Broadcasting Tube & Capacitor Guide

Richardson Electronics

Engineered Solutions

Thank you

Whether you have been a customer of Richardson Electronics for four decades or four months, on behalf of our entire staff, I would like to personally thank you for your business.

Our commitment to unsurpassed service has been the reason for our continued success. Same day shipments, special testing, competitive pricing and timely response to your technical questions are just a few examples of our commitment to you.

With over 70 global sales offices and 33 warehouses, we are committed to local, cultural and business support.

When my father, Arthur Richardson, Sr., started the company in 1947, we worked long hours and went out of the way to assist each and every customer. Today, our global efforts support over 135,000 customers annually, due much in part to the same employee dedication. We still handle each and every transaction with the same family dedication to service.

We trust you have been satisfied with your service from Richardson Electronics. If there is any way we can improve our service or product offering, please let us know. Your valued comments are welcomed at ***info@rell.com***.

The tube industry has been an exciting market to be a part of over the past 50 years and we are committed to supporting your current and future needs. With new, dynamic programs such as digital television and digital radio ahead of us, the future should be just as exciting. We appreciate your business and we look forward to providing solutions for your requirements in the future.

Sincerely,

Edward J. Richardson — Chairman of the Board & Chief Operating Officer

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The Richardson Story

The year 1947 was filled with milestones. Jackie Robinson became the first African-American to play for a major-league baseball team. President Harry S. Truman implemented the Truman Doctrine to squelch the spread of Communism and ENIAC, one of the world's first digital computers, was turned on.

That same year Arthur Richardson, Sr. began his own story. After World War II, Arthur worked for the Majestic Radio & Television Corporation selling war assets. Upon leaving the company, Arthur collected his salary in radio tubes. Soon afterwards, he and his wife, Florence, were selling tubes out of a barn on their farm in the rural town of Wayne, Illinois.

During the day Arthur would make sales calls and at night he and his wife would pack and ship tubes. The couple worked hard, but they enjoyed working together. Their diligence paid off and their business grew. An office was established in Chicago and soon afterwards the Richardsons moved their operations to a warehouse in the Chicago suburb of Franklin Park.

In 1961, the Richardsons welcomed their youngest son, Ed, into the business. From picking & packing in the warehouse to assisting in the front office, Ed worked side by side with his parents while learning the family business.

Ed was appointed president of the Company in 1974 and began to expand the Company's horizons. The Company acquired tube manufacturing companies such as National Electronics and Cetron and added product lines from RCA, GE, Westinghouse and Philips to its ever-expanding line of products.

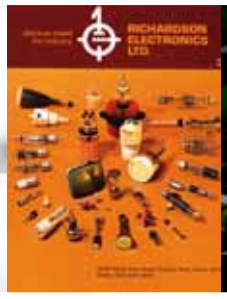
In 1979, Arthur Richardson, Sr. died. After his father's death, Ed continued to build upon his parents' legacy. Continuing with its plans for expansion, the Company established an RF and microwave semiconductor product offering in response to the rise of solid-state technology. Business continued to boom and by the early 1980s, Richardson Electronics was distributing radio frequency (RF) and wireless communications, industrial power conversion, security and display systems products.

Under Ed's direction, the Company flourished and opened several offices in the USA, as well as distribution and design centers in Latin America, Europe and Asia. Today the Company has over 70 locations worldwide and a customer base of more than 135,000. The Company went public in 1983 and moved to its current location in LaFox, Illinois in 1986. Like Wayne, the birthplace of the Company, LaFox is a small, farm community about 50 miles west of Chicago.

Today Richardson Electronics, Ltd. (an ISO 9002 registered supplier) continues to stay one step ahead of the competition by providing unique services and products. The Company is a global provider of "engineered solutions." This term is used to describe Richardson Electronics' core engineering and manufacturing expertise in identifying and supporting cost-effective solutions for its customers, which may include product manufacturing, systems integration, prototype design and manufacture, testing and logistics. Approximately 50 percent of the Company's sales consist of products that are designed-in, modified, manufactured or assembled for customer specific requirements.

The Company has come a long way from its humble beginnings in a barn. It continues to thrive and evolve as the technology advances. The expertise, experience and relationships Richardson Electronics has acquired over the past five decades has positioned the Company to provide customers with solutions for their needs for many years to come.





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Power Triodes

Triodes are often used in FM transmission where a simple, yet highly stable, design is desired. Triodes have lower power gain than tetrodes, but can still achieve output powers up to 35 kW in newer transmitter designs. Triodes can also be found as the PA (power amplifier) stage in some AM transmitters. Due to their high linearity, **Eimac** triodes are ideal in some recent digital innovations.

Turn to Richardson Electronics for leading brands from **Eimac**, **Amperex** and **National**.

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Amplification Factor (μ)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series* (See p. 24)	Chimney
3-500Z/8802	FAC	5	14.6	130	110	4	.35	.8	SK410	SK406
3CV30000H3	Vapor	6.3	160	20	100	7	5	36	NONE	NONE
3CX10000A1/8158	FAC	7.5	99	5	160	7	4	22.4	SK1300	SK1306
3CX10000A3/8159	FAC	7.5	99	20	160	7	4	22.4	SK1300	SK1306
3CX10000A7/8160	FAC	7.5	100	200	160	7.6	3.7	22.5	SK1300	SK1306
3CX10000U7	FAC	15	13.5	200	250	5.5	5.5	10	SK2500	CALL
3CX12000U7	FAC	15	13.5	200	260	6.5	4	12	SK2500	CALL
3CX1200Z7/YU181	FAC	6.3	25	200	110	4	.6	1.6	SK410	SK446
3CX1500A7/8877	FAC	5	10.5	200	250	3.5	1	2.1	SK2200	SK2216
3CX15000A3	FAC	6.3	160	20	100	7	4.8	23	SK1300	SK1306
3CX15000A7	FAC	6.3	160	200	110	7	4.6	25.5	SK1300	SK1306
3CX20000A7	FAC	6.3	160	200	110	7.8	4.2	27.5	SK1300	SK1336
3CX2500A3/8161	FAC	7.5	51.5	20	110	6.5	2.1	10	COLLETS	NONE
3CX2500F3/8251	FAC	7.5	51.5	20	110	6.5	2.1	10	N/A	NONE
3CX3000A1/8238	FAC	7.5	51.5	5	110	5.5	1.1	5.1	COLLETS	NONE
3CX3000A7	FAC	7.5	51.5	160	110	4.8	1.5	5.5	COLLETS	NONE
3CX3000F1/8239	FAC	7.5	51.5	5	75	5.5	1.1	5.1	COLLETS	NONE
3CX3000F7/8162	FAC	7.5	50.5	160	75	4.8	1.5	5.5	N/A	NONE
3CX800A7	FAC	13.5	1.5	200	350	2.2	.5	.8	SK1900	SK1906
3CPX800A7	FAC	13.5	1.5	200	500	3.2	.4	.9	SK1900	SK1906
7480A/ML7480A	Water	13	205	20	40	1.5	.3	80	BR400	NONE
7482/ML7482	Vapor	14.5	450	45	30	14	25	440	CALL	CALL
833A	FAC	10	10	35	30	4	.5	1.6	124-0212-100	NONE
833C	FAC	10	10	35	30	4	.5	1.6	124-0212-100	NONE
8874/3CX400A7	FAC	6.3	3	240	500	2	.3	.3	SK1900	SK606
8877/3CX1500A7	FAC	5	10.5	200	250	3.5	1	2.1	SK2200	SK2216
RS1084CJ	Water	12.5	200	6.6	40	1.4	7.6	60	CALL	CALL
RS2068CL/TH345	FAC	9	112	7	110	—	3.4	22	CALL	CALL
TH354	FAC	7	145	5.5	300	6	3	10.5	CALL	CALL
YC236	FAC	5	10	200	110	4	.85	2	SK2200	SK2216
YL1580	FAC	5	130	8	860	5.5	6	5.5	CALL	CALL
YL1630	FAC	10.4	165	7	250	10	4	30	CALL	CALL
YU148/3CX6000A7	FAC	7	78	200	110	5.7	2.5	10	N/A	CALL

*Note: Socket Series: Please refer to pages 24 through 26 for details on socket variations. Richardson recommends replacing with the same socket originally supplied with your transmitter. Certain model #s came with unique sockets. Check your transmitter manual if you have any questions.

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Broadcasting Excellence

The choice of successful broadcasters...

