	Waveguide	Conduction

N10079 with Power Supply N4290



Travelling Wave Tube Amplifiers for Satellite Ground Stations

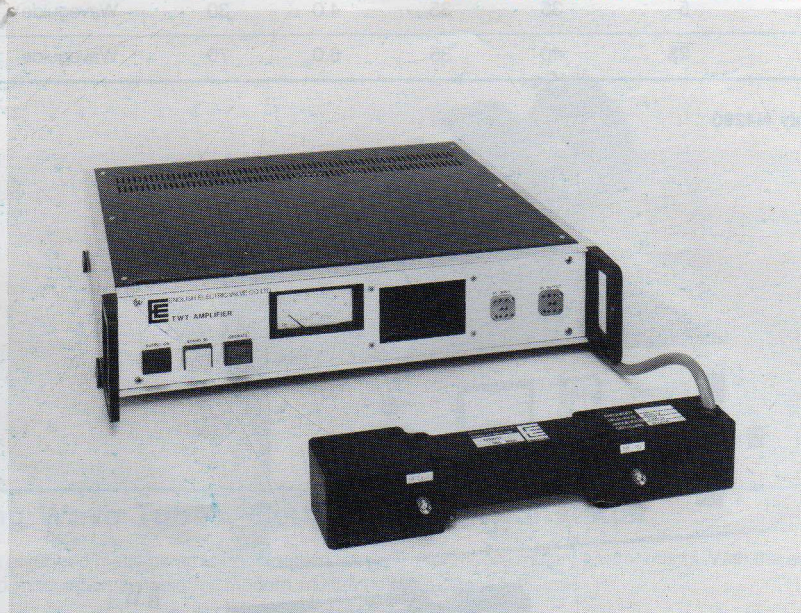
Frequency range (GHz)	Type	Output power (W)	Gain (dB)	Input Supply		Overall dimensions (mm)	Weight approx (kg)	Environment
				Voltage (V)	Frequency (Hz)			
7.9-8.4	N4283	60	34	28	D.C.	301 x 130 x 325	10	Ground mobile
7.9-8.4	N4297	60	34	240/115	50/60	183 x 153 x 501	10	Ground mobile
7.9-8.4	N4295	125	45	240/115	50/60	483 x 223 x 480	27	Ground mobile
13-14.3	N4238A	250	70	240/115	50/60	483 x 400 x 610	57	Fixed
14-14.5	N4238	270	65	240/115	50/60	483 x 400 x 610	57	Fixed
14-14.5	N4290	270	65	240/115	50/60	483 x 178 x 610	30	Transportable
17.3-18.1	N4238B	220	65	240/115	50/60	483 x 400 x 610	57	Fixed
27.5-30	N4296	4	35	240/115	50/60	483 x 223 x 364	20	Ground mobile

Travelling Wave Tube Amplifiers for Test and Instrumentation

The following Travelling Wave Tube Amplifiers are housed in standard 19-inch rack mounting instrument cases and operate from 240/115 V, 50/60 Hz single phase prime power. A range of additional optional features is available, including a pre-amplifier. Values stated for gain and noise factor apply without pre-amplifier.

Frequency range (GHz)	Type	Output power (W)	Gain (dB)	Noise factor (dB)	Height (mm)	Depth (mm)	Approx weight (kg)
2.5-8.0	N4462	200	45	30	223	610	25
5.0-10	N4182	1.0	34	30	96	368	12.7
5.0-26.5	N4256	0.2	23	30	96	368	12.7
8.0-16	N4183	1.0	32	30	96	368	12.7
6.0-18	N4463	200	50	30	223	610	25
9.0-18	N4214	2.0	30	30	96	368	12.7
9.0-18	N4264	200	30	35	400	610	60
18-40	N4288	1.0	30	30	96	368	12.7
18-40	N4464	25	40	30	223	610	25

High Efficiency, Dual Collector TWT N10012 with Power Supply



Travelling Wave Tubes for Microwave Links

These tubes range from glass envelope types, which are interchangeable by the user within a separate focus mount, to metal/ceramic types with integral focusing. They are used in both analogue and digital line-of-sight systems.

Frequency range (GHz)	Type	Saturated output power (W)	Low level gain (dB)†	Noise factor (dB)	Collector		R.F. connectors	Focus system
					Voltage (kV)	Current (mA)		
3.55-5.0	N1073	16	41	23	1.7	45	Waveguide	N4136
4.4-5.0	N10023	12	46	25	1.3	45	SMA	Integral
5.8-7.2	N1072	19	41	23	1.7	45	Waveguide	N4135
5.9-7.4	N10018	12	39	26	1.3	34	Waveguide	Integral
5.9-7.4	N10019	12	39	26	1.3	34	SMA	Integral
5.8-8.5	N10504	20	41	22	1.3	50	Waveguide	MRW80
7.1-8.4	N10022	10	47	26	1.3	40	SMA	Integral
10.7-11.7	N10012**	12	42	27	1.5/0.6**	14/15**	SMA	Integral

☛ New type.

** High efficiency dual collector tube.

† Gain at 3 dB below saturation output power level.

ELECTRO~OPTICAL DEVICES

Leddicons	page 56
Vidicons	60
Image Isocons	65
Focus and Deflection Yokes	65
Shutter Tubes	65
Storage Tubes	66
Thermal Imaging Cameras	66
Image Intensifiers	67
Charge Coupled Devices (C.C.D.)	68
C.C.D. Cameras	69
Cathode Ray Tubes	70
LUCID Liquid Crystal Displays	74
Character Display Tubes	76
Glow Modulators	76
Concentrated Arc Lamps	76



Development is proceeding on a wide range of electro-optical devices and enquiries are invited for specific applications. Most of the television camera tubes listed can be supplied in alternative forms (radiation resistant and fibre-optic faceplates, vidicons with faceplate reticles etc).

Leddicon® Television Camera Tubes

Type★	Alternative number	Suffix letters	Spectral response	Grade	Heater current (mA)	Front/rear loading	Gun type	Light bias	Features
2/3-inch (17.7 mm) Leddicons									
XQ1427	P8160	B, G, R		Broadcast					
XQ1428	P8161	B, G, R		Industrial	95	Front	Triode	—	
XQ2427	P8460	B, G, R		Broadcast					
XQ2428	P8461	B, G, R		Industrial	95	Front	Diode	—	Dynamic beam control facility (D.B.C.).
XQ3427	P8462	B, G, R		Broadcast					Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
XQ3428	P8463	B, G, R		Industrial	95	Rear	Diode	—	
XQ3457	P8474	B, G, R		Broadcast	95	Rear	Diode	—	Electrostatic deflection. Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
1-inch (25 mm) Leddicons									
XQ1070	P8022	B, G, L, R		Broadcast					
XQ1071	P8022IG	B, G, L, R		Industrial					
XQ1073R	P8024AR		Extended red	Broadcast					
XQ1075R	P8024RF		ER with filter	Broadcast	95	Front	Triode	External	
XQ1070/02	P8142	B, G, L, R							
XQ1073/02R	P8144AR		Extended red						
XQ1075/02R	P8144RF		ER with filter	Broadcast	95	Rear	Triode	External	
XQ1080	P8145	B, G, L, R							
XQ1083R	P8146AR		Extended red						
XQ1085R	P8146RF		ER with filter	Broadcast	95	Rear	Tetrode	External	Highlight overload protection (H.O.P.).
XQ1500	P8147	B, G, L, R							
XQ1503R	P8148AR		Extended red						
XQ1505R	P8148RF		ER with filter	Broadcast	190	Rear	Tetrode	External	Highlight overload protection (H.O.P.).
XQ2070/02	P8196	B, G, L, R							
XQ2073/02R	P8197AR		Extended red						
XQ2075/02R	P8197RF		ER with filter	Broadcast	95	Rear	Diode	External	Dynamic beam control facility (D.B.C.).
XQ2070/03	P8190	B, G, L, R							
XQ2073/03R	P8191AR		Extended red						
XQ2075/03R	P8191RF		ER with filter	Broadcast	95	Front	Diode	External	Dynamic beam control facility (D.B.C.).
↔XQ2070/05		B, G, L, R							
↔XQ2073/05R			Extended red						
↔XQ2075/05R			ER with filter	Broadcast	95	Rear	Diode	—	Dynamic beam control facility (D.B.C.).

★ Where an alternative number is shown, tubes may be ordered using either the XQ- or P- series number. The complete type number comprises the series number with appropriate suffix letter/letters as follows:—

↔ New type.

XQ- or P- series numbers:

B Blue channel L Luminance channel Monochrome tubes – no suffix letter
G Green channel R Red channel

P- series numbers only:

AR Extended red without filter, for red channel RF Extended red with infrared filter, for red channel IG Industrial grade

® Registered EEV Trademark for photoconductive camera tubes with lead oxide target. Features of these tubes include very short lag, low dark current and unity gamma. All types have high resolution photolayers and separate mesh connections.

1-inch Leddicons continued

Type★	Alternative number	Suffix letters	Spectral response	Grade	Heater current (mA)	Front/rear loading	Gun type	Light bias	Features
XQ2170/02	P8496	B, G, L, R							
XQ2173/02R	P8497AR		Extended red						
XQ2175/02R	P8497RF		ER with filter	Broadcast	190	Rear	Diode	External	Dynamic beam control facility (D.B.C.).
XQ2170/03	P8490	B, G, L, R							
XQ2173/03R	P8491AR		Extended red						
XQ2175/03R	P8491RF		ER with filter	Broadcast	190	Front	Diode	External	Dynamic beam control facility (D.B.C.).
↔XQ2170/05		B, G, L, R							
↔XQ2173/05R			Extended red						
↔XQ2175/05R			ER with filter	Broadcast	190	Rear	Diode	—	Dynamic beam control facility (D.B.C.).
XQ3070/02	P8442	B, G, L, R							
XQ3073/02R	P8443AR		Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
XQ3075/02R	P8443RF		ER with filter	Broadcast	95	Rear	Diode	External	
↔XQ3070/12 series			Version of XQ3070/02 series with two signal contacts on target ring.						
XQ3070/05		B, G, L, R							
XQ3073/05R			Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
XQ3075/05R			ER with filter	Broadcast	95	Rear	Diode	—	
↔XQ3070/15 series			Version of XQ3070/05 series with two signal contacts on target ring.						
XQ3170/02	P8498	B, G, L, R							
XQ3173/02R	P8499AR		Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
XQ3175/02R	P8499RF		ER with filter	Broadcast	190	Rear	Diode	External	
↔XQ3170/12 series			Version of XQ3170/02 series with two signal contacts on target ring.						
↔XQ3170/05		B, G, L, R							
↔XQ3173/05R			Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
↔XQ3175/05R			ER with filter	Broadcast	190	Rear	Diode	—	
↔XQ3170/15 series			Version of XQ3170/05 series with two signal contacts on target ring.						

30 mm Leddicons

P8130H		B, G, L, R							
P8132AR			Extended red						
P8132RF			ER with filter	Broadcast	300	Rear	Triode	Internal, fixed	Coaxial G3-G4 design.
P8131H		B, G, L, R							
P8133AR			Extended red						
P8133RF			ER with filter	Broadcast	190	Rear	Triode	Internal, variable	Coaxial G3-G4 design.
P8135		B, G, L, R							
P8137AR			Extended red						Coaxial G3-G4 design. Highlight overload protection (H.O.P.).
P8137RF			ER with filter	Broadcast	190	Rear	Tetrode	Internal, variable	
P8136		B, G, L, R							
P8138AR			Extended red						Coaxial G3-G4 design. Highlight overload protection (H.O.P.).
P8138RF			ER with filter	Broadcast	300	Rear	Tetrode	Internal, fixed	
P8400H		B, G, L, R							
P8401AR			Extended red					Internal, variable	
P8401RF			ER with filter	Broadcast	400 max	Rear	Triode	(integral control)	Coaxial G3-G4 design.

30 mm Leddicons continued

Type★	Alternative number	Suffix letters	Spectral response	Grade	Heater current (mA)	Front/rear loading	Gun type	Light bias	Features
P8436		B, G, L, R							
P8438AR			Extended red						Coaxial G3-G4 design. Highlight overload protection (H.O.P.).
P8438RF			ER with filter	Broadcast	400 max	Rear	Tetrode	Internal, variable (integral control)	
P8452		B, G, L, R							
P8453AR			Extended red						Coaxial G3-G4 design. Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
P8453RF			ER with filter	Broadcast	400 max	Rear	Diode	Internal, variable (integral control)	
P8454		B, G, L, R							
P8455AR			Extended red						Coaxial G3-G4 design. Dynamic beam control facility (D.B.C.).
P8455RF			ER with filter	Broadcast	400 max	Rear	Diode	Internal, variable (integral control)	
↖ XQ1020		B, G, L, R							
↖ XQ1023R			Extended red						
↖ XQ1025R			ER with filter	Broadcast	190	Rear	Triode	-	
↖ XQ1410	P8520	B, G, L, R							
↖ XQ1413R	P8521AR		Extended red						
↖ XQ1415R	P8521RF		ER with filter	Broadcast	300	Rear	Triode	External	
↖ XQ1430		B, G, L, R							
↖ XQ1433R			Extended red						
↖ XQ1435R			ER with filter	Broadcast	300	Rear	Triode	-	
↖ XQ2440	P8532	B, G, L, R							
↖ XQ2443R	P8533AR		Extended red						Dynamic beam control facility (D.B.C.).
↖ XQ2445R	P8533RF		ER with filter	Broadcast	300	Rear	Diode	External	
↖ XQ3410	P8534	B, G, L, R							
↖ XQ3413R	P8535AR		Extended red						1-inch raster for TK47EP. Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
↖ XQ3415R	P8535RF		ER with filter	Broadcast	300	Rear	Diode	External	
↖ XQ3430	P8530	B, G, L, R							
↖ XQ3433R	P8531AR		Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
↖ XQ3435R	P8531RF		ER with filter	Broadcast	300	Rear	Diode	External	
↖ XQ3440	P8540	B, G, L, R							
↖ XQ3443R	P8541AR		Extended red						Dynamic beam control facility (D.B.C.). Low output capacitance (L.O.C.).
↖ XQ3445R	P8541RF		ER with filter	Broadcast	300	Rear	Diode	External	

★ Where an alternative number is shown, tubes may be ordered using either the XQ- or P- series number. The complete type number comprises the series number with appropriate suffix letter/letters as follows:-

↖ New type.

XQ- or P- series numbers:

B Blue channel
 G Green channel
 L Luminance channel
 R Red channel
 Monochrome tubes - no suffix letter

P- series numbers only:

AR Extended red without filter, for red channel
 RF Extended red with infrared filter, for red channel
 IG Industrial grade

® Registered EEV Trademark for photoconductive camera tubes with lead oxide target. Features of these tubes include very short lag, low dark current and unity gamma. All types have high resolution photolayers and separate mesh connections.

Leddicons for X-ray Image Intensifier Service

Type★	Alternative number	Description
1-inch (25 mm)		
XQ1072	P8022X	Front loading, light bias via tube socket, no anti-halation disc.
XQ1073X		Version of XQ1072 with BG18 anti-halation disc for flare reduction.
XQ2172/02	P8496X	Rear loading, diode gun tube, light bias via tube socket, standard anti-halation disc.
XQ2172/03	P8490X	Front loading, diode gun tube, light bias via tube socket, no anti-halation disc.
XQ2172/03X		Front loading, diode gun tube, light bias via tube socket, BG18 anti-halation disc.
→ XQ2182/02	P8496TX	Version of XQ2172/02 with thin target layer for higher signal current.
→ XQ2182/03	P8490TX	Version of XQ2172/03 with thin target layer for higher signal current.
30 mm		
P8452X		High resolution diode gun tube, low output capacitance (L.O.C.), high signal current, 20 mm image diameter.
P8456X		High resolution diode gun tube, low output capacitance (L.O.C.), high signal current, 24 mm image diameter.
XQ1022		Standard 30 mm Leddicon outline, with no anti-halation disc, 18 mm image diameter.

Infrared Leddicons

→ The P8029 is a 1-inch diameter Leddicon, with a new photoconductive layer sensitive from the visible into the 1–2 μm infrared band and beyond. The tubes have triode guns with separate mesh construction and magnetic focusing and deflection; they are front loading in vidicon type cameras fitted with standard lenses. Three quality grades are available, differing in blemish and shading performance and identified by a suffix to the type number (e.g., P8029-1 is the highest grade).

Leddicon Conditioning Unit P4217

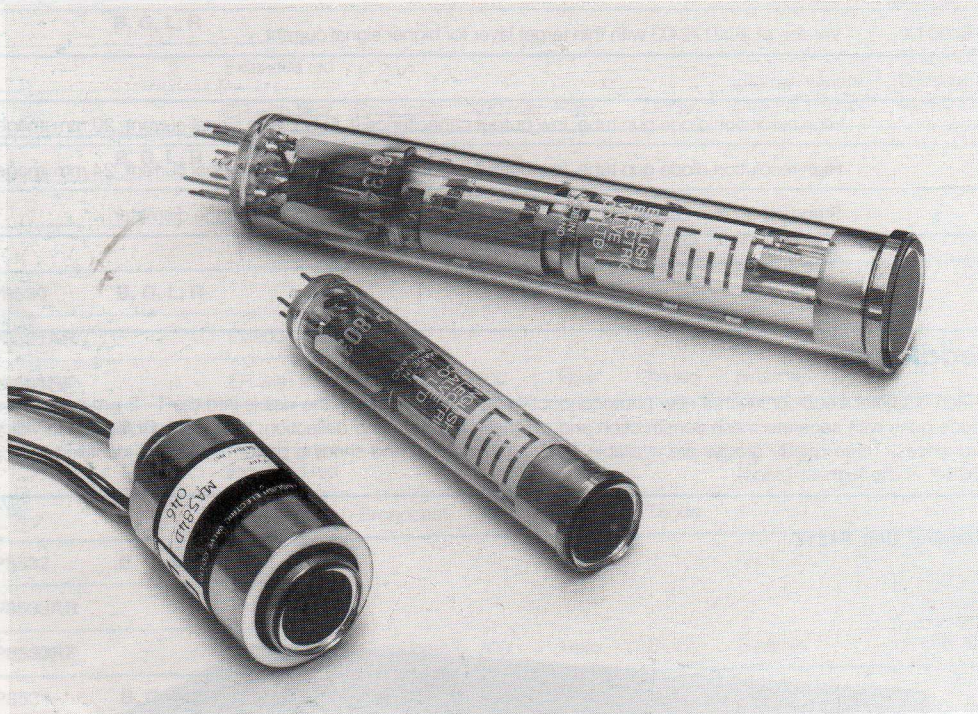


Leddicon Test Equipment

Type	Description
P4217	A 6-socket unit designed to allow lead oxide camera tubes such as the Leddicon to be conditioned periodically without using expensive colour camera equipment. Operation for a few hours each month extends tube shelf life and is beneficial to operational life. The standard unit has 6 sockets capable of accepting any version of 30 mm or 25 mm tubes. Compatible modules for $\frac{2}{3}$ -inch and mixed mode tubes are available as separate options.
P4225	Custom built test facility for Leddicon type camera tubes. The basic unit is a single free-standing desk type structure, which can be fitted with equipment to test any of the EEV range of Leddicons.
P4226	Self-contained lag measuring set for Leddicons and Vidicons; can also be integrated into the P4225 test facility.

Television Camera Tubes – 2/3-inch Vidicons Separate Mesh, Magnetic Focus and Deflection

Type	Application	Features	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
P8037 ■	Compact colour and monochrome cameras for industrial, educational and surveillance applications.	High sensitivity and short lag. Compact construction.	Commercial	95	ii
P8250 ■	Very small cameras for pipe inspection and surveillance.	Very short (65 mm) tube with flying leads. For use in EEV focus and deflection yoke MA584D. Silicon diode array target.	†	95	vi



Vidicons P8250, P8037, 8134V1

Television Camera Tubes – 2/3-inch Rugged Vidicons Separate Mesh, Magnetic Focus and Deflection

Type	Application	Characteristics	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
P8209	Military and industrial involving shock and vibration.	Integral focus and deflection coils. Overall diameter 1 inch approx.	†	95	ii
P8216	Military and industrial involving shock and vibration.	Short tube, 91 mm overall length.	†	95	ii
P8251 ■	Military and industrial involving shock and vibration.	Similar to P8216 but with silicon diode array target.	†	95	vi
P8252 ■	Military and industrial involving shock and vibration.	Similar to P8216 but with silicon diode array target bonded to faceplate.	†	95	vi
P8253 ■	Military and industrial involving shock and vibration.	Similar to P8209 but with silicon diode array target bonded to faceplate.	†	95	vi

Television Camera Tubes – 1-inch Vidicons Separate Mesh, Magnetic Focus and Deflection

Type	Derivative	Application	Characteristics	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
8541A (P842)		Broadcast, educational and high quality industrial.	High sensitivity at all light levels. Moderate sensitivity to red up to 900 nm. Short lag.	1st Grade	95	ii
	8541F	Direct coupling to image intensifiers and converters.	Fibre-optic faceplate, limiting resolution 900 TV lines.	†	95	ii
	P849	Industrial and educational.	High sensitivity and short lag. Relaxed blemish specification.	Commercial	95	ii
	8541/P849D	Low cost industrial and surveillance.	P849 with relaxed specification.	Industrial	95	ii
	P842X	Medical use in conjunction with X-ray sensitive image intensifier.	Photosurface selected to match intensifiers with P20 phosphor output. Short lag.	†	95	ii
8572A (P843)		Colour or monochrome telecine and caption scanning. Can be selected for use in PE24 and PE240 cameras. Available with anti-halation faceplate stud.	High sensitivity but very short lag at high light levels. Resistant to image retention.	1st Grade	600	i
	P844	Colour or monochrome telecine and caption scanning.	Low power heater version of 8572A (P843).	1st Grade	95	i
	P844X	Medical use in conjunction with X-ray sensitive image intensifier.	Medium lag for integration of intensifier noise.	†	95	v
P8030		Colour or monochrome telecine, caption scanning; educational.	Version of 8541A with 300 mA heater.	†	300	ii
P8031		Industrial and educational.	High sensitivity and short lag. For use in cameras requiring 300 mA heater.	Commercial	300	ii
P8034A		Radar screen viewing. Low light level surveillance where scene motion is limited.	High sensitivity, long lag photo-cathode for normal and slow scan operation at low light levels.	†	95	iv
P8038		Colour telecine, selected for use in TK28 and similar cameras.	High sensitivity and short lag. Signal output and resolution uniform over whole raster.	1st Grade	95	ii
P8038B		Blue channel of colour telecine, selected for use in TK28 and similar cameras.	High sensitivity and short lag. Signal output and resolution uniform over whole raster.	1st Grade	95	iii
P8122		Specialized closed-circuit industrial systems.	Similar to P8125 but with overall length reduced to 5.18 inches.	†	95	vi
P8125		Specialized closed-circuit industrial systems.	Silicon diode array target, unaffected by extreme light overload and scan failure. No photoconductive lag. Low blooming. High sensitivity including near infrared.	†	95	vi
P8126		Specialized closed-circuit industrial systems.	Similar to P8125 but with improved gun giving higher amplitude response at frequencies up to 700 TV lines.	†	95	vi
P8203		Ultra high resolution medical, educational and industrial systems.	Limiting resolution in the region of 1600 TV lines.	1st Grade	95	ii
	P8204	Ultra high resolution medical, educational and industrial systems.	P8203 with relaxed blemish specification.	Commercial	95	ii
	P8205	Ultra high resolution medical, educational and industrial systems.	P8204 with relaxed blemish specification.	Industrial	95	ii

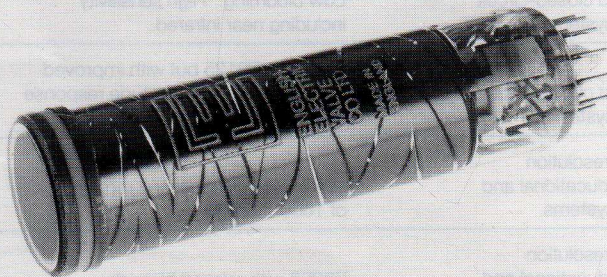
† Specific tube grades and electrical parameters can be negotiated.

■ Made to special order only.

Television Camera Tubes – 1-inch Rugged Vidicons Separate Mesh, Magnetic Focus and Deflection

Type	Application	Characteristics	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
P831	Military and industrial involving shock and vibration.	Short tube, electrical characteristics similar to 8541A.	†	95	ii
P831 IG	Industrial involving shock and vibration.	Rugged, industrial grade tube of reduced length. Improved replacement for 7262A when fitted with integral mesh connector clip.	Industrial	95	ii
P863‡	Military and industrial involving shock and vibration.	Developed from P831, with mesh connected to ring adjacent to target connection to eliminate pick-up by leads.	†	95	ii
P8123	Military and industrial involving shock and vibration.	Similar to P831 but with silicon diode array target.	†	95	vi
P8127	Military and industrial involving severe shock and vibration.	Short tube with silicon diode array target bonded to faceplate.	†	95	vi
P8129	Military and industrial involving shock and vibration.	Very short (4 inches–102 mm), with compact integral focus and deflection coils. Silicon diode array target bonded to faceplate.	†	95	vi
P8201	Military and industrial involving shock and vibration.	Very short (4 inches–102 mm), with compact integral focus and deflection coils.	†	95	ii
P8202	Military and industrial involving shock and vibration.	Similar to P8201 but with silicon diode array target.	†	95	vi
P8208	Military and industrial involving severe shock and vibration.	Similar to P8201 but with improved environmental specification.	†	95	ii
P8214	Military and industrial involving shock and vibration.	Short tube with integral focus and deflection coils.	†	95	ii
P8218	Military and industrial involving shock and vibration.	Short tube, electrical characteristics similar to P831.	†	300	ii
P8254	Military and industrial involving shock and vibration.	Short tube with integral focus and deflection coils. Silicon diode array target bonded to faceplate.	†	95	vi

FPS Vidicon P8280



➤ New type.

® Registered EEV trade mark.

† Specific tube grades and electrical parameters can be negotiated.

‡ Can be purchased with scanning/focus/alignment coil assembly.

Television Camera Tubes – 1-inch Rugged Vidicons Magnetic Focus, Electrostatic Deflection (FPS)

Type	Application	Features	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
P8280	Military and industrial involving severe shock and vibration.	Short, high resolution tube with silicon diode array target. Compact focus coil available from EEV.	†	95	vi
P8281	Military and industrial involving severe shock and vibration.	Short tube with very high resolution (1600 lines). Compact focus coil available from EEV.	†	95	ii
P8281F	Direct coupling to image intensifiers and converters.	P8281 with fibre-optic faceplate	†	95	ii

Television Camera Tubes – 1-inch Vidicons Electrostatic Focus and Magnetic Deflection

Type	Application	Features	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
8134	Broadcast and industrial, compact monochrome.	Industrial grade tube.	†	95	ii
8134V1/ 4811	Broadcast, colour, telecine. Can be supplied in matched sets for RCA TK27 camera.	Uniform sensitivity and geometry for multi-tube colour cameras. It can be selected for use in the red, blue or green channels.	1st Grade	95	ii

Television Camera Tubes – Pyroelectric Vidicons (Pevicons®)

Development is continuing of higher performance variants and specific enquiries are invited. The faceplate is normally germanium but other materials can be supplied. The types listed are also available with special non-parallel faceplates for infrared interferometry applications.

Type	Faceplate diameter	Application	Features
P8092	1-inch	Thermal imaging	Maximum sensitivity in the 8 to 14 micron band, with thermal resolution better than 0.2 °C. Mechanically similar to 1-inch separate mesh vidicons. Gas stabilized.
P8093	1-inch	Thermal imaging	High vacuum (hard) tube with performance similar to P8092.
P8094	1-inch	Thermal imaging	Gas stabilized tube with reticulated target giving superior spatial resolution. Electrically interchangeable with P8092.
P8220	1-inch	Thermal imaging	Similar to P8092, with overall length reduced by 26 mm.

Television Camera Tubes – 1-inch Vidicons Integral Mesh, Magnetic Focus and Deflection

Requirements for integral mesh vidicons can be met using current separate mesh tubes, converted to integral mesh operation with an external shorting clip on the base.

Type	Application	Characteristics	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see page 64)
7038	Colour or monochrome telecine and caption scanning. Can be selected for use in PE240 camera.	Medium/high sensitivity but short lag at high light levels. Resistant to image retention.	1st Grade	600	i
P862	Industrial	Medium/high sensitivity and short lag. P849D with connector for integral mesh operation.	Industrial	95	ii
P864	Industrial and educational.	High sensitivity, short lag. P849 with connector for integral mesh operation.	Commercial	95	ii

Television Camera Tubes – 1½-inch Vidicons

Type	Application	Features	Blemish standard	Heater current at 6.3 V (mA)	Photo-surface (see below)
------	-------------	----------	------------------	------------------------------	---------------------------

Electrostatic Focus and Magnetic Deflection

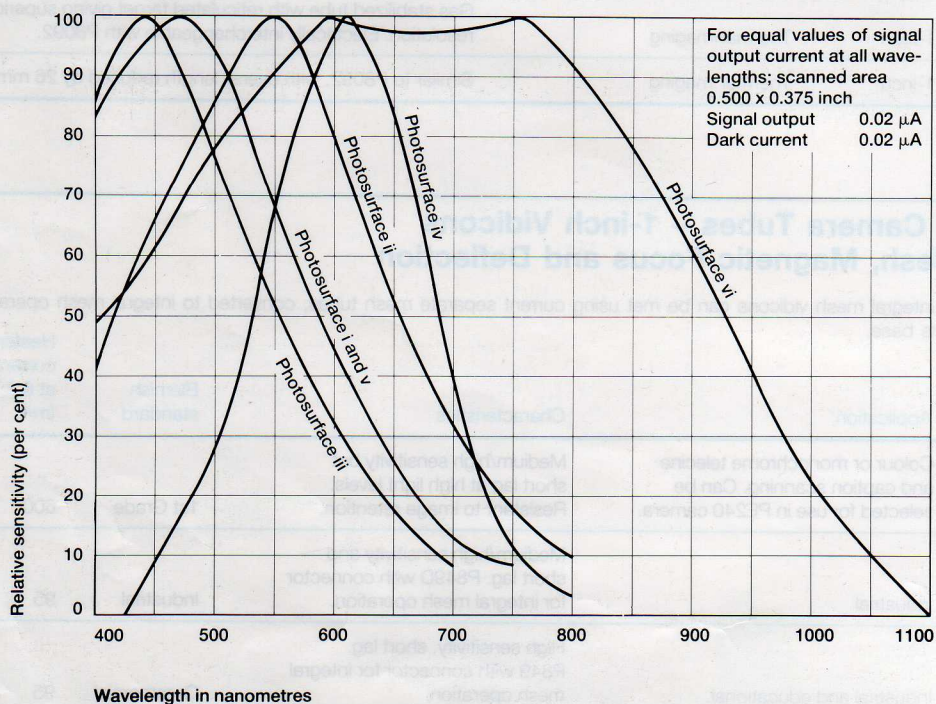
8480	Colour or monochrome cameras, telecine and high grade industrial.	Low deflection power, negligible electrostatic focusing power. Reduced camera size by eliminating focus coil. High resolution.	1st Grade	95	i
8480V1/4810	High quality colour cameras such as RCA TK27.	Similar to 8480 but tested to closer limits for signal uniformity, beam astigmatism and other characteristics.	Selected	95	i

Separate Mesh, Magnetic Focus and Deflection

8521 ■	High resolution applications.	Limiting resolution in the region of 2000 TV lines. Very short lag.	†	600	ii
P8217	High resolution applications	Ultra-high and uniform resolution in suitable yoke. Mesh connection by flying lead below target flange, to eliminate pick-up.	†	600	ii

Vidicon Photosurfaces

Type	Description
Photosurface i	High sensitivity photosurface with very short lag at high light levels. Resistant to image retention and intended for colour or monochrome telecine and caption scanning.
Photosurface ii	The colour response peaks in the green region and extends into the near infrared; near panchromatic response is obtained in daylight. This photosurface provides higher sensitivity than type i and has high sensitivity at both high and low light levels. It must not be exposed to bright lights for long periods.
Photosurface iii	This photosurface is similar in sensitivity to type ii but its colour response peaks in the blue region. It provides improved colour rendition with tungsten illumination. It has extremely short lag when used at light levels of 10–100 lux incident on the faceplate.
Photosurface iv	This photosurface has been specially designed with long lag characteristics. It is intended for integrating repetitive light inputs of low level such as from X-ray image intensifier screens or cathode ray tube displays.
Photosurface v	High sensitivity, medium lag photosurface developed for use with X-ray image intensifiers. The spectral response is very similar to photosurface iii and is well matched to P20 phosphor.
Photosurface vi	The silicon diode array target has a wide spectral response ranging from blue to infrared. The very high sensitivity in the visible and infrared, combined with its high resolution and low lag properties make it very suitable for surveillance applications, good picture quality being obtained with a target illumination of less than 0.5 lux. The red and infrared sensitivity also makes it suitable for use in the red channel of a colour camera.