There is a difference!

Innovative features in Eimac products include:

- Rugged grids made with propriety Y3™ wire
- Patented advanced cooling fin design
- Low noise and high efficiency
- Laser-cut pyrolytic graphite grids
- All Eimac products are made in the USA
- Tubes are fully manufactured in the ISO9001 certified California facility

Rugged

Robust

Reliable

Emmy Award Winner • OEM Approved Product • The "Standard" since 1934

Turn to Richardson Electronics for:

- Over $6 million of Eimac inventory — in stock!
- Over 300 part numbers in stock!
- Product available from 33 global warehouses
- Same day shipments for orders placed by 4 PM CST
- Emergency 24/7 & Next Flight Out (NFO) service
- Large supply of accessories, sockets, etc.

Richardson Electronics is Eimac's authorized stocking distributor

Power Tetrodes

Power Tetrodes

For high linearity, high gain and greater isolation, the tetrode is the tube of choice. Many manufacturers offer tetrode design transmitters to meet increasing power needs. In fact, tetrodes are the primary means for achieving power levels above 1 MW. Shortwave transmitters, including those broadcasting in Digital Radio Mondiale (DRM) format, turn to Eimac products from 100 kW to 1 MW.

Air-cooling is used with plate dissipation ratings of up to 40 kW; while water, vapor-phase and multi-phase cooling is used above 40 kW.

Richardson Electronics offers the world's largest selection of power tetrodes from stock. Turn to Richardson Electronics for names like **Eimac, Amperex, BURLE, and National Electronics.**

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series* (See pg.24)	Chimney
4-1000A/8166	FAC	7.5	21.3	1	110	6	.95	3.8	SK510	SK506
4-125A/4D21	FAC	5	6.5	.12	120	3	.23	.33	SK410	SK406
4-250A/5D22	FAC	5	14.1	.25	120	3	.2	.35	SK410	SK406
4-400A/8438	FAC	5	14.7	.40	110	4	.59	1.54	SK410	SK406
4-400AX/YL1461	FAC	5	14.1	.4	110	3.5	.25	.65	SK410	SK406
4-400B/7527	FAC	5	14.7	.4	110	4	.59	1.54	SK410	SK406
4-400C/6775	FAC	5	14.7	.4	110	4	.59	1.54	SK410	SK406
4-500A	FAC	10	10.2	.5	110	4	.322	1.265	SK410	SK406
4-500B	FAC	10	10.2	.5	110	4	.322	1.265	SK410	SK406
4-65A/8165	FAC	6	3.5	.65	150	.5	.125	.28	122-0247-202	CALL
4CM100000G	Multi	15	215	100	200	12.5	10	105	SK2011A	N/A
4CM300000GA	Multi	18	430	300	50	11	36	300	CALL	N/A
4CM400000A	Multi	16.3	590	400	110	17.5	50	700	CALL	N/A
4CM500000G	Multi	23	500	500	30	12.5	54	550	CALL	N/A
4CV100000C/8351	Vapor	10	300	100	30	18	10	123	SK1500A	N/A
4CV100000E	Vapor	15.5	215	100	108	15	19.5	168	SK2000	N/A
4CV250000B	Vapor	12	660	250	30	20	23	330	CALL	N/A
4CV50000E	Vapor	12	215	50	110	10	9.14	137	SK2000	N/A
4CX10000D/8171	FAC	7.5	75	10	110	7.5	3.3	15.95	SK1300	SK1306
4CX10000J	FAC	7.5	103	10	100	7.5	2.2	10	SK300A	SK1306
4CX1000A/8168	FAC	6	9	1	110	3.0	.88	1.63	SK840	SK806
4CX1000K/8352	FAC	6	9	1	110	3	.88	1.63	SK820	SK806
4CX12000A/8989	FAC	6.5	120	12	220	9	2.83	20	SK300A	SK336
4CX15000A/8281	FAC	6.3	160	15	110	10	4.3	28.5	SK300A	SK316
4CX15000J/8910	FAC	7.5	158	15	110	10	4.6	36.5	SK300A	SK316
4CX15000R	FAC	6.3	160	15	110	10	4.6	36.5	SK300A	SK316
4CX1500A	FAC	5	38.5	1.5	220	1.85	.75	1.85	SK831	SK806

*Note: Socket Series: Please refer to pages 24 through 26 for details on socket variations. Richardson recommends replacing with the same socket originally supplied with your transmitter. Certain model #s came with unique sockets. Check with your OEM if any questions.

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Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
4CX20000A/8990	FAC	10	140	20	110	9	4.1	28.2	SK360	SK326
4CX20000B	FAC	10	140	20	30	7.8	7.8	28.2	SK320	SK326
4CX20000C	FAC	10	140	20	110	9	4.01	28.2	SK320	SK326
4CX20000D/9015	FAC	7.5	145	20	110	11.6	3.7	35	SK360	NONE
4CX20000E	FAC	10	140	20	110	9	4.15	28.9	SK300A	SK316
4CX25000A	FAC	8.5	150	25	230	7.8	5.35	32	SK300A	SK326
4CX250B/7203	FAC	6	2.6	.25	500	2	.25	.3	SK600A	SK606
4CX250BC/8957	FAC	6	2.4	.25	500	2	.15	.3	SK600A	SK606
4CX250R/7580W	FAC	6	2.6	.25	500	2	.25	.3	SK600A	SK606
4CX3000A/8169	FAC	9	41.5	3	150	5	1.7	5.3	SK1400A	SK1406
4CX300A/8167	FAC	6	2.9	.3	500	2.5	.25	.4	SK700A	SK606
4CX300Y/8561	FAC	6	3	.3	110	2	.4	.6	SK700A	SK606
4CX35000C/8349	FAC	10	295	35	30	15	5.7	55	SK1500A	NONE
4CX3500A	FAC	5	90	3.5	220	5	1.32	5.5	SK340	SK306
4CX40000GM	FAC	15	170	40	250	10	10	60	N/A	N/A
4CX5000A/8170	FAC	7.5	75	5	220	7.5	1.9	10	SK300A	SK306
4CX5000J/8909	FAC	7.5	103	5	100	4.0	1.7	3.15	SK300	SK306
4CX5000R/8170W	FAC	7.5	75	5	100	7.5	1.9	10	SK300	SK306
4CX7500A	FAC	7	110	7.5	220	7.5	2.25	10	SK340	N/A
4X150A/7034	FAC	6	2.6	.15	500	15	.25	.39	SK600A	SK626
4X500A/QBL4/800	FAC	5	13.5	.5	120	4	.31	.93	SK900	N/A
5F23A	FAC	5	14.7	.4	110	4	.59	1.54	CALL	CALL
5F65R	FAC	—	—	.49	250	3.3	.6	1	J65SR	CALL
6076/QBL5/3500	FAC	6.3	32.5	3	220	5.5	1.1	2.8	CALL	CALL
6076A	FAC	6.3	32.5	3	220	5	1.1	4	CALL	CALL
6079/QB5/1750	FAC	10	9.9	3	60	—	.24	.75	S3703	CALL
6156/QB3.5/750	FAC	5	14.1	.25	75	3	.225	1	40211-01	CALL
6252/QQE03/20	FAC	6.3/12.6	1.3/6.5	.01	600	—	2X.05	.2	122-0105-00	CALL
7527A/YL1460	FAC	5	14.1	.27	110	2.5	.1	1375	CALL	CALL
7650	FAC	6.3	7.5	.7	1215	2.5	.5	.8	89-078	CALL

Featured Product

Drop-in Replacement for the Discontinued NEC 8F76R

Toshiba power tubes are found in operation around the world and characterize the quality performance from this trusted manufacturer. With NEC exiting the broadcast power tube marketplace, you will be pleased to know that Toshiba has drop-in versions of many of the NEC types, including the popular 8F76R. With decades of proven performance, these tubes will meet your performance expectations. Richardson Electronics stocks the 8F76R and other Toshiba types to support your existing transmitter.

For those of you who have not been pleased with the performance of low-priced alternatives to NEC, you will be comforted to know the Toshiba tubes have proven reliability in replacing NEC sockets throughout Asia, North America and Europe. Avoid potential headaches and turn to Richardson Electronics for the proven Toshiba equivalent.

TOSHIBA

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BURLE

Electron Tubes

Pictured above is the massive BURLE 1.2 Million square foot Lancaster, PA facility. A long tradition of quality product has been produced here, including the RCA picture tube circa 1940s.