Television Camera Tubes – Image Isocons

Image Isocons are designed to provide optimum performance at low levels of scene illumination (moonlight conditions). Typical applications include – Night time detection and reconnaissance – Helicopter night landing and vehicle operations – Navigation – Deep sea low light inspection – Surveillance of borders, factory perimeters – Low intensity X-ray fluoroscopy.

These tubes can be manufactured with different spectral responses, including ultraviolet, and different target spacings. Specific enquiries are invited.

Size	Nominal image diagonal	Type	Description
55 mm	40 mm	P8040	High sensitivity, ruggedized tube with plain glass faceplate and close spaced target suitable for medical applications. It is particularly suitable where high performance from a small camera is required.
55 mm	40 mm	P8040-UV	P8040 with special faceplate and photocathode for ultraviolet operation.
55 mm	40 mm	P8041	High sensitivity, ruggedized tube, identical with P8040 but with fibre-optic faceplate.
55 mm	18 mm	P8042	Similar to P8040 but designed to use 18 mm optical image format.
3-inch	40 mm	P880	High sensitivity tube, externally similar to image orthicon; most image orthicon cameras can readily be modified to accept it.

Focus and Deflection Yokes

Type	Description
MA355A	Combined focus and deflection yoke for use with 55 mm Image Isocons P8040 and P8041.
MA517A	Combined focus and deflection yoke for use with the range of standard 1-inch Vidicons.
MA561A	Combined focus and deflection yoke for special vidicons such as P8214 and P8254, and Silicon Intensifier Target tubes.
MA584A	Combined focus and deflection yoke for use with 3/8-inch Vidicon P8037.
MA584D	Combined focus and deflection yoke for use with short 3/8-inch Vidicons such as P8250.
MA671A	Combined focus and deflection yoke for 30 mm Leddicons in CCTV, surveillance and industrial applications.
MA809A	Combined focus and deflection yoke for use with 1 1/2-inch Vidicons such as 8521.
MA957A	Combined focus and deflection yoke for use with high resolution vidicons such as P8126 and P8203.
MA2050A	Combined focus and deflection yoke for use with standard 1-inch Vidicons, especially rugged types such as P863, and with 1-inch Pyro-electric Vidicons such as P8092 and P8093.
MA2051A	Combined focus and deflection yoke for short, rugged 1-inch Vidicons such as P8129, P8201, P8202 and P8208.

Shutter Tubes

Electrostatically focused image converters with electrostatic deflectors, able to operate in framing or streak mode. P855 and P8307 incorporate a fine mesh accelerator which can be used for gating and to reduce time resolution. Standard output phosphor is P11 for P855 and P856, P20 for P8307 series; P46 and P47 phosphors are available to special order. All tubes have sapphire input and fibre-optic output windows.

Useful screen area (mm)	Type	Structure	Equivalent background illumination (max) (lux)	Static resolution (min) (line pairs/mm)	Photo-cathode	Operating voltage (kV)	Application
65 x 40	P855A	Tetrode	2×10^{-5}	16	S20	16	For sweep or framing operation, capable of 10 picosecond time resolution
65 x 40	P855B	Tetrode	2×10^{-5}	16	S25	16	
65 x 40	P855C	Tetrode	◆	16	S1	16	
65 x 40	P8307A	Tetrode	1×10^{-5}	18	S20	18	For sweep operation; capable of 2 picosecond time resolution
65 x 40	P8307B	Tetrode	1×10^{-5}	18	S25	18	
65 x 40	P8307C	Tetrode	▲	18	S1	18	
70 x 40	P856A	Triode	1×10^{-5}	16	S20	18	For sweep or framing operation; used in J. Hadland 790 camera *
70 x 40	P856B	Triode	1×10^{-5}	16	S25	18	
70 x 40	P856C	Triode	◆	16	S1	18	
70 x 40	P8307D	Tetrode	1×10^{-5}	18	S20	18	For sweep or framing operation; capable of 2 picosecond time resolution
70 x 40	P8307E	Tetrode	1×10^{-5}	18	S25	18	
70 x 40	P8307F	Tetrode	▲	18	S1	18	

† Specific tube grades and electrical parameters can be negotiated.

■ Made to special order only.

◆ Equivalent background noise 3×10^{-12} A/cm² max.

▲ Equivalent background noise 5×10^{-12} A/cm² max.

* Available from John Hadland Ltd., Newhouse Laboratories, Bovingdon, Herts.

Storage Tubes

Useful screen size	Type	Description	Typical luminance (cd/m ²)	Deflection
4.0 inches (10.2 cm) dia.	E713B (CV9422)	Direct view storage tube recommended for radar applications under limited vibration conditions.	6200	Magnetic
4.0 inches (10.2 cm) dia.	E723	Direct view storage tube with two writing guns. Designed as a direct replacement for use in Phantom aircraft radar displays.	5000	Electrostatic
4.0 inches (10.2 cm) dia.	E740	Direct view storage tube with a central undeflected spot position. The tube is of ruggedized construction and encapsulated in a magnetic shield. Suitable for daylight viewing of airborne radar displays and other applications where vibration is encountered.	4500	Electrostatic

Thermal Imaging Cameras

Type	Description
P4428	Portable, self-contained thermal imaging camera and monitor, battery powered. Engineered specifically for use by firefighting services in dense smoke. It is 11 inches long by 6½ inches diameter and weighs only 3 kg. P4428 supersedes type P4228.
P4430	Portable, self-contained thermal imaging camera and monitor based on the P4428. Engineered for applications which require interchangeable lenses with focal lengths from 25 to 75 mm. It is 11 inches long by 6½ inches diameter and weighs approximately 3 kg excluding lens.
P4440	Portable, self-contained thermal imaging camera and monitor using the P8220 pyroelectric vidicon. Designed as a lightweight hand held system with interchangeable lenses. It is 13 inches long by 3½ inches diameter and weighs approximately 2 kg excluding lens.
P4450	Thermal test pattern generator, designed to aid setup and servicing of thermal imaging cameras including P4228, P4428, P4430 and P4440. Switchable for use with 110 V, 60 Hz or 220 V, 50 Hz supply.

Thermal Imaging Camera for Firefighting Applications

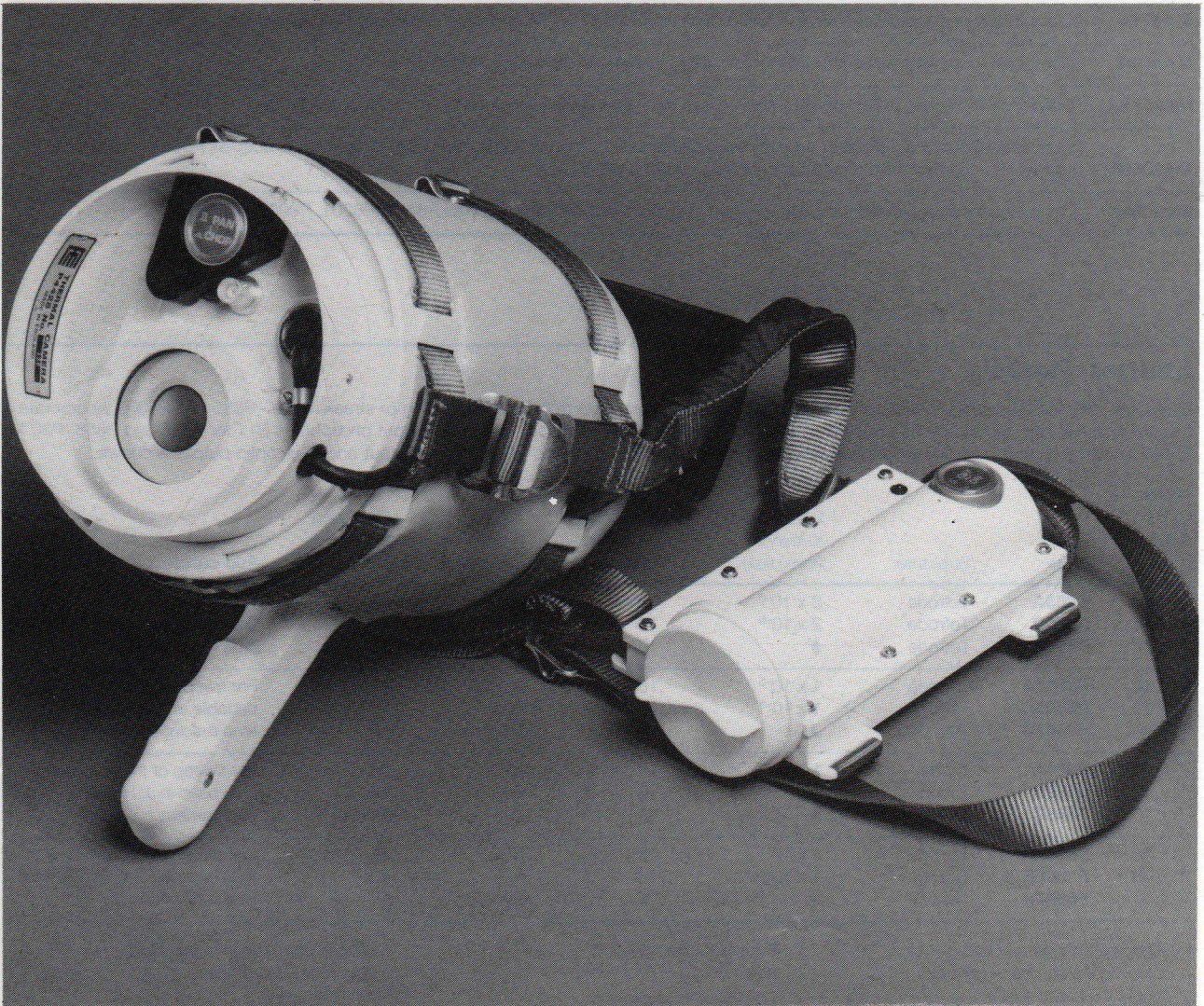


Image Intensifiers

Compact, rugged tubes for night vision and other low light level applications. All types incorporate a P20 type phosphor.

Useful diameter (mm)		Type	Magnification (approx)	Typical luminance gain	Typical centre resolution (lp/mm)	Distortion (%)	Net weight (g)	Application
input	output							
18	18	P8304A †	1.0	15 000	28	zero	105	Second generation intensifier to fit AN/PV5-5A goggles. *
18	18	P8304B †	1.0	15 000	28	zero	100	Second generation intensifier for single tube goggles. *
18	18	P8304C †	1.0	22 000	28	zero	185	Second generation intensifier for pocketoscope. *
18	18	P8304D †	1.0	30 000	28	zero	100	Similar to P8304B but giving a higher performance for use in armoured vehicle sights. *
11	11	P8304E †	1.0	10 000	28	zero	98	Engineering grade second generation intensifier with 11 mm useful cathode diameter. *
18	18	P8304F ▷‡◆	1.0	10 000	32	zero	78	Second generation intensifier packaged to minimum size for goggles and ultra-lightweight weapon sights. Inverting output. *
18	18	P8304J †	1.0	30 000	28	zero	210	Second generation proximity focus replacement for XX1500. *
18	18	P8514A ▷‡◆	1.0	25 000	39	zero	78	Compact third generation intensifier for night vision goggles. Suitable for use in aircraft. *
18	18	P8514EG ‡◆	1.0	27 000	36	zero	78	Compact third generation intensifier for general applications including use in aircraft. *
18	18	P8514FP ‡◆	1.0	Up to 35 000	36	zero	85	Variable gain third generation intensifier. Plano input and output. *
18	18	P8514KC ▷‡◆	1.0	28 000	39	zero	98	Compact third generation intensifier for lightweight weapon sights. *
18	18	P8514KE ‡◆	1.0	27 000	36	zero	98	Third generation intensifier for general applications. *
25▶	25▶	P8332	1.17	3000	40	8	1400	First generation intensifier with enhanced infrared response. Suitable for active use with IR searchlight. *
25	25	P8073	0.95	100*	71	7	150	Pre-amplifier for intensified low light television. *
25	25	P8079HP ‡◆	0.84 to 1.0	70 000***	40	19	900	High performance replacement for first generation intensifiers, giving approx. 50% improvement in range. *
25	25	P8079DC ▲‡◆	0.94 to 1.0	70 000***	40	6	900	High performance replacement for first generation intensifiers, giving approx. 50% improvement in range and distortion free picture. *

Tubes conforming to other requirements are also available.

FLITE (Field and Laboratory Intensifier Test Equipment)

Type	Length (mm)	Width (mm)	Height (mm)	Net weight (kg)	Application
P4262	550	650	400	40	Testing of first, second and third generation image intensifiers.

▷ Approved to BS CECC (or pending).

■ New type.

† Fibre-optic input and output, proximity focused intensifier with microchannel plate.

‡ Reduced veiling glare glass input, inverting fibre-optic output.

▲ Distortion Compensation incorporated.

◆ Flash Protection incorporated.

* Single stage, fibre-optic input and output.

▶ Other formats are available.

*** Three stages, fibre-optic input and output.

‡ D.C. input voltage 6.75 V. Internal automatic brightness control.

Charge Coupled Devices

Development of improved CCD image sensors continues. A revised type numbering system is used for the P85000/P86000 range of sensors; this identifies the main features of each device using the last four digits of the type number as follows:

P8□□□□

Scan system

5 = 525 lines
6 = 625 lines
7 = X-Y

Principal characteristics

0 = unspecified
1 = 2/3-inch format, non anti-blooming (mask UT101)
2 = 2/3-inch format, non anti-blooming (mask UT102)
3 = 2/3-inch format, anti-blooming (mask UT102)
4 = 1/2-inch format, anti-blooming (mask UT103)
5 = 2/3-inch format, anti-blooming (mask UT104)

Application

1 = bare die
2 = monochrome TV
3 = scientific
4 = Peltier cooled
5 = gen. 2 intensified
6 = unspecified
7 = gen. 3 intensified
8 = back illuminated
9 = unspecified

Performance grade

1 = grade 1
2 = grade 2
3 = grade 3
5 = set-up grade

Type

New range	Maintenance type	Image size (mm)	Scan system (TV lines)	Anti-blooming	Package size (mm)	Electrical connections	Application
	P8602♦	8.5 x 6.4	625	no	19.4 x 15	30 pin x .05 inch D.I.L.	Monochrome TV
	P8606♦	6.4 x 4.8	625	no			
↔P8612-		8.5 x 6.4	625	no			
P8532-		8.5 x 6.4	525	yes			
↔P8542-		6.4 x 4.8	525	yes	25.4 x 15	20 pin x 0.1 inch D.I.L.	Monochrome TV
P8632-		8.5 x 6.4	625	yes			
↔P8642-		6.4 x 4.8	625	yes			
P8603	P8613-	8.5 x 12.7*	full frame	no	19.4 x 15	30 pin x .05 inch D.I.L.	Scientific
	P8607♦	6.4 x 9.5†	full frame	no			
P8623-		8.5 x 12.7*	full frame	no	25.4 x 15	20 pin x 0.1 inch D.I.L.	Scientific
	P8604♦	8.5 x 6.4	625	no	28 x 27	22 pin x 0.1 inch D.I.L.	Peltier cooled
↔P8614-		8.5 x 6.4	625	no			
	P8650■♦	8.5 x 6.4	625	no	44Ø x 33	30 pin x .05 inch D.I.L.	Intensified
P85351		18 diagonal◇	525	yes	43Ø x 55	22 pin x 0.1 inch D.I.L.	Intensified
P85352		18 diagonal◇	525	yes			
↔P8615-		18 diagonal◇	625	no	44Ø x 51	18 pin x 0.1 inch	Intensified
P86351		18 diagonal◇	625	yes	43Ø x 55	22 pin x 0.1 inch D.I.L.	Intensified
P86352		18 diagonal◇	625	yes			

Mask UT101 has a 385 x 576-element array for 625-line operation, UT102 and UT103 have 385 x 576 (625-line) or 385 x 488 (525-line) arrays, and UT104 has a 578 x 576 (625-line) or 578 x 488 (525-line) array.

♦ Not electrically interchangeable with the corresponding new types.

◇ Image size on input of intensifier.

* Image diagonal 15.3 mm, achieved by using both frame and store areas of the basic 10.6 mm device.

† Image diagonal 11.5 mm, achieved by using both frame and store areas of the basic 8 mm device.

★ P40000 series *photon* cameras are designed to operate in harsh environmental conditions.

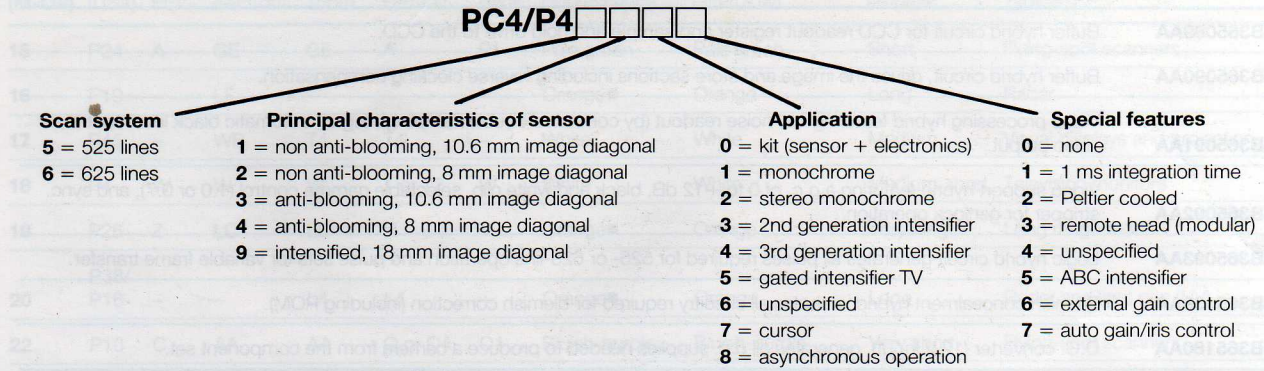
§ All cameras are available with dedicated 525-line sensor under appropriate type numbers.

↔ New type.

■ Made to special order only.

CCD Cameras – *photon* and Modular ranges

The main features of the *photon* range cameras are identified by the last four digits of the type number, as follows:



Enquiries are invited for applications not listed below.

Type	Description
P46100§	Kit camera, comprising CCD sensor and hybrid support electronics as required for particular application.

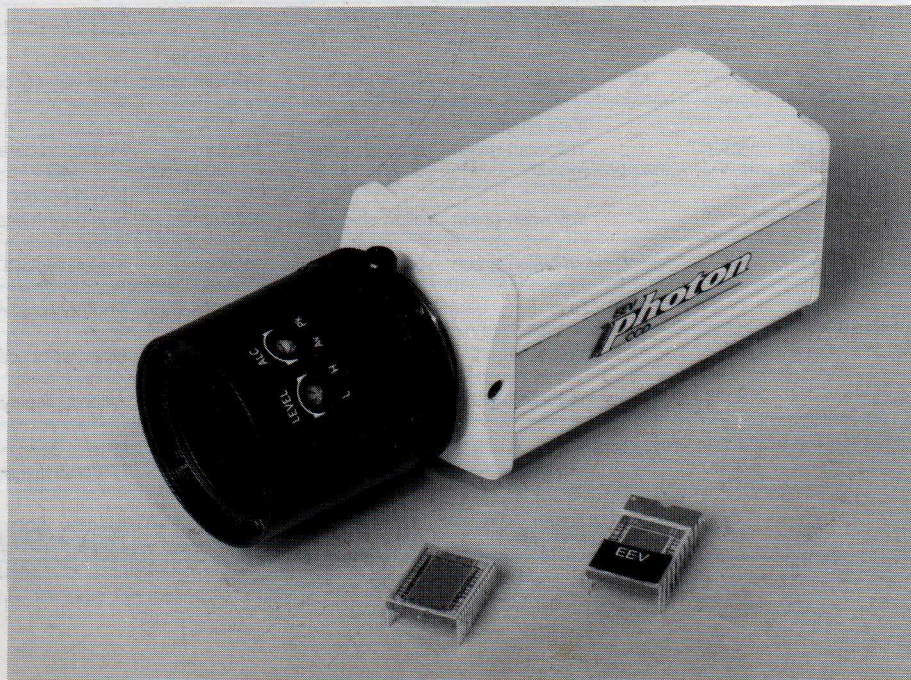
photon CCD Cameras*

P46310§	General purpose monochrome TV camera with genlock. Image diagonal 10.6 mm, output 625 line CCIR.
P46311§	General purpose monochrome TV camera with genlock and choice of TV or 1 ms integration time (switchable). Image diagonal 10.6 mm, output 625 line CCIR.
P46935§	Low light level intensified CCD camera with 18 mm image diagonal on the intensifier input; automatic brightness control (ABC). Replaces P4321.
P46936§	Similar to P46935 but with external gain control for scientific applications at low light levels.
P46937§	Similar to P46935 but with automatic gain control and auto-iris for operation over a wide range of light levels.
PC46410§	New <i>photon</i> CCD camera for use in surveillance and machine vision applications.
PC46411§	Similar to PC46410 but with an electronic shutter giving 1 ms or standard TV field integration times.

New Modular Range of CCD Cameras

P46312§	Monochrome TV camera with Peltier cooled CCD permitting operation at high ambient temperatures or where long signal integration times are required.
P46323§	Twin head monochrome TV camera for stereo imaging.
P46373§	Cursor camera. Has electronically generated and controlled cursor lines for use in inspection applications.
P46953§	Gated intensified CCD camera; exposure time variable from 1 ms down to 1 μ s. Conventional CCIR video output.
P46963§	Gated intensified CCD camera using full-frame sensor. Incorporates frame store and signal processing.

CCD Camera and Image Sensors



CCD Support Components

Type	Description
ESB365089AA	Buffer hybrid circuit for CCD readout register and sample and hold drive to the CCD.
ESB365090AA	Buffer hybrid circuit, drives the image and store sections including reverse clocking compensation.
ESB365091AA	Video processing hybrid featuring low noise readout (by correlated double sampling), a.g.c., automatic black level control, video output.
ESB365092AA	Video support hybrid featuring a.g.c. of 0 to +12 dB, black and white clip, selectable gamma control (1.0 or 0.7), and sync. stripper for genlock operation.
ESB365093AA	Logic hybrid circuit generates all pulses required for 525- or 625-line operation and pulse sets for variable frame transfer.
ESB365139AA	Blemish concealment hybrid, includes all circuitry required for blemish correction (including ROM).
ESB365180AA	D.C. converter (12 V input), generates all d.c. supplies needed to produce a camera from the component set.

Self-scanned Photodiode Array

The P87000 is a solid-state area image sensor comprising 125 x 125 photodiode-type sensing elements with associated scanning circuitry. Sample quantities are available for evaluation.

Type	Image size (mm)	Scan system	Frame rate	Packaging	Application
P87000	5 x 5	Serial X-Y 125 line	50 Hz typical	24 pin D.I.L.	Industrial imaging

Cathode Ray Tube Phosphors

Standard Coding for EEV Cathode Ray Tubes

The first one or two figures indicate the diameter or diagonal of the screen in cm.

The last two figures indicate the phosphor used, as in the following table.

The letter is a reference defining a particular tube design.

Examples:

2168A	304B
21 - 21 cm diagonal of screen	3 - 3 cm diameter of screen
68 - phosphor code with aluminizing	04 - phosphor code
A - reference letter	B - reference letter

The phosphor code is normally omitted from the type number in data sheets and catalogues; thus 304B will be found in the 300B series data.

EEV (M-OV)	EIA (USA)	Old EEV	Pro-electron	Brimar Thorn	Ferranti	Rank	Fluorescence	Phosphorescence (afterglow)	Persistence (approx)	Typical use
01	P1	G	GJ	GJ	D2	G	Yellowish-green	Yellowish-green	Medium	Projection and oscilloscope
02	P28	V	KE	K	K	Y	Yellow-green	Yellow-green	Long	Radar
03	P20	M	KA	KA	V	K2	Yellow-green	Yellow-green	Medium to medium-short	High visibility displays
04	P43	-	GY	GY	V3	-	(Line emitter) Yellowish-green	Yellowish-green	Medium	Projection data display
06	P42	-	GW	-	-	-	Yellowish-green	Yellowish-green	Medium	Low repetition rate/ high brightness displays
07	P44	-	GX	GX	V4	-	Yellowish-green	Yellowish-green	Medium	Visual displays
08	P11	P	BE	BE	P or P2	B	Blue	Blue	Medium-short	Photographic recording
10	P46	-	KG	-	A5	-	Yellow-green	Yellow-green	Very short	Flying-spot scanners
11	P53	-	-	-	-	-	Yellowish-green	Yellowish-green	Medium	Avionic displays
13	P28/ P11	-	-	-	-	-	Yellowish-green	Yellowish-green (blue flash)	Medium	Radar
14	P38/ P46	-	-	L6	L6	-	Orange	Orange	Long	Radar and light pen (R)

Cathode Ray Tube Phosphors continued

EEV (M-OV)	EIA (USA)	Old EEV	Pro-electron	Brimar Thorn	Ferranti	Rank	Fluorescence	Phosphorescence (afterglow)	Persistence (approx)	Typical use
15	P24	A	GE	GE	A	P1	Pale green	Pale green	Short	Flying-spot scanners
16	P19	-	LF	-	-	-	Orange■	Orange	Long	Radar
17	P45	-	WB	T4	T4	-	White	White	Medium	Visual displays and projection
18	P4	W	W	W	T or T2	W	White	White	Medium-short	Television monitors
19	P26	Z	LC	LC	H	Y	Orange■	Orange	Very long	Long range radar
20	P38/ P16	-	-	L4	L4	-	Orange■	Orange	Long	Radar and light pen (UV)
22	P16	C	AA	AA	Q or Q4	Q1	Bluish-purple	Bluish-purple	Very short	Flying-spot scanners
23	P33	Y	LD	LD	L	L2	Orange■	Orange	Very long	Medium-short range radar
24	P31	H	GH	GH	S	M1	Green	Green	Medium-short	General-purpose oscilloscopes
25	P2	N	GL	GL	K5	-	Yellow-green	Yellow-green	Medium	Wide speed range oscilloscopes
26	-	T	LA	LA	Z	-	Yellowish-orange	Yellowish-orange	Medium	Anti-flicker display
27	P38	S	LB	L2	L3	L3	Orange■	Orange	Long	Medium and short range radar
28‡	P26/ P25	-	-	-	H4	-	Orange	Orange	Long	Medium range radar
29	P39	E	GR	GR	K8	J4	Yellowish-green	Yellowish-green	Long	Medium and short range radar Anti-flicker displays
31	P38	D	LK	L3	L4	-	Orange■	Orange	Long	Medium and short range radar
32	P25	-	LJ	M	-	-	Orange	Orange	Medium	Radar
33	P12	U	L	-	K3	L4	Orange■	Orange	Long	Radar
34	P22R	-	X	-	R2 or R3	R4	Reddish-orange	Reddish-orange	Medium	Data and graphics display
35	P28/ P26	L	-	-	-	-	Orange	Yellowish-green Orange	Long Very long	Label radar display
36	P47	-	BH	-	Q8	-	Purplish-blue	Purplish-blue	Very short	Photographic recording
37	P22	B	X	-	-	F1	Blue	Blue	Very short	Projection
38	P56	R	RF	-	-	-	Red	Red	Medium	Projection
39	-	-	LA	-	-	-	Yellowish-orange	Yellowish-orange	Medium	Anti-flicker data display
44	P32	-	GB	-	J6	-	Purplish-blue	Yellowish-green	Medium-short Long☆	Radar and low speed oscilloscopes
45	P14	-	Y	-	J5	-	Purplish-blue	Yellowish-orange	Blue: medium-short Yellowish-orange: medium between 2 and 4 seconds	Radar with repetition rate
46	P7	X	GM	GM	J	D	White	Yellowish-green	Medium-short Long☆	Radar and low speed oscilloscopes
47	P40	F	D or G	-	-	-	White	Yellowish-green	Blue: medium-short Yellow: long	Low repetition rate displays
48	-	-	-	-	-	-	Red-infrared (800-900 nm)	Red-infrared	Short	Infrared display
49	-	-	-	-	-	-	Red-infrared (700 nm)	Red-infrared	Short	Infrared display

+ 50 The addition of 50 to any of the EEV phosphor codes above indicates an aluminized screen, e.g. phosphor no. 25 with an aluminized screen becomes phosphor no. 75.

■ This screen is readily damaged by slow-moving traces of high brightness, and should not be used with a stationary trace. It is normally used for radar PPI display.

‡ Reduced-burn type phosphor.

■ New type.

☆ White: medium-short.

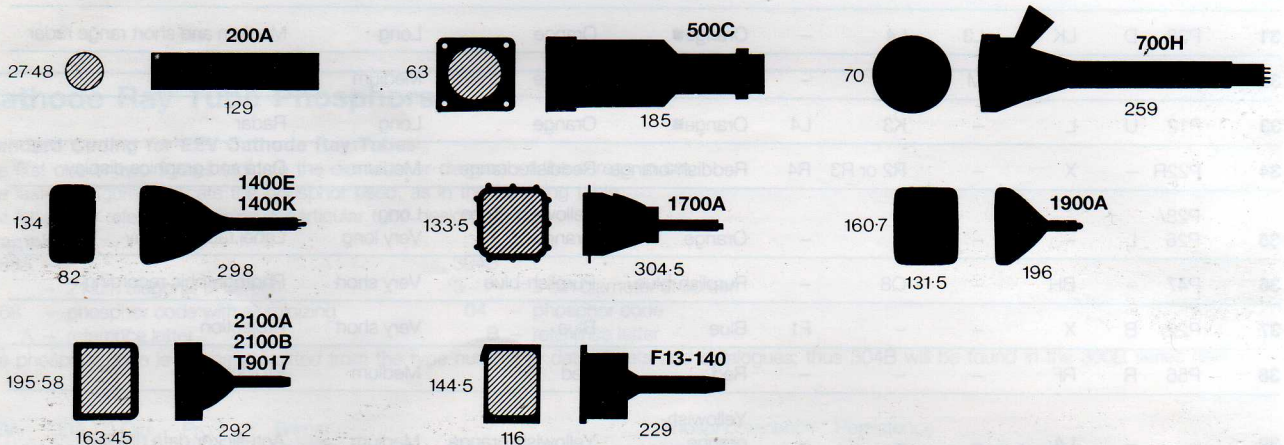
Military and Avionics Tubes

Type	Deflection angle (degrees)	Typical phosphor (EEV code)	Typical characteristics			Heater supply		Application
			Resolution (mm)	Luminance (cd/m ²)	Final anode voltage (kV)	(V)	(mA)	
200A★	25	P46 (60)	0.025	14 000 (spot)	7.5	6.3	300	Vehicle display
500C	30	P43 (54)	0.025	250	8.0	6.3	300	Vehicle display
700H (CV6217)	38	P11 (58) P26 (69)	0.07	3000	30	6.3	300	Airborne projection
1400E	44	(78)	0.6	—	17.5	19	100	Weather radar
1400K (CV6229)	44	(78)	0.6	—	17.5	19	100	Weather radar
1700A★	35	P31 (74)	0.32	2000	10	6.3	300	Radar
1900A	90	(89)	0.25	150	12	11	150	Rugged display
2100A	70	P4 (68)	0.25	250	14	6.3	300	Head-down display
2100B	70	P4 (68)	0.25	250	14	6.3	300	Head-down display
F13-140	60	P1 (GJ)	0.3	—	10	6.3	450	Head-down display
T9017	70	P4 (68)	0.25	250	14	6.3	300	Head-down display

Tubes are normally supplied in compliance with a customer's detailed test specification.

Options available to order include: potted flying leads and connectors; permanently bonded mounting frame; potted deflection yoke; mumetal shielding; contrast enhancement filters; electromagnetic interference protection and anti-reflective coatings.