The Unique BURLE CERMOLOX® Design

- High Gain
- Low Screen Current
- Linear Amplification
- High Power Efficiency
- Compact, Rugged Construction
- Coaxial Construction for Ease of High Frequency Circuit Design

CERMOLOX® construction achieves close, concentric electrode spacing by using close-tolerance parts and accurate fixturing for assembly.

Precise alignment of control and screen-grid wires is accomplished by simultaneously cutting the grid blanks using electrical discharge machining techniques. Most BURLE tetrode power tubes are built using CERMOLOX construction techniques.

VHF TV tubes

BURLE VHF tubes, with over 20,000 hours of documented life, are ideal choices for both visual and aural service. The tubes are supplemented with matching cavities for both high and low bands. These amplifiers deliver power efficiently in visual and aural or internally-diplexed power chains for efficient television operation.

VHF and UHF Translators

BURLE translator tubes are highly linear, high-gain tubes with matching cavities for broadband translator/transponder service and permit low level internal diplexing of visual and aural signals. This diplexing technique eliminates the need for dual amplifier chains and high power diplexers. The linearity of BURLE tubes provides an economic advantage over many competitive types. BURLE tubes provide the required linearity with Class AB operation in contrast to competitive types requiring Class A operation.

Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
7F71R	FAC	4	78	3.5	300	4	1.8	4	CALL	CALL
7F71RA	FAC	4	78	3.5	300	5	1.8	5	122-0105-100	CALL
8122	FAC	13.5	1.3	0.4	500	2	.3	.3	124-0311-100	SK606
8122V1	FAC	13.5	1.3	0.4	500	2	.3	.3	124-0311-100	SK606
8791	FAC	5.5	7.2	1	400	2.5	.5	.8	89-078	CALL
8791/V1	FAC	5.5	7.2	1	400	2.4	.4	.5	89-083	CALL
8792	FAC	5.5	17.3	1.8	400	2.5	.9	1	89-095-1	CALL
8792/V1	FAC	5.5	17.3	1.5	400	3.5	.7	5	89-095-1	CALL
8794	FAC	5.7	116	10	400	5.5	2	3	89-088	CALL
8806	FAC	5.7	115	12.5	400	6.5	2.4	10.8	89-088	CALL
8807/4CX16000A	FAC	9.5	140	15	400	2.5	3.3	17.6	89-085	CALL
8812/YL1420	FAC	6.3	120	6	260	8.3	1.45	7	8222-032-14033	CALL
8813/YL1430	FAC	8	116	5	260	6	2.4	.4	CALL	CALL
8814/YL1440	FAC	4.2	53	.9	260	4	.4	2.4	CALL	CALL
8890	FAC	5.7	115	5	400	4	1.8	5	89-085	CALL
8891/4CX18000A	FAC	9.5	140	17.5	400	6.6	3.68	18.8	CALL	CALL
8915/YL1520	FAC	10.4	115	18	260	8	2.4	27.5	CALL	CALL
8916/4CX24000A	FAC	9.5	147	22	400	7.8	4.5	27.5	89-094	CALL
8976	FAC	9.5	145	17.5	200	13	3.7	18.7	89-085	CALL
8977	FAC	5.7	115	6	400	8.2	1.32	7	89-085	CALL
8984	FAC	12.5	155	40	300	10.5	6.4	55	89-085	CALL

Engineered Solutions **Cavity Replacements/Repairs**

Richardson Electronics is excited to introduce a comprehensive program for cavity replacements and cavity repairs. For those looking to replace their existing BURLE cavity, please see our full list of BURLE newly manufactured cavity types on page 29.

For those preferring to have their existing cavity repaired, turn to our complete repair program.
Regardless if you have a BURLE, Eimac, Thales or customized cavity from an OEM, contact Richardson Electronics to evaluate the ability to repair your cavity.

The cavity plays an important role in the performance of your transmitter. They efficiently operate the power tube, provide tube base contacts, appropriate cooling, and the optimum environment for long tube life and low-maintenance operation. Regular replacement or maintenance of both the tube and the cavity assures optimum integration of both units into a reliable, high-performance package.

Repair work on existing cavities typically includes:
- Thoroughly clean and silver-plate cavity parts, replace all defective parts, and clean outside surfaces
- Replace all RF finger stock in the tube socket & all sliding tuning shorts
- Rebuild both the grid & screen teflon blocker assemblies
- Install new ferrite loaded lossy wire on both the grid & screen terminals
- High voltage spot-knock the plate, screen, and grid
- Tune the cavity to desired channel and test to full combined rated power

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Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
8986	FAC	11	105	12.5	150	13	2.1	15.2	89-059	CALL
8987/YL1540	FAC	4.2	53	2	260	4.2	.7	2.2	8222-032-13842	CALL
8988	FAC	5.7	115	5	400	4.6	1.8	5	89-085	CALL
8F45R	FAC	7.5	75	5	110	7.5	2.4	14	CALL	CALL
8F67R	FAC	7.5	126	25	230	6.3	3	15.2	CALL	CALL
8F68R	FAC	8.5	185	25	230	9	1	30	CALL	CALL
8F76R	FAC	7.5	120	15	250	15	3.3	15	8F76R-SOCKET	CALL
9007/4CX26000A	FAC	9.5	147	25	400	8.4	4.9	33	89-094	CALL
9011	FAC	11	105	20	150	12	3.2	31	J6001	CALL
9017	FAC	5.5	34	3	860	4	1	1.1	CALL	CALL
9019/YC130	FAC	7.5	160	18	110	10	4.55	36.5	CALL	CALL
AM347	FAC	6	34	4.5	1000	4	0.8	1.1	SK347	CALL
CQK-25-2	Water	10	210	40	30	12	—	80	CALL	CALL
CQK-50-2	Water	12.6	335	100	30	18	—	192	CALL	CALL
CQK-350-1	Water	25	635	550	30	22	—	1350	CALL	CALL
NL327	FAC	6	34	4.5	1000	4	1.5	.5	SK327	CALL
NL347/YL1750	FAC	6	34	4.5	1000	4	.8	1.1	SK347	CALL
QB3.5/750GA	FAC	5	14.1	—	120	2.5	.3	.575	40211-01	CALL
RS1034L	FAC	4.5	200	13	960	5.1	3.6	12.4	CALL	CALL

Engineered Solutions **Retrofitting Your Transmitter**

Richardson Electronics has assisted customers over the years with retrofits to their existing equipment, including upgrading to higher efficiency tube transmission, offering more cost-effective solutions, as well as aiding customers when a certain tube-type may have become obsolete.

Richardson Electronics can address any of the below concerns:

- *Deciding how to address the high cost of going digital*
- *Looking to increase the output power of your existing system*
- *Wanting to increase life and/or efficiency of existing tubes*
- *Trouble sourcing discontinued tubes*

- *Analog to Digital Conversions*
- *Klystron to IOT Conversions*
- *IOT to MSDC IOT Conversions*
- *Increased Output Power Upgrades*
- *Enhanced Efficiency Upgrades*

Benefits of Retrofitting...

- Delay capital expenditure for new transmitter — by years
- Increase longevity of tube life
- Reduce monthly electrical bills
- Maintain reliable source for spare parts
- Avoid continued price increases on rare tube types

Let Richardson Electronics offer a customized evaluation of available options.

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Featured Product **Eimac Shortwave Tubes**

Richardson Electronics offers a full selection of ceramic/metal, multiphase-cooled (water/vapor) or air–cooled power tetrodes to support modern high power short wave (HF) radio transmitters, for a variety of applications including:

Replacements

Previously, broadcasting organizations were dependent upon a single Thales factory for replacement tetrodes. A single source of supply is obviously an undesirable situation for the users of these high-powered tetrodes. For this reason, the CPI Eimac Division now offers an alternative source for these strategically important items.

The CPI Eimac 4CM300,000GA and 4CM500,000G tetrodes are an exact form, fit and function equivalent to the Thales TH537 and TH558 types, and will work in all transmitters, including auto-tuned models.

There are several key features of the Eimac product including:

- These “made in U.S.A.” devices are complete drop-in replacements for TH537 and TH558.
- The Eimac units fit into the Thales sockets without changes to the equipment or the operation.
- The Eimac units are designed to be rebuildable at end of life. The Thales units reportedly cannot be rebuilt easily due to a different internal design.

These Eimac tubes have been tested and operated in many Thomson, Marconi and Telefunken transmitter models and have been installed by TDF, France; BBC, England; VOA, USA and other broadcasters since 1996, with proven life of 20,000 hours.

New/Existing Analog Transmitters

Stations around the world are operating in analog using the popular Eimac types such as the 4CV50,000E, 4CV100,000C&E and 4CV250,000B with high reliability and robust performance.

Modern Digital (DRM) Designs

The Eimac product is designed for flexibility. Its pyrolytic graphite grids allow for reliable performance in existing analog designs as well as optimal performance in newer digital (DRM) transmitters. Currently, American, Asian and European manufacturers are designing new state-of-the-art DRM transmitters which will allow the Eimac tube to be the tube of choice when you purchase your new transmitter.
Ask for the Eimac tube by name!

Part Number	Cooling	Typical Output Power Level (kW)	Key Applications
4CM40,000G	Multi	60	Analog/DRM
4CV50,000E	Vapor	137	Analog
4CV100,000C	Vapor	168	Analog
4CV100,000E	Vapor	140	Analog
4CM100,000G	Multi	105	Analog/DRM
4CV250,000B	Vapor	460	Analog
4CM300,000GA	Multi	300	Replace TH537/Analog/DRM
4CM400,000A	Multi	500	Analog/DRM
4CM500,000G	Multi	550	Replace TH558/Analog/DRM

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Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
RS1036L	FAC	4.5	200		960	6	3.7	11	CALL	CALL
RS1052C	FAC	3.2	80	3.5	790	3.3	1.3	2.2	CALL	CALL
RS1054L	FAC	3	140	5	1000	4.8	1.52	4.6	CALL	CALL
RS1092L/CL	FAC	3.9	134	12.5	1000	5.5	3.3	11	CALL	CALL
RS1092SK	Vapor	3.9	134	12.5	1000	6	3.3	10	CALL	CALL
RS2014CL	FAC	7.5	78	6	110	6.5	2.3	10	SK300A	SK406
RS2032CL	FAC	9.5	80	12	110	7.5	2.3	12	CALL	CALL
RS2068CL/TH345	FAC	120	12	8.2	110	9	3.4	22	CALL	CALL
TH289	FAC	6	50	3	300	5	0.8	3	CALL	CALL
TH298	FAC	6	50	5	300	5	1.25	3	CALL	CALL
TH327	FAC	6	34	4.5	1000	5	1.5	.5	SK327	CALL
TH331/Y844	FAC	5	65	7	1000	3.5	1.8	7	CALL	CALL
TH347	FAC	5.8	34	4.5	1000	4	1.15	1.1	SK347	CALL
TH361	FAC	7	140	12	300	5.4	2.4	5.25	CALL	CALL

Quick TIP

INSPECT YOUR SHIPMENT IMMEDIATELY UPON RECEIPT! Please inspect your tubes at time of receipt, regardless of outside appearance. As most manufacturer's warranties are limited to factory workmanship defects, it is essential that any shipping damage be reported to the shipping company immediately to file a complaint.

1. Open all cartons and inspect for any possible damage to the product before signing for the shipment.
2. If damage is discovered, sign for the shipment as "damaged."
3. Call Richardson Electronics immediately to confirm you received a damaged product and you have reported it immediately to the shipping company.
4. Richardson Electronics will assist you with instructions on processing for a replacement product. While all manufacturers take great care to package product properly for normal shipping conditions, improper handling by shippers can happen and taking the above steps will limit losses.

Featured Product **Drop-in Replacement for Thales TH347**

AMPEREX AM347 TETRODE

The AM347 is a drop-in, total equivalent to the Thales TH347. The Amperex brand AM347 is a metal-ceramic, forced-air cooled, coaxial power tetrode, manufactured in the state-of-the-art Brive facility.

The tube features high gain and high linearity and is primarily intended as a linear broadband amplifier in band IV/V television transmitters and transposers.

- 1.1 kW peak-of-sync in common amplification (vision/sound)
- 1.2 kW in sound-carrier amplification
- Operating frequency up to 1000 MHz
- Excellent linearity
- Anode dissipation up to 4.5 kW, with forced-air cooling
- Typical gain: 15.5 dB

Amperex

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Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
TH371	FAC	8	180	18	300	6	5.4	21	CALL	CALL
TH375/RS2022CL	FAC	10	86	12	250	3.6	2.25	2.2	CALL	CALL
TH382	FAC	4.2	125	12.5	1000	5.5	4.5	5.25	CALL	CALL
TH393	FAC	6	65	7.5	1000	5.5	1.6	2.2	CALL	CALL
TH399	FAC	7	140	12	120	7.2	2.4	10	CALL	CALL
TH537	Multi	18	430	300	30	11	36	300	CALL	CALL
TH555	Vapor	15	320	62	50	14	17	200	CALL	CALL
TH558	Multi	23	500	500	110	12.5	54	550	CALL	CALL
TH561	Vapor	7	140	20	300	5.5	3.1	10.5	CALL	CALL
TH563	Vapor	5	250	42	900	—	9	31.5	CALL	CALL
TH571	Vapor	8	185	75	300	6	5.4	21	CALL	CALL
TH581	FAC	10	270	75	110	11	15	125	CALL	CALL

Featured Product

Drop-In Replacements for the TH537 & TH558

The CPI-Eimac 4CM300,000GA and 4CM500,000G power grid tubes were designed as optimal equivalents to the Thales TH537 and TH558 power grid tubes. These "made in U.S.A." devices are complete drop-in replacements for transmitters using the Thales tubes.

There are several key benefits of the Eimac product including:

- Competitively priced
- Fits into the TH537 and TH558 sockets without any changes to the equipment or the operation (no changes in voltages, etc.)
- Unlike the Thales types, the Eimac units were specifically designed to be rebuildable at end-of-life, allowing for tremendous cost-saving opportunities
- Improved filament support structure *resulting in longer life* due to reduced filament/cathode distortion (No grid to filament shorts)
- Grids are "laser flash" processed with a high precision laser cutter
- Little chance of corrosion at the stem, a typical source of early failure as the tabulation of the Eimac design is performed at the anode end

To avoid unforeseen delivery or price increases, there should be two approved brands for this important transmitting device. Having a second source will guarantee a prompt source for product if your original supplier runs into quality issues, material shortages or other production delays.

Eimac tubes have already been installed at key shortwave locations in France, England, Germany, USA, Vietnam, Taiwan and China.

The standard warranty is 24 months or 7,000 hours of filament operation time, whichever comes first.

Quick TIP

A filament management program can assist in achieving maximum life for your tube. Lowering your filament voltage by 5% after the first two hundred hours of life can extend life. As your tube shows end-of-life symptoms, the filament voltage can be brought back up to and above 100% rated levels.

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Power Tetrodes (cont'd)

Part Number	Cooling Method	Filament Voltage (V)	Filament Current (A)	Plate Dissipation (kW)	Max. Frequency (MHz)	Typical Anode Voltage (kV)	Typical Anode Current (A)	Typical Power Out (kW)	Socket Series (See pg.24)	Chimney
TH582	Vapor	4.2	146	25	1000	5.5	3.45	10.5	CALL	CALL
TH584	Vapor	4.2	130	—	1000	7	4.5	10.5	CALL	CALL
YL1052	FAC	3.8	20.5	1.8	790	0	1.1	1.2	CALL	CALL
YL1056	FAC	3.8	19.5	2	860	3.5	.8	1.7	CALL	CALL
YL1057	FAC	3.8	19.5	2.2	860	3.4	.75	1	CALL	CALL
YL1470	FAC	6.3	118	8	200	7	2.3	11	8222-032-12502	CALL
YL1541	FAC	4.2	53	2	110	4	.55	2.1	CALL	CALL
YL1560	FAC	5	130	7	1000	5.5	1.9	3.3	CALL	CALL
YL1580	FAC	5	130	5	8	860	2	6	CALL	CALL
YL1610/9014	FAC	8	113	14	250	7	3	11	8222-032-15350	CALL
YL1630	FAC	10.4	165	10.4	250	7	7.5	4	CALL	CALL
YL1631/9018	FAC	10.4	112	17	250	4.5	1.2	20	8222-032-15352	CALL

Inside a Modern Tube Factory

A look inside the state-of-the-art Covimag facility

The Covimag facility (shown left), which manufactures Amperex brand tubes, is a perfect example of leadership in tube manufacturing, as seen by its modern manufacturing facility.