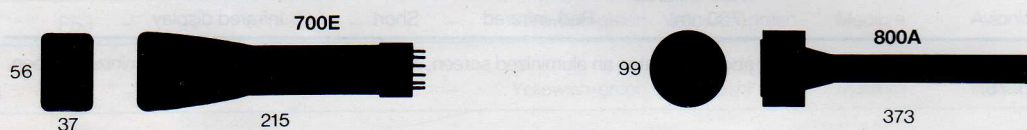
Overall dimensions in mm



Instrument and Projection Tubes

Type	Deflection angle (degrees)	Typical phosphor (EEV code)	Final anode voltage (kV)	Cut-off voltage (V max)	Sensitivity (V/cm)		Heater supply		Base	Application
					X	Y	(V)	(mA)		
700E	—	P31 (24)	2.0	-100	46	107	6.3	300	B12A	Instruments
800A	25	P53 (61) P45 (67)	35	-130	—	—	6.3	400	B12A	Projection

Overall dimensions in mm



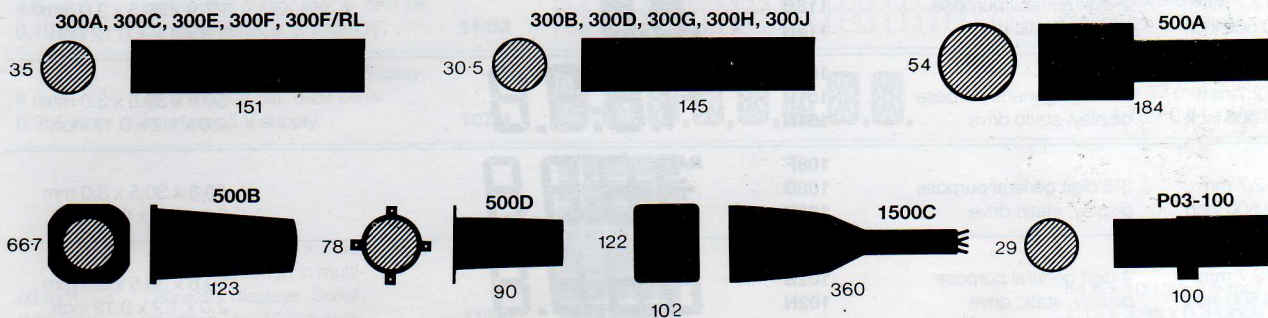
Rugged, Miniature, High Resolution Electrostatic Tubes

Typical characteristics†

Type	Overall voltage (kV)	Line intensity at 25 m/s (cd/m ²)	Resolution (μm)	Deflection factor (V/mm)		Scanned area (mm)		Heater supply		Weight (g)
				X	Y	X	Y	(V)	(mA)	
300A	5.0	1250	22	11	11.5	20	15	6.3	95	200
300B	2.0	100	33	9.0	8.6	16	12	6.3	95	172
	5.0	1250	22	11.7	13.4					
300C	5.0	2500	22	11	11.5	20	15	6.3	95	200
	10	8000	18	18	23					
300D	7.0	8000	20	16.4	18.8	16	12	6.3	95	175
	10	12 000	18	20	26					
300E	7.0	6000	20	15.4	16.1	20	15	6.3	95	200
	10	9000	18	18	23					
300F	10	2500	20	18	23	20	15	6.3	110	200
300F/RL	7.0	—	20	15.4	17.5	20	15	6.3	110	200
300G	5.0	—	22	11.7	13.4	16	12	6.3	95	180
300H	2.0	—	35	9.0	8.6	16	12	6.3	110	172
300J	2.9	—	35	6.6	7.5	16	12	6.3	95	172
500A	7.0	9000	27	14	11	32	24	6.3	95	250
500B★	3.0	—	50	16.3	19.6	38	19	6.3	95	368
500D	2.5	—	60	17	19	32	24	6.3	95	225
1500C	12	100	75	7.6	9.4	100	75	6.3	300	2118
P03-100	0.9	—	170	10	10	17.5	9.5	6.3	300	160

All tubes have flying lead connections

Overall dimensions in mm



Miniscan Remote CRT Display System

The MINISCAN display system comprises a CRT and a separate drive electronics/power unit, the two being connected by an umbilical cable up to 1000 mm in length.

Any CRT in the EEV range with electrostatic focus and deflection may be used.

The unit housing the drive electronics/power supply measures 175 x 150 x 107 mm and weighs 2 kg approx.

☛ New type.

★ Fibre-optic faceplate.

† These tubes can be supplied with any of the fine-grain phosphors available. Brightness will depend on phosphor type.




LUCID Liquid Crystal Displays

Digit height	Description	Type*	Display (not to scale)	Overall dimensions
5.5 mm 0.217 inch	3½ digit general purpose display, static drive	130B	±1.8:8.8	23.6 x 13.7 x 3.0 mm 0.93 x 0.54 x 0.12 inch
5.5 mm 0.217 inch	4 digit general purpose display, static drive	129B	8.8:8.8	23.6 x 13.7 x 3.0 mm 0.93 x 0.54 x 0.12 inch
6.0 mm 0.236 inch	16 digit telecommunications display, multiplex drive	126B	0000000000000000 BATT. LOW	70 x 20 x 3.0 mm 2.76 x 0.79 x 0.12 inch
7.0 mm 0.276 inch	8 digit general purpose display, multiplex drive	119B	±8.8:8.8:8.8:8.8	51.3 x 22 x 3.0 mm 2.02 x 0.87 x 0.12 inch
8.9 mm 0.35 inch	8 digit general purpose display, static drive	124F 124B	8.8:8.8:8.8:8.8:8.8:8.8	86.4 x 24.1 x 3.0 mm 3.4 x 0.95 x 0.12 inch
9 mm 0.355 inch	8 character, 15-segment alpha-numeric, multiplex drive	107F 107N	0.0.0.0.0.0.0.0.	70 x 25 x 3.0 mm 2.76 x 0.98 x 0.12 inch
9 mm 0.355 inch	8 digit general purpose display, multiplex drive	109F 109N	8.8:8.8:8.8:8.8:8.8:8.8	70 x 25 x 3.0 mm 2.76 x 0.98 x 0.12 inch
9 mm 0.355 inch	8 digit general purpose display, multiplex drive	122B	8.8:8.8:8.8:8.8:8.8:8.8	69.9 x 22 x 3.0 mm 2.75 x 0.87 x 0.12 inch
10 mm 0.394 inch	4½ digit general purpose display, multiplex drive	121F 121B 121N	LOW BATTERY CONTINUITY -1.8:8.8:8.8	50.8 x 30.5 x 3.0 mm 2.0 x 1.2 x 0.12 inch
10.2 mm 0.400 inch	4½ digit, general purpose display, static drive	103F 103B 103N	±1.8:8:8.8	50.8 x 30.5 x 3.0 mm 2.0 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	2 digit general purpose display, static drive	118F 118B 118N	.8.8	27.9 x 30.5 x 3.0 mm 1.1 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	3½ digit general purpose display, static drive	101F 101B 101N	±1.8:8.8	50.8 x 30.5 x 3.0 mm 2.0 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	3½ digit general purpose display, static drive	108F 108B 108N	BAT ±1.8:8.8	50.8 x 30.5 x 3.0 mm 2.0 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	4 digit general purpose display, static drive	102F 102B 102N	8.8:8.8	50.8 x 30.5 x 3.0 mm 2.0 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	6 digit general purpose display, static drive	104F 104B 104N	8.8:8.8:8.8	69.9 x 30.5 x 3.0 mm 2.75 x 1.2 x 0.12 inch
12.7 mm 0.500 inch	8 digit general purpose display, static drive	131F 131B 131N	8.8:8.8:8.8:8.8:8.8	93.8 x 30.5 x 3.0 mm 3.69 x 1.2 x 0.12 inch
17.78 mm 0.700 inch	3½ digit general purpose display, static drive	116F 116N	±1.8:8.8	69.9 x 38.1 x 3.0 mm 2.75 x 1.5 x 0.12 inch
17.78 mm 0.700 inch	4 digit general purpose display, static drive	111F 111N	8.8:8.8	69.9 x 38.1 x 3.0 mm 2.75 x 1.5 x 0.12 inch
20.5 mm 0.810 inch	6 digit general purpose display, static drive	123F 123B 123N	8888.8.8	93.9 x 38.1 x 3.0 mm 3.7 x 1.5 x 0.12 inch

*Suffix F indicates front surface contacts suitable for spring clip connectors.
 Suffix B indicates back surface contacts suitable for elastomeric connectors.
 Suffix N indicates bonded pin connectors, for use with appropriate sockets or direct p.c.b. connection.





LUCID Liquid Crystal Displays continued

The displays listed are available with a choice of polarisers and fluids for a wide range of applications.

Digit height	Description	Type*	Display (not to scale)	Overall dimensions
26 x 21 mm 1.02 x 0.83 inch	General purpose shutter, static drive	127F 127B		37.6 x 25 x 3.0 mm 1.48 x 0.98 x 0.12 inch
40 x 40 mm 1.58 x 1.58 inch	General purpose shutter, static drive	128F 128B		53.6 x 46 x 3.0 mm 2.11 x 1.81 x 0.12 inch
59.9 mm 2.360 inch	Single character 5 x 7 dot matrix display, static drive	117F		50.8 x 77 x 3.0 mm 2.0 x 3.03 x 0.12 inch

LUCID Liquid Crystal Display Modules

These modules incorporate drive circuitry and accept ASCII data. A custom design service for liquid crystal display modules for industrial and military applications, incorporating drive circuitry and custom LCDs, is available.

Digit height	Description	Type	Display (not to scale)	Overall dimensions
4.1 mm 0.16 inch	2 rows x 16 characters, 5 x 7 dot matrix plus cursor line. 4- or 8-bit parallel interface. 5 V supply.	115M		84 x 44 x 9.8 mm 3.3 x 1.73 x 0.39 inch
4.8 mm 0.19 inch	2 rows x 32 characters, 5 x 7 dot matrix plus cursor line. 4- or 8-bit parallel interface. 5 V supply.	114M		175 x 31 x 9.8 mm 6.9 x 1.2 x 0.39 inch
9 mm 0.355 inch	8 character, 15-segment display. 48 character set, 8-bit serial interface, 5 V supply.	107M		84 x 44 x 13 mm 3.3 x 1.73 x 0.51 inch
60 mm 2.36 inch	Single character 5 x 7 dot matrix, can be cascaded in multi-character displays. Serial interface, 4 - 10 V supply.	117M		54.6 x 100.3 x 8.5 mm 2.15 x 3.95 x 0.34 inch

LUCID Custom Liquid Crystal Displays

A custom design service is available for displays incorporating special symbols, bargraphs or dot matrix formats.

Max size (mm)	Technology	Timescale (typical)
154 x 143	Twisted nematic or guest-host	Samples 8-10 weeks Production 12 weeks from sample approval

Character Display Tubes

EEV has developed 7-segment numeric and 7 x 5 matrix alpha-numeric character tubes with displays in white, red, blue, yellow or green; special characters can also be supplied. The power supply is 12 V d.c., all necessary conversions being carried out within the tube package, and the display can be switched rapidly by low level CMOS logic.

Character size (mm)	Type	Type of display	Typical power consumption (W)	Typical peak luminance (cd/m ²)	Switching voltage (V)
90 x 55	E727 ■	7-segment	2	3400 (green)	5.0
90 x 55	E737	7-segment	2	3400 (green)	12
90 x 55	E747 ★	7-segment	2	3400 (green)	12
90 x 70	E729	7 x 5 matrix	2	4100 (green)	10
152 x 88	E728 ■	7-segment	3	2000 (green)	5.0
152 x 88	E748 □	7-segment	3	2000 (green)	12

Glow Modulators

Crater diameter (inch)	Type	Luminance min† (cd/m ²)	Luminous intensity min† (candela)	Peak cathode current max (mA)	Average cathode current range (mA)	Break-down voltage max (V)	Operating voltage max† (V)
0.025	XL683/R1169	1.14 x 10 ⁵ ◆	0.037◆	45	5-25	225	150
0.028	XL601	8.52 x 10 ⁵	0.27	45	0.25-30	225	150*
0.028	XL631	8.52 x 10 ⁵	0.27	45	0.25-30	225	150*
0.028	XL641	7.5 x 10 ⁵	0.25	45	1.0-30	225	150
0.060	1B59	1.7 x 10 ⁵	0.3	75	5.0-35	225	150
0.060	XL603	2.12 x 10 ⁵	0.375	75	5.0-30	225	150

Concentrated Arc Lamps

A range of high brightness point sources for a variety of applications. Concentrated arc lamps radiate light of very stable colour temperature (3200 K) and are available with power ratings from 2 to 300 W and source diameters from 0.18 to 2.79 mm (0.007 to 0.110 inch).

Type	Power input (W)	Operating voltage (V)	Starting voltage (V min)	Source diameter (mm)	Average luminance (cd/m ²)	Bulb type	Base
XL676/A2T ◇	2	27	1000	0.18	17.8 x 10 ⁶	End view	3-pin
XL677/C2T ◇	2	27	1000	0.18	17.8 x 10 ⁶	End view	3-pin
XL679/C25	25	20	1000	0.76	35.5 x 10 ⁶	End view	octal
XL679P/C25P	25	20	1000	0.76	35.5 x 10 ⁶	End view	pre-focus octal
XL681/C100	100	16	2000	1.78	38.7 x 10 ⁶	End view	med. 4-pin
XL681P/C100P	100	16	2000	1.78	38.7 x 10 ⁶	End view	pre-focus med. 4-pin

■ Made to special order only.

* At 20 mA d.c.

† At 30 mA d.c.

★ Current type, replaces E727 for new designs.

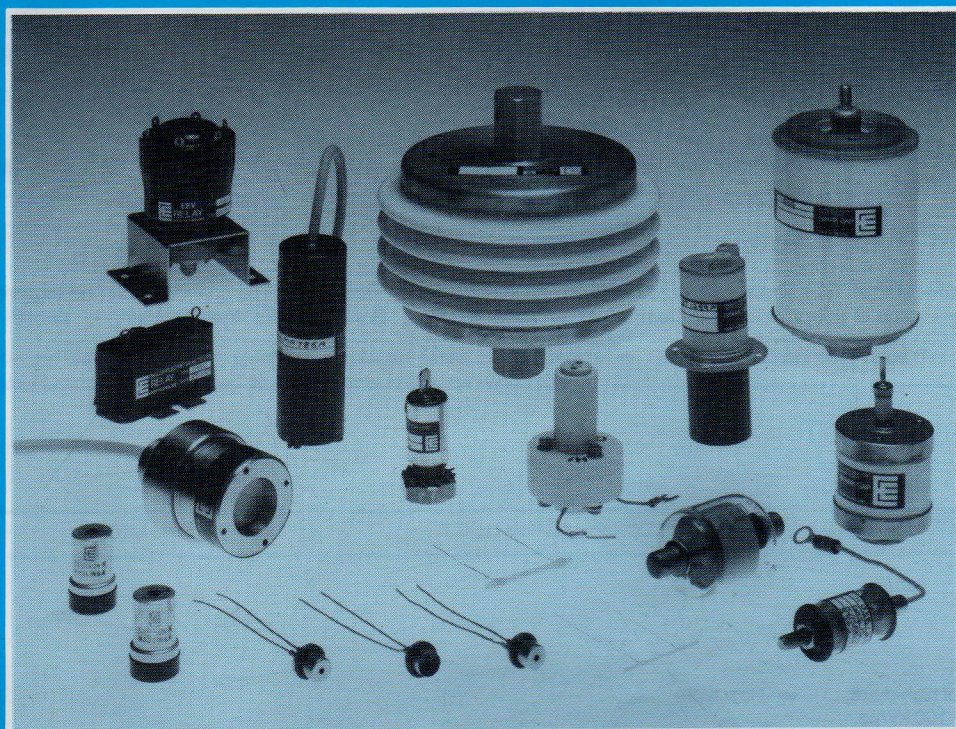
◆ At 15 mA d.c.

□ Current type, replaces E728 for new designs.

◇ Tungsten cathode.

SPECIAL PRODUCTS

Spark Gaps	page 78
Triggered Vacuum Gaps	79
Transient Protection Units (TPU)	79
Ozotron	79
Combustible Gas Detector Elements	80
Portable Gas Detection Instruments	81
Electrometer Triode	81
Vacuum and Gas-filled Relays	82



Spark Gaps

EEV manufactures a comprehensive range of spark gaps for ignitor applications, d.c. protection, heavy current applications and for the protection of pulsed circuits. Each of the styles listed below comprises a series of spark gaps with breakdown voltages covering the specified range. Customers' enquiries for spark gaps to suit individual requirements are invited.

Series	Number of electrodes	Range of breakdown voltage (kV)	Cumulative charge rating (coulombs)	Connections/mounting
GX2001	2	3.0–5.0 (d.c.)	8000	Screw mounted
→GX2001A	2-electrode spark gap similar to type GX2001 but with the facility for the user to adjust the d.c. breakdown voltage over a wide range.			
GX3002	3	5–6.0	1500	Screw and flying lead. Integral trigger transformer
GXA	2	5–16 (pulsed d.c. over a range 1000–1200 p.p.s.)	100	CT2 end cap and octal base
GXB	2	5–16 (pulsed d.c. over a range 1000–1200 p.p.s.)	100	CT2 end caps
GXC	2	0.5–3.0 (d.c.)	100	Flexible leads
GXE	2	0.5–6.0 (d.c.)	50	Flexible leads
GXF/C	2	0.25–4.0 (d.c.)	20 000	Bolt on
GXF/G	2	0.25–2.5 (d.c.)	20 000	Bolt on
GXG	3	15–5.0 (d.c.)	8000	Screw mounted
GXH	2	0.5–6.0	600	6BA and 9.5 mm cap
GXK	2	0.4–8.0 (d.c.)	50	CT1 end caps
GXL	3	0.4–1.2 (d.c.)	10	CT1 end caps
GXM	2	0.25–4.5 (d.c.)	40	Flying leads
GXMT	3	0.5–1.0 (d.c.)	50	CT1 end cap and leads
GXN	2	0.4–8.0 (d.c.)	400	CT1 end caps
GXP	2	0.4–8.0 (d.c.)	50	Stud and CT1 end caps
GXQ	3	0.4–6.5 (d.c.)	1000	Screw mounted
GXR	2	0.4–8.0 (d.c.)	400	Stud and CT1 end cap
GXS*	2	0.5–3.0	10	Stud mounted
GXT	3	15–4.5	1500	Screw mounted
GXV	2	0.4–8.0 (d.c.)	400	Stud mounted
GXW	2	0.4–4.0 (d.c.)	1000	Screw mounted
GXX	2	8.0–5.0 (d.c.)	75	Stud mounted
GXY	2	0.5–1.5 (d.c.)	400	Screw mounted
GXZ	2	0.4–3.0 (d.c.)	10	Flexible leads
QT1259	3	23–2.7	1500	Flange and leads
QT1259P	3-electrode spark gap similar to QT1259 but with an integral trigger transformer. The spark gap can be triggered by a trigger voltage of 250 V discharged from a 0.47 μ F capacitor.			
TGF	3	16–4.5		Screw mounted

* For use under conditions of high dv/dt; typical impulse ratio 1.5 at 100 kV/ μ s.

→ New type.

Trigger Transformers for Spark Gaps

Type	Description
MA785A	A compact pulse transformer designed to provide 30 kV pulses, at a rate of rise of 30 kV/ μ s, suitable for triggering spark gaps. It has a voltage transformation ratio of 150:1 and gives a peak output current of 1.0 A. The device will withstand shock acceleration up to 981 m/s ² (11 ms half sine) and vibration acceleration up to 96.6 m/s ² (20 Hz to 500 Hz).
MA819A	A small pulse transformer designed to provide fast rise time, positive or negative 20 kV pulses, suitable for triggering spark gaps. It has a voltage transformation ratio of 100:1 and a maximum peak output voltage of 25 kV.
MA2162A	A compact trigger transformer designed to provide fast rise-time, positive or negative, high voltage pulses, suitable for triggering spark gaps. Its main feature is a primary to secondary insulation greater than 40 kV. The transformation ratio is 50:1.

Triggered Vacuum Gaps

Type	Number of electrodes	Range of breakdown voltage (kV)	Cumulative charge rating (coulombs)	Connections/mounting
TVG1	3	0.5–20	40	CT1 cap and flexible lead
TVG4	3	0.3–3.0	0.05	Flexible leads

EBW Devices

EEV produces Detonators, Squibbs and Triggered Vacuum Gaps for exploding bridge wire (EBW) circuits. These devices are produced to exacting safety standards.

Transient Protection Units (TPU) for EMP

A series of fast reaction transient protection units designed to protect electrical and electronic equipment from EMP induced transients. The units will also protect against lightning and other switching transients.

Type	Transient energy handling capability	Areas of application
TPU1	10 J	Antenna protection up to v.h.f.
TPU3	100 J	Low power mains equipment.
TPU4	20–200 kJ	Mains busbar installations.
TPU7 TPU7A	10J	Equipment connected to communication lines.
TPU7P	30J	Signal control lines, d.c./a.c., 60 A max.
TPU8 TPU8A	Similar to TPU7 and TPU7A but with hexagonal body section for clamping purposes.	

Ozotron – Halogen Sensitive Element

The Ozotron will detect minute quantities of halogen gases in the atmosphere. Sensitivity is dependent upon the gas being measured. Freon 12 (dichlorodifluoromethane) is given as an example in the following table.

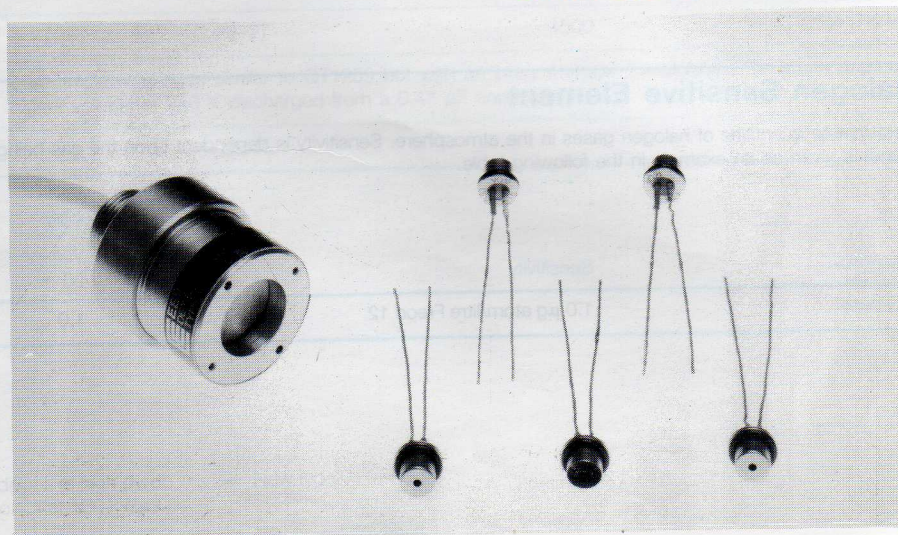
Type	Description	Sensitivity	Typical heater supply		Typical h.t. voltage (V)
			Current (A)	Voltage (V)	
K	B7G base	1.0 μ g atom/litre Freon 12	5.0	1.0	200–250

Combustible Gas Detector Elements

The detectors listed below consist of two elements which are used as two arms of a bridge circuit. They are designed to detect methane in air in concentrations from 0.1% upwards. There is no interference from water vapour or carbon dioxide. The minimum sensitivities specified apply when the recommended circuit and mounting are used.

Type	Minimum sensitivity (mV/% methane)	Linearity (% methane)	Response time (sec)★	Maximum methane concentration (%)	Bridge supply (V)	Maximum bridge power consumption (W)
VQ1	20	up to 3	2	10	2.0 ± 0.1	0.75
VQ2	15	up to 3	2	5	2.0 ± 0.1	0.48
VQ3	20	up to 3	2	6	2.5 ± 0.1	1.1
VQ4 ◇	20	up to 3	2	10	2.0 ± 0.1	0.75
VQ5	A pair of inactive elements for use in detecting up to 100% concentration of gas.				2.0 ± 0.1	0.48
VQ6	A pair of inactive elements for use in detecting up to 100% concentration of gas.				2.0 ± 0.1	0.75
VQ8	Similar drive requirements to VQ3 but with improved resistance to poisoning from lead bearing vapours.					
VQ9	15	up to 3	2	5	2.0 ± 0.1 or 175 mA	0.48
VQ10	15	3	2	5	2.0 ± 0.1	0.48
VQ11	For use where exposure to concentrations of gas up to 100% may occur, the detection of combustible gases containing halogens, or when small amounts of non-flammable hydrocarbons are present.					
VQ16	For use in atmospheres where traces of silicone poisoning agents may be present; similar drive requirements to VQ3.					
VQ17 ◇	20	up to 3	2	6	2.5 ± 0.1	1.1
VQ21 ☆	10	up to 3	2	5	2.0	0.75
VQ21T ☆	18	up to 3	2	5	2.0	0.75
VQ22 ☆	10	up to 3	2	5	2.0	0.48
VQ22T ☆	15	up to 3	2	5	2.0	0.48
VQ23 ☆	10	up to 3	2	5	2.5	1.1
VQ23T ☆	18	up to 3	2	5	2.5	1.1
VQ24	30	up to 3	2	5	3.5	0.36□
↔ VQ25 ☆	Similar to VQ11 but with improved resistance to poisoning.					
↔ VQ27 ☆	10	up to 3	2	5	2.5	1.1
↔ VQ28 ◇	20	up to 3	2	5	2.0 ± 0.1	0.48
VQ4250	Sealed, stainless-steel detector head with a stainless-steel filter; it can be supplied fitted with any of the EEV range of gas sensing elements together with the appropriate trimming resistor. The head has an integral 3-core cable for termination in a junction box or similar facility. Complies with the requirements of BASEEFA Standard SFA 3009: 1972 and BS5501 Parts 1 & 5: 1977 for Group IIC gases (excluding ethyl nitrate).					
↔ VQ4250EA	Similar to VQ4250 but also has CSA approval Class 1 Groups A, B, C and D.					

Detector Head VQ4250 with a range of Detector Elements



Portable Gas Detection Instruments

A series of portable gas detection instruments has been introduced by EEV, each type having BASEEFA intrinsic safety certification Ex ib sd IIc T4 Certificate No. Ex 86427. Three types are designed for the detection of flammable gases, covering the range 0–100% L.E.L. (Lower Explosive Level) and the fourth, type GD4702051, is used for detecting hydrogen sulphide in concentrations from 0 to 100 p.p.m.

GD4701002 incorporates EEV sensor type VQ2, giving approximately 16 hours of battery life; GD4701024 employs the low power consumption element VQ24, with an extended battery life of about 28 hours.

GD4701022 has a low power poison resistant flammable gas sensor which, whilst still able to give more than 16 hours continuous operation from a fresh, fully charged battery, is able to withstand silicone (hexamethyldisiloxane) HMDS poisoning for up to 15 times longer than the equivalent standard low power gas sensor.

Calibration and the two alarm levels are push button set and the calibration and alarm information is digitally stored, thus eliminating drift in the settings. Fault monitoring and battery condition monitoring are part of the continuous self-checking process performed during operation of the instrument.

LED displays and lamps provide a wide range of messages and diagnostic facilities in addition to the normal gas concentration values.

Each instrument is contained within an ABS case with the on/off switch and displays on the front panel and the calibration housing and battery charger socket on the rear panel.

Accessories available for use with the instrument include a mains powered battery charger GDA47001BC designed specifically for this application, calibration caps, sampling probes and aspirators.

Portable Gas Detection Instrument GD4701002



Electrometer Triode

Subminiature electrometer triode for linear and logarithmic use, with a controlled relationship between positive grid current and anode current. Connections are by flying leads.

Type	Anode voltage max (V)	Anode current max (μA)	Grid current (A)	Mutual conductance ($\mu\text{A/V}$)	Amplification factor	Filament voltage (V)	Filament current (mA)
B1628	25	250	3×10^{-15}	80	2.0	1.25	14

➔ New type.

◇ Two elements supplied on a single mount.

★ Time to register $1\frac{1}{4}$ in a $2\frac{1}{2}\%$ concentration.

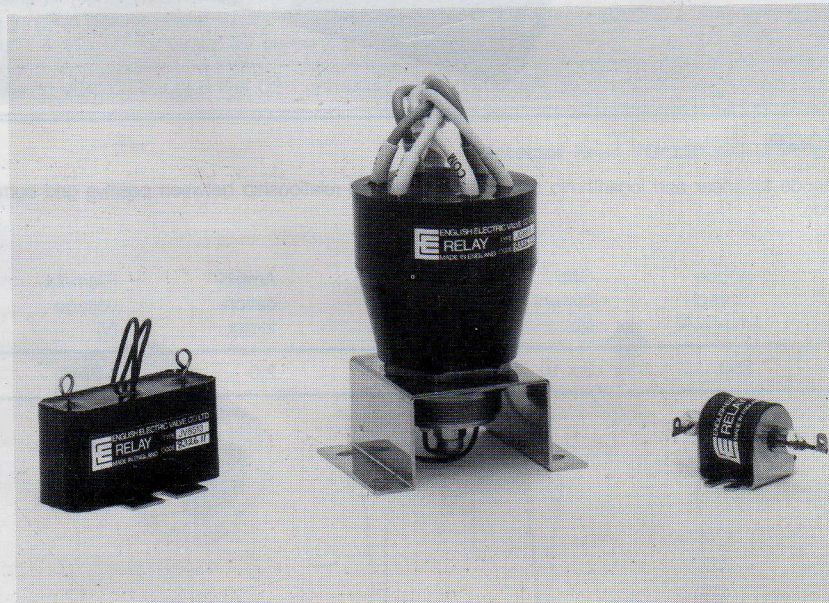
☆ This type has improved resistance to the poisoning effects of silicone vapours.

□ Maximum sensor dissipation.

Vacuum and Gas-filled Relays

Type	Description	Contact ratings		Coil		Net weight (g)
		Voltage (kV)*	Current (A)**	Voltage (V)	Resistance (Ω)	
JG6511	Gas filled, general purpose double pole double throw relay. Flexible lead connections to coil and contacts.	7.5	30	12	10.8-13.2	250
JG6511N	Gas-filled, general purpose double pole, double throw relay. Solder terminal connections to contacts.	7.5	30	12	10.8-13.2	250
JG6511R	Gas-filled, general purpose double pole, double throw relay. Fitted with UL and CSA approved leads.	7.5	30	12	10.8-13.2	250
JG6514A	Single-pole, normally open gas-filled relay for capacitor discharge circuits in laser equipment.	30	30	12	21.6-26.4	250
JG6514B	Single-pole, normally open gas filled relay for capacitor discharge circuits in laser equipment.	30	30	26.5	90-110	250
JG6516A	Single-pole, normally closed gas-filled relay suitable for use as a safety 'dump' switch.	30	10	26.5	90-110	300
↔ JG6517A	Single-pole, normally closed gas-filled relay suitable for use as a safety 'dump' switch.	30	30	26.5	90-110	250
↔ JG6518	Single-pole, normally closed gas-filled safety 'dump' relay for extreme environmental conditions.	40	10	26.5	90-110	300
↔ JG6521	Single-pole, normally open gas-filled relay, ceramic/metal construction, for high voltage capacitor discharge circuits.	40	30	26.5	90-110	400
↔ JG6522	Single-pole, normally closed gas-filled relay, ceramic/metal construction for use as a reliable safety 'dump' switch.	40	30	26.5	90-110	400
JV6512	Single pole double throw vacuum relay.	5.0	10	12	90-110	25
JV6513	Single pole normally closed vacuum relay, suitable for 'dump' service in medical and laser safety interlocks.	10	5.0	12	90-110	60
↔ JV6513B						

Relays JV6513, JG6511, JV6512



* Max peak, d.c. or 50 Hz.

** Continuous, d.c. or 50 Hz.

↔ New type.

POST CARDS

We are constantly bringing our mailing lists up to date and would appreciate your help so that we may continue to be of service to you. Complete and return this postcard to our interest in...

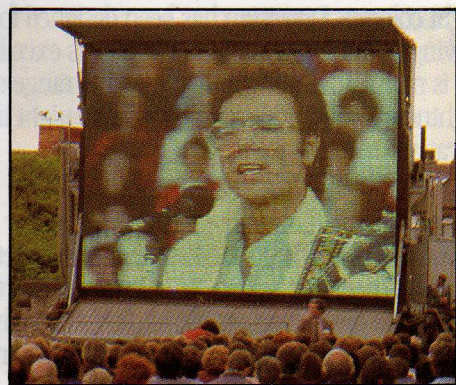


The remainder of this postcard is for use with your information...

If you wish to be included in our mailing list, please indicate your interest by ticking the appropriate box:

STAR VISION

- Broadcast & Communications
- Radio
- TV
- TV Camera Tubes
- Broadcast
- Industrial
- Low Light



THE WORLD'S FINEST GIANT COLOUR VIDEO DISPLAY SYSTEM

Starvision is the world's finest giant screen colour matrix television and information display system. With permanently-installed and mobile systems sold and in service at major international events, Starvision is setting new and higher standards for picture quality and brilliance and for efficiency and reliability.

Starvision's outstanding performance is made possible by the unique and highly efficient column display cathode ray tubes developed and manufactured by EEV. These provide Starvision with its unrivalled combination of brilliant pictures with excellent definition, long life and low power consumption.

Colour and action in television pictures are reproduced with excellent colour fidelity, high brightness and without any visible flicker or blurred or persistent images. This performance is maintained under the widest range of operating conditions, from bright daylight to darkest night, in summer or winter, indoors or out.

Computer-generated graphics, animation, alphanumeric messages, scores and other information can also be displayed equally brilliantly by Starvision either simultaneously with television pictures or separately.

THE CLEAR LEADER

Compared with other matrix display systems Starvision offers:

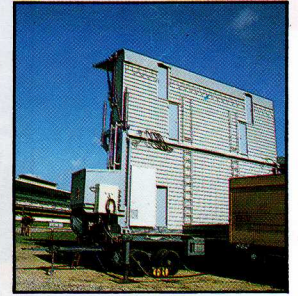
Higher definition - Starvision's picture element density is greater by up to three times. This means viewers are provided with sharper and more detailed images.

Bright colour - Starvision has been designed for viewing in full daylight. Colour fidelity is excellent and is maintained accurately over a full range of brightness levels for all conditions from night time operation up to the fullest daylight.

Low power consumption - Starvision's power consumption is as little as 5% of that of competing systems. Therefore, unlike other systems, Starvision has no heat dissipation problems. Power supply installation costs are held down and there are no noisy cooling fans.

Compactness and mobility - Starvision's unique design provides a screen which is light in weight and occupies a minimum of space. Fully mobile systems are available, offering the largest self-contained mobile colour matrix screens in the world. They can be up to 6 metres (19 feet 10 inches) high and 8 metres (26 feet 8 inches) or more wide. Displays for fixed installation can be made exactly to the sizes which meet your needs.

Reliability and ease of servicing - Starvision's design keeps servicing and maintenance to a minimum by the use of durable components and materials and by making servicing and fault rectification as simple as possible.



WHAT CAN STARVISION DO FOR YOUR BUSINESS?

Starvision can dramatically improve the entertainment for viewers and provide them with the information they need. Examples of the service which Starvision can provide are:

TELEVISION COVERAGE

- Live coverage of events
- Action replays (slow-motion, freeze-frames...)
- Replays of earlier events
- The day's highlights
- Personality presentations and interviews
- Competitor parades
- Presentations
- TV advertising

DATA DISPLAY

- Event timing and scoring
- Venue records and statistics
- Competitors' details
- Statistics and results
- Advertising messages
- Attendance figures
- Coming events



POST CARDS

We are constantly bringing our mailing lists up to date and would appreciate your help so that we may continue to be of service to you. Please complete and return this postcard indicating your interest in EEV products.

The remaining cards are for use when further information is required.

If you wish to be included on our mailing list, please indicate your interest(s) by ticking the appropriate box;

- | | |
|--|--|
| <input type="checkbox"/> Broadcast & Communications | <input type="checkbox"/> TV Camera Tubes |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Broadcast |
| <input type="checkbox"/> TV | <input type="checkbox"/> Industrial |
| <input type="checkbox"/> Microwave Links | <input type="checkbox"/> Low Light |
| <input type="checkbox"/> Satellite Communications | <input type="checkbox"/> Surveillance & Security |
| <input type="checkbox"/> Civil Radar | <input type="checkbox"/> Thermal |
| <input type="checkbox"/> Marine | <input type="checkbox"/> Camera Tube Test Eqpt. |
| <input type="checkbox"/> Airborne | <input type="checkbox"/> Chips |
| <input type="checkbox"/> Ground | <input type="checkbox"/> TV Cameras |
| <input type="checkbox"/> Receiver Protection | <input type="checkbox"/> Thermal |
| <input type="checkbox"/> Cathode Ray Tubes | <input type="checkbox"/> Low Light |
| <input type="checkbox"/> Defence | <input type="checkbox"/> CCD |
| <input type="checkbox"/> ECM | <input type="checkbox"/> LUCID LCDs |
| <input type="checkbox"/> Night Vision | <input type="checkbox"/> Standard |
| <input type="checkbox"/> Radar | <input type="checkbox"/> Custom |
| <input type="checkbox"/> Cathode Ray Tubes | <input type="checkbox"/> Medical |
| <input type="checkbox"/> Industry | <input type="checkbox"/> Magnetrons for Linacs |
| <input type="checkbox"/> Nuclear Machines | <input type="checkbox"/> X-Ray Camera Tubes |
| <input type="checkbox"/> RF Heating | <input type="checkbox"/> Scientific & Miscellaneous Instruments |
| <input type="checkbox"/> Microwave Heating | <input type="checkbox"/> Shutter Tubes |
| <input type="checkbox"/> Laser Pulsing | <input type="checkbox"/> Ozotrons |
| <input type="checkbox"/> Spot Welding | <input type="checkbox"/> Rectifiers |
| <input type="checkbox"/> Metal Forming | |
| <input type="checkbox"/> Information Displays | |
| <input type="checkbox"/> Plastics Forming | |
| <input type="checkbox"/> Gas Detectors | |

Cartes Postales

Nous nous efforçons de tenir à jour notre liste de correspondants et serons heureux de votre coopération afin de continuer à vous rendre service. Veuillez remplir et nous retourner cette carte en indiquant quel est votre intérêt particulier dans les produits EEV.

Les cartes supplémentaires sont pour votre usage lorsque vous désirerez d'autres renseignements.

Name _____

Position _____

Company _____

Address _____

Town _____

County, District or Province _____

Country _____

Post Code _____

EQUIVALENTS INDEX

This index lists tubes of various manufacturers for which EEV tubes may be used as replacements. CV and NATO type numbers are also included.

The types listed in the column 'EEV replacement' may be used as direct replacements for those under the heading 'Type to be replaced' except where indicated by an asterisk * which means that minor modifications may be necessary because of slight mechanical or electrical differences. Details of these differences are available from EEV.

Where the symbol † appears in the column 'page number', abridged data for the tube are not given in this catalogue but enquiries are welcomed.

☆ Indicates manufacture at Chelmsford.

◇ Indicates manufacture at Witham.

▽ Indicates manufacture at Lincoln.

Index d'équivalence des tubes

Cet index comprend les tubes de divers fabricants et pour le remplacement desquels il existe des tubes EEV. Les numéros des types CV et NATO sont également inclus.

Les types mentionnés dans la colonne 'EEV replacement' peuvent être utilisés directement pour le remplacement de ceux mentionnés sous le titre 'type to be replaced' sauf lorsque marqué d'un astérisque * qui indique qu'il peut être nécessaire de procéder à une légère modification en raison d'une différence mineure mécanique ou électrique. Pour plus de détails de ces différences s'adresser à EEV.

Lorsque le symbole † est porté dans la colonne 'page number' les caractéristiques abrégées de ce tube ne sont pas données dans cet index mais nous répondrons à toute demande de renseignements.

Pour toutes les indications nous utilisons le code suivant:—

- ☆ produits fabriqués par Chelmsford.
- ◇ produits fabriqués par Witham.
- ▽ produits fabriqués par Lincoln.

Liste Gleichwertiger Röhren

Diese liste zeigt Röhren verschiedener Hersteller, welche durch Röhren von EEV ersetzt werden können. CV und NATO-Typennummern werden ebenfalls angeführt.

Die in der Spalte 'EEV replacement' angegebenen Typen können direkt als gleichwertiger Ersatz anstelle der Typen in der Rubrik 'type to be replaced' verwendet werden. Bei den mit einem Sternchen * gekennzeichneten Typen können jedoch unbedeutende Abänderungen auf Grund von geringfügigen mechanischen oder elektrischen Unterschieden erforderlich sein. Näheres über diese Unterschiede ist bei EEV erhältlich.

Das Symbol † in der Spalte 'page number' bedeutet, daß für die entsprechende Röhre in diesem Katalog keine Kurzdaten angeführt sind. Anfragen zu diesen Röhren sind uns jedoch willkommen.

Die folgende Zeichnung wird für die Daten verwendet:

- ☆ Produkt der Chelmsford.
- ◇ Produkt der Witham.
- ▽ Produkt der Lincoln.

Indice de intercambiabilidad

En este Índice se dá una relación de lámparas electrónicas de diversas marcas para las que se pueden utilizar como repuesto las lámparas EEV. Asimismo, se incluyen los números CV y NATO.

Los tipos que figuran en la columna 'EEV replacement' pueden utilizarse directamente como repuestos de los detallados bajo el epígrafe 'type to be replaced' excepto cuando vayan acompañados de un asterisco *, el cual indica que pueden ser necesarias pequeñas modificaciones debido a ligeras diferencias de orden mecánico o eléctrico. Se puede obtener detalles de estas variaciones de EEV.

El símbolo † en la columna 'page number' significa que no se facilita en este Catálogo un resumen informativo sobre la lámpara, pero se suministrarán con el mayor gusto los datos procedentes, a solicitud del interesado.

En todo lugar se ha utilizado la siguiente clave:—

- ☆ indica fabricado por Chelmsford.
- ◇ indica fabricado por Witham.
- ▽ indica fabricado por Lincoln.

Indice degli equivalenti

Il presente indice elenca le valvole costruite da altre società che possono venire sostituite dalle valvole EEV. La distinta elenca parimenti i numeri CV e NATO.

I modelli figuranti nella colonna 'EEV replacement' possono venir usati a sostituzione diretta dei modelli elencati sotto la dicitura 'type to be replaced', eccettuato il caso in cui figurì l'asterisco *; in detto caso, occorre apportare lievi modifiche per compensare leggere diversità meccaniche o elettriche. Per ottenere particolari di queste differenze rivolgersi a EEV.

Dove appare il simbolo † nella colonna 'page number', non vengono forniti i dati abbreviati inerenti la valvola; in tal caso, comunque, il cliente è pregato di interpellarci.

Nel presente opuscolo, si usa il seguente codice:—

- ☆ indica che la valvola è costruita dalla Chelmsford.
- ◇ indica che la valvola è costruita dalla Witham.
- ▽ indica che la valvola è costruita dalla Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
1B58	▽ BS58	24	4CW10,000A	☆ 4CW10,000A	14	12E12*	☆ C1150/1	13
1B59	☆ 1B59	76	4CW25,000A	☆ 4CW25,000A	14	15D12	☆ B1153	10
1B63A	▽ BS914	27	4CX5000A	☆ 4CX5000A	14	20PE13A	☆ P8037	60
1G32P*	☆ FX2535	5	4CX5000R/8170W	☆ 4CX5000R/8170W	14	22M1	☆ 1B59	76
1G35P	☆ FX2505	5	4CX10,000D	☆ 4CX10,000D	14	30MD1	▽ BS502	39
1G45P	☆ FX227	5	4CX10,000J	☆ 4CX10,000J	14	0041-15-300-0014	▽ BS810	27
1K24	☆ 3B24W	5	4CX15,000A	☆ 4CX15,000A	14	43QV26*	☆ 8541A	61
2B52*	☆ C1134	12	4CX35,000C	☆ 4CX35,000C	14	43QV26/P*	☆ P849D	61
2B94*	☆ C178A/5894	12	4D21*	☆ C1108	12	43QV26/R*	☆ 8541	61
2G22P	☆ 8503	5	4F21*	☆ C1108	12	43QV26/T*	☆ 8541	61
2J42	☆ MG5244	45	4G48P*	☆ CX1140	5	52QV26*	☆ 8541A	61
2J42A	☆ MG5222	46	4J31	☆ 4J31	44	52QV26/R*	☆ P842X	61
2J70A	☆ MG5289	43	4J32	☆ 4J32	44	55B/200A	☆ C1134	12
2J70B	☆ MG5267	43	4J33	☆ 4J33	44	55B/400A	☆ C178A/5894	12
3B21P*	☆ C1150/1	13	4J34	☆ 4J34	44	55QU26	☆ 8541	61
3B24W	☆ 3B24W	5	4J35	☆ 4J35	44	59-60/06/014	☆ M5057	49
3B29*	☆ 3B24W	5	4J43	☆ 4J43	43	59-60/08/001	▽ BS834	22
3C/500E	☆ B1152	10	4J44	☆ 4J44	43	59-60/08/005	▽ BS800	24
3C/800E	☆ B1153	10	4J52A	☆ 4J52A	46	59-60/08/028	▽ BS958	28
3C45	☆ FX227	5	4J53	☆ 4J53	44	59-60/08/031	▽ BS975	27
3C45/6130	☆ FX227	5	4KM100LA	☆ K376L	40	59-60/08/032	▽ BS969	27
3C45/PL345	☆ FX227	5	4KM100LF	☆ K377L	40	59-60/08/033	▽ BS977	27
3C45A	☆ FX227	5	4KM150LA*	☆ K3276HBCD	40	59-60/12/003	☆ CX1157	6
3C45W*	☆ FX227	5	4KM50,000LA3*	☆ K365	40	59-60/12/005	☆ CX1535	6
3F15TR*	☆ BR161	10	4KM50,000LQ	☆ 4KM50,000LQ	41	59-60/90/001	▽ BS502	39
3F21P*	☆ C1150/1	13	4KM50,000LR	☆ 4KM50,000LR	41	59-60/90/013	▽ BS510	39
3F60P*	☆ C1149/1	13	4MA7	☆ M5057	49	59-60/90/024	▽ BS104	24
3G49P	☆ FX2519A/5949A	5	4PR60B*	☆ C1149/1	13	59-60/90/077A	☆ P8079HP	67
3G125T*	☆ BY1144L	12	4PR60C	☆ C1149B	13	59-60/90/077B	☆ P8079HP	67
3J/167E*	☆ BR1196	10	4PR250A	☆ C1582	13	59-60/90/086	☆ P8079HP	67
3J/187E*	☆ BR1196	10	4PR400A	☆ C1583	13	59-60/90/107	☆ P8079HP	67
3J/188E	☆ BR1160C	10	4S016T*	☆ C1108	12	59-60/90/190	☆ P8079HP	67
3J/192E*	☆ BR1165C	10	4S040T*	☆ C1136	12	63QV26*	☆ 8541A	61
3J/199E*	☆ BR1162C	10	5C22	☆ 8503	5	63QV26/P*	☆ 8541	61
3J/280E*	☆ BR1183	10	5C22/HT415	☆ 8503	5	100MD1	▽ BS510	39
3JC/187E*	☆ BR1196	10	5C22/PL522	☆ 8503	5	100MD4	▽ BS510	39
3K3000LQ	☆ 3K3000LQ	41	5D22*	☆ C1112	12	101B	☆ 101B	74
3L2T*	☆ BR1160C	10	5D22/4-250A*	☆ C1112	12	101F	☆ 101F	74
3L5T*	☆ BR1162C	10	5F22*	☆ C1112	12	101N	☆ 101N	74
3PR400A7	☆ B1634A	13	5F23A*	☆ C1136	12	102B	☆ 102B	74
3Q/188E	☆ BW1165CJ3	11	6T40	☆ B1152	10	102F	☆ 102F	74
3Q/199E*	☆ BW1162CJ3	11	6T50	☆ B1153	10	102N	☆ 102N	74
3R/167E*	☆ BW1195J3	11	6T51	☆ B1565	10	103B	☆ 103B	74
3R/199E	☆ BW1162CJ3	11	7C23	☆ BR1165C	10	103F	☆ 103F	74
3R/225E	☆ BW1610J2F	11	7T25R*	☆ BR1160C	10	103N	☆ 103N	74
3R/252E*	☆ BW1102J2	11	7T70R*	☆ BR1630F	10	104B	☆ 104B	74
	☆ BW1182J2	11	7T84RB	☆ B1565	10	104F	☆ 104F	74
3R/265S1	☆ BW1121J1	11	7T85R	☆ B1565	10	104N	☆ 104N	74
3R/265S2	☆ BW1121J2	11	8F10R	☆ 4CX5000A	14	107F	☆ 107F	74
3R/280E*	☆ BW1605J2F	11	8F11R	☆ 4CX10,000D	14	107M	☆ 107M	75
3V5T*	☆ BW1162CJ3	11	8MA20	☆ M5055	48	107N	☆ 107N	74
3Z/340G	☆ BY1144L	12	8T39*	☆ BY1122	12	108B	☆ 108B	74
4-125*	☆ C1108	12		☆ BY1124	12	108F	☆ 108F	74
4-125A*	☆ C1108	12	8T61*	☆ BW189	11	108N	☆ 108N	74
4-250*	☆ C1112	12	8T71R*	☆ BR189	10	109F	☆ 109F	74
4-250A*	☆ C1112	12	9C25*	☆ BR1102	10	109N	☆ 109N	74
4-250A/5D22*	☆ C1112	12	9M40	☆ MG5222	46	111F	☆ 111F	74
4-400A	☆ C1136	12	9M61	☆ MG5258	45	111N	☆ 111N	74
4-400C	☆ C1136	12	9M62A	☆ MG5259	45	114M	☆ 114M	75
4B/550E*	☆ C1148	13	9M72	☆ MG5264	46	115M	☆ 115M	75
4B/551B	☆ C1148	13	9M80	☆ MG5255	45	116F	☆ 116F	74
4B/551E*	☆ C1166	13	9M302	☆ MG5251	45	116N	☆ 116N	74
4B/602E	☆ C1149/1	13	9M303	☆ MG5238A	45	117F	☆ 117F	75
4B/603E	☆ C1150/1	13	9M502	☆ MG5232	45	117M	☆ 117M	75
4C35	☆ FX2505	5	9M612	☆ MG5241	45	118B	☆ 118B	74
4C35/PL435	☆ FX2505	5	9X64	▽ BS196	27	118F	☆ 118F	74
4C35A	☆ FX2505	5	11E15	☆ C1134	12	118N	☆ 118N	74
4CV75,000A	☆ CY1170J	14	11E16	☆ C178A/5894	12	119B	☆ 119B	74

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
121B	☆ 121B	74	2255IND	☆ P8031	61	5867	☆ B1135	10
121F	☆ 121F	74	2255IND*	☆ 8541	61	5894*	☆ C178A/5894	12
121N	☆ 121N	74	2255NOR*	☆ 8541A	61	5895-99-118-1006	▽ BS872	23
122B	☆ 122B	74	2255ROE*	☆ P842X	61	5910-99-105-8307	☆ U500A/15/75J	16
123B	☆ 123B	74	2255SF	☆ P8031Z	†	5910-99-142-5816	☆ UC1000A/20/150	18
123F	☆ 123F	74	2260AMR	☆ P849D	61	5910-99-142-5817	☆ UC450A/30/150	18
123N	☆ 123N	74	2260BAE	☆ P849D	61	5910-99-221-6706	☆ U1000A/3/40JB	17
124B	☆ 124B	74	2260ENT	☆ P849D	61	5910-99-519-0952	☆ U500/10/40A	16
124F	☆ 124F	74	2260FIM	☆ P844	61	5910-99-521-4158	☆ UC2300/10/125J	19
126B	☆ 126B	74	2260IND	☆ 8541	61	5910-99-522-3862	☆ UFC100/30/120J	20
127B	☆ 127B	75	2260NOR	☆ 8541A	61	5910-99-527-5989	☆ MA52	16
127F	☆ 127F	75	2260ROE	☆ P842X	61	5910-99-533-6992	☆ UC2300/8/125JB	19
128B	☆ 128B	75	2700*	☆ 8134	63	5910-99-533-6993	☆ UC750/20/150JA	18
128F	☆ 128F	75	2700IND*	☆ 8134V1/4811	63	5910-99-539-2266	☆ U80/15/40	16
129B	☆ 129B	74	2705IND	☆ 8134V1/4811	63	5910-99-547-5259	☆ UC1000/20/150JA	18
130B	☆ 130B	74	4503A	☆ P8218	62	5910-99-580-1051	☆ U30/15/20	16
131B	☆ 131B	74	4532	☆ P8125	61	5910-99-580-1052	☆ U50/15/30	16
131F	☆ 131F	74	4543	☆ 8541A	61	5910-99-580-1053	☆ U80/15/40	16
131N	☆ 131N	74	4588*	☆ P8034A	61	5910-99-580-9488	☆ U500/10/40	16
200A	☆ 200A	72	4591 Series	☆ P8130H Series	57	5910-99-580-9489	☆ U400/10/40	16
238B	▽ BK46/5555	4	4592 series	☆ P8130H Series	57	5910-99-618-9142	☆ U2000/8/75JA	17
300A	☆ 300A	73		☆ P8400H Series	57	5910-99-630-8439	☆ MA126	16
300B	☆ 300B	73	4593	☆ P8132AR	57	5910-99-639-9552	☆ U500/3/40J	16
300C	☆ 300C	73		☆ P8401AR	57	5910-99-639-9976	☆ UF6/15/7	19
300D	☆ 300D	73	4594	☆ P8132RF	57	5910-99-658-7208	☆ UFC50/32/100M	20
300E	☆ 300E	73	4809	☆ P8038	61	5910-99-924-3070	☆ U90/15/40	16
300F	☆ 300F	73	4810	☆ 8480V1/4810	64	5910-99-924-7741	☆ U1000/3/40C	17
300F/RL	☆ 300F/RL	73	4811	☆ 8134V1/4811	63	5910-99-924-7742	☆ U2000/3/40C	17
300G	☆ 300G	73	4816	☆ XQ1022	59	5910-99-949-5686	☆ U1000/3/40A	17
300H	☆ 300H	73	4817	☆ XQ1022	59	5910-99-954-0316	☆ U1000/10/75J	17
300J	☆ 300J	73	5550	▽ BK66/5550	4	5910-99-954-0317	☆ U2000/8/75J	17
303	☆ MG5251	45	5551	▽ BK448/5551A	4	5910-99-954-0329	☆ U500/10/40	16
306	☆ MG5232	45	5551A	▽ BK448/5551A	4	5910-99-954-0794	☆ UF10/15/7J	19
308H	◇ N10503C	52	5552	▽ BK484/5552A	4	5910-99-954-0803	☆ UF6/15/7	19
500A	☆ 500A	73	5552A	▽ BK484/5552A	4	5910-99-957-2089	☆ U2000/8/75J	17
500B	☆ 500B	73	5553	▽ BK486/5553B	4	5910-99-957-2090	☆ U1000/10/75J	17
500C	☆ 500C	72	5553B	▽ BK486/5553B	4	5910-99-972-0246	☆ U750/10/40	16
500D	☆ 500D	73	5554	▽ BK504/5554	4	5920-99-112-1705	▽ GXF5	78
651	▽ BK484/5552A	4	5555	▽ BK46/5555	4	5920-99-537-6697	▽ GXN25	78
652	▽ BK448/5551A	4	5586	☆ 5586	44	5920-99-625-5240	▽ GXB185	78
655	▽ BK486/5553B	4	5586A	☆ MG5236A	43	5920-99-639-9438	▽ GXN20	78
656	▽ BK484/5552A	4	5657	☆ 5657	44	5920-99-786-8117	▽ GXA6/CT1	78
657	▽ BK448/5551A	4	5671*	☆ BR189	10	5923*	☆ BW1165CJ3	11
658	▽ BK486/5553B	4	5762A*	☆ BR1160C	10	5924	☆ BR1165C	10
681	▽ BK66/5550	4	5820-99-636-1873	▽ GXV6.5	78	5948*	☆ CX1140	5
700E	☆ 700E	72	5820-99-716-7194	▽ BS908	27	5948A*	☆ CX1140	5
700H	☆ 700H	72	5820-99-720-0419	☆ P8201B	62	5949	☆ FX2519A/5949A	5
715C*	☆ C1150/1	13	5820-99-735-1975	☆ E737	76	5949A	☆ FX2519A/5949A	5
751H	◇ N10502	52	5820-99-763-7398	▽ GXF2.5/G	78	5956*	☆ FX2535	5
800A	☆ 800A	72	5822	▽ BK5822A	4	5957*	☆ FX2535	5
1255FIM*	☆ 7038	63	5822A	▽ BK5822A	4	5960-00-100-7136	☆ FX2505	5
1255NOR*	☆ 7038	63	5840-99-527-4682	▽ BS660	38	5960-00-108-0259	☆ FX227	5
1400E	☆ 1400E	72	5840-99-527-4683	▽ BS662	38	5960-00-114-4714	☆ 3B24W	5
1400K	☆ 1400K	72	5840-99-537-5864	▽ BS958	28	5960-00-116-9924	☆ 3B24W	5
1430-99-624-0673	▽ GXE30	78	5840-99-618-7987	☆ MA311	49	5960-00-116-9969	☆ 8503	5
1500C	☆ 1500C	73	5840-99-626-3141	▽ BS856	26	5960-00-166-7692	☆ 5586	44
1700A	☆ 1700A	72	5840-99-638-5501	▽ BS824	24	5960-00-166-7693	☆ 5657	44
1700B	☆ 1700B	†	5840-99-719-4649	▽ BS800	24	5960-00-188-3534	▽ BS914	27
1754/5948	☆ CX1140	5	5840-99-719-4746	☆ M566Q	44	5960-00-243-5018	☆ C1136	12
1900A	☆ 1900A	72	5840-99-743-0784	▽ B3NG1602	†	5960-00-248-3077	☆ 8503	5
1907	☆ FX2519A/5949A	5	5840-99-771-5844	◇ N10524	52	5960-00-248-3088	☆ FX2519A/5949A	5
2070-700-1248	☆ FX2535	5	5841-99-194-5713	▽ BS824	24	5960-00-262-0227	☆ 4J53	44
2100A	☆ 2100A	72	5841-99-639-1407	▽ BS752	38	5960-00-262-1355	☆ FX227	5
2100B	☆ 2100B	72	5841-99-643-9725	▽ GXR18.5	78	5960-00-390-5208	☆ 8503	5
2255AMR*	☆ P849D	61	5841-99-649-9447	▽ GXX160/2	78	5960-00-477-5329	☆ M5114B	44
2255BAE*	☆ P849D	61	5841-99-954-5468	▽ GXB160	78	5960-00-504-8548	☆ 4J31	44
2255ENT*	☆ P849D	61	5853	▽ BS110	24	5960-00-542-7181	☆ FX2519A/5949A	5
2255FIM*	☆ P844	61	5855-99-788-5967	☆ P4428	66	5960-00-548-9851	☆ 8503	5

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
5960-00-552-8277	☆ FX2505	5	5960-99-037-0335	☆ C1134	12	5960-99-038-1713	▽ GXQ350L	78
5960-00-652-5994	◇ N1073	54	5960-99-037-2063	☆ BR189	10	5960-99-038-2768	▽ BS975	27
5960-00-663-5968	☆ 4CX5000A	14	5960-99-037-2081	▽ BS502	39	5960-99-038-2769	▽ BS969	27
5960-00-669-6807	☆ 4J52A	46	5960-99-037-2083	☆ FX227	5	5960-99-038-2770	▽ BS977	27
5960-00-669-8515	▽ BK66/5550	4	5960-99-037-2089	☆ BR1162C	10	5960-99-118-0159	☆ M5051	43
5960-00-669-8676	☆ C1134	12	5960-99-037-2118	☆ 8503	5	5960-99-118-0160	☆ CX1180	6
5960-00-752-5979	☆ C1149/1	13	5960-99-037-2156	☆ CX1140	5	5960-99-118-0190	☆ P842X	61
5960-00-800-0602	☆ 7038	63	5960-99-037-2162	▽ BS834	22	5960-99-118-0680	☆ M5032Q	45
5960-00-808-4523	☆ FX2535	5	5960-99-037-2231	☆ CX1191	5	5960-99-118-0681	☆ M5033Q	45
5960-00-905-9126	☆ 4CX15,000A	14	5960-99-037-2315	☆ C1112	12	5960-99-118-0737	▽ BS876	23
5960-01-106-7904	◇ N1002A	54	5960-99-037-2423	☆ FX2505	5	5960-99-118-1008	▽ BS832	24
5960-01-127-0246	◇ N10023	54	5960-99-037-2964	▽ BS510	39	5960-99-118-1158	▽ BS874	23
5960-14-205-0742	☆ 6587	5	5960-99-037-3109	☆ M554R	43	5960-99-118-1616	☆ 8541	61
5960-14-206-3386	☆ 4J52A	46	5960-99-037-3112	☆ M569P	44	5960-99-118-1690	☆ 4CX35,000C	14
5960-14-220-4497	☆ C1108	12	5960-99-037-3164	☆ C1136	12	5960-99-118-1763	☆ FX2535	5
5960-14-220-4515	☆ 5586	44	5960-99-037-3202	☆ M578B	43	5960-99-118-1922	☆ P831S	62
5960-14-220-4523	☆ FX227	5	5960-99-037-3213	☆ M570W	44	5960-99-118-2085	☆ CX1528	7
5960-14-220-4526	☆ C1112	12	5960-99-037-3214	☆ M569W	44	5960-99-118-2323	☆ CX1191	5
5960-14-226-0204	☆ 5657	44	5960-99-037-3215	☆ M579B	44	5960-99-118-2358	☆ P863B	†
5960-14-256-3774	☆ P862	63	5960-99-037-3263	☆ A207	5	5960-99-118-3525	▽ BS536	39
5960-17-033-9201	☆ 4CX5000A	14	5960-99-037-3279	☆ C1134	12	5960-99-118-3717	▽ BS138	22
5960-17-035-0700	☆ 8541	61	5960-99-037-3306	☆ M554Q	43	5960-99-118-3937	▽ BS930	27
5960-17-606-4243	☆ CX1140	5	5960-99-037-3307	☆ M566P	44	5960-99-118-6132	☆ M5089	46
5960-21-855-6948	☆ CX1180	6	5960-99-037-3308	☆ M566R	44	5960-99-118-6134	☆ M5068	46
5960-21-855-9183	☆ C1166	13	5960-99-037-3309	☆ M573Q	†	5960-99-118-6420	☆ P8130M	†
5960-21-859-7072	☆ CX1157	6	5960-99-037-3335	☆ C1134X	†	5960-99-118-7223	▽ BS822	27
5960-99-000-0233	▽ GXA50	78	5960-99-037-3380	☆ M554P	43	5960-99-118-8702	☆ 4CX15,000A	14
5960-99-000-0295	▽ GXA85	78	5960-99-037-3474	▽ GXB160	78	5960-99-118-8789	☆ M5133R	44
5960-99-000-0372	☆ FX227	5	5960-99-037-3500	▽ BS390	24	5960-99-118-8790	☆ M5136P	44
5960-99-000-0402	▽ GXA80	78	5960-99-037-3584	☆ C1149/1	13	5960-99-118-8791	☆ M5052	43
5960-99-000-0427	☆ C1150/1	13	5960-99-037-3590	▽ BS440	27	5960-99-118-9438	☆ FX2530	5
5960-99-000-0482	☆ A237	5	5960-99-037-3736	☆ 8356	46	5960-99-462-2783	☆ 4CX5000A	14
5960-99-000-0488	▽ GXA95	78	5960-99-037-3828	☆ CX1140	5	5960-99-522-3862	☆ UFC100/30/120J	20
5960-99-000-0513	☆ 4J53	44	5960-99-037-3996	☆ BR1160C	10	5960-99-531-5910	☆ P831 SN10	†
5960-99-000-1742	▽ BK504/5554	4	5960-99-037-4037	☆ M566W	44	5960-99-537-1816	☆ P863C	†
5960-99-000-1743	▽ GXA60	78	5960-99-037-4038	☆ M570B	44	5960-99-537-1817	☆ P863D	†
5960-99-000-1787	☆ FX2505	5	5960-99-037-4039	☆ M569B	44	5960-99-539-4433	☆ C1148	13
5960-99-000-1859	▽ GXA160	78	5960-99-037-4063	☆ P831	62	5960-99-543-2728	☆ CX1559	5
5960-99-000-1897	☆ 4J34	44	5960-99-037-4188	☆ M577B	43	5960-99-638-5501	▽ BS824	24
5960-99-000-1898	☆ 4J35	44	5960-99-037-4189	☆ M595B	44	5960-99-638-8969	☆ P863B1	†
5960-99-000-1914	☆ 4J31	44	5960-99-037-4367	☆ CX1159	5	5960-99-648-3181	☆ P863E	†
5960-99-000-1916	☆ 4J33	44	5960-99-037-4580	☆ M5032Q	45	5960-99-658-1310	☆ M5169S	43
5960-99-000-1923	▽ BS810	27	5960-99-037-4602	☆ BR1161	10	5960-99-662-6114	☆ CX1168	6
5960-99-000-2124	▽ BK484/5552A	4	5960-99-037-4627	☆ 4CX10,000D	14	5960-99-711-9596	☆ M579P	44
5960-99-000-2130	☆ C1108	12	5960-99-037-4671	☆ E713B	66	5960-99-711-9597	☆ M569Q	44
5960-99-000-2131	☆ C1112	12	5960-99-037-4673	☆ M5005	46	5960-99-714-5244	☆ 6027H	45
5960-99-000-2160	☆ A207	5	5960-99-037-4688	▽ BS390	24	5960-99-716-6546	☆ M569R	44
5960-99-000-2181	▽ BS104	24	5960-99-037-4902	☆ M554U	43	5960-99-716-6547	☆ M570P	44
5960-99-000-2306	▽ BS156	27	5960-99-037-5146	☆ 4J52A	46	5960-99-716-6548	☆ M570Q	44
5960-99-000-2307	▽ BS158	27	5960-99-037-5177	☆ M577B	43	5960-99-716-6604	☆ 8503	5
5960-99-000-2311	▽ BS200	27	5960-99-037-5295	☆ BR1122	10	5960-99-717-7551	☆ FX2522/8613	6
5960-99-000-2322	☆ BR161	10	5960-99-037-5320	☆ C1166	13	5960-99-718-4707	▽ BS606	39
5960-99-000-2359	▽ BS156	27	5960-99-037-5440	☆ BS826	27	5960-99-719-4379	▽ BS324	24
5960-99-000-2416*	☆ C1149/1	13	5960-99-037-5665	☆ C1134P	†	5960-99-719-5437	☆ P8132RF	57
5960-99-000-2482	▽ BS838	22	5960-99-037-5812	☆ CX1157	6	5960-99-719-5439	☆ P8132RF	57
5960-99-000-2520	☆ 8503	5	5960-99-037-5879	☆ P863	62	5960-99-719-5440	☆ P8130B	†
5960-99-000-2744	☆ 4J34	44	5960-99-037-5940	☆ M5035	44	5960-99-719-5441	☆ P8130G	†
5960-99-000-2797	☆ C178A/5894	12	5960-99-037-6033	☆ CX1157	6	5960-99-719-5442	☆ P8130R	†
5960-99-000-2799	☆ C1134	12	5960-99-037-6035	☆ P863	62	5960-99-719-5448	☆ CY1172	14
5960-99-000-2858	☆ 3B24W	5	5960-99-038-0248	▽ BS834	22	5960-99-720-0135	☆ M5187	46
5960-99-000-2993	☆ 8503	5	5960-99-038-0502	▽ BS536	39	5960-99-721-0092	☆ CX1154	6
5960-99-000-3540	☆ 8503	5	5960-99-038-0505	▽ BS800	24	5960-99-744-7609	▽ GXA350	78
5960-99-000-3611	☆ 5586	44	5960-99-038-0523	▽ BS838	22	5960-99-777-2363	☆ MG5238A	45
5960-99-000-3629*	☆ FX227	5	5960-99-038-0524	▽ BS138	22	5960-99-777-2364	☆ MG5241	45
5960-99-000-3840	▽ BS462	27	5960-99-038-0525	▽ BS262	28	5960-99-777-2370	☆ CX1164	6
5960-99-000-3926	☆ BR1165	10	5960-99-038-0670	◇ N1094	52	5960-99-779-9285	◇ N10503C	52
5960-99-000-3958	☆ 5657	44	5960-99-038-1141	▽ BS958	28	5960-99-781-4717	☆ K347A	41
5960-99-000-5018	☆ 4J52A	46	5960-99-038-1265	☆ CX1535	6	5960-99-782-4007	☆ MG5236A	43

5855-99-863-7691- P25149

* † Please refer to page 85.