Amperex

The quality of a tube is an entire program. From the materials sourced, to the processing and workmanship dedicated to the product. To ensure our customers the finest in performance and reliability, our partners must pass stringent quality assurance evaluations.

Engineered Solutions
broadcast.rell.com
Richardson Electronics

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Unequalled Tradition

For more than half a century, the Amperex name has been associated with high-quality production of electron tubes. Using time-tested PHILIPS technologies, Amperex tubes remain among the most dependable for AM, FM, UHF and VHF applications.

Company Profile

Covimag — the manufacturer of Amperex brand tubes — is a leader in ceramic and glass power grid tube technology. By implementing many of the manufacturing techniques from its Philips-Amperex manufacturing roots, Covimag's Brive facility is not only the most modern tube facility in the world having been built in the 1990s, but also one of the premiere tube manufacturers in the world.

Glass Tube Availability

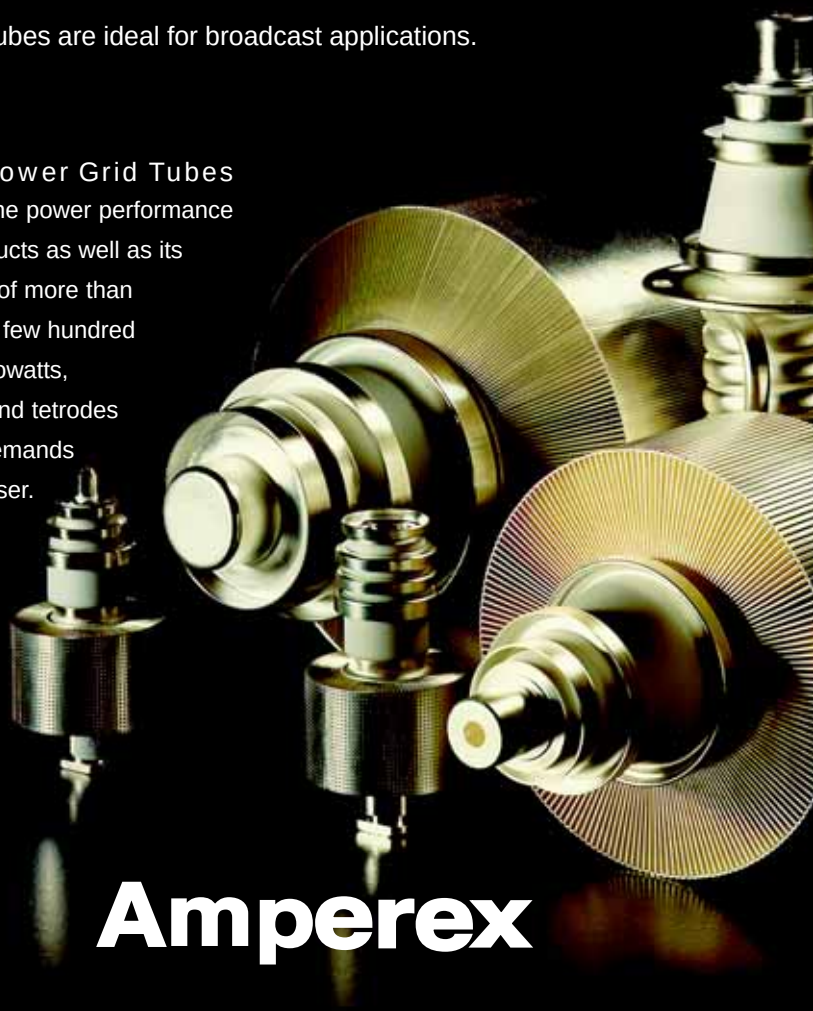
Amperex is the world-leader in the production of medium and high power glass power grid tubes. You won't find a better selection of glass triode and tetrodes operating from a few hundred watts to 3 kW. These tubes are ideal for broadcast applications.

Ceramic RF Power Grid Tubes

You'll appreciate the power performance of Amperex's products as well as its extensive offering of more than 160 types. From a few hundred watts to tens of kilowatts, Amperex triodes and tetrodes meet the power demands of the broadcast user.

Richardson Electronics is the exclusive distributor of Amperex products.

Rely on Richardson's distribution expertise and technical support for all your Amperex needs.



Amperex

Power Pentodes

Richardson Electronics offers pentode tubes with plate dissipations and useful output power up to several kilowatts. Although less popular than triodes and tetrodes, because of their complexity both in manufacturing and circuit design, pentodes maintain a position of importance as amplifiers and regulators in a wide variety of uses, including the broadcast industry and audiophiles.

Looking for a pentode style receiving tube? Ask your Richardson Electronics representative for information on our wide selection of receiving tubes.

Part Number	Cooling Method	Filament Current (A)	Filament Voltage (V)	Max. Frequency (MHz)	Typical Anode Current (A)	Typical Anode Voltage (kV)	Typical Power Out (kW)
5-500A	FAC	10.2	10	110	.64	4	1.6
5CX1500A	FAC	38.5	5	110	.9	5	3.2
5CX1500B	FAC	38.5	5	110	.9	5	3.2
5CX3000A/8966	FAC	41.5	9	110	1.4	6	5.5

Planar Triodes

Richardson Electronics offers planar triodes for a variety of applications including usage in repeaters. Using high quality ceramic/metal construction, these planar triodes can operate in very ruggedized conditions for several thousand hours. For those seeking additional cooling, radiators are available on many types to allow for forced-air cooling.

Part Number	Amplification Factor (μ)	Max. Anode Dissipation (W)	Filament Current (mA)	Filament Voltage (V)	Typical Anode Current (mA)	Typical Anode Voltage (V)	Typical Power Out (W)
7211SR/Y667	80	150	—	6.3	—	2.2	250
8755	135	150	1.3	6.3	1	1.7	650
TH328	180	1000	5.4	5.5	.35	1.9	100
TH338	90	1500	3.3	5.7	.35	2.4	200
TH339	200	1500	5.7	5.7	.34	2.4	200
Y667A/7211SRCL	80	200	—	6.3	—	2.2	100
YD1381	110	250	1.3	6.0	.23	1.5	140

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UHF-TV Klystrons

Richardson Electronics offers UHF-TV klystrons for the maintenance of existing systems. Devices range in frequency from 470 MHz to 860 MHz and in power levels from 15 kW to more than 60 kW. They feature external cavities and employ energy-saving means from ACE (BCD) to multi-stage depressed collector (MSDC).

Part Number	Maximum Frequency (MHz)	Minimum Frequency (MHz)	Approx. Gain (dB)	Max. Output Power (kW)	Drop-in Replacements for
VKP7981-R	860	470	32	15	K3270BCD,YK1220/23
VKP7982-R	860	470	35	32	K3271BCD, YK1230/33/35
VKP7983-R	810	470	36	64	K3672BCD, YK1263/65
VKP7990	810	470	35	64	KSC3361*
VKP7990A	810	470	35	64	—

**Near equivalent — contact Richardson Electronics for details.*

Engineered Solutions

Klystron Support

Richardson Electronics can supply technical bulletins to aid in:

- Gas Checking Klystrons
- Hi-Potting Klystron Electron Gun Elements
- Reduced Heater Voltage Operation
- Hi-Potting MSDC ACE Electrode
- Hi-Potting of UHF-TV MSDC Klystrons
- Installation of Radiation Shield
- MSDC Cooling

This is a free service for CPI products. Please note CPI assumes no obligation or responsibility to supply parts, to pay for the cost of modifications, to exchange existing products for new production models.

Featured Product

CPI VKP7990 MSDC UHF-TV Klystron

Communications & Power Industries

The MPP (Microwave Power Products) division of CPI has produced one of the most reliable, high performance tubes for the broadcast industry in the VKP7990.

The VKP7990 is a multi-staged depressed collector (MSDC) klystron for high-power UHF TV broadcasting.

In addition to operating in numerous Harris and TVT transmitters across the U.S., the VKP7990 has also been used successfully to replace YK1285 series tubes in Astre Systems transmitters as well as in upgraded retrofits of standard YK1265/K3672BCD transmitters.

One of the forefathers of energy saving technology, CPI's Heinz Bohlen states that "the average user of our VKP7990 has experienced over a 50% reduction in monthly utility bills over standard klystron technology and has also seen the typical life of their tubes double."

There are multiple reported cases of over 80,000 hours of life on these tubes and typical life has regularly been reported in excess of 60,000 hours! Experience the CPI difference today.