◇ Manufactured at Witham.

☆ Manufactured at Chelmsford.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
5960-99-782-4008	☆ MG5237A	43	8252*	☆ C1149/1	13	A237	☆ A237	5
5960-99-785-6416	☆ CX1191A	5	8269*	☆ BR1196	10	A239	☆ 3B24W	5
5985-17-047-6832	▽ BS172	24	8281	☆ 4CX15,000A	14	ACM3*	☆ BR1167	10
6027H	☆ 6027H	45	8329	☆ 8503	5	ACS5	☆ 4CX5000A	14
6130	☆ FX227	5	8349	☆ 4CX35,000C	14	ACT70	☆ BR1160C	10
6155*	☆ C1108	12	8349/4CX35,000C	☆ 4CX35,000C	14	AJ5551	▽ BK448/5551A	4
6156*	☆ C1112	12	8356	☆ 8356	46	AJ5552	▽ BK484/5552A	4
6252*	☆ C1134	12	8360*	▽ BK492/7669	4	AJ6346*	▽ BK448/5551A	4
6268/4C35	☆ FX2505	5	8370	☆ FX2535	5	AJ6347*	▽ BK484/5552A	4
6279/5C22	☆ 8503	5	8424	☆ 8503	5	AP413	▽ BS990	24
6279A	☆ 8503	5	8438	☆ C1136	12	AR10T	▽ BK484/5552A	4
6326	☆ 7038	63	8480	☆ 8480	64	AR14T	▽ BK448/5551A	4
6334	▽ BS918	27	8480V1	☆ 8480V1/4810	64	AR31	▽ BK66/5550	4
6346*	▽ BK448/5551A	4	8488	☆ 6587	5	ATC10-50*	☆ U50/15/30	16
6347*	▽ BK484/5552A	4	8503	☆ 8503	5		☆ U50/20/40	16
6348*	▽ BK486/5553B	4	8521	☆ 8521	64	ATC15-75*	☆ U75/15/40	16
6421*	☆ BR1124	10	8541	☆ 8541/P849D	61		☆ U80/15/40	16
6511*	▽ BK5822A	4	8541A	☆ 8541A	61	ATL10-3*	☆ BR1122	10
6512*	▽ BK504/5554	4	8541F	☆ 8541F	61		☆ BR1124	10
6513*	▽ BK46/5555	4	8572	☆ 8572A	61	AX4-125A/4D21*	☆ C1108	12
6522	☆ 8503	5	8572A	☆ 8572A	61	AX4-250A/5D22*	☆ C1112	12
6587	☆ 6587	5	8592	☆ BW1162CJ3	11	AX9903/5894*	☆ C178A/5894	12
6587A	☆ 6587	5	8604	☆ P844	61	AX9903*	☆ C178A/5894	12
6625-99-633-5876	▽ BS698	38	8613	☆ FX2522/8613	6	AX9904*	☆ BW1165CJ3	11
6625-99-798-4453	▽ BS644	38	8680	☆ BW1185J2	11	AX9904R	☆ BR1165C	10
6696*	☆ BW1608J2F	11	8765	☆ FX2534/8765	6	AX9910*	☆ C1134	12
6777	☆ FX2530/6777	5	8803	☆ FX2505	5	AX9911	☆ FX2505	5
6960*	☆ BW1162CJ3	11	8823	☆ P8037	60	AX9912	☆ 8503	5
6961	☆ BR1162C	10	8844	☆ P8037	60	B3CP98---	▽ B3CP98---	22
6972	☆ M575	46	9620*	☆ P849D	61	B3DL1600 Series	▽ B3DL1600 Series	33
7021	▽ BK448/5551A	4	9677B	☆ 8541A	61	B3ED9902	▽ B3ED9902	38
7028	☆ MG5238B	45	9677C	☆ 8541	61	B3ED9920	▽ B3ED9920	38
7031	▽ BK484/5552A	4	9677D	☆ P842F	61	B3IM16---	▽ B3IM16---	22
7038	☆ 7038	63	9677F1	☆ P844	61	B3IM1830	▽ B3IM1830	22
7041	▽ BK486/5553B	4	9677F2	☆ P844	61	B3LO1601	▽ B3LO1601	34
7092	☆ B1153	10	9677M	☆ P849D	61	B3LO1602	▽ B3LO1602	34
7171	▽ BK476	4	9677P	☆ P849D	61	B3LO1610	▽ B3LO1610	34
7207*	▽ BK488A	4	9677S2	☆ 8541A	61	B3LO1642	▽ B3LO1642	34
7226A*	☆ P831	62	9677SC	☆ 8541A	61	B3LO1801	▽ B3LO1801	34
7237	☆ BR1162C	10	9728	☆ P8031	61	B3LO1803	▽ B3LO1803	34
7262A	☆ P831 IG	62	9728D	☆ P8031F	61	B3LO1804	▽ B3LO1804	34
7263A*	☆ P831	62	9728Q	☆ P8031Z	61	B3LO1805	▽ B3LO1805	34
7291	☆ 7038	63	9730	☆ P863	62	B3LO9801	▽ B3LO9801	34
7381	▽ BS918	27	9812PA	☆ 8541	61	B3LO9802	▽ B3LO9802	34
7384	☆ CX1140	5	9814PA	☆ P831	62	B3LO9803	▽ B3LO9803	34
7527	☆ C1136	12	9831	☆ P8037	60	B3LO9804	▽ B3LO9804	34
7568	☆ FX2519A/5949A	5	10667F	☆ 7038	63	B3LO9810	▽ B3LO9810	34
7583/KU82*	☆ FX2530/6777	5	23174A	☆ P8123	62	B3LT0601	▽ B3LT0601	23
7590	☆ FX2519A/5949A	5	23174B/C	☆ P8127	62	B3LT0602	▽ B3LT0602	23
7603	☆ FX2505	5	55850*	☆ 7038	63	B3LT1003	▽ B3LT1003	34
7665	☆ 7665	6	55850F	☆ P844	61	B3LT101-	▽ B3LT101-	25
7665A	☆ 7665A	6	55850N	☆ 8541	61	B3LT12---	▽ B3LT12---	26
7668	☆ B1592	13	55850S	☆ 8541A	61	B3LT16---	▽ B3LT16---	28
7669	▽ BK492/7669	4	55851AM	☆ P849D	61	B3LT1601	▽ B3LT1601	34
7670*	▽ BK492/7669	4	55851F	☆ P8038	61	B3LT1602	▽ B3LT1602	34
7671	▽ BK494/7671	4	55875	☆ P8130H	57	B3LT1605	▽ B3LT1605	34
7673	▽ BK498/7673	4	55875-IG	☆ P8130H IG	57	B3LT1608	▽ B3LT1608	34
7681	▽ BK544	4	55875B	☆ P8130HB	57	B3LT1610	▽ B3LT1610	34
7703	▽ BK7703	4	55875B-IG	☆ P8130HB IG	57	B3LT1623	▽ B3LT1623	34
8134	☆ 8134	63	55875G	☆ P8130HG	57	B3LT1625	▽ B3LT1625	34
8134V1/4811	☆ 8134V1/4811	63	55875G-IG	☆ P8130HG IG	57	B3LT1630	▽ B3LT1630	34
8134VB	☆ 8134V1/4811	63	55875L	☆ P8130HL	57	B3LT181-	▽ B3LT181-	30
8170	☆ 4CX5000A	14	55875R	☆ P8130HR	57	B3NG1500	▽ B3NG1500	38
8170/4CX5000A	☆ 4CX5000A	14	55875R-IG	☆ P8130HR IG	57	B3NG1600	▽ B3NG1600	38
8170W	☆ 4CX5000R/8170W	14	55876X	☆ P8130HX	57	B3PL1002	▽ B3PL1002	25
8171	☆ 4CX10,000D	14	56032*	▽ BS918	27	B3PL1007	▽ B3PL1007	25
8171/4CX10,000D	☆ 4CX10,000D	14	A2T	☆ XL676/A2T	76	B3PL12---	▽ B3PL12---	26
8188	☆ C1583	13	A207	☆ A207	5	B3PL160-	▽ B3PL160-	28

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
B3PL1601	▽ B3PL1601	28	B7SW1010 Series	▽ B7SW1010 Series	37	BK416	▽ BK7703 Series	4
B3PL180-	▽ B3PL180-	30	B7SW1210 Series	▽ B7SW1210 Series	37	BK416/7703	▽ BK7703 Series	4
B3PL1800	▽ B3PL1800	30	B7SW1410 Series	▽ B7SW1410 Series	37	BK428	▽ BK472	4
B3PL1802	▽ B3PL1802	30	B7SW1601	▽ B7SW1601	37	BK442	▽ BK492/7669	4
B3PN0603	▽ B3PN0603	23	B7SW1610 Series	▽ B7SW1610 Series	37	BK442/7669	▽ BK492/7669	4
B3PS1210	▽ B3PS1210	26	B7SW1648	▽ B7SW1648	37	BK444	▽ BK494/7671	4
B3RH1000 Series	▽ B3RH1000 Series	33	B7SW1701	▽ B7SW1701	37	BK444/7671	▽ BK494/7671	4
B3RH1600 Series	▽ B3RH1600 Series	33	B7SW1710 Series	▽ B7SW1710 Series	37	BK446	▽ BK498/7673	4
B3SP9801	▽ B3SP9801	22	B7SW1801	▽ B7SW1801	37	BK446/7673	▽ BK498/7673	4
B3SP9802	▽ B3SP9802	22	B7SW1810 Series	▽ B7SW1810 Series	37	BK448	▽ BK448/5551A	4
B3SP9803	▽ B3SP9803	22	B7SW2201	▽ B7SW2201	37	BK448/5551A	▽ BK448/5551A	4
B3SS0605	▽ B3SS0605	23	B1135	☆ B1135	10	BK472	▽ BK472	4
B3SS0610	▽ B3SS0610	23	B1135A	☆ B1135A	10	BK474	▽ BK474	4
B3SS100-	▽ B3SS100-	25	B1152	☆ B1152	10	BK476	▽ BK476	4
B3SS102-	▽ B3SS102-	25	B1153	☆ B1153	10	BK482	▽ BK482	4
B3SS12--	▽ B3SS12--	26	B1153B	☆ B1153B	10	BK484	▽ BK484/5552A	4
B3SS1616	▽ B3SS1616	28	B1510	☆ B1510	13	BK484/5552A	▽ BK484/5552A	4
B3SS165-	▽ B3SS165-	28	B1510A	☆ B1510A	13	BK486	▽ BK486/5553B	4
B3SS166-	▽ B3SS166-	28	B1565	☆ B1565	10	BK486/5553B	▽ BK486/5553B	4
B3SS1800	▽ B3SS1800	30	B1565A	☆ B1565A	10	BK488A	▽ BK488A	4
B3SS18--	▽ B3SS18--	30	B1584	☆ B1584	13	BK488B	▽ BK488B	4
B3TL120 Series	▽ B3TL120 Series	26	B1592	☆ B1592	13	BK492	▽ BK492/7669	4
B3TL121 Series	▽ B3TL121 Series	26	B1628	▽ B1628	81	BK492/7669	▽ BK492/7669	4
B3TL1001	▽ B3TL1001	24	B1634A	☆ B1634A	13	BK494	▽ BK494/7671	4
B3TL1005	▽ B3TL1005	24	BC4392 Series	☆ P8130H Series	57	BK494/7671	▽ BK494/7671	4
B3TL1010	▽ B3TL1010	24		☆ P8400H Series	57	BK496	▽ BK496	4
B3TL1011	▽ B3TL1011	24	BC4393	☆ P8132AR	57	BK498	▽ BK498/7673	4
B3TL1012	▽ B3TL1012	24		☆ P8401AR	57	BK498/7673	▽ BK498/7673	4
B3TL1206	▽ B3TL1206	26	BC4394	☆ P8132RF	57	BK502	▽ BK502	4
B3TL1207	▽ B3TL1207	26		☆ P8401RF	57	BK504	▽ BK504/5554	4
B5LD2251	▽ B5LD2251	35	BC4532	☆ P8125	61	BK504/5554	▽ BK504/5554	4
B5LD2731	▽ B5LD2731	35	BC4592	☆ P8130H	57	BK506	▽ BK506	4
B5LD22201	▽ B5LD22201	35		☆ P8400H	57	BK508	▽ BK508	4
B5LD221001	▽ B5LD221001	35	BC4593	☆ P8132AR	57	BK514	▽ BK514	4
B5SS222-	▽ B5SS222-	31		☆ P8401AR	57	BK518	▽ BK518	4
B7DC06--	▽ B7DC06--	36	BC4594	☆ P8132RF	57	BK542/1081	▽ BK502	4
B7DC10--	▽ B7DC10--	36		☆ P8401RF	57	BK544	▽ BK544	4
B7DC12--	▽ B7DC12--	36	BC4992 Series	☆ P8130H Series	57	BK5822A	▽ BK5822A	4
B7FR1001	▽ B7FR1001	32		☆ P8400H Series	57	BK7703	▽ BK7703	4
B7FR1052	▽ B7FR1052	32	BC4993	☆ P8132AR	57	BK7703A	▽ BK7703A	4
B7FR1201	▽ B7FR1201	32		☆ P8401AR	57	BK7703B	▽ BK7703B	4
B7FR1601	▽ B7FR1601	32	BC4994	☆ P8132RF	57	BK7703C	▽ BK7703C	4
B7FR1602	▽ B7FR1602	32		☆ P8401RF	57	BL27	▽ BS918	27
B7IS1602	▽ B7IS1602	35	BC8134	☆ 8134V1/4811	63	BLT088	▽ BS192	27
B7JC1010	▽ B7JC1010	35	BC8480	☆ 8480V1/4810	64	BLT119	▽ BS110	24
B7JC1013	▽ B7JC1013	35	BC8541	☆ 8541A	61	BM25LG	☆ BM25LG	43
B7JC1210	▽ B7JC1210	35	BEL03a	☆ 3B24W	5	BM1001	▽ M5125	42
B7JC1615	▽ B7JC1615	35	BEL125	☆ C1108	12	BM1001A	▽ M5125	42
B7JC1619	▽ B7JC1619	35	BEL250	☆ C1112	12	BR161	☆ BR161	10
B7JC1622	▽ B7JC1622	35	BEL400	☆ C1136	12	BR189	☆ BR189	10
B7JC1625	▽ B7JC1625	35	BK24	▽ BK484/5552A	4	BR191B	☆ BR1160C	10
B7JC1814	▽ B7JC1814	35	BK24/5552A	▽ BK484/5552A	4	BR1102	☆ BR1102	10
B7JC1820	▽ B7JC1820	35	BK34	▽ BK486/5553B	4	BR1121	☆ BR1121	10
B7LD10200	▽ B7LD10200	35	BK42	▽ BK448/5551A	4	BR1122	☆ BR1122	10
B7LD10751	▽ B7LD10751	35	BK42/5551A	▽ BK448/5551A	4	BR1124	☆ BR1124	10
B7LD12751	▽ B7LD12751	35	BK44	▽ BK504/5554	4	BR1126*	☆ BR1196	10
B7LD16501	▽ B7LD16501	35	BK44/5554	▽ BK504/5554	4	BR1151*	☆ BR1161	10
B7LD18501	▽ B7LD18501	35	BK46	▽ BK46/5555	4	BR1160	☆ BR1160C	10
B7LD98401	▽ B7LD98401	35	BK46/5555	▽ BK46/5555	4	BR1160C	☆ BR1160C	10
B7LD101201	▽ B7LD101201	35	BK66	▽ BK66/5550	4	BR1161	☆ BR1161	10
B7LD103001	▽ B7LD103001	35	BK66/5550	▽ BK66/5550	4	BR1162	☆ BR1162C	10
B7LD103002	▽ B7LD103002	35	BK146	▽ BK486/5553B	4	BR1162C	☆ BR1162C	10
B7LD152501	▽ B7LD152501	35	BK146/5553B	▽ BK486/5553B	4	BR1165	☆ BR1165C	10
B7LD161001	▽ B7LD161001	35	BK168	▽ BK5822A	4	BR1165C	☆ BR1165C	10
B7LD162001	▽ B7LD162001	35	BK168/5822A	▽ BK5822A	4	BR1167	☆ BR1167	10
B7PC1612	▽ B7PC1612	35	BK178	▽ BK488A	4	BR1169	☆ BR1610F	10
B7PC1621	▽ B7PC1621	35	BK194	▽ BK496	4	BR1181	☆ BR1610F	10
B7SW0610	▽ B7SW0610	37	BK394	▽ BK506	4	BR1182	☆ BR1182	10

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
BR1183	☆ BR1183	10	BS323	▽ BS323	24	BS826	▽ BS826	27
BR1195	☆ BR1195	10	BS324	▽ BS324	24	BS830	▽ BS830	27
BR1195F	☆ BR1195F	10	BS332	▽ BS810	27	BS832	▽ BS832	24
BR1196	☆ BR1196	10	BS342	▽ BS342	39	BS833	▽ BS833	24
BR1196F	☆ BR1196F	10	BS386	▽ BS386	39	BS834	▽ BS834	22
BR1512	☆ BR1512	10	BS390	▽ BS390	24	BS838	▽ BS838	22
BR1512A	☆ BR1512A	10	BS440	▽ BS440	27	BS846	▽ BS846	24
BR1512AF	☆ BR1512AF	10	BS450	▽ BS450	27	BS848	▽ BS848	24
BR1512F	☆ BR1512F	10	BS452	▽ BS452	27	BS850	▽ BS450	27
BR1513	☆ BR1610F	10	BS454	▽ BS454	27	BS854	▽ BS854	23
BR1513A	☆ BR1606F	10	BS462	▽ BS462	27	BS856	▽ BS856	26
BR1513AF	☆ BR1606F	10	BS466	▽ BS466	27	BS858	▽ BS858	26
BR1513F	☆ BR1610F	10	BS470	▽ GXE30	78	BS870	▽ BS870	23
BR1514	☆ BR1607F	10	BS502	▽ BS502	39	BS872	▽ BS872	23
BR1514F	☆ BR1607F	10	BS504	▽ BS504	39	BS874	▽ BS874	23
BR1587	☆ BR1587	10	BS506	▽ BS510	39	BS875	▽ BS875	23
BR1589F	☆ BR1589F	10	BS510	▽ BS510	39	BS876	▽ BS876	23
BR1601F	☆ BR1601F	10	BS512	▽ BS512	39	BS882	▽ BS882	27
BR1606F	☆ BR1606F	10	BS514	▽ BS514	39	BS888	▽ BS888	32
BR1607F	☆ BR1607F	10	BS516	▽ BS516	39	BS894	▽ BS894	24
BR1608F	☆ BR1608F	10	BS522	▽ BS522	39	BS908	▽ BS908	27
BR1610F	☆ BR1610F	10	BS524	▽ BS524	39	BS910	▽ BS910	23
BR1617F	☆ BR1617F	10	BS526	▽ BS526	39	BS914	▽ BS914	27
BR1629	☆ BR1629	13	BS528	▽ BS528	39	BS916	▽ BS916	24
BR1630F	☆ BR1630F	10	BS530	▽ BS530	39	BS918	▽ BS918	27
BS50C Series	▽ BS50C Series	36	BS532	▽ BS532	39	BS927	▽ BS927	30
BS50L	▽ BS50L	36	BS534	▽ BS534	39	BS928	▽ BS928	27
BS50Q Series	▽ BS50Q Series	36	BS536	▽ BS536	39	BS930	▽ BS930	27
BS50S Series	▽ BS50S Series	36	BS538	▽ BS538	39	BS950	▽ BS950	27
BS50W Series	▽ BS50W Series	36	BS540	▽ BS540	39	BS951	▽ BS951	28
BS50X Series	▽ BS50X Series	36	BS546	▽ BS546	39	BS956	▽ BS956	27
BS58	▽ BS58	24	BS600	▽ BS600	39	BS958	▽ BS958	28
BS63	▽ BS63	31	BS602A	▽ BS602A	39	BS958D	▽ BS958D	28
BS66	▽ BS66	31	BS602C	▽ BS602C	39	BS962	▽ BS962	27
BS68	▽ BS68	31	BS606	▽ BS606	39	BS966	▽ BS966	26
BS71	▽ BS71	31	BS610 Series	▽ BS610 Series	39	BS969	▽ BS969	27
BS72	▽ BS72	31	BS611	▽ BS611	39	BS970	▽ BS970	27
BS73	▽ BS73	31	BS612	▽ BS612	39	BS975	▽ BS975	27
BS75	▽ BS75	31	BS614	▽ BS614	39	BS977	▽ BS977	27
BS90	▽ GXA95	78	BS615	▽ BS615	39	BS990	▽ BS990	24
BS104	▽ BS104	24	BS620	▽ BS620	39	BS994	▽ BS994	24
BS110	▽ BS110	24	BS638	▽ BS638	39	BS1002	▽ BS1002	33
BS128	▽ BS128	23	BS640	▽ BS640	38	BS1008	▽ BS1008	33
BS130	▽ BS206	28	BS642	▽ BS642	39	BS1009	▽ BS1009	33
BS138	▽ BS138	22	BS644	▽ BS644	38	BS1024	▽ BS1024	33
BS156	▽ BS156	27	BS646	▽ BS646	38	BS2010	▽ BS2010	31
BS158	▽ BS158	27	BS658	▽ BS658	38	BS2011	▽ BS2011	31
BS169	▽ BS169	34	BS660	▽ BS660	38	BS2012	▽ BS2012	31
BS171	▽ BS171	24	BS662	▽ BS662	38	BS209-	▽ BS209-	31
BS172	▽ BS172	24	BS690A	▽ BS690A	38	BS2095	▽ BS2095	31
BS192	▽ BS192	27	BS696	▽ BS696	39	BS4106	▽ BS4106	28
BS194	▽ BS194	24	BS698	▽ BS698	38	BS4107	▽ BS4107	28
BS196	▽ BS196	27	BS750	▽ BS750	38	BS4108	▽ BS4108	28
BS200	▽ BS200	27	BS752	▽ BS752	38	BS4110	▽ BS4110	24
BS201 Series	▽ BS201 Series	31	BS754	▽ BS754	38	BS4111	▽ BS4111	24
BS202 Series	▽ BS202 Series	31	BS756	▽ BS756	38	BS4114	▽ BS4114	30
BS206	▽ BS206	28	BS758	▽ BS758	38	BS4120	▽ BS4120	28
BS221	▽ BS221	26	BS762	▽ BS762	38	BS4121	▽ BS4121	28
BS224	▽ BS224	26	BS764	▽ BS764	38	BS4122	▽ BS4122	28
BS226	▽ BS226	26	BS766	▽ BS766	38	BS4123	▽ BS4123	28
BS228	▽ BS228	27	BS774	▽ BS774	38	BS4124	▽ BS4124	28
BS256	▽ BS256	28	BS788	▽ BS788	38	BS4150	▽ BS4150	28
BS260	▽ BS260	28	BS800	▽ BS800	24	BS4151	▽ BS4151	28
BS260D	▽ BS260D	28	BS810	▽ BS810	27	BS4160	▽ BS4160	28
BS262	▽ BS262	28	BS814	▽ BS814	27	BS4161	▽ BS4161	28
BS299	▽ BS299	30	BS816	▽ BS816	27	BS4162	▽ BS4162	28
BS316	▽ BS316	27	BS822	▽ BS822	27	BS4163	▽ BS4163	28
BS320	▽ BS320	27	BS824	▽ BS824	24	BS4172	▽ BS4172	24

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
BS4220	▽ BS4220	26	BW4050	☆ BW4050	11	CF3C25	☆ UFC25/30/140J	20
BS4306	▽ BS4306	28	BW4070	☆ BW4070	11	CF3C34	☆ UFC34/30/140J	20
BS4912	▽ BS4912	23	BW4088A	☆ BW4088A	11	CF3C43	☆ UFC43/30/140J	20
BT79	☆ FX227	5	BW4088B	☆ BW4088B	11	CF3C50	☆ UFC50/30/140J	20
BT83	☆ 8503	5	BW4215	☆ BW4215	11	CF3C450*	☆ UFC450/30/200J	20
BTL6-1*	☆ BR1124	10	BY189A	☆ BY189A	12	CF3C1000E	☆ UFC1000/30/200J	20
BTL15-2*	☆ BR161	10	BY194	☆ BY194	12	CF3C2000*	☆ UFC2000/20/200J	20
	☆ BR1102	10	BY1102	☆ BY1102	12	CF3W1000E	☆ UFCW1000/30/375	19
BTR596	▽ BS452	27	BY1121	☆ BY1121	12	CFED350	☆ UFC350/15/125J	20
BW189	☆ BW189	11	BY1122	☆ BY1122	12	CFED450	☆ UFC450/12/125J	20
BW194	☆ BW194	11	BY1124	☆ BY1124	12		☆ UFC450/15/125J	20
BW1102	☆ BW1102	11	BY1144	☆ BY1144L	12	CFED500	☆ UFC500/12/125J	20
BW1102J2	☆ BW1102J2	11	BY1144L	☆ BY1144L	12		☆ UFC500/15/125J	20
BW1121	☆ BW1121	11	BY1151*	☆ BY1151	12	CFED1000	☆ UFC1000A/12/125J	20
BW1121J1	☆ BW1121J1	11	BY1161	☆ BY1161	12		☆ UFC1000A/15/125J	20
BW1121J2	☆ BW1121J2	11	BY1184J	☆ BY1184J	12		☆ UFC2000/20/200J	20
BW1122	☆ BW1122	11	BY4048A	☆ BY4048A	12	CFHD12	☆ UFC12/30/140J	20
BW1124	☆ BW1124	11	BY4049	☆ BY4049	12		☆ UFC12/36/140J	20
BW1124J1	☆ BW1124J1	11	BY4060	☆ BY4060	12	CFHD25	☆ UFC25/30/140J	20
BW1124J2	☆ BW1124J2	11	BY4063	☆ BY4063	12		☆ UFC25/36/140J	20
BW1143*	☆ BW1184J2S	11	C2T	☆ XL677/C2T	76	CFHD50	☆ UFC50/30/140J	20
BW1143J2S*	☆ BW1184J2S	11	C25	☆ XL679/C25	76		☆ UFC50/36/140J	20
BW1161	☆ BW1161	11	C25P	☆ XL679P/C25P	76	CFHD76	☆ UFC76/30/120J	20
BW1162	☆ BW1162CJ3	11	C100	☆ XL681/C100	76	CFHD100	☆ UFC100/30/120J	20
BW1162J3	☆ BW1162CJ3	11	C100P	☆ XL681P/C100P	76		☆ UFC100/36/120J	20
BW1162CJ3	☆ BW1162CJ3	11	C102A	☆ P8031	61	CFHE6.5	☆ UFC6/30/140J	20
BW1165	☆ BW1165CJ3	11	C102B	☆ 8541	61	CFHE12	☆ UFC12/30/140J	20
BW1165J3	☆ BW1165CJ3	11	C103A	☆ P8030	61		☆ UFC12/36/140J	20
BW1165CJ3	☆ BW1165CJ3	11	C103B	☆ 8541A	61	CFHE18.5	☆ UFC18/30/140J	20
BW1169J3*	☆ BW1610J2F	11	C104A*	☆ P844	61	CFHE25	☆ UFC25/30/140J	20
BW1176J2	☆ BW1176J2	11	C104B	☆ P844	61		☆ UFC25/36/140J	20
BW1181J3	☆ BW1610J2F	11	C105A	☆ P8031Z	61	CFHE34	☆ UFC34/30/140J	20
BW1182J1	☆ BW1182J1	11	C105B	☆ P849Z	61	CFHE40	☆ UFC40/30/140J	20
BW1182J2	☆ BW1182J2	11	C178A	☆ C178A/5894	12	CFHE43	☆ UFC43/30/140J	20
BW1183J1	☆ BW1183J2S	11	C178A/5894	☆ C178A/5894	12	CFHE50	☆ UFC50/30/140J	20
BW1183J2	☆ BW1183J2S	11	C933*	☆ 7038	63		☆ UFC50/36/140J	20
BW1183J2S	☆ BW1183J2S	11	C1108	☆ C1108	12	CFHP450	☆ UFC450/30/200J	20
BW1184J2	☆ BW1184J2	11	C1111*	☆ C1150/1	13	CFHP1000	☆ UFC1000/30/200J	20
BW1185J2	☆ BW1185J2	11	C1112	☆ C1112	12	CQL5-1	☆ 4CX5000A	14
BW1195	☆ BW1195	11	C1133*	☆ C1149/1	13	CR1501	☆ CR1501	14
BW1195J3	☆ BW1195J3	11	C1134	☆ C1134	12	CR1502	☆ CR1502	14
BW1195J3F	☆ BW1195J3F	11	C1136	☆ C1136	12	CR1613	☆ CR1613	14
BW1196	☆ BW1196	11	C1148	☆ C1148	13	CR2327	☆ CR2327	14
BW1196J3	☆ BW1196J3	11	C1149	☆ C1149/1	13	CR2347	☆ CR2347	14
BW1196J3F	☆ BW1196J3F	11	C1149/1	☆ C1149/1	13	CR2382	☆ CR2382	14
BW1196J3F1	☆ BW1196J3F1	11	C1149A	☆ C1149A	13	CSV1-500	☆ UC500/3/45J	18
BW1513AJ2	☆ BW1606J2F	11	C1149B	☆ C1149B	13	CV1C1000E	☆ UC1000/10/125J	18
BW1513AJ2F	☆ BW1606J2F	11	C1150	☆ C1150/1	13	CV1C1500E	☆ UC1500/8/125J	18
BW1513J2	☆ BW1610J2F	11	C1150/1	☆ C1150/1	13		☆ UC1500/10/125J	18
BW1513J2F	☆ BW1610J2F	11	C1166	☆ C1166	13	CV1C2300E	☆ UC2300/8/125J	19
BW1514J2	☆ BW1607J2F	11	C1534	☆ C1534	12		☆ UC2300/8/125JB	19
BW1514J2F	☆ BW1607J2F	11	C1581	☆ C1581	13		☆ UC2300/10/125J	19
BW1515J2F	☆ BW1515J2F	11	C1582	☆ C1582	13	CV2A1000E	☆ UCA1000/20/250	19
BW1601J2F	☆ BW1601J2F	11	C1583	☆ C1583	13	CV2C250E	☆ UC250/25/125J	18
BW1602J2F	☆ BW1602J2F	11	C1583A	☆ C1583A	13	CV2C450E	☆ UC450/25/125J	18
BW1605J2F	☆ BW1605J2F	11	C1632	☆ C1632	13	CV2C750E	☆ UC750/20/150J	18
BW1606J2F	☆ BW1606J2F	11	C1632A	☆ C1632A	13		☆ UC750/20/150JA	18
BW1607J2F	☆ BW1607J2F	11	C9132A	☆ P8031	61	CV2C1000E	☆ UC1000/20/150J	18
BW1608J2F	☆ BW1608J2F	11	C9133A	☆ P8031	61		☆ UC1000/20/150JA	18
BW1609J2	☆ BW1609J2	11	C9138A	☆ P8031	61	CV2C1500E	☆ UC1500/20/150J	18
BW1609J2F	☆ BW1609J2F	11	C23174	☆ P8123	62	CV2C2000E	☆ UC2000/20/150J	19
BW1610J2F	☆ BW1610J2F	11	C23219	☆ P8202	62	CV2W1200E	☆ UCW1200/20/500	19
BW1612J2F	☆ BW1612J2F	11	CACA125	☆ UC125/5/25	18	CV3C250E	☆ UC250/30/150J	18
BW1617J2F	☆ BW1617J2F	11	CADC30-15S	☆ UC30/10/20	18	CV3C450E	☆ UC450/30/150J	18
BW4027	☆ BW4027	11	CF2C2000	☆ UFC2000/20/200J	20	CV3C450F	☆ UFC450/30/200J	20
BW4028	☆ BW4028	11	CF3C6.5	☆ UFC6/30/140J	20	CV3C450G	☆ UC450A/30/150	18
BW4029	☆ BW4029	11	CF3C12	☆ UFC12/30/140J	20			
BW4034	☆ BW4034	11	CF3C18.5	☆ UFC18/30/140J	20			

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
CV3C650E	☆ UC650/30/150J	18	CV6131	☆ C1149/1	13	CX1140	☆ CX1140	5
CV3C650K	☆ UCW650/30/500	19	CV6132	▽ BS440	27	CX1154	☆ CX1154	6
CV3C1000E	☆ UC1000/30/150J	18	CV6184	☆ 4CX10,000D	14	CX1154B	☆ CX1154B	6
CV3W250E	☆ UCW250/30/500	19	CV6207	▽ BS826	27	CX1157	☆ CX1157	6
CV3W650E	☆ UCW650/30/500	19	CV6217	☆ 700H	72	CX1159	☆ CX1159	5
CV3W1000*	☆ UCW1000/30/500A	19	CV6229	☆ 1400K	72	CX1164	☆ CX1164	6
CV295	▽ GXA85	78	CV6241	☆ CX1157	6	CX1168	☆ CX1168	6
CV372	☆ FX227	5	CV6243	☆ P863	62	CX1168B	☆ CX1168B	6
CV402	▽ GXA80	78	CV8001	☆ M569	44	CX1171	☆ CX1171	6
CV427	☆ C1150/1	13	CV8002	☆ M579	44	CX1171B	☆ CX1171B	6
CV482	☆ A237	5	CV8051	☆ A207	5	CX1174	☆ CX1174	6
CV488	▽ GXA95	78	CV8067	☆ C1134	12	CX1174B	☆ CX1174B	6
CV513	☆ 4J53	44	CV8096	☆ M566	44	CX1175	☆ CX1175	6
CV1742	▽ BK504/5554	4	CV8097	☆ M566	44	CX1175B	☆ CX1175B	6
CV1743	▽ GXA60	78	CV8132	☆ C1134X	†	CX1180	☆ CX1180	6
CV1787	☆ FX2505	5	CV8295	☆ 4CX5000A	14	CX1191	☆ CX1191	5
CV1858	▽ GXA130	78	CV8296	▽ GXB160	78	CX1191A	☆ CX1191A	5
CV1859	▽ GXA160	78	CV8317	▽ BS390	24	CX1191D	☆ CX1191D	5
CV1897	☆ 4J34	44	CV8404	☆ FX2519A/5949A	5	CX1192	☆ CX1192	6
CV1898	☆ 4J35	44	CV8505	☆ 8356	46	CX1192B	☆ CX1192B	6
CV1914	☆ 4J31	44	CV8563	☆ CX1140	5	CX1193	☆ CX1193	6
CV1916	☆ 4J33	44	CV8671	▽ GXK20	78	CX1193B	☆ CX1193B	6
CV1923	▽ BS810	27	CV8699	☆ 4CX10,000D	14	CX1194B	☆ CX1194B	6
CV2124	▽ BK484/5552A	4	CV8730	☆ BR1160C	10	CX1199	☆ CX1199	6
CV2130	☆ C1108	12	CV8771	☆ M566	44	CX1199B	☆ CX1199B	6
CV2131	☆ C1112	12	CV8772	☆ M570	44	CX1525	☆ CX1525	7
CV2160	☆ A207	5	CV8773	☆ M569	44	CX1525A	☆ CX1525A	7
CV2181	▽ BS104	24	CV8797	☆ P831	62	CX1526	☆ CX1526	7
CV2306	▽ BS156	27	CV8904	☆ M577B	43	CX1528	☆ CX1528	7
CV2307	▽ BS158	27	CV8905	☆ M595B	44	CX1529	☆ CX1549	7
CV2311	▽ BS200	27	CV9080	☆ CX1159	5	CX1530	☆ CX1530	6
CV2322	☆ BR161	10	CV9343	☆ BR1161	10	CX1535	☆ CX1535	6
CV2359	▽ BS156	27	CV9422	☆ E713B	66	CX1535A	☆ CX1535A	6
CV2416*	☆ C1149/1	13	CV9424	☆ M5005	46	CX1536	☆ CX1536	7
CV2482	▽ BS838	22	CV9442	▽ BS390	24	CX1536A	☆ CX1536A	7
CV2520	☆ 8503	5	CV9833	☆ M554	43	CX1547	☆ CX1547	7
CV2797	☆ C178A/5894	12	CV10210	☆ M577B	43	CX1549	☆ CX1549	7
CV2799	☆ C1134	12	CV10368	☆ BR1122	10	CX1550	☆ CX1550	5
CV2826	▽ BS914	27	CV10404	☆ C1166	13	CX1551	☆ CX1551	5
CV2858	☆ 3B24W	5	CV10466	☆ 4KM50,000LR	41	CX1559	☆ CX1559	5
CV2993	☆ 8503	5	CV10994	☆ CX1157	6	CX1569	☆ CX1569	5
CV3518*	☆ CX1140	5	CV11107	☆ 4CX35,000C	14	CX1571	☆ CX1571	8
CV3521	☆ FX2519A/5949A	5	CV11154	☆ M5035	44	CX1572	☆ CX1572	8
CV3540*	☆ 8503	5	CVDD1000	☆ UC1000/10/125J	18	CX1573C	☆ CX1573C	8
CV3611	☆ 5586	44	CVDP1500	☆ UC1500/8/125J	18	CX1574C	☆ CX1574C	8
CV3629	☆ FX227	5		☆ UC1500/10/125J	18	CX1585	☆ CX1585	8
CV3745	▽ BS58	24	CVDP2300	☆ UC2300/10/125J	19	CX1585A	☆ CX1585A	8
CV3840	▽ BS462	27		☆ UC2300/8/125J	19	CX1588	☆ CX1588	6
CV3926	☆ BR1165C	10		☆ UC2300/8/125JB	19	CX1599	☆ CX1599	6
CV3958	☆ 5657	44	CVFP250	☆ UC250/25/125J	18	CX1621	☆ CX1621	6
CV5018	☆ 4J52A	46	CVFP450	☆ UC450/25/125J	18	CX1622	☆ CX1622	8
CV5207	☆ 1B59	76	CVFP750	☆ UC750/20/150J	18	CX1625	☆ CX1625	8
CV5218	☆ BR189	10		☆ UC750/20/150JA	18	CX1625A	☆ CX1625A	8
CV5239	☆ BR1162C	10	CVFP1000	☆ UC1000/20/150J	18	CX1635	☆ CX1635	8
CV5247	☆ FX2505	5		☆ UC1000/20/150JA	18	CX1636	☆ CX1636	8
CV5343	☆ C1112	12	CVFP1500	☆ UC1500/20/150J	18	CX1659	☆ CX1659	5
CV5427	☆ FX2505	5	CVFP2000	☆ UC2000/20/150J	19	CX1666	☆ CX1666	8
CV5721*	☆ CX1140	5	CVHP250	☆ UC250/30/150J	18	CX1668	☆ CX1668	6
CV5923	☆ M554	43	CVHP450	☆ UC450/30/150J	18	CX1671	☆ CX1671	6
CV5959	☆ C1136	12	CVHP650	☆ UC650/30/150J	18	CX1671D	☆ CX1671D	6
CV5992	☆ M578B	43	CVHP1000	☆ UC1000/30/150J	18	CX1685	☆ CX1685	8
CV5999	☆ M570	44	CW1600J2	☆ CW1600J2	14	CX1685A	☆ CX1685A	8
CV6005	▽ BS502	39	CW1603J2	☆ CW1603J2	14	CX1722	☆ CX1722	8
CV6007	☆ FX227	5	CWV1-1000*	☆ UCW1000/30/500A	19	CX1725	☆ CX1725	8
CV6022	☆ 8503	5		☆ UCW1200/20/500	19	CX1735	☆ CX1735	8
CV6028	▽ BS834	22	CWV2-650	☆ UCW650/30/500	19	CX1735A	☆ CX1735A	8
CV6051	☆ CX1191	5	CX1119	☆ CX1140	5	CX1736	☆ CX1736	7
CV6107	▽ BS510	39	CX1120	☆ CX1191	5	CX1736A	☆ CX1736A	7

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
CX1825	☆ CX1825	8	FTW3-1*	☆ BW1162CJ3	11	GXMT Series	▽ GXMT Series	78
CY1170J	☆ CY1170J	14	FX219	☆ 8503	5	GXM15/2	▽ GXN15	78
CY1172	☆ CY1172	14	FX225	☆ FX2505	5	GXN Series	▽ GXN Series	78
CY1637	☆ CY1637	14	FX227	☆ FX227	5	GXP Series	▽ GXP Series	78
CY4120	☆ CY4120	14	FX231	☆ 8503	5	GXQ Series	▽ GXQ Series	78
DET40	☆ B1135	10	FX290	☆ 8503	5	GXR Series	▽ GXR Series	78
DX423	☆ MG5294	49	FX2505	☆ FX2505	5	GXS Series	▽ GXS Series	78
E36*	☆ FX2535	5	FX2517	☆ FX2535	5	GXT Series	▽ GXT Series	78
E37B	☆ FX2535	5	FX2519A/5949A	☆ FX2519A/5949A	5	GXV Series	▽ GXV Series	78
E38	☆ FX2535	5	FX2522/8613	☆ FX2522/8613	6	GXW Series	▽ GXW Series	78
E125A*	☆ C1108	12	FX2530/6777	☆ FX2530/6777	5	GXX Series	▽ GXX Series	78
E250A*	☆ C1112	12	FX2533/HY61	☆ FX2533/HY61	6	GXY Series	▽ GXY Series	78
E713B	☆ E713B	66	FX2534/8765	☆ FX2534/8765	6	GXZ Series	▽ GXZ Series	78
E723	☆ E723	66	FX2535	☆ FX2535	5	HS200	☆ 7038	63
E727	☆ E727	76	GCS50/150*	☆ U150/15/40	16	HT415*	☆ 8503	5
E728	☆ E728	76	GD4701002	☆ GD4701002	81	HY61	☆ FX2533/HY61	6
E729	☆ E729	76	GD4701022	☆ GD4701022	81	HY1102*	☆ CX1571	8
E737	☆ E737	76	GD4701024	☆ GD4701024	81	HY1302*	☆ CX1572	8
E740	☆ E740	66	GD4702051	☆ GD4702051	81		☆ CX1573C	8
E747	☆ E747	76	GDA47001BC	☆ GDA47001BC	81	ITK3-1*	☆ BW1195J3	11
E748	☆ E748	76	GHT3/CV5721*	☆ CX1140	5	ITK5-1	☆ BW1196J3F1	11
E3033	☆ 4CX10,000D	14	GHT8	☆ CX1528	7	ITK8-1*	☆ BW1610J2F	11
E3061	☆ B1153	10	GHT9	☆ CX1549	7	ITK10-1*	☆ BW1610J2F	11
E3062	☆ B1153	10	GL4-250A/5D22*	☆ C1112	12	ITK120-2*	☆ BW1602J2F	11
E3509L	☆ MG5222	46	GL4D21/4-125A*	☆ C1108	12	ITL2-1	☆ BR1512F	10
E3513	☆ MG5251	45	GL415	▽ BK66/5550	4	ITL3-1*	☆ BR1195F	10
E3526	☆ MG5232	45	GL5550	▽ BK66/5550	4	ITL5-1*	☆ BR1196F	10
E3902	▽ BS206	28	GL5551A	▽ BK448/5551A	4	JCS1-25	☆ UF25/10/40	19
ECS3-30*	☆ U30/15/20	16	GL5552A	▽ BK484/5552A	4	JCS1-50	☆ UF50/10/40	19
EHT7B	☆ B1510A	13	GL5553B	▽ BK486/5553B	4	JCS1-75	☆ UF75/10/40	19
EMAGJ108	☆ EMAGJ108	47	GL5554	▽ BK504/5554	4	JCS1-100	☆ UF100/10/40	19
EMAGQ132	☆ EMAGQ132	48	GL5555	▽ BK46/5555	4	JCS1-150	☆ UF150/10/40	19
EMBTQ116	☆ EMBTQ116	49	GL5822A	▽ BK5822A	4	JCS1-250	☆ UF250/8/40	19
EMBTQ139	☆ EMBTQ139	49	GL5894*	☆ C178A/5894	12	JF20	▽ BS824	24
EMBTX104	☆ EMBTX104	47	GL6346*	▽ BK448/5551A	4	JF20D	▽ BS832	24
EMBTX115	☆ EMBTX115	47	GL6347*	▽ BK484/5552A	4	JG6511	▽ JG6511	82
EMBTX123	☆ EMBTX123	47	GL6348*	▽ BK486/5553B	4	JG6511N	▽ JG6511N	82
EMBTX124	☆ EMBTX124	47	GL6511*	▽ BK5822A	4	JG6511R	▽ JG6511R	82
EMBTX135	☆ EMBTX135	47	GL6512*	▽ BK504/5554	4	JG6514A	▽ JG6514A	82
EMBTX137	☆ EMBTX137	47	GL6513*	▽ BK46/5555	4	JG6514B	▽ JG6514B	82
EMBTX138	☆ EMBTX138	47	GL7171	▽ BK476	4	JG6516A	▽ JG6516A	82
EMPTX101	☆ EMPTX101	47	GL7207*	▽ BK488A	4	JG6517A	▽ JG6517A	82
ES105	☆ MG5267	43	GL7669	▽ BK492/7669	4	JG6518	▽ JG6518	82
ESB365089AA	☆ ESB365089AA	70	GL7671	▽ BK494/7671	4	JG6521	▽ JG6521	82
ESB365090AA	☆ ESB365090AA	70	GL7673	▽ BK498/7673	4	JG6522	▽ JG6522	82
ESB365091AA	☆ ESB365091AA	70	GL7681	▽ BK544	4	JP9-2.5D	☆ MG5238A	45
ESB365092AA	☆ ESB365092AA	70	GL7703	▽ BK7703	4	JP9-2.5E	☆ MG5238B	45
ESB365093AA	☆ ESB365093AA	70	GL37207*	▽ BK488A	4	JP9-2.5F	☆ MG5251	45
ESB365139AA	☆ ESB365139AA	70	GL37248	▽ BK508	4	JP9-7	☆ MG5244	45
ESB365180AA	☆ ESB365180AA	70	GP14B*	▽ GXT Series	78	JP9-7D	☆ MG5244	45
ESU77*	☆ A207	5	GP41B*	▽ GXT Series	78	JP9-7L	☆ MG5256	45
ET2J70A	☆ MG5289	43	GX/SG4/20	▽ GXK20	78	JP9-15	☆ MG5222	46
ET105	☆ MG5267	43	GX/SG4/30	▽ GXK30	78	JP9-18	☆ MG5264	46
ET760	☆ MG5244	45	GX/SG11/80	▽ GXK80	78	JP9-75	☆ M575	46
ETL3-1	☆ BR1196	10	GX2001	▽ GX2001	78	JP9-80	☆ 4J52A	46
F13-140	☆ F13-140	72	GX2001A	▽ GX2001A	78	JV6512	▽ JV6512	82
F133	☆ CX1140	5	GX3002	▽ GX3002	78	JV6513	▽ JV6513	82
F183	☆ CX1159	5	GXA Series	▽ GXA Series	78	JV6513B	▽ JV6513B	82
FG235	▽ BK484/5552A	4	GXB Series	▽ GXB Series	78	K Ozotron	▽ K Ozotron	79
FG238B	▽ BK46/5555	4	GXC Series	▽ GXC Series	78	K12/2L	☆ UFC12/32/100	20
FG258	▽ BK486/5553B	4	GXE Series	▽ GXE Series	78	K16/2L	☆ UFC16/32/100	20
FG259B	▽ BK504/5554	4	GXF/C Series	▽ GXF/C Series	78	K25/2L	☆ UFC25/32/100	20
FG271	▽ BK448/5551A	4	GXF/G Series	▽ GXF/G Series	78	K50/2L	☆ UFC50/32/100	20
FTL2-1*	☆ BR1162C	10	GXG Series	▽ GXG Series	78	K100/2L	☆ UFC100/24/100	20
FTL3-1*	☆ BR1162C	10	GXH Series	▽ GXH Series	78	K347	☆ K347A	41
	☆ BR1196	10	GXK Series	▽ GXK Series	78	K347A	☆ K347A	41
FTL3-2*	☆ BR1162C	10	GXL Series	▽ GXL Series	78	K347AC	☆ K347AC	41
FTL8-1*	☆ BR1124	10	GXM Series	▽ GXM Series	78	K365	☆ K365	40

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
K370	☆ K370	40	K4204	☆ K4204	40	M1315	☆ MG5238A	45
K371	☆ K371	40	K4205	☆ K4205	40	M1315A	☆ MG5238B	45
K372	☆ K372	40	K4206	☆ K4206	40	M1325	☆ M5187	46
K376	☆ K376L	40	K4251W	☆ K4251W	40	M1328	☆ M5199	46
K376L	☆ K376L	40	K4275	☆ K4275	40	M1350	☆ MG5238B	45
K377	☆ K377L	40	K4275W	☆ K4275W	40	M1353	☆ MG5233	45
K377L	☆ K377L	40	K4276	☆ K4276	40	M1354	☆ MG5234	45
K386	☆ K386	41	K4276W	☆ K4276W	40	M1361	☆ MG5232	45
K3017	☆ K3217HBCD	40	K4651	☆ K4651	40	M4011	☆ M4011	49
K3018	☆ K3218HBCD	40	K4651W	☆ K4651W	40	M4016	☆ M4016	49
K3019	☆ K3219HBCD	40	K4653	☆ K4653	40	M4017	☆ M4017	49
K3082	☆ K3282BCD	40	K4653W	☆ K4653W	40	M4117	▽ M4117	42
K3083	☆ K3283BCD	40	KU15	☆ FX227	5	M4119	▽ M4119	42
K3084	☆ K3284BCD	40	KU17	☆ FX2535	5	M4121	☆ M4121	42
K3153	☆ K3153	40	KU25	☆ 8503	5	M4152B	▽ M4152B	42
K3217	☆ K3217HBCD	40	KU29	☆ 6587	5	M4169	▽ M4169	42
K3217H	☆ K3217HBCD	40	KU42	☆ FX227	5	M4227	▽ M4227	42
K3217HBCD	☆ K3217HBCD	40	KU54*	☆ CX1140	5	M4261	▽ M4261	42
K3218	☆ K3218HBCD	40	KU72*	☆ CX1157	6	M4503B	▽ BS914	27
K3218H	☆ K3218HBCD	40	KU74*	☆ CX1528	7	M4527E	☆ MG5259	45
K3218HBCD	☆ K3218HBCD	40	KU81	☆ FX2535	5	M4703B	▽ BS196	27
K3219	☆ K3219HBCD	40	KU99	☆ FX227	5		▽ BS206	28
K3219H	☆ K3219HBCD	40	KU275C*	☆ CX1525	7	M5005	☆ M5005	46
K3219HBCD	☆ K3219HBCD	40	KU401	☆ FX2505	5	M5005A	☆ M5005A	46
K3230BCD	☆ K3230BCD	40	KU402	☆ 8503	5	M5008	☆ M5032	45
K3231BCD	☆ K3231BCD	40	L2060	▽ BS502	39	M5009	☆ M5033	45
K3270	☆ K3270BCD	40	L2061	▽ BS510	39	M5015	▽ M5125	42
K3270BCD	☆ K3270BCD	40	L2063	▽ BS386	39	M5020	☆ MG5223	43
K3271	☆ K3271BCD	40	M503A	☆ MG5244	45	M5022	☆ M5199	46
K3271BCD	☆ K3271BCD	40	M513B	☆ MG5222	46	M5028	☆ M5028	42
K3272WBCD	☆ K3272WBCD	40	M515	☆ M5187	46	M5030	☆ M5030A	44
K3276H	☆ K3276HBCD	40	M518A	☆ 4J31 to 4J35	44	M5030A	☆ M5030A	44
K3276HBCD	☆ K3276HBCD	40		☆ and 4J53	44	M5031	☆ MG5256	45
K3277H	☆ K3277HBCD	40	M526	☆ MG5244	45	M5032	☆ M5032	45
K3277HBCD	☆ K3277HBCD	40	M536	☆ 4J43 and 4J44	43	M5033	☆ M5033	45
K3278H	☆ K3278HBCD	40	M542	☆ 5586	44	M5034	☆ M5034A	44
K3278HBCD	☆ K3278HBCD	40	M551	☆ 4J52A	46	M5034A	☆ M5034A	44
K3282	☆ K3282BCD	40	M554	☆ M554	43	M5035	☆ M5035	44
K3282BCD	☆ K3282BCD	40	M559	☆ 8356	46	M5039	☆ MG5222	46
K3283	☆ K3283BCD	40	M565	☆ M565	43	M5042	☆ M5042S	46
K3283BCD	☆ K3283BCD	40	M566	☆ M566	44	M5042S	☆ M5042S	46
K3284	☆ K3284BCD	40	M569	☆ M569	44	M5043	☆ MG5233	45
K3284BCD	☆ K3284BCD	40	M570	☆ M570	44	M5044	☆ MG5234	45
K3382	☆ K3382BCD	40	M575 Series	☆ M575 Series	46	M5048	☆ M5048	44
K3382BCD	☆ K3382BCD	40	M577	☆ M577B	43	M5051	☆ M5051	43
K3383	☆ K3383BCD	40	M577A	☆ M577B	43	M5052	☆ M5052	43
K3383BCD	☆ K3383BCD	40	M577B	☆ M577B	43	M5055	☆ M5055	48
K3384	☆ K3384BCD	40	M578	☆ M578B	43	M5057	☆ M5057	49
K3384BCD	☆ K3384BCD	40	M578A	☆ M578B	43	M5058	▽ M5125	42
K3572BCD	☆ K3572BCD	40	M578B	☆ M578B	43	M5059	☆ MG5311	48
K3573BCD	☆ K3573BCD	40	M579	☆ M579	44	M5060	☆ M5168	48
K3672BCD	☆ K3672BCD	40	M586	☆ M586	43	M5063/2J70B	☆ MG5267	43
K3673BCD	☆ K3673BCD	40	M595	☆ M595B	44	M5065	☆ MG5259	45
K3773BCD	☆ K3773BCD	40	M595B	☆ M595B	44	M5068	☆ M5068	46
K3936G6	☆ K3936G6	41	M598B	☆ MG5264	46	M5079A	☆ MG5299	43
K3936G12	☆ K3936G12	41	M599A	☆ MG5238A	45	M5080	☆ M5080	46
K3936L6	☆ K3936L6	41	M599B	☆ MG5238B	45	M5081	☆ M5081	46
K3936L12	☆ K3936L12	41	M599F	☆ MG5251	45	M5083	☆ MG5236A	43
K3936L24	☆ K3936L24	41	M1222	☆ 4J34	44	M5083A	☆ MG5236A	43
K4019A	☆ K4019A	40	M1224	☆ 4J32	44	M5089	☆ M5089	46
K4145	☆ K4145	40	M1225	☆ 4J31	44	M5091	☆ MG5237A	43
K4146	☆ K4146	40	M1226	☆ 4J31	44	M5091A	☆ MG5237A	43
K4147	☆ K4147	40	M1302	☆ MG5223	43	M5103	▽ M5125	42
K4148M	☆ K4148M	41	M1304	☆ MG5222	46	M5108	☆ MG5258	45
K4153	☆ K4153	40	M1308	☆ MG5244	45	M5110	☆ MG5257	45
K4170	☆ K4170	40	M1310	☆ MG5256	45	M5111	☆ MG5239	46
K4171	☆ K4171	40	M1311	☆ MG5222	46	M5113	☆ MG5237A	43
K4172	☆ K4172	40	M1312	☆ MG5264	46	M5114B	☆ M5114B	44

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
M5115	☆ MG5255	45	MA39016X	▽ BS206	28	MG5261	☆ MG5261	44
M5125	▽ M5125	42	MA39114X	▽ BS4107	28	MG5263	☆ MG5263	43
M5125X	▽ M5125X	42	MA39138X	▽ BS206	28	MG5264	☆ MG5264	46
M5133	☆ M5133	44	MAG3	☆ MG5244	45	MG5265	☆ MG5265	46
M5134	☆ M5134	44	MAG16	☆ M5199	46	MG5267	☆ MG5267	43
M5135	☆ M5135	44	MAG19	☆ MAG19	47	MG5271	☆ MG5271	46
M5136	☆ M5136	44	MAG21 Series	☆ MAG21 Series	46	MG5272	☆ MG5272	47
M5145	☆ MG5240	43	MAG23 Series	☆ MAG23 Series	45	MG5273	☆ MG5273	45
M5149	☆ M5149	46	MAGQ121	☆ MAGQ121	48	MG5274	☆ MG5274	45
M5154	☆ M5154	48	MAGX111	☆ MAGX111	45	MG5280	☆ MG5280	48
M5157 Series	☆ M5157 Series	46	MAGX113	☆ MAGX113	45	MG5282	☆ MG5282	44
M5162	☆ M5162	44	MAGX114	☆ MAGX114	45	MG5283	☆ MG5283	43
M5163	☆ MG5294	49	MC567*	☆ M554	43	MG5284	☆ MG5284	43
M5167	▽ M5167	42		☆ M5169	43	MG5286	☆ MG5286	46
M5168	☆ M5168	48	MCF1145	☆ M5080	46	MG5289	☆ MG5289	43
M5169	☆ M5169	43	MCF1331*	☆ M5169	43	MG5294	☆ MG5294	49
M5170	☆ M5170	44	MCV1352*	☆ M5169	43	MG5295	☆ MG5295	49
M5187	☆ M5187	46	MCV1353*	☆ M5169	43	MG5296	☆ MG5296	46
M5187F	☆ M5187F	46	MD80X54	▽ BS206	28	MG5297	☆ MG5297	45
M5188	☆ M5188	46	MD2901	▽ BS452	27	MG5298	☆ MG5298	44
M5193	▽ M5193	42	MD5901	▽ BS958	28	MG5299	☆ MG5299	43
M5196A	☆ MG5238A	45	MD5901	☆ MD5901	42	MG5301	☆ MG5301	48
M5196B	☆ MG5238B	45	MD5902	☆ MD5902	42	MG5302	☆ MG5302	48
M5196F	☆ MG5251	45	MD5903	☆ MD5903	42	MG5303	☆ MG5303	48
M5197	☆ MG5234	45	ME1101	☆ MG5244	45	MG5304	☆ MG5304	48
M5198	☆ MG5233	45	ME1503	☆ FX2505	5	MG5309	☆ MG5309	44
M5199	☆ M5199	46	MG4253	▽ MG4253	42	MG5311	☆ MG5311	48
MA52	☆ MA52	16	MG5202	☆ MG5202	44	MG5314	☆ MG5314	43
MA54	☆ MA54	16	MG5204	☆ MG5204	44	MG5315	☆ MG5315	43
MA100	☆ MA100	17	MG5206	☆ MG5206	44	MG5321	☆ MG5321	48
MA100A	☆ MA100A	17	MG5213	☆ MG5213	46	MG5323	☆ MG5323	47
MA125	☆ MA125	16	MG5217	☆ MG5232	45	MG5329	☆ MG5329	48
MA125A	☆ MA125A	16	MG5218	☆ MG5218	46	MG5340	☆ MG5340	48
MA126	☆ MA126	16	MG5222	☆ MG5222	46	MG5344	☆ MG5344	43
MA164	☆ MA164	16	MG5223	☆ MG5223	43	MG5345	☆ MG5345	43
MA228	☆ MA228	49	MG5223F	☆ MG5223F	43	ML5894*	☆ C178A/5894	12
MA244	☆ MA244	49	MG5226	☆ MG5226	46	ML6421*	☆ BR1124	10
MA281	☆ MA281	19	MG5230	☆ MG5230	46	MRW80	◇ MRW80	54
MA282	☆ MA282	19	MG5231	☆ MG5231	46	MXT92	▽ BS192	27
MA286	☆ M5154	48	MG5232	☆ MG5232	45	N1061	◇ N1061	52
MA296	☆ MA296	17	MG5232F	☆ MG5232F	45	N1067	▽ BS386	39
MA297	☆ MA297	49	MG5233	☆ MG5233	45	N1072	◇ N1072	54
MA297A	☆ MA297A	49	MG5234	☆ MG5234	45	N1073	◇ N1073	54
MA311	☆ MA311	49	MG5236	☆ MG5236A	43	N1074	◇ N1073	54
MA339	☆ MA339	49	MG5236A	☆ MG5236A	43	N1077	◇ N1077	50
MA355A	☆ MA355A	65	MG5237	☆ MG5237A	43	N1078	◇ N1078	50
MA406	☆ MA406	49	MG5237A	☆ MG5237A	43	N1080A	◇ N1080A	50
MA445	☆ MA445	49	MG5238A	☆ MG5238A	45	N1081	◇ N1081	50
MA517A	☆ MA517A	65	MG5238B	☆ MG5238B	45	N1082	◇ N1082	50
MA522	☆ MA522	16	MG5239	☆ MG5239	46	N1089	◇ N1089	50
MA561A	☆ MA561A	65	MG5240	☆ MG5240	43	N1094	◇ N1094	52
MA584A	☆ MA584A	65	MG5241	☆ MG5241	45	N4135	◇ N4135	54
MA584D	☆ MA584D	65	MG5241F	☆ MG5241F	45	N4136	◇ N4136	54
MA671A	☆ MA671A	65	MG5242	☆ MG5242	46	N4182	◇ N4182	54
MA761	☆ MA761	42	MG5243	☆ MG5243	45	N4183	◇ N4183	54
MA785A	▽ MA785A	79	MG5244	☆ MG5244	45	N4214	◇ N4214	54
MA809A	☆ MA809A	65	MG5245	☆ MG5245	45	N4238	◇ N4238	53
MA819A	▽ MA819A	79	MG5248	☆ MG5248	45	N4238A	◇ N4238A	53
MA924A	☆ MA924A	49	MG5249	▽ MG5249	42	N4238B	◇ N4238B	53
MA957A	☆ MA957A	65	MG5251	☆ MG5251	45	N4256	◇ N4256	54
MA2050A	☆ MA2050A	65	MG5253	☆ MG5253	45	N4264	◇ N4264	54
MA2051A	☆ MA2051A	65	MG5254	☆ MG5254	45	N4277	◇ N4277	51
MA2162A	▽ MA2162A	79	MG5255	☆ MG5255	45	N4282	◇ N4282	51
MA3167A	▽ BS452	27	MG5256	☆ MG5256	45	N4283	◇ N4283	53
MA3846X	▽ BS830	27	MG5257	☆ MG5257	45	N4288	◇ N4288	54
MA3920X	▽ BS4123	28	MG5258	☆ MG5258	45	N4290	◇ N4290	53
MA3993	▽ BS206	28	MG5259	☆ MG5259	45	N4295	◇ N4295	53
MA39105X	▽ BS4124	28	MG5260	▽ MG5260	42	N4296	◇ N4296	53