Quick TIP

Remember large tubes can become gassy when not in use over a period of time. It's recommended to condition your klystrons and IOTs every 6 months when not in use.

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Inductive Output Tubes (IOTS)

The IOT became the tube of choice for TV broadcasters in the 1990s due to its compact size and improved efficiencies over the klystron. The standard IOT can easily be operated either in combined or common mode. This “first generation build-up style” IOT requires separation of the output cavity before dropping in a replacement tube. The American made **L-3** design is a direct equivalent to the E2V 40, 60, and 70 kW tubes. Customers around the world are turning to the L-3 IOT—and in most cases our customers have already turned into repeat customers. Reliable performance, surpassed life expectations and attractive pricing should allow you to feel comfortable with us as well.

STANDARD ANALOG IOTS

Part No.	Former Part No.	Peak Sync (kW)	Aural Only (kW)	Common Mode (kW)	Avg. Beam Current (Max) - Amps	Heater Voltage (Max.) - Volts	Drop-in Replacement for the following:
L3-IOT40	L4481	45	25	33 + 3.3	2.5	7	IOT7340/8303/8300
L3-IOT60	L4482	64	30	44 + 4.4	3	7	IOT7360/8404/8600
L3-IOT70	L4470	75	35	55 + 5.5	3	7	IOT8505
L3-IOT80	L4480	80	35	70 + 7	3	7	IOT8707*

**Near equivalent — contact Richardson Electronics for details.*

STANDARD DIGITAL IOTS

Part No.	Former Part No.	Peak Output 8VSB (kW)	Avg. Output 8VSB (kW)	Max. Beam Voltage (kW)	Avg. Beam Current (Max) - Amps	Heater Voltage (Max.) - Volts	Drop-in Replacement for the following:
L3-IOTD85	L4482D	85	20	32	2	7	IOTD270
L3-IOTD110	L4470D	110	25	36	2.5	7	IOTD2100
L3-IOTD130	L4480D	130	30	36	2.5	7	IOTD2130*

**Near equivalent — contact Richardson Electronics for details.*

Featured Product **Drop-In Replacement for E2V IOTs**

The L-3 series of standard IOTs (see tables above) are designed for analog and digital applications in today's IOT transmitters. L-3 has proven drop-in replacements for the following E2V analog IOTs:

ANALOG

- IOT7340/8300/8303 (40 kW)
- IOT7360/8600/8404 (60 kW)
- IOT 8505 (70 kW)

In addition, L-3 has drop-in replacements for these E2V digital IOTs:

DIGITAL

- IOTD270 (20 kW)
- IOTD2100 (25 kW)

Have a Thales (Comark), Harris, Itelco, Larcan, Axcera or ABS transmitter?

Turn to Richardson Electronics for unsurpassed service, warranty and delivery!

L-3 is the broadcaster’s choice:

- Unsurpassed warranty - 2 years ***full*** replacement
- Made in the USA at the ISO9001:2000 factory
- Delivery from Richardson Electronics’ stock
- 24/7 technical support — **1-800-REL-IOTS**
- Installation support options
- Proven field reliability in Thales (Comark), Harris, ABS, Larcan, Axcera and Itelco transmitters
- L-3 is the performance leader due to:
  - Proven performance at ***lowest idle current — allowing substantial cost savings***
  - Input system delivering best gain characteristics
  - Easiest tuning in the industry
  - Fully correctable at all rated powers due to excellent linearity
  - Reliable performance
  - One tube tunes to all domestic channels

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L3 communications

Over 2 million hours of proven field experience!

The CEA won the prestigious Digital TV Magazine Award for Advancement in the Art and Science of Television Broadcast.

Tube expertise since 1932 — Pioneers of linear beam tubes for civilian and military applications.

A modern clean-room environment with computerized, controlled conditions results in consistent, reliable production.

A $3.5M renovation program allowed influx of state-of-the-art design, production and test equipment in the 150,000 square ft. facility.

L-3 IOTs Feature:

- Unsurpassed warranty – 2 years full replacement
- Complete drop-in equivalents for E2V IOTs
- Delivery from stock from Richardson's global warehouses
- 24/7 technical support — **1-800-REL-IOTS**
- Proven field reliability in Thales (Comark), Harris, ABS, Axcera, Larcan and Itelco transmitters
- Performance leader due to:
  - Input system delivering best gain characteristics
  - Easiest tuning in the industry
  - Fully correctable at all rated powers due to excellent linearity
  - Lowest idle current

- Traditional "Build-up" Style IOTs
- New, "Plug-In" Style IOTs
- High Efficiency CEAs
- Crowbar Thyratrons

Who is L-3?

L-3 Communications, a $5 billion global conglomerate, purchased the Electron Device Group of Northrop Grumman in 2002. Northrop had acquired the well-respected Litton Electron Device Group one year earlier.

This L-3 Electron Devices Division has designed and manufactured microwave vacuum devices for over 50 years. The ISO-9001:2000 certified facilities in San Carlos, CA and Williamsport, PA, produce hundreds of microwave tubes, amplifiers and other vacuum devices.

NATO and their allies turn to the L-3 military product lines as they meet and exceed the stringent requirements for operation and durability in today's advanced Radar, EW, Missile and Communication systems.

This high quality translates into the industry's premiere products for critical commercial applications including Medical, Satellite Communications, TV Broadcasting and High Energy Plasma research.

Products for Broadcast, Electronic Defense and Radar

Plug-In IOTs

The second generation “plug-in” style IOT is now being introduced. This IOT will allow dropping in of an IOT without disassembling the cavity assembly, thus reducing your install time by around 75%. Existing standard IOT customers can easily upgrade their trolleys to use the plug-in style IOT.

L-3 IOTs come with an unsurpassed, two year full warranty!

PLUG-IN IOTs

Part No.	Application	Format*	Peak Output (kW)	Average Output (kW)	Common Mode (kw)	Avg. Beam Current (Max) - Amps	Replaces the following:
L3-IOT70P	Analog	NTSC	—	—	60 + 6.0	3.0	IOT8505, L3-IOT70
L3-IOTD110P	Digital	8VSB	130	30	—	2.5	IOTD2100, L3-IOTD110

** Values shown above are based on the indicated formats. Tubes can be operated in other formats. Contact Richardson Electronics for details.*

Engineered Solutions

Aftermarket “Plug-in” Style IOT

Looking for even an easier option in replacing IOTs in the field?

L-3 now introduces the first “plug-in” style IOT designed for aftermarket applications. This tube easily drops right into the trolley. A simple one-time retrofit of installing bi-directional finger stock onto your existing output cavity is all that is needed. Call Richardson Electronics for your **free** kit.

The new IOT design does not have any body water fittings/flange, allowing easy fit into the trolley.

It is common for many owners of the traditional “build-up” style IOT to spend over an hour installing their replacement tubes due to the need to open the input cavities before dropping in the IOT. The “plug-in” style IOT drops right into the input cavity and therefore can cut the install time by 75%.

Find out more about this exciting, new program to support your existing IOT transmitters!

Engineered Solutions IOT Efficiency Analysis

Looking to operate your IOT more efficiently? Allow Richardson Electronics to review your existing operating conditions to determine potential areas for improved efficiency performance. Through this process we have been able to offer recommendations, which once implemented, have lowered monthly utility bills by thousands of dollars.

This is a free service from Richardson Electronics and L-3. Call today.

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Constant Efficiency Amplifiers (CEAs)

A marriage of two proven technologies, the IOT and the multiple stage depressed collector, the Constant Efficiency Amplifier (CEA) is considered the most efficient UHF-TV amplifier available. Designed for DTV, the 5-staged **L-3** CEA can reduce transmission costs by over $20,000 per tube per year. Excellent linearity allows full correction across the entire UHF band while delivering 30 kW of average power (130 kW peak power) in 8VSB service. PAO synthetic oil cools and electrically insulates the MSDC collector, saving thousands of dollars in maintenance and repair costs. Richardson Electronics will be supporting your aftermarket needs with affordable replacements available from stock.

Part No.	Application	Format*	Peak Output (kW)	Average Output (kW)	Common Mode (kw)	Avg. Beam Current (Max) - Amps	Heater Voltage (Max.) - Volts
L3-CEA80A	Analog	NTSC	—	—	60 + 6.0	3.0	7
L3-CEA130	Digital	8VSB	130	30	—	2.5	7

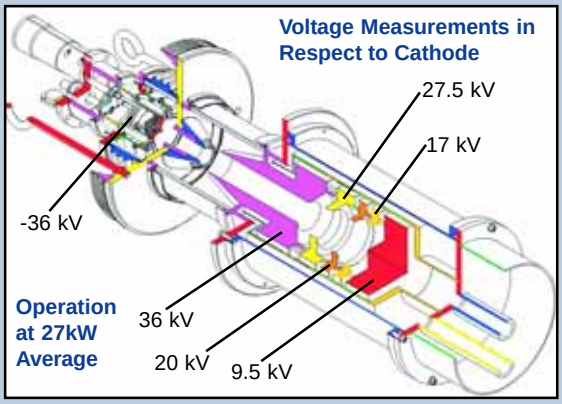
** Values shown above are based on the indicated formats. Tubes can be operated in other formats. Contact Richardson Electronics for details.*

Featured Product

L-3CEA130 Constant Efficiency Amplifier

In 2001, L-3 won the prestigious “Best in Show” Award at NAB for its introduction of the Constant Efficiency Amplifier (CEA). L-3 has proven its design with reliable field performance with CEAs operating in numerous locations, including many Thales Paragon and Axcera Visionary transmitters. Benefits include:

- Unsurpassed warranty — 2 years ***full*** replacement
- Five stage collector — all stages with ***active*** voltage applied for highest efficiency
- Patented oil-cooled technology
- Saves $70K annually per tube in operating costs compared to solid state
- Saves $20K annually per tube in operating costs compared to standard IOT
- L-3’s five active stage collector design allows it to reach efficiencies near 60% in digital and a Figure of Merit (FOM) of 140% in NTSC
- 130 kW peak for DTV and 60 + 6.0kW in common mode in NTSC



Engineered Solutions

Retrofitting to MSDC IOTs

Richardson Electronics’ “engineered solutions” team now offers retrofits to the high efficiency multi-stage depressed collector (MSDC) IOTs.

Whether operating a klystron based transmitter or a standard IOT transmitter, its worth considering upgrading to a MSDC IOT design. For example, the L-3 constant efficiency amplifier (CEA), operating with a five-active staged collector design can offer up to 60% efficiency, which can dramatically reduce your utility costs from the klystron (9% analog pulsed, 14% non-pulsed) and standard IOT (40% analog average picture level) systems.

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Featured Product **New Improved Input Cavity**

The L-3-INPUTCAVITY has been redesigned as an ideal way to maximize your efficiency. The efficiency can be increased by improving the input match to the grid. The new, improved input cavity offers:

- New, low dielectric quartz DC block
- Improved high power linearity and efficiency
- Reduced RF drive from exciter and improved reliability
- 25% lighter than original version
- Superior VSWR match
- Constant input impedance to the load for better matching.

In addition, the new input cavity features:

- Smaller and lighter design than previous, but is still 100% interchangeable with the following systems:
  - **L-3 systems:** L3-IOT40, L3-IOT60, L3-IOT70 and L3-IOT80
  - **E2V systems:** IOT7340/8303/8300, IOT7360/8404/8400 and IOT8505/IOT2100
- IOT connections are made from the top allowing quick set-up
- Improved tuner assembly prevents binding
- Improved DC block

New lightweight cavity

Original, tall cavity

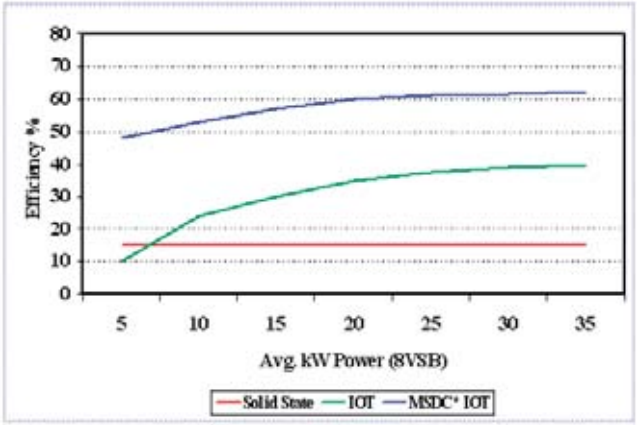
Engineered Solutions **Digital TV — Tube or Solid-state?**

Many companies are looking at purchasing a new digital transmitter in the next few years. When selecting a transmitter, one of the first options to consider is whether to choose a tube-based system or solid-state.

More and more customers are looking at total costs of the purchase, taking into consideration not only the acquisition costs, but also the utility costs and costs to maintain the system.

To the right is a chart showing the improved efficiency savings of an MSDC IOT. The L-3 five active staged voltage CEA is represented by the blue line in the table, and the solid state system is shown in red.

Over a 10 year period, the utility savings of a 30 kW (average) power transmitter could exceed $1 million dollars in areas where the kW/hour costs exceed 12 cents. Considering most medium and high power tube transmitters are priced lower than their solid-state counter parts, selecting a tube-based system is a wise decision.



Digital (8VSB) Efficiency Example (30 kW Output Power)

	Solid-state	IOT	CEA
Efficiency	20	40	59
Total Beam Power	150	75	51
Ann. Power Costs @ 7.5 cents kW/hr	$98,000	$49,000	$33,000
Ann. Power Costs @ 10 cents kW/hr	$137,000	$66,000	$45,000
Ann. Power Costs @ 12 cents kW/hr	$158,000	$79,000	$54,000

Quick TIP

Significant improvements have been made in input cavity designs since the introduction of the IOT in the early 1990s. If you have not replaced your original cavities, we recommend considering doing so for improved linearity and efficiency.

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IOT/CEA Accessories

To complete your IOT and CEA transmission system, Richardson Electronics offers the full array of support components. It is highly recommended for those who have not replaced or upgraded their originally supplied equipment, that you should consider the below as possible products for procurement to allow for the most effective operation of your IOT.

L-3 manufactures many of the key support products at its own facility in Williamsport, Pennsylvania. The result is lower priced, improved design and more efficient products.

The following parts can be used to replace your existing L-3 components, and in some cases, replace your existing E2V product.

Part Number	Description
L3-TROLLEY	Trolley Carriage
L3-INPUTCAVITY	Input Cavity
L3-OUTPUTCAVITY1	Prime Output Cavity
L3-OUTPUTCAVITY2	Secondary Output Cavity
L3-OUTPUTCOUPLER	Output Coupler

Crowbar Devices

Richardson Electronics stocks the two common types of crowbar switching devices found in many IOT transmitter designs. Many early IOT transmitters included the GP-41B spark gap, while other models used a thyratron style crowbar circuit. The L-3 L4945A thyratron is a complete equivalent to the E2V CX2708.

Part Number	Type	Static Breakdown Voltage (kV)	VT Min. Trig. (kV, open circuit)	Max. Peak Forward Anode Voltage (kV)	Max. Peak Forward Anode Current (A)
GP-41B	Spark Gap	42	20	—	—
L4945A	Thyratron	—	—	40	1500

Featured Product **Drop-in Replacement for E2V CX2708**

L4945A Crowbar Thyratron

L-3 Communications designed the L-4645A thyratron to be an equivalent to the E2V CX2708. The L-4945A offers broadcasters a reliable and economic alternative for performing crowbar operations in IOT transmitters.

L-3 has developed a fine reputation for producing an extensive line of ceramic/metal thyratrons. Customers from the laser and scientific markets as well as the medical and industrial sectors have been using L-3 Electron Device thyratrons for over 15 years. These devices are produced using rigorous military standards such as MIL-I 45208 and MIL-Q-9858A assuring unequaled reliability and long lasting performance.

Having manufactured over 300 units in the last couple years, L-3 has been able to refine its production to offer you a superb operating device. With proven field performance in Thales (Comark), Harris, Itelco, Larcan, Axcera and ABS transmitters you will find the product suitable to your needs.

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Sockets

Richardson Electronics carries a wide selection of sockets necessary to keep your equipment up and running. Whether you are using a triode, tetrode or pentode, we have a socket available for that tube.