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
N4297	◇ N4297	53	NL1053A	▽ BK482	4	P8038	☆ P8038	61
N4462	◇ N4462	54	NL1061	▽ BK492/7669	4	P8038B	☆ P8038B	61
N4463	◇ N4463	54	NL1062	▽ BK494/7671	4	P8040	☆ P8040	65
N4464	◇ N4464	54	NL1081	▽ BK502	4	P8040-UV	☆ P8040-UV	65
N10011	◇ N10011	52	NL1082	▽ BK544	4	P8041	☆ P8041	65
N10012	◇ N10012	54	NL2408*	▽ BK492/7669	4	P8042	☆ P8042	65
N10018	◇ N10018	54	NL5550	▽ BK66/5550	4	P8073	☆ P8073	67
N10019	◇ N10019	54	NL5553B	▽ BK486/5553B	4	P8079DC	☆ P8079DC	67
N10021	◇ N10021	53	NL7171	▽ BK476	4	P8079HP	☆ P8079HP	67
N10022	◇ N10022	54	NL7673	▽ BK498/7673	4	P8092	☆ P8092	63
N10023	◇ N10023	54	NL7703	▽ BK7703	4	P8093	☆ P8093	63
N10024	◇ N10024	50	NU829*	☆ C178A/5894	12	P8094	☆ P8094	63
N10025	◇ N10025	53	NV1941	▽ BS834	22	P8122	☆ P8122	61
N10028	◇ N10028	50	NV2441	▽ BS838	22	P8123	☆ P8123	62
N10033	◇ N10033	50	P03-100	☆ P03-100	73	P8125	☆ P8125	61
N10036	◇ N10036	50	P535/1E*	☆ C1150/1	13	P8126	☆ P8126	61
N10037	◇ N10037	50	P552/1E*	☆ C1150/1	13	P8127	☆ P8127	62
N10038	◇ N10038	53	P813	☆ 7038	63	P8129	☆ P8129	62
N10040	◇ N10040	50	P820	☆ 7038	63	P8130 Series	☆ P8130 Series	†
N10041	◇ N10041	50	P831	☆ P831	62	P8130H Series	☆ P8130H Series	57
N10042	◇ N10042	50	P831 IG	☆ P831 IG	62	P8130X	☆ XQ1022	59
N10043	◇ N10043	50	P842	☆ 8541A	61	P8131 Series	☆ P8131 Series	†
N10044	◇ N10044	50	P842X	☆ P842X	61	P8131H Series	☆ P8131H Series	57
N10050	◇ N10050	50	P843	☆ 8572A	61	P8132AR	☆ P8132AR	57
N10051	◇ N10051	52	P844	☆ P844	61	P8132RF	☆ P8132RF	57
N10052	◇ N10052	52	P844X	☆ P844X	61	P8133AR	☆ P8133AR	57
N10053	◇ N10053	50	P849	☆ P849	61	P8133RF	☆ P8133RF	57
N10056	◇ N10056	50	P849D	☆ 8541/P849D	61	P8135 Series	☆ P8135 Series	57
N10057	◇ N10057	53	P855 Series	☆ P855 Series	65	P8136 Series	☆ P8136 Series	57
N10063	◇ N10063	50	P856 Series	☆ P856 Series	65	P8137AR	☆ P8137AR	57
N10067	◇ N10067	53	P862	☆ P862	63	P8137RF	☆ P8137RF	57
N10068	◇ N10068	52	P863	☆ P863	62	P8138AR	☆ P8138AR	57
N10072	◇ N10072	52	P864	☆ P864	63	P8138RF	☆ P8138RF	57
N10074	◇ N10074	52	P880	☆ P880	65	P8142 Series	☆ P8142 Series	56
N10077	◇ N10077	53	P4217	☆ P4217	59		☆ XQ1070/02 Series	56
N10078	◇ N10078	53	P4225	☆ P4225	59	P8144AR	☆ P8144AR	56
N10079	◇ N10079	53	P4226	☆ P4226	59		☆ XQ1073/02R	56
N10080	◇ N10080	53	P4228	☆ P4428	66	P8144RF	☆ P8144RF	56
N10081	◇ N10081	53	P4262	☆ P4262	67		☆ XQ1075/02R	56
N10082	◇ N10082	53	P4428	☆ P4428	66	P8145 Series	☆ P8145 Series	56
N10500	◇ N10500	51	P4430	☆ P4430	66		☆ XQ1080 Series	56
N10501	◇ N10501	51	P4440	☆ P4440	66	P8146AR	☆ P8146AR	56
N10502	◇ N10502	52	P4448	☆ P4448	66		☆ XQ1083R	56
N10503C	◇ N10503C	52	P4450	☆ P4450	66	P8146RF	☆ P8146RF	56
N10504	◇ N10504	54	P8000 Series	☆ P8130H Series	57		☆ XQ1085R	56
N10508	◇ N10508	52	P8001 Series	☆ P8130H Series	57	P8147 Series	☆ P8147 Series	56
N10517	◇ N10517	52		☆ P8400H Series	57		☆ XQ1500 Series	56
N10520	◇ N10520	51	P8003 Series	☆ P8132 Series	57	P8148AR	☆ P8148AR	56
N10524	◇ N10524	52		☆ P8401 Series	57		☆ XQ1503R	56
N10524A	◇ N10524A	52	P8005 Series	☆ P8131H Series	57	P8148RF	☆ P8148RF	56
N10525	◇ N10525	51	P8007 Series	☆ P8133 Series	57		☆ XQ1505R	56
N10528	◇ N10528	51	P8008 Series	☆ P8436 Series	58	P8160 Series	☆ P8160 Series	56
N10530	◇ N10530	52	P8021 Series	☆ P8022 Series	56		☆ XQ1427 Series	56
N10531	◇ N10531	51	P8022 Series	☆ P8022 Series	56	P8161 Series	☆ P8161 Series	56
N10532	◇ N10532	51		☆ XQ1070 Series	56		☆ XQ1428 Series	56
N10534	◇ N10534	51	P8022IG	☆ P8022IG	56	P8190 Series	☆ P1490 Series	56
N10542	◇ N10542	51		☆ XQ1071	56		☆ XQ2070/03 Series	56
N10543	◇ N10543	52	P8022X	☆ P8022X	59	P8191AR	☆ P8191AR	56
N10544	◇ N10544	52		☆ XQ1072	59		☆ XQ2073/03R	56
N10559	◇ N10559	52	P8024AR	☆ P8024AR	56	P8191RF	☆ P8191RF	56
N10560	◇ N10560	52		☆ XQ1073R	56		☆ XQ2075/03R	56
NL1009A	▽ BK544	4	P8024RF	☆ P8024RF	56	P8196 Series	☆ P8196 Series	56
NL1022A	▽ BK5822A	4		☆ XQ1075R	56		☆ XQ2070/02 Series	56
NL1036	▽ BK476	4	P8029 Series	☆ P8029 Series	59	P8197AR	☆ P8197AR	56
NL1037	▽ BK7703	4	P8030	☆ P8030	61		☆ XQ2073/02R	56
NL1039	▽ BK7703	4	P8031	☆ P8031	61	P8197RF	☆ P8197RF	56
NL1051A	▽ BK448/5551A	4	P8034A	☆ P8034A	61		☆ XQ2075/02R	56
NL1052A	▽ BK484/5552A	4	P8037	☆ P8037	60	P8201	☆ P8201	62

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
P8202	☆ P8202	62	P8496X	☆ XQ2172/02	59	P8632-	☆ P8632-	68
P8203	☆ P8203	61	P8497AR	☆ P8497AR	57	P86351	☆ P86351	68
P8204	☆ P8204	61		☆ XQ2173/02R	57	P86352	☆ P86352	68
P8205	☆ P8205	61	P8497RF	☆ P8497RF	57	P8642-	☆ P8642-	68
P8208	☆ P8208	62		☆ XQ2175/02R	57	P87000	☆ P87000	70
P8209	☆ P8209	60	P8498 Series	☆ P8498 Series	57	PC46410	☆ PC46410	69
P8214	☆ P8214	62		☆ XQ3170/02 Series	57	PC46411	☆ PC46411	69
P8216	☆ P8216	60	P8499AR	☆ P8499AR	57	PL4D21*	☆ C1108	12
P8217	☆ P8217	64		☆ XQ3173/02R	57	PL5C22/HT415	☆ 8503	5
P8218	☆ P8218	62	P8499RF	☆ P8499RF	57	PL5D22*	☆ C1112	12
P8220	☆ P8220	63		☆ XQ3175/02R	57	PL165A	☆ FX2505	5
P8250	☆ P8250	60	P8514 Series	☆ P8514 Series	67	PL174	☆ 6587	5
P8251	☆ P8251	60	P8520 Series	☆ P8520 Series	58	PL345	☆ FX227	5
P8252	☆ P8252	60		☆ XQ1410 Series	58	PL435	☆ FX2505	5
P8253	☆ P8253	60	P8521AR	☆ P8521AR	58	PL522	☆ 8503	5
P8254	☆ P8254	62		☆ XQ1413R	58	PL2052A	▽ BK484/5552A	4
P8280	☆ P8280	63	P8521RF	☆ P8521RF	58	PL5551A	▽ BK448/5551A	4
P8281	☆ P8281	63		☆ XQ1415R	58	PL5552A	▽ BK484/5552A	4
P8281F	☆ P8281F	63	P8530 Series	☆ P8530 Series	58	PL5553B	▽ BK486/5553B	4
P8304 Series	☆ P8304 Series	67		☆ XQ3430 Series	58	PL5555	▽ BK46/5555	4
P8307 Series	☆ P8307 Series	65	P8531AR	☆ P8531AR	58	PL5822A	▽ BK5822A	4
P8332	☆ P8332	67		☆ XQ3433R	58	PMDM2	▽ BS514	39
P8400 Series	☆ P8400 Series	†	P8531RF	☆ P8531RF	58	PMDM2B	▽ BS524	39
P8400H Series	☆ P8400H Series	57		☆ XQ3435R	58	PMDM3	▽ BS512	39
P8401AR	☆ P8401AR	57	P8532 Series	☆ P8532 Series	58	PMDM10	▽ BS516	39
P8401RF	☆ P8401RF	57		☆ XQ2440 Series	58	PMDM11	▽ BS528	39
P8436 Series	☆ P8436 Series	58	P8533AR	☆ P8533AR	58	PMDU7	▽ BS600	39
P8438AR	☆ P8438AR	58		☆ XQ2443R	58	Q160-1*	☆ C1108	12
P8438RF	☆ P8438RF	58	P8533RF	☆ P8533RF	58	Q400-1*	☆ C1112	12
P8442 Series	☆ P8442 Series	57		☆ XQ2445R	58	Q450-1*	☆ C1136	12
	☆ XQ3070/02 Series	57	P8534 Series	☆ P8534 Series	58	QB3/300	☆ C1108	12
P8443AR	☆ P8443AR	57		☆ XQ3410 Series	58	QB3.5/750	☆ C1112	12
	☆ XQ3073/02R	57	P8535AR	☆ P8535AR	58	QB4/1100	☆ C1136	12
P8443RF	☆ P8443RF	57		☆ XQ3413R	58	QF34	▽ BS894	24
	☆ XQ3075/02R	57	P8535RF	☆ P8535RF	58	QF37	▽ BS894	24
P8452 Series	☆ P8452 Series	58		☆ XQ3415R	58	QF38*	▽ BS994	24
P8452X	☆ P8452X	59	P8540 Series	☆ P8540 Series	58	QF41	▽ BS810	27
P8453AR	☆ P8453AR	58		☆ XQ3440 Series	58	QF41M	▽ BS462	27
P8453RF	☆ P8453RF	58	P8541AR	☆ P8541AR	58	QF45	▽ BS810	27
P8454 Series	☆ P8454 Series	58		☆ XQ3443R	58	QF401	▽ BS888	32
P8455AR	☆ P8455AR	58	P8541RF	☆ P8541RF	58	QF451	▽ BS810	27
P8455RF	☆ P8455RF	58		☆ XQ3445R	58	QF451L	▽ BS908	27
P8456X	☆ P8456X	59	P8602	☆ P8602	68	QF451LA*	▽ BS908	27
P8460 Series	☆ P8460 Series	56	P8603	☆ P8603	68	QF451M	▽ BS462	27
	☆ XQ2427 Series	56	P8604	☆ P8604	68	QF451P	▽ BS822	27
P8461 Series	☆ P8461 Series	56	P8606	☆ P8606	68	QKH1535	☆ MG5222	46
	☆ XQ2428 Series	56	P8607	☆ P8607	68	QKH1862	☆ MG5222	46
P8462 Series	☆ P8462 Series	56	P8650	☆ P8650	68	QKH1978	☆ MG5267	43
	☆ XQ3427 Series	56	P46100	☆ P46100	69	QKH2001	☆ MG5267	43
P8463 Series	☆ P8463 Series	56	P46310	☆ P46310	69	QQE03/20	☆ C1134	12
	☆ XQ3428 Series	56	P46311	☆ P46311	69	QQE06/40	☆ C178A/5894	12
P8474 Series	☆ P8474 Series	56	P46312	☆ P46312	69	QQV03-20A	☆ C1134	12
	☆ XQ3457 Series	56	P46323	☆ P46323	69	QQV03-20B	☆ C1534	12
P8490 Series	☆ P8490 Series	57	P46373	☆ P46373	69	QQV06-40A	☆ C178A/5894	12
	☆ XQ2170/03 Series	57	P46935	☆ P46935	69	QT1259	▽ QT1259	78
P8490TX	☆ P8490TX	59	P46936	☆ P46936	69	QT1259P	▽ QT1259P	78
	☆ XQ2182/03	59	P46937	☆ P46937	69	QV20-P18*	☆ C1149/1	13
P8490X	☆ P8490X	59	P46953	☆ P46953	69	QV20-P18B*	☆ C1149/1	13
	☆ XQ2172/03	59	P46963	☆ P46963	69	QY3-125	☆ C1108	12
P8491AR	☆ P8491AR	57	P8532-	☆ P8532-	68	QY4-250	☆ C1112	12
	☆ XQ2173/03R	57	P85351	☆ P85351	68	QY4-400	☆ C1136	12
P8491RF	☆ P8491RF	57	P85352	☆ P85352	68	R1130B	☆ 1B59	76
	☆ XQ2175/03R	57	P8542-	☆ P8542-	68	R1169	☆ XL683/R1169	76
P8496 Series	☆ P8496 Series	57	P8612-	☆ P8612-	68	RE125C*	☆ C1108	12
	☆ XQ2170/02 Series	57	P8613-	☆ P8613-	68	RE400C*	☆ C1136	12
P8496TX	☆ P8496TX	59	P8614-	☆ P8614-	68	RS520*	☆ BW1124	11
	☆ XQ2182/02	59	P8615-	☆ P8615-	68	RS526	☆ BW1161	11
P8496X	☆ P8496X	59	P8623-	☆ P8623-	68	RS630	☆ B1135	10

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
RS635*	☆ B1153	10	TGL9482	☆ C178A/5894	12	TPU7A	▽ TPU7A	79
RS683*	☆ C1108	12	TH3B24W	☆ 3B24W	5	TPU7P	▽ TPU7P	79
RS685*	☆ C1108	12	TH4J52A	☆ 4J52A	46	TPU8	▽ TPU8	79
RS686*	☆ C1136	12	TH537	☆ CW1603J2	14	TPU8A	▽ TPU8A	79
RS726*	☆ BR1161	10	TH1362	☆ M5030A	44	TRW1	▽ BS800	24
RS822*	☆ BY189A	12	TH1363	☆ M5034A	44	TT16D	☆ C1108	12
	☆ BY1102	12	TH1586	☆ 5586	44	TT20	☆ C1134	12
RS826	☆ BY1161	12	TH1657	☆ 5657	44	TT25*	☆ C178A/5894	12
RS833*	☆ BY1122	12	TH2416A	☆ K3936G6	41	TTR31MR	▽ BS822	27
RS1001L	☆ BR1122	10	TH2416B	☆ K3936G12	41	TV1542	▽ M5125X	42
RS1002A	☆ C1136	12	TH2417A	☆ K3936L6	41	TV2255	☆ P8031	61
RS1007*	☆ C1108	12	TH2417B	☆ K3936L12	41	TV8000	☆ 8541A	61
RS1009*	☆ C178A/5894	12	TH2417CA	☆ K3936L24	41	TV8800	☆ P8037	60
RS1019*	☆ C1134	12	TH3060B*	▽ M5125	42	TV9300	☆ P844	61
RS1026	☆ B1135	10	TH3084	☆ M5170	44	TVG1	▽ TVG1	79
RS1036	☆ B1152	10	TH3085	☆ M5162	44	TVG4	☆ TVG4	79
RS1046	☆ B1153	10	TH5586	☆ 5586	44	TWC35	◇ N10018/1	54
RS2002V	☆ CY1172	14	TH5657	☆ 5657	44	TWC35B	◇ N10018/3	54
RS2014CL	☆ 4CX5000A	14	TH6334	▽ BS320	27	TWC35C	◇ N10018/2	54
RS2016	☆ 4CX5000A	14	TH6435	☆ FX2505	5	TWC37	◇ N10019/1	54
RS2044CL*	☆ 4CX5000A	14	TH6522	☆ 8503	5	TWC37B	◇ N10019/3	54
RS2793	☆ 4CX5000A	14	TH7010	▽ BK66/5550	4	TWC37C	◇ N10019/2	54
RS2794*	☆ 4CX10.000D	14	TH7020	▽ BK448/5551A	4	TY4-400	☆ B1135	10
RS3005CJ	☆ BW1195J3	11	TH7021*	▽ BK448/5551A	4	TY4-400C	☆ B1135A	10
RS3005CL	☆ BR1195	10	TH7023	▽ BK448/5551A	4	TY5-500	☆ B1152	10
RS3010CJ	☆ BW1196J3	11	TH7030	▽ BK484/5552A	4	TY6-800	☆ B1153	10
RS3010CL	☆ BR1196	10	TH7031*	▽ BK484/5552A	4	TY6-3000R*	☆ BR1196	10
RS3040CJ	☆ BW1182J2	11	TH7033	▽ BK484/5552A	4	TY6-5000A	☆ BR1165C	10
RS3040CL	☆ BR1182	10	TH7036	▽ BK544	4	TY6-5000B	☆ BR1160C	10
RS3150CJ	☆ BW1184J2	11	TH7037	▽ BK484/5552A	4	TY6-5000W*	☆ BW1165CJ3	11
RS3300CJ	☆ BW1609J2	11	TH7040	▽ BK486/5553B	4	TY7-6000A	☆ BR1162C	10
RS5300S	☆ BR1587	10	TH7041*	▽ BK486/5553B	4	TY7-6000H	☆ BW1162CJ3	11
RW80	◇ N10504	54	TH7043	▽ BK486/5553B	4	TY7-6000W*	☆ BW1162CJ3	11
S1200	☆ P8125B	61	TH7047	▽ BK486/5553B	4	TY8-6000A	☆ BR1162C	10
S1201	☆ P8125A	61	TH7050	▽ BK7703	4	U6/15/7F	☆ UF6/15/7	19
S1202	☆ P8125	61	TH7051	▽ BK7703	4	U10/15/7F	☆ UF10/15/7J	19
SAS*	▽ BK472	4	TH9801	☆ P849D	61	U30/15	☆ U30/15/20	16
SEC*	▽ BK496	4	TH9804	☆ 7038	63	U30/15/20	☆ U30/15/20	16
SGR1	☆ FX2505	5	TH9806PA	☆ 8541	61	U50/15	☆ U50/15/30	16
SRS360	☆ B1135	10	TH9807PA	☆ P844	61	U50/15/30	☆ U50/15/30	16
SRS455	☆ C1108	12		☆ 8541A	61	U50/20/40	☆ U50/20/40	16
SRS456	☆ C1136	12	TH9808PA	☆ P849D	61	U60/30/75	☆ U60/30/75	16
SRS4451*	☆ C178A/5894	12	TH9810	☆ P849D	61	U75/15/40	☆ U75/15/40	16
SRS4452	☆ C1134	12	TH9812PA	☆ P842X	61	U80/15	☆ U80/15/40	16
SRV355*	☆ BY1161	12	TH9813	☆ 8134V1/4811	63	U80/15/40	☆ U80/15/40	16
T357	▽ BS452	27	TH9814PA	☆ P831	62	U90/15/40	☆ U90/15/40	16
T380-1	☆ B1135	10	TH9815PA	☆ P842X	61	U100/20/40	☆ U100/20/40	16
T9017	☆ T9017	72	TH9818PA	☆ P842X	61	U100/25/75	☆ U100/25/75	16
TA3095*	☆ M5169	43	TH9820	☆ P8125 Series	61	U150/15/40	☆ U150/15/40	16
TB3/750	☆ B1135	10	TH9826*	☆ P8201	62	U150/25/75	☆ U150/25/75	16
TB4/1500	☆ B1152	10	TH9827*	☆ P8202	62	U200/10/40	☆ U200/10/40	16
TB5/2500	☆ B1153	10	TH9830	☆ 8521	64	U200/15/40	☆ U200/15/40	16
TBH7/8000	☆ BW1162CJ3	11	TH9831*	☆ 8480V1/4810	64	U200/15/40A	☆ U200/15/40A	16
TBL6/6000	☆ BR1165C	10	TH9832	☆ 8521	64	U200/20/75	☆ U200/20/75	16
TBL6/6000B	☆ BR1160C	10	TH9833	☆ P8031	61	U250/10/40J	☆ U250/10/40J	16
TBL7/8000	☆ BR1162C	10	TH9834	☆ P8201	62	U250/10/40JA	☆ U250/10/40JA	16
TBL7/9000*	☆ BR1196	10	TH9835	☆ P8202	62	U250/15/75J	☆ U250/15/75J	16
TBW6/6000	☆ BW1165CJ3	11	TH9839	☆ P8202	62	U300/10/40	☆ U300/10/40	16
TBW7/8000*	☆ BW1162CJ3	11	TH9844	☆ P8201	62	U300/15/40	☆ U300/15/40	16
TD25	☆ C178A/5894	12	TH9847	☆ P8254	62	U300/20/75	☆ U300/20/75	16
TD1306-001	☆ 8541A	61	TH9855	☆ P8093	63	U300/20/75A	☆ U300/20/75A	16
TD1306-047	☆ P8125 Series	61	THX840	☆ P8092	63	U400/10/40	☆ U400/10/40	16
TD1319	☆ 8541A	61	TL368	▽ BS206	28	U400/10/40A	☆ U400/10/40A	16
TG200	☆ FX2505	5	TL368A	▽ BS4124	28	U500/3/40J	☆ U500/3/40J	16
TG1000	☆ 8503	5	TPU1	▽ TPU1	79	U500/5/40J	☆ U500/5/40J	16
TGF Series	▽ TGF Series	78	TPU3	▽ TPU3	79	U500/10/40	☆ U500/10/40	16
TGL9477	☆ C1108	12	TPU4	▽ TPU4	79	U500/10/40A	☆ U500/10/40A	16
TGL9481	☆ C1134	12	TPU7	▽ TPU7	79	U500/15/75	☆ U500/15/75	16

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
U500/15/75A	☆ U500/15/75A	16	UC1000/8/125J	☆ UC1000/10/125J	18	UF250/8/40	☆ UF250/8/40	19
U500A/10/40J	☆ U500A/10/40J	16	UC1000/10/125J	☆ UC1000/10/125J	18	UF300/10/50	☆ UF300/10/50	19
U500A/10/40JA	☆ U500A/10/40JA	16	UC1000/15/125	☆ UC1000/15/125	18	UF300/15/75	☆ UF300/15/75	19
U500A/10/40JB	☆ U500A/10/40JB	16	UC1000/20/150J	☆ UC1000/20/150J	18	UF500/10/50	☆ UF500/10/50	19
U500A/15/75J	☆ U500A/15/75J	16	UC1000/20/150JA	☆ UC1000/20/150JA	18	UF750/8/75	☆ UF750/8/75	19
U600/8/40	☆ U600/10/40	16	UC1000/30/150J	☆ UC1000/30/150J	18	UF1000/8/75	☆ UF1000/8/75	19
U600/10/40	☆ U600/10/40	16	UC1000A/20/150	☆ UC1000A/20/150	18	UFC6/30/140J	☆ UFC6/30/140J	20
U650/3/40	☆ U650/3/40	16	UC1500/8/125J	☆ UC1500/8/125J	18	UFC12/30/140J	☆ UFC12/30/140J	20
U650/3/40A	☆ U650/3/40A	16	UC1500/10/125J	☆ UC1500/10/125J	18	UFC12/32/100	☆ UFC12/32/100	20
U750/10/40	☆ U750/10/40	16	UC1500/20/150J	☆ UC1500/20/150J	18	UFC12/36/140J	☆ UFC12/36/140J	20
U750/10/40A	☆ U750/10/40A	16	UC2000/20/150J	☆ UC2000/20/150J	19	UFC16/32/100	☆ UFC16/32/100	20
U750/10/40B	☆ U750/10/40B	16	UC2300/8/125J	☆ UC2300/8/125J	19	UFC18/30/140J	☆ UFC18/30/140J	20
U750/10/75J	☆ U750/10/75J	16	UC2300/8/125JB	☆ UC2300/8/125JB	19	UFC25/30/140J	☆ UFC25/30/140J	20
U750/15/75	☆ U750/15/75	16	UC2300/10/125J	☆ UC2300/10/125J	19	UFC25/32/100	☆ UFC25/32/100	20
U1000/3	☆ U1000/3/40	17	UC3000/3/125J	☆ UC3000/3/125J	19	UFC25/36/140J	☆ UFC25/36/140J	20
U1000/3/40	☆ U1000/3/40	17	UC5000/6/200	☆ UC5000/6/200	19	UFC28/36/140J	☆ UFC28/36/140J	20
U1000/3/40A	☆ U1000/3/40A	17	UCA1000/20/250	☆ UCA1000/20/250	19	UFC30/36/140J	☆ UFC30/36/140J	20
U1000/3/40C	☆ U1000/3/40C	17	UCA2000/20/275	☆ UCA2000/20/275	19	UFC34/30/140J	☆ UFC34/30/140J	20
U1000/3M	☆ U1000/3/40A	17	UCA5000/6/230	☆ UCA5000/6/230	19	UFC40/30/140J	☆ UFC40/30/140J	20
U1000/10/75J	☆ U1000/10/75J	17	UCS5-200*	☆ U200/10/40	16	UFC43/30/140J	☆ UFC43/30/140J	20
U1000A/3/40JB	☆ U1000A/3/40JB	17		☆ U200/15/40	16	UFC50/30/140J	☆ UFC50/30/140J	20
U1000A/3/40JD	☆ U1000A/3/40JD	17	UCS10-300*	☆ U300/10/40	16	UFC50/32/100	☆ UFC50/32/100	20
U1000A/3/40JE	☆ U1000A/3/40JE	17		☆ U300/15/40	16	UFC50/36/140J	☆ UFC50/36/140J	20
U1000A/3/40JF	☆ U1000A/3/40JF	17	UCS10-400	☆ U400/10/40	16	UFC76/30/120J	☆ UFC76/30/120J	20
U1000A/10/75J	☆ U1000A/10/75J	17	UCS10-500	☆ U500/10/40	16	UFC100/24/100	☆ UFC100/24/100	20
U1200/10/75J	☆ U1200/10/75J	17	UCSF250	☆ U250/10/40J	16	UFC100/30/120J	☆ UFC100/30/120J	20
U1200/10/75JB	☆ U1200/10/75JB	17		☆ U250/10/40JA	16	UFC150/15/140	☆ UFC150/15/140	20
U1500/8/75	☆ U1500/8/75	17	UCSF500	☆ U500A/10/40J	16	UFC350/15/125J	☆ UFC350/15/125J	20
U2000/2	☆ U2000/3/40	17		☆ U500A/10/40JA	16	UFC450/12/125J	☆ UFC450/12/125J	20
U2000/2P	☆ U2000/3/40B	17		☆ U500A/10/40JB	16	UFC450/15/125J	☆ UFC450/15/125J	20
U2000/3	☆ U2000/3/40	17	UCSL1000	☆ U1000A/3/40JB	17	UFC450/30/200J	☆ UFC450/30/200J	20
U2000/3/40	☆ U2000/3/40	17		☆ U1000A/3/40JD	17	UFC500/12/125J	☆ UFC500/12/125J	20
U2000/3/40B	☆ U2000/3/40B	17		☆ U1000A/3/40JE	17	UFC500/15/125J	☆ UFC500/15/125J	20
U2000/3/40C	☆ U2000/3/40C	17		☆ U1000A/3/40JF	17	UFC700/15/125	☆ UFC700/15/125	20
U2000/3P	☆ U2000/3/40B	17	UCSL2000	☆ U2000/3/40	17	UFC750/15/125	☆ UFC750/15/125	20
U2000/8/75J	☆ U2000/8/75J	17	UCSL3000	☆ U3000/3/40J	17	UFC1000/15/125	☆ UFC1000/15/125	20
U2000/8/75JA	☆ U2000/8/75JA	17		☆ U3000/3/40JA	17	UFC1000/20/200	☆ UFC1000/20/200	20
U2000B/8/75JC	☆ U2000B/8/75JC	17	UCSX700*	☆ U750/10/40	16	UFC1000/30/200J	☆ UFC1000/30/200J	20
U2100/8/75	☆ U2100/8/75	17	UCSX1000	☆ U1000/10/75J	17	UFC1000A/12/125J	☆ UFC1000A/12/125J	20
U3000/3/40J	☆ U3000/3/40J	17	UCSXF750	☆ U750/10/75J	16			
U3000/3/40JA	☆ U3000/3/40JA	17	UCSXF1000	☆ U1000A/10/75J	17			
U3000/3/40JB	☆ U3000/3/40JB	17	UCSXF1200	☆ U1200/10/75J	17			
UA75/15/40	☆ U75/15/40	16		☆ U1200/10/75JB	17			
UA200/10/40	☆ U200/10/40	16	UCSXF2000	☆ U2000/8/75J	17			
UA300/10/40	☆ U300/10/40	16		☆ U2000/8/75JA	17			
UB50/20/40	☆ U50/20/40	16		☆ U2000B/8/75JC	17			
UB150/15/40	☆ U150/15/40	16	UCW250/30/500	☆ UCW250/30/500	19	UG60/30/75	☆ U60/30/75	16
UB400/10/40	☆ U400/10/40	16	UCW650/30/500	☆ UCW650/30/500	19	UG100/25/75	☆ U100/25/75	16
UB400/10/40A	☆ U400/10/40A	16	UCW870/30/500	☆ UCW870/30/500	19	UG200/20/75	☆ U200/20/75	16
UC30/10/20	☆ UC30/10/20	18	UCW1000/30/500A	☆ UCW1000/30/500A	19	UG500/15/75	☆ U500/15/75	16
UC90/5/25	☆ UC90/5/25	18	UCW1000/30/500C	☆ UCW1000/30/500C	19	UH150/25/75	☆ U150/25/75	16
UC125/5/25	☆ UC125/5/25	18	UCW1200/20/500	☆ UCW1200/20/500	19	UH300/20/75	☆ U300/20/75	16
UC125/5/25B	☆ UC125/5/25B	18	UD100/20/40	☆ U100/20/40	16	UH750/15/75	☆ U750/15/75	16
UC125/5/25C	☆ UC125/5/25C	18	UD200/15/40	☆ U200/15/40	16	UJ1000/3B	☆ U1000A/3/40JB	17
UC250/5/40J	☆ UC250/5/40J	18	UD500/10/40	☆ U500/10/40	16	UJA500/5	☆ U500/5/40J	16
UC250/25/125J	☆ UC250/25/125J	18	UD500/10/40A	☆ U500/10/40A	16	UJB3000/3	☆ U3000/3/40J	17
UC250/30/150J	☆ UC250/30/150J	18	UE300/15/40	☆ U300/15/40	16	UKC450/30/150	☆ UC450/30/150J	18
UC250/30/150JD	☆ UC250/30/150JD	18	UE750/10/40	☆ U750/10/40	16	USL500	☆ U500/3/40J	16
UC450/25/125J	☆ UC450/25/125J	18	UF6/15/7	☆ UF6/15/7	19		☆ U500/5/40J	16
UC450/30/150J	☆ UC450/30/150J	18	UF10/15/7J	☆ UF10/15/7J	19	UXCF250	☆ U250/15/75J	16
UC450A/30/150	☆ UC450A/30/150	18	UF12/20/40	☆ UF12/20/40	19	UXCF500	☆ U500A/15/75J	16
UC500/3/45J	☆ UC500/3/45J	18	UF25/10/40	☆ UF25/10/40	19	VA936G6	☆ K3936G6	41
UC500/3/45JA	☆ UC500/3/45JA	18	UF25/20/40	☆ UF25/20/40	19	VA936G12	☆ K3936G12	41
UC500/5/45J	☆ UC500/5/45J	18	UF50/10/40	☆ UF50/10/40	19	VA936L6	☆ K3936L6	41
UC500/5/45JA	☆ UC500/5/45JA	18	UF50/20/40	☆ UF50/20/40	19	VA936L12	☆ K3936L12	41
UC650/30/150J	☆ UC650/30/150J	18	UF75/10/40	☆ UF75/10/40	19	VCCA12	☆ UF12/20/40	19
UC750/20/150J	☆ UC750/20/150J	18	UF100/10/40	☆ UF100/10/40	19	VCCA25	☆ UF25/20/40	19
UC750/20/150JA	☆ UC750/20/150JA	18	UF150/10/40	☆ UF150/10/40	19	VCCA50	☆ UF50/20/40	19

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
VDX1047	▽ BS206	28	WL7669	▽ BK492/7669	4	XQ1061*	☆ 8541A	61
VDX1047S	▽ BS4123	28	WL7671	▽ BK494/7671	4	XQ1062	☆ P8031	61
VDX1099	▽ BS4124	28	WL7673	▽ BK498/7673	4	XQ1063	☆ P8031	61
VDX1138	▽ BS958	28	WL7681	▽ BK544	4	XQ1064	☆ P8031	61
VKC7936L24	☆ K3936L24	41	WT210-0070	▽ BK66/5550	4	XQ1065*	☆ P844	61
VMMHC250*	☆ UC250/30/150JD	18	WT210-0071	▽ BK448/5551A	4	XQ1066	☆ P8031F	61
VMMHC450*	☆ UC450A/30/150	18	WT210-0072	▽ BK484/5552A	4	XQ1067	☆ P8031F	61
VMMHC1000*	☆ UC1000A/20/150	18	WT210-0073	▽ BK486/5553B	4	XQ1070 Series	☆ XQ1070 Series	56
VQ1	☆ VQ1	80	WT210-0147	▽ BK484/5552A	4		☆ P8022 Series	56
VQ2	☆ VQ2	80	WT210-0149	▽ BK448/5551A	4	XQ1070/02 Series	☆ XQ1070/02 Series	56
VQ3	☆ VQ3	80	WT210-0152	▽ BK486/5553B	4		☆ P8142 Series	56
VQ4	☆ VQ4	80	WT210-0158	▽ BK448/5551A	4	XQ1071	☆ XQ1071	56
VQ5	☆ VQ5	80	WT210-0159	▽ BK484/5552A	4		☆ P8022 IG	56
VQ6	☆ VQ6	80	WT210-0165	▽ BK486/5553B	4	XQ1072	☆ XQ1072	59
VQ8	☆ VQ8	80	WT210-0170	▽ BK5822A	4		☆ P8022X	59
VQ9	☆ VQ9	80	WT210-0246	▽ BK544	4	XQ1073/02R	☆ XQ1073/02R	56
VQ10	☆ VQ10	80	WT210-0249	▽ BK448/5551A	4		☆ P8144AR	56
VQ11	☆ VQ11	80	WT210-0252	▽ BK484/5552A	4	XQ1073R	☆ XQ1073R	56
VQ16	☆ VQ16	80	WT210-0274	▽ BK492/7669	4		☆ P8024AR	56
VQ17	☆ VQ17	80	WT210-0275	▽ BK494/7671	4	XQ1073X	☆ XQ1073X	56
VQ21	☆ VQ21	80	WT210-0285	▽ BK494/7671	4	XQ1075/02R	☆ XQ1075/02R	56
VQ21T	☆ VQ21T	80	WT210-0290	▽ BK492/7669	4		☆ P8144RF	56
VQ22	☆ VQ22	80	WT210-0306	▽ BK482	4	XQ1075R	☆ XQ1075R	56
VQ22T	☆ VQ22T	80	X-6.25	☆ UF6/15/7	19		☆ P8024RF	56
VQ23	☆ VQ23	80	X-10	☆ UF10/15/7J	19	XQ1076	☆ P8024RF IG	†
VQ23T	☆ VQ23T	80	XH3-045	☆ FX227	5	XQ1080 Series	☆ XQ1080 Series	56
VQ24	☆ VQ24	80	XH8-100	☆ FX2505	5		☆ P8145 Series	56
VQ25	☆ VQ25	80	XH16-200	☆ 8503	5	XQ1081 Series	☆ P8145 IG Series	†
VQ27	☆ VQ27	80	XH25-500	☆ FX2519A/5949A	5	XQ1083R	☆ XQ1083R	56
VQ28	☆ VQ28	80	XL601	☆ XL601	76		☆ P8146AR	56
VQ4250	☆ VQ4250	80	XL603	☆ XL603	76	XQ1085R	☆ XQ1085R	56
VQ4250EA	☆ VQ4250EA	80	XL631	☆ XL631	76		☆ P8146RF	56
VT123	☆ 5586	44	XL641	☆ XL641	76	XQ1086R	☆ P8146RF IG	†
VTC5760B1	◇ N10524A	52	XL676/A2T	☆ XL676/A2T	76	XQ1120*	☆ 8134V1/4811	63
VTC5760C1	◇ N10524	52	XL677/C2T	☆ XL677/C2T	76	XQ1121*	☆ 8134	63
VTU6393C1	◇ N10057	53	XL679/C25	☆ XL679/C25	76	XQ1160*	☆ P831	62
VVC50-42-20*	☆ U50/20/40	16	XL679P/C25P	☆ XL679P/C25P	76	XQ1161*	☆ P831	62
VVC100-42-20*	☆ U100/20/40	16	XL681/C100	☆ XL681/C100	76	XQ1180*	☆ P8034A	61
VVC200-42-7.5	☆ U200/10/40	16	XL681P/C100P	☆ XL681P/C100P	76	XQ1181*	☆ P8034A	61
VVC200-42-15*	☆ U200/15/40	16	XL683/R1169	☆ XL683/R1169	76	XQ1200	☆ P8125 Series	61
VVC300-42-7.5*	☆ U300/10/40	16	XQ1003*	☆ P849D	61	XQ1240	☆ P8038	61
VVC300-42-15*	☆ U300/15/40	16	XQ1004*	☆ 8541	61	XQ1241	☆ P849D	61
VVC400-42-7.5*	☆ U400/10/40	16	XQ1005	☆ 8541A	61	XQ1271	☆ P8037	60
VVC500-42-10*	☆ U500/10/40	16	XQ1005X	☆ 8541AX	61	XQ1280	☆ P842X	61
W5M/1A	◇ N10018 Series	54	XQ1007	☆ P849D	61	XQ1285	☆ P842F	61
W5MC/1A	◇ N10019 Series	54	XQ1008	☆ 8541	61	XQ1290	☆ P842X	61
WF42	▽ BS200	27	XQ1020 Series	☆ XQ1020 Series	58	XQ1291	☆ 8541A	61
WF45	▽ BS914	27	XQ1021 Series	☆ P8130 IG Series	†	XQ1292	☆ 8541	61
WF49A	▽ BS194	24		☆ P8400 IG Series	†	XQ1293	☆ P849D	61
WF402	▽ BS158	27	XQ1022	☆ XQ1022	59	XQ1294	☆ P849D	61
WF403	▽ BS156	27	XQ1023R	☆ XQ1023R	58	XQ1295	☆ P844	61
WF409	▽ BS452	27	XQ1024R	☆ P8132AR IG	†	XQ1296	☆ P849F	61
WF412L	▽ BS826	27		☆ P8401AR IG	†	XQ1297	☆ P849F	61
WF415	▽ BS440	27	XQ1025R	☆ XQ1025R	58	XQ1311	☆ P8037	60
WF416	▽ BS450	27	XQ1026R	☆ P8132RF IG	†	XQ1400	☆ P8125B	61
WL5D22*	☆ C1112	12		☆ P8401RF IG	†	XQ1401	☆ P8125B	61
WL651	▽ BK484/5552A	4	XQ1030*	☆ P831 IG	62	XQ1402	☆ P8125	61
WL652	▽ BK448/5551A	4	XQ1031*	☆ P831 IG	62	XQ1410 Series	☆ XQ1410 Series	58
WL655	▽ BK486/5553B	4	XQ1032*	☆ P831 IG	62		☆ P8020 Series	58
WL656	▽ BK484/5552A	4	XQ1040	☆ P844	61	XQ1413R	☆ XQ1413R	58
WL657	▽ BK448/5551A	4	XQ1041	☆ P842X	61		☆ P8521AR	58
WL658	▽ BK486/5553B	4	XQ1042	☆ 8541A	61	XQ1415R	☆ XQ1415R	58
WL681	▽ BK66/5550	4	XQ1043	☆ 8541	61		☆ P8521RF	58
WL5550	▽ BK66/5550	4	XQ1044	☆ P849D	61	XQ1427 Series	☆ XQ1427 Series	56
WL5551A	▽ BK448/5551A	4	XQ1050*	☆ 8572A	61		☆ P8160 Series	56
WL5552A	▽ BK484/5552A	4	XQ1053	☆ P8031	61	XQ1428 Series	☆ XQ1428 Series	56
WL5553B	▽ BK486/5553B	4	XQ1054	☆ P8031	61		☆ P8161 Series	56
WL5822A	▽ BK5822A	4	XQ1060*	☆ P842X	61	XQ1430 Series	☆ XQ1430 Series	58

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no	Type to be replaced	EEV replacement	Page no
XQ1433R	☆ XQ1433R	58	XQ2428 Series	☆ XQ2428 Series	56	XX1500	☆ P8304J	67
XQ1435R	☆ XQ1435R	58		☆ P8461 Series	56	YD1120	☆ BR1160C	10
XQ1500 Series	☆ XQ1500 Series	56	XQ2440 Series	☆ XQ2440 Series	58	YD1150	☆ BR1587	10
	☆ P8147 Series	56		☆ P8532 Series	58	YD1151	☆ BW1195	11
XQ1503R	☆ XQ1503R	56	XQ2443R	☆ XQ2443R	58	YD1152	☆ BW1195J3	11
	☆ P8148AR	56		☆ P8533AR	58	YD1160	☆ BR1196	10
XQ1505R	☆ XQ1505R	56	XQ2445R	☆ XQ2445R	58	YD1161	☆ BW1196	11
	☆ P8148RF	56		☆ P8533RF	58	YD1162	☆ BW1196J3	11
XQ1520 (fixed bias)	☆ P8436	58	XQ3070/02 Series	☆ XQ3070/02 Series	57	YD1170*	☆ BR1606F	10
XQ1520 (variable bias)*	☆ P8135	57		☆ P8442 Series	57	YD1171*	☆ BW1610J2F	11
XQ1523R (fixed bias)*	☆ P8438AR	58	XQ3070/05 Series	☆ XQ3070/05 Series	57	YD1172*	☆ BW1610J2F	11
			XQ3070/12 Series	☆ XQ3070/12 Series	57	YD1175*	☆ BR1610F	10
XQ1523R (variable bias)*	☆ P8137AR	57	XQ3070/15 Series	☆ XQ3070/15 Series	57	YD1177*	☆ BW1610J2F	11
XQ1525 (fixed bias)*	☆ P8438RF	58	XQ3073/02R	☆ XQ3073/02R	57	YD1185*	☆ BR1182	10
XQ1525 (variable bias)*	☆ P8137RF	57		☆ P8443AR	57	YD1187*	☆ BW1182J2	11
XQ2070/02 Series	☆ XQ2070/02 Series	56	XQ3073/05R	☆ XQ3073/05R	57	YD1202	☆ BW1184J2	11
	☆ P8196 Series	56	XQ3075/02R	☆ XQ3075/02R	57	YD1212	☆ BW1185J2	11
XQ2070/03 Series	☆ XQ2070/03 Series	56		☆ P8443RF	57	YD1230*	☆ BR1196	10
	☆ P8190 Series	56	XQ3075/05R	☆ XQ3075/05R	57	YD1240	☆ BR1512	10
XQ2070/05	☆ XQ2070/05	56	XQ3170/02 Series	☆ XQ3170/02 Series	57	YD1244	☆ BR1512A	10
XQ2073/02R	☆ XQ2073/02R	56		☆ P8498 Series	57	YJ1040*	☆ 8356	46
	☆ P8197AR	56	XQ3170/05 Series	☆ XQ3170/05 Series	57	YJ1060	☆ 6027H	45
XQ2073/03R	☆ XQ2073/03R	56	XQ3170/12 Series	☆ XQ3170/12 Series	57	YJ1110	☆ MG5222	46
	☆ P8191AR	56	XQ3170/15 Series	☆ XQ3170/15 Series	57	YJ1120	☆ M5187	46
XQ2073/05R	☆ XQ2073/05R	56	XQ3173/02R	☆ XQ3173/02R	57	YJ1121	☆ M5199	46
XQ2075/02R	☆ XQ2075/02R	56		☆ P8499AR	57	YJ1123	☆ M5089	46
	☆ P8197RF	56	XQ3173/05R	☆ XQ3173/05R	57	YJ1124	☆ M5068	46
XQ2075/03R	☆ XQ2075/03R	56	XQ3175/02R	☆ XQ3175/02R	57	YJ1200	☆ M5005	46
	☆ P8191RF	56		☆ P8499RF	57	YJ1250	☆ M5042S	46
XQ2075/05R	☆ XQ2075/05R	56	XQ3175/05R	☆ XQ3175/05R	57	YJ1300	☆ MG5233	45
XQ2170/02 Series	☆ XQ2170/02 Series	57	XQ3410 Series	☆ XQ3410 Series	58	YK1000*	☆ K365	40
	☆ P8496 Series	57		☆ P8534 Series	58	YK1220	☆ K3270BCD	40
XQ2170/03 Series	☆ XQ2170/03 Series	57	XQ3413R	☆ XQ3413R	58	YK1223	☆ K3270BCD	40
	☆ P8490 Series	57		☆ P8535AR	58	YK1230	☆ K3271BCD	40
XQ2170/05	☆ XQ2170/05	57	XQ3415R	☆ XQ3415R	58	YK1233	☆ K3271BCD	40
XQ2172/02	☆ XQ2172/02	59		☆ P8535RF	58	YK1263	☆ K3572BCD	40
	☆ P8496X	59	XQ3427 Series	☆ XQ3427 Series	56	YK1265	☆ K3672BCD	40
XQ2172/03	☆ XQ2172/03	59		☆ P8462 Series	56	YL1091	☆ CY1172	14
	☆ P8490X	59	XQ3428 Series	☆ XQ3428 Series	56	YL1430	☆ CR1501	14
XQ2172/03X	☆ XQ2172/03X	59		☆ P8463 Series	56	YL1440	☆ CR1502	14
XQ2173/02R	☆ XQ2173/02R	57	XQ3430 Series	☆ XQ3430 Series	58	YL1460	☆ C1136	12
	☆ P8497AR	57		☆ P8530 Series	58	Z7803	☆ P8281	63
XQ2173/03R	☆ XQ2173/03R	57	XQ3433R	☆ XQ3433R	58	Z7803S	☆ P8280	63
	☆ P8491AR	57		☆ P8531AR	58	ZX1051	▽ BK448/5551A	4
XQ2173/05R	☆ XQ2173/05R	57	XQ3435R	☆ XQ3435R	58	ZX1052	▽ BK484/5552A	4
XQ2175/02R	☆ XQ2175/02R	57		☆ P8531RF	58	ZX1053	▽ BK486/5553B	4
	☆ P8497RF	57	XQ3440 Series	☆ XQ3440 Series	58	ZX1061	▽ BK502	4
XQ2175/03R	☆ XQ2175/03R	57		☆ P8540 Series	58	ZX1062	▽ BK544	4
	☆ P8491RF	57	XQ3443R	☆ XQ3443R	58	ZX1063	▽ BK482	4
XQ2175/05R	☆ XQ2175/05R	57		☆ P8541AR	58	ZX1081	▽ BK492/7669	4
	☆ XQ2175/05R	57	XQ3445R	☆ XQ3445R	58	ZX1082	▽ BK494/7671	4
XQ2182/02	☆ XQ2182/02	59		☆ P8541RF	58	I11-70/0.8	▽ BK502	4
	☆ P8496TX	59	XQ3457 Series	☆ XQ3457 Series	56	I11-100/1.5	▽ BK504/5554	4
XQ2182/03	☆ XQ2182/03	59		☆ P8474 Series	56	I11-140/0.8	▽ BK484/5552A	4
	☆ P8490TX	59	XX1148	☆ P8079HP	67	I11-200/1.5	▽ BK46/5555	4
XQ2427 Series	☆ XQ2427 Series	56	XX1149	☆ P8079HP	67	I11-350/0.8	▽ BK486/5553B	4
	☆ P8460 Series	56	XX1063	☆ P8079HP	67	ГМИ-83*	☆ C1150/1	13
			XX1064	☆ P8079HP	67			

* † Please refer to page 85.

☆ Manufactured at Chelmsford.

◇ Manufactured at Witham.

▽ Manufactured at Lincoln.

Principal Overseas EEV Offices, Distributors and Representatives

Albania	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
Australia	GEC Electronics Group, Components Division, 2 Giffnock Avenue, P.O. Box 143, North Ryde, N.S.W. 2113. Tel: (02) 887 6222 Telex: AA26080 GECACE Cables: Ellauto Sydney Fax: (02) 888 3447
Austria	Walter Boecksteiner & Co., Ruthgasse 29/6, P.O. Box 138, 1191 Vienna. Tel: (222) 36 79 19 Telex: 133715 WBOE Cables: Britubium Vienna
Bangladesh	Magnet Services Limited, Magnet House, 71 Dilkusha Commercial Area, Motijheel, P.O. Box 3499, Dhaka 2. Tel: 252011-13, 231019, 233163, 233174 Telex: 642774 Gecdac Cables: Lodestone Dhaka
Belgium, Luxembourg, Zaire, Rwanda	SAIT Electronics, 66 Chaussée de Ruisbroek, B-1190 Brussels. Tel: (2) 370 53 11 Telex: 61807 SAITTXB Cables: Wireless Brussels
Brazil	Tecelinc Tecnologia Electronica Ltda., Rua Major Sertorio, 463-4 Andar, 01222 - Sao Paulo. Tel: 257 3645, 258 4286 Telex: 11 25588 TLNO BR Fax: 256 6446
Bulgaria	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
Canada	EEV Canada Ltd., 67 Westmore Drive, Rexdale, Ontario M9V 3Y6. Tel: (416) 745 9494 Telex: 06 989363 Eneican Tor Cables: Enelecan Toronto Fax: (416) 745 0618
Chile	Gibbs y Cia S.A.C., Providencia 1050, Torres de Tamar, Casilla (P.O. Box) 1-T Tamar, Santiago. Tel: 2231061, 2222072 Telex: 340309 Gibbs CK Fax: 56 2 223 5387, Santiago, Chile
Czechoslovakia	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
Denmark	CSI a-s, Hoersvinget 7, DK-2630, Taastrup. Tel: (02) 99 99 11 Telex: 33609 CSI DK Fax: (02) 99 19 50
Egypt	Power Tubes, Camera Tubes and Magnetrons: Allied Marketing Company, 22 Youssef Abbas Street, Medinet Nasr., Cairo, P.O. Box 2751 El Horeya, Heliopolis, Cairo. Tel: 600956 Telex: 22890 Allie UN Cables: Allimacop
Finland	Aseko Oy, Itälahdenkatu 27A, P.O. Box 96, 00211 Helsinki. Tel: (0) 692 7300 Telex: 1001161 Aseko Cables: Aseko Helsinki Fax: (0) 692 7753
France	EEV Division Tubes Electroniques de GEC Composants s.a., 2 rue Henri Bergson, 92600 Asnières. Tel: (331) 40 80 54 00 Telex: 610471 INELM Fax: (331) 47 90 62 15
German Democratic Republic	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
German Federal Republic	Nucletron Vertriebs - GmbH, Gärtnerstrasse 60, 8 Munich 50. Tel: (089) 14 90 02-0 Telex: 5215297 Nucl D Fax: (089) 149002-11
Greece	Telmaco sa., 2 Semitelou Street, Gr. 115-28, 106 75 Athens. Tel: 7755 642/684 Telex: 21-9185 Telm GR Cables: Teltramaco
Hong Kong, Macao	Cable and Wireless Systems Ltd., GPO Box 4477, 4/F, Sun Hung Kai Centre, 30 Harbour Road, Hong Kong. Tel: 5-8339200 Telex: HX 74000 CWSHX Cables: Cwsystems Fax: 852-123-4381
Hungary	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504

Principal Overseas EEV Offices, Distributors and Representatives

India	Aimil Sales and Agencies Private Ltd., Naimex House, A8 Mohan Co-operative Industrial Estate, Mathura Road, New Delhi 110 044. Tel: 6830818, 6833851 Telex: 3166620, 3161540 Aimil In Cables: Aimildel 40/3 15th Cross, Margosa Road, Malleswaram, Bangalore 560003. Tel: 366613, 340412 Telex: 9845-8269 Aimil In Cables: Aimilbang Malhotra House, Post Box 119, Walchand Hirachand Marg, Bombay 400 001. Tel: 265654, 265655 Telex: 11 73331 Aimil In Cables: Aimilbom B-3/2 Gillander House, P.O. Box 440, Calcutta 700 001. Tel: 203304 Telex: 021 7731 Aimil In Cables: Aimil
Indonesia	P. T. Multi Dharma Guna, Jl. Sungai Gerong No. 15, P.O. Box 3821, Jakarta 10002. Tel: 322528, 333261 Telex: 61722 MDG IA Fax: (021) 333161
Ireland, Republic of	Industrial Engineering Designers Ltd., 163 Glenageary Park, Dun Laoghaire, Co. Dublin. Tel: (01) 853695 Telex: 93591 IED/EI
Italy	Marconi Italiana S.p.A., Via A. Negrone 1A, 16153 Genova. Tel: 60021 Telex: 270386 Marcon I Cables: Expanse Cornigliano-Ligure Fax: 6002416 Via Palmanova 185, 20132 Milan. Tel: 25 63 141 Telex: 311467 Marcon I Cables: Expanse Milan Fax: 2563141-240 Via Reno 21, 00198 Rome. Tel: 850564/6/7 Telex: 626189 Marcon I Fax: 850565 Via Adige 39, 00198 Rome. Tel: 853041 Telex: 610272 Marcon I Cables: Expanse Rome Starvision only: Starvision Italia SRL, Via G. B. Martini, 6 Rome 00193. Tel: 3747941 Telex: 620362 Lomax I
Japan	Cornes and Co. Ltd., C.P.O. Box 158, Tokyo 100-91. Tel: 272-5771 Telex: J24874 Cornes Cables: Cornes Tokyo Fax: 271 1479 Marden House, C.P.O. Box 329, Osaka 530-91. Tel: 532-1013 Telex: 525-4496 Corosa J. Cables: Cornes Osaka Fax: 541 8850
Jordan	Consult-Tel, P.O. Box 35055, Amman. Tel: (962-6) 636668 Telex: 22345 Consult Jo Cables: Consultel Fax: (962-6) 637668 Consult-Tel
Korea, South	Saetong Corporation, Taeyang Building 6 Floor 606/607, 44-4 Yeoido-Dong, Yeongdeungpo-Ku, Seoul, Korea 150. Tel: (2) 783 6551/5 Telex: K23596 Saetong Cables: Saetong Ltd., Seoul Fax: (2) 784 2788 Starvision only: Lucky Goldstar International Corp., 537 Namdaemun-ro 5 GA, Jung-gu, Seoul 100. Tel: (2) 77132 Telex: Lgint K27266 Cables: Fourclover Seoul
Kuwait	Centronix, P.O. Box 2208, Safat, Kuwait. Tel: 813447 Telex: KT22147 Abeer Cables: Uniservco, Kuwait
Malaysia	Intercontinental Engineering & Trading Pte. Ltd., Block 803, King George's Avenue, # 01-182, # 02-182, # 02-186, Singapore 0820. Tanglin P.O. Box 247, Singapore 9124. Tel: 2968890 (10 lines) Telex: RS23461 Intra Cables: Intraengin Fax: 2965006 Intrafax
Mexico	MAPESA, Nebraska 199, 03810 Mexico D.F. Tel: (5) 5 23 06 40/5, 43 11 73/6, 87 15 07/6, 87 14 33 Telex: 258557 MAPE UR RED
Netherlands	Alphatron Professional Components B.V., K.P. van der Mandelelaan 40, P.O. Box 21003, 3001 AA, Rotterdam. Tel: 010-4520600 Telex: 24009 Alpha NI Fax: 010-4521270
New Zealand	AWA New Zealand Limited, Wineera Drive, Private Bag, Porirua, Wellington. Tel: +64 (4) 370-159, 375-069 Telex: 31001 AWA NZ Fax: +64 (4) 374-201
Norway	Norsk Marconi A/S, Marconi Trading, Components Div., Ryensvingen 5, P.O. Box 50, Manglerud, N-0612, Oslo 6. Tel: (2) 680480 Telex: 77140 Cables: Marconi Oslo Fax: (2) 194-975
Pakistan	General Products Group (Private) Ltd., 239 Staff Lines, P.O. Box 3987, Fatima Jinnah Road, Karachi 4. Tel: 513541-42-43 Telex: 24179 GPG PK Cables: Products Karachi 12-L Gulberg -11, Near Mini Market, P.O. Box 1387, Lahore 11. Tel: 875223, 875207 Telex: 44127 GPGLE PK Cables: Tropics Lahore

Principal Overseas EEV Offices, Distributors and Representatives

Philippines	Camera Tubes only. Electro Pacific Corporation, 208 BRB Building, 1258 Quezon Avenue, P.O. Box 120, Quezon City, Philippines. Tel: 97-71-29 Cables: Electro QC Telex: 23313 NPC PH
Poland	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
Portugal	Amperel-Electrónica Industrial Lda., Av. Fontes Pereira de Melo, 47 4º Dto., 1000 Lisbon. Tel: 53 22 27, 53 26 98, 54 14 57, 52 71 84 Telex: 18588 Amprel P Cables: Amperel Lisbon
Qatar	Nasir Bin Khalid al Thani and Sons Holding Co. (W.W.L.), P.O. Box 318, Doha, Qatar. Tel: (0974) 417388, 443838, 443939, 443821, 443822 Telex: 4203 NBKS DH Cables: Nasiralthani
Rumania	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504
Singapore	Intercontinental Engineering & Trading Pte Ltd., Block 803, King George's Avenue, # 01-182, # 02-182, # 02-186, Singapore 0820. Tanglin P.O. Box 247, Singapore 9124. Tel: 2968890 (10 lines) Telex: RS23461 Intra Cables: Intraengin Fax: 2965006 Intrafax Starvision only: The General Electric Co. of Singapore Pte. Ltd., Magnet House, 985 Bukit Timah Road, Singapore 2158. Tel: 4663011 Telex: RS36730 GECRS Cables: Geclsingap Singapore
South Africa (also Botswana, Lesotho, Mozambique and Swaziland)	Hamrad (Pty) Ltd., 114 Buitengragt, Cape Town 8001. P.O. Box 3579, Cape Town 8000. Tel: (021) 24-7060 Telex: 527670, C.T. Cables: Hamtrade, C.T.
Spain	Eurotronica, S.A., Don Ramon de la Cruz, 90, 28006 Madrid. Tel: 401 52 00 Telex: 27284 and 42775 Eurot E Cables: Eurotronica Madrid
Sweden	Pronesto AB, Hemvarnsgatan 15, Box 1358, 171 26 Solna. Tel: 08-733 93 00 Telex: 19270 Pro S Fax: 08-7645009
Switzerland	Erno Electronic AG, Niederhaslstrasse 12, CH-8157 Dielsdorf, Zurich. Tel: 01-853 2323 Telex: 826416 Fax: 01-853 3379
Taiwan	Hongkong Trading Co. Ltd., 392, Tun-Hwa South Road, No. 1 of Second Floor, Taipei, Taiwan, P.O. Box 53-856, Taipei. Tel: 771-9473, 771-9704, 771-7585 Telex: 11017 Protexol Cables: Protexol Taipei.
Thailand	Siam Teltech Co. Ltd., White Group Building, No. 75 Soi Rubia, Sukhumvit 42 Road, Bangkok. P.O. Box 2718, Bangkok 1011. Tel: 3902445-54 Telex: 82631 Whitco TH Fax: 381 1525
Turkey	Ratel Radyo Telekomünikasyon A/S, Okçu Musa Caddesi, Bankalar Sarayı, Kat 3, 86020 Karaköy, Istanbul. Tel: (11) 143 79 22 (4 lines) Telex: 24285 RTLC TR Fax: 1455947
United States of America	EEV Inc., 4 Westchester Plaza, Elmsford, N.Y. 10523. Tel: 914 592 6050 Telex: 6818096 Fax: 914 682 8922
Yugoslavia	F. A. Bernhardt GmbH, Melkstattweg 27, P.F. 1628, D-8170 Bad Tölz 2, German Federal Republic. Tel: (08041) 41676 Telex: 526246 Fab d Cables: Hankobern Bad Tölz Fax: +49 8041 71504

8127.

8218.

8217

8218

8863.

811

**UK: EEV, Waterhouse Lane, Chelmsford, Essex, CM1 2QU, England.
Tel. (0245) 493493. Telex 99103. Fax. (0245) 492492.**

**FRANCE: EEV Division Tubes Electroniques de GEC Composants s.a.,
2 rue Henri Bergson, 92600 Asnières, France.
Tel. (331) 4080 5400. Telex 610471 INELM. Fax. (331) 4790 6215.**

**USA: EEV Inc, 4 Westchester Plaza, Elmsford, NY 10523, USA.
Tel. (914) 592 6050. Telex 6818096. Fax. (914) 682 8922.**

**CANADA: EEV Canada Ltd, 67 Westmore Drive, Rexdale, Ontario, M9V 3Y6.
Tel. (416) 745 9494. Telex 06 989 363. Fax. (416) 745 0618.**