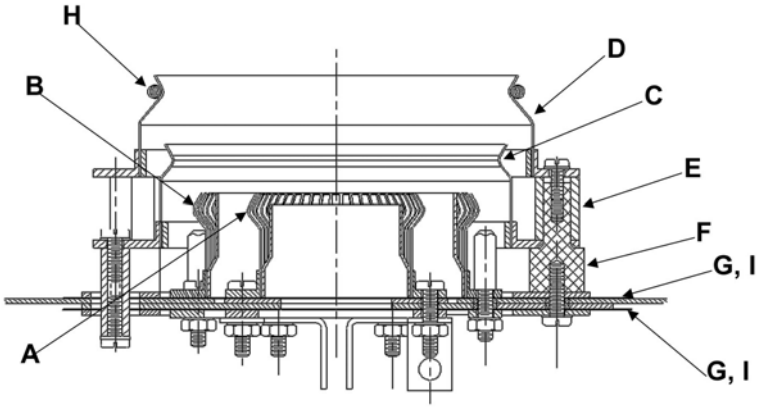
Please note the last two columns of the Power Triodes and Power Tetrodes sections (pages 4-14), where you will find the appropriate socket series and chimney for each tube type. Call your local office if you have any questions identifying the proper socket.

SK300 SERIES

Application/Version	Part No.	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Original type in older FM systems	**SK300**	—	—	—
Standard Socket (dc, LF, HF)	**SK300A**	—	—	—
For 4CX20,000 family to HF	**SK320**	—	—	—
Pulsed LF/HF & dc	**SK340**	—	—	—
VHF/Modern FM applications	**SK350**	fil 10000	2000	—
VHF/Modern FM applications	**SK360**	fil 10000	2000	—
Bypass Cap kit for SK350, 360	**SK355**	g^2 8800	5000	—
For cathode-driven applications	**SK375**	—	—	—

Common tube types: 4CX3500A, 4CX5000A, 4CX15000A, 4CX7500A, 4CX20000C

SK300 and SK1300 SERIES PART OPTIONS



Socket Type	A Inner Filament Collet	B Outer Filament Collet	C Control Grid Collet	D Screen Grid Collet	E Sleeve Insulator	F Post Insulator	G Bypass Capacitor	H Grid Collet Spring	I Filament Collet Insulator
SK300A	001837	001838	115738	115740	015380	015379	—	149297	001820
SK350	001837	001838	001839	001840	243113	154819	243131	149297	—
SK360	001837	001838	001839	001840	243348	243348	243131	149297	—
SK361A	001837	001838	015884	—	—	050724	—	149297	241535
Y291	001837	001838	115925	115927	001813	015379	See Item "I"	—	149081
SK1300	001837	001838	115594	—	115595	115596	—	149297	001820
SK1320	001837	001838	115594	—	115595	115596	—	149297	154280

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Sockets (cont'd)

SK600 SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	**SK600A**	G2 2700	1000	—
SK636B w/ Clamp Available	**SK620A**	G2 1100	1000	—
SK636B w/ Clamp Available	**SK630A**	G2 1100	1000	Cathode
W/ Square Mounting Plate	**SK640**	—	—	—

Common tube types: 4X150A, 4CX250B, 4CX350A, 8930

SK700 SERIES

Application	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	**SK700A**	G2 1200	400	One Heater Gnded
Liquid Immersion Application	**SK740**	—	—	—
Special	**SK760**	—	—	—

Common tube types: 4CX300A

SK800 SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	**SK800B**	g2 1500	400	-
Cathode/Heater Grounded	**SK810B**	g2 1500	400	Cathode, 1 Heater
Screen Grounded	**SK820**	cath 500	400	Screen
For Tetrodes	**SK831**	g2 2500	1000	-
For Pentodes	**SK840**	g2 2500	1000	G3

Common tube types: 4CX1000A, 4CX1500A, 5CX1500A/B

Engineered Solutions

Updated Edition — Care & Feeding Handbook

Richardson Electronics offers the 2004 edition of the *Care & Feeding of Power Grid Tubes* handbook. This handbook, published by the Eimac division of CPI, offers numerous tips for TV & Radio broadcasting. This new version includes expanded sections on oxide cathodes, grids, anodes, vac-ion pumps and cooling, as well as a discussion of multi-phase cooling.

To request a **free** copy of the handbook, customers can call their local Richardson Electronics office or visit **broadcast.rell.com**.

Quick TIP

When replacing your power grid tube, don't pull back and forth too much on the tube. Slight back and forth movement while pulling straight out will ensure the fingers of the socket will not be damaged.

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Sockets (cont'd)

SK1300 SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	SK1300	—	—	—
W/ Ground Contacts	SK1320	—	—	Grid

Common tube types: 3CX10000A7, 3CX15000A7, 3CX20000A7

SK1400 SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	SK1400A	G2 1800	1000	—
Screen Grounded	SK1470A	—	—	Screen

Common tube types: 4CX3000A, 5CX3000A

SK1500A SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Without Tube Seating Device	SK1500A	—	—	—
With Tube Seating Device	SK1510A	—	—	—

Common tube types: 4CX35000C, 4CV100000C

SK2000 SERIES

Application/Version	Part Number	Bypass Cap (pF)	Cap. VDCW	Grounded Contacts
Standard Socket	SK2000	G2 7200	4000	1 fil
Preferred for RF Applications	SK2011A	G2 12800	4000	—
Low Bypass Capacitance	YC100	G2 1600	4000	—

Common tube types: 4CV50,000E, 4CW100,000E

Engineered Solutions

816R Retrofit Kit in Stock

To help support the retrofit of Continental 816R-5B and -6C transmitters, Richardson Electronics stocks the following necessary components:

Eimac power grid tube **4CX20,000E**
Filament transformer **662-0410-020**
Filament voltmeter **458-5006-020**

Several stations have already successfully retrofitted their existing YC130/9019 socket to use the Eimac 4CX20,000E power tetrode. The 4CX20,000E was designed specifically by Eimac to maximize life and reliability in the Continental 816R-5B and –5C transmitters. We can provide step-by-step information on this conversion.

The YC130/9019 is available from stock for customers not electing to pursue the retrofit at this time. Please note all new production 816R transmitters now being delivered by Continental come with the 4CX20,000E. Contact Richardson Electronics for your **816R-KIT**, available from our stock.

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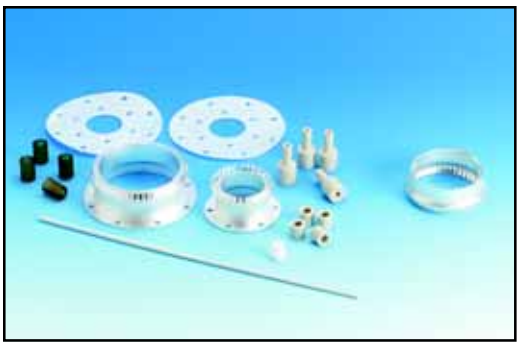

Socket Accessories

Richardson Electronics carries a vast array of ancillary parts for common sockets. Customers can choose to buy an individual component like insulators or collets, or choose a “socket spare parts kit” listed below.

As a reference, page 24 shows a SK300 series socket diagram with typical spare parts available, on an individual basis.

SK300-KIT

Qty.	Name	Part No.
1	Bushing	154176
1	Screen Collet Spring	149297
2	Teflon® Insulator	001820
4	Post Insulator	015379
4	Sleeve Insulator	015380
1	Inner Filament Collet	011837
1	Outer Filament Collet	011838

SK1300-KIT

Qty.	Name	Part No.
1	Grid Collet Spring	149297
2	Teflon® Insulator	001820
4	Post Insulator	154280
4	Sleeve Insulator	115595
1	Inner Filament Collet	001837
4	Post Insulator	115596

SK840-KIT

Qty.	Name	Part No.
8	Contact Finger	149062
2	Ceramic Cylinder	011637
6	Bushing	011639
1	Ceramic Spacer	115969
1	Ceramic Spacer	011920
1	Ceramic Spacer	011638
1	Metal Spacer	115513
2	Inner Insulator	149548
1	Suppressor Grid Contact Ring	149068

SK1500-KIT

Qty.	Name	Part No.
6	Spacer	154550
4	Spacer	149288
3	Spacer	149291
2	Spacer	149292
3	Insulator Cap	149289
1	Spacer	149293
3	Insulator Assembly	149506

Chimneys

Chimneys effectively direct the flow of air to your power tube’s anode cooling fins with minimum pressure drop using an **Eimac** chimney. Rely on Richardson Electronics for all your sockets, chimneys and accessories specifically designed to ensure longer tube life and better performance for your tubes.

Refer to the power triode (page 4) and power tetrode (page 6) sections of this guide to select the proper chimney of each available tube.

Quick TIP

Insufficient airflow is a major contributor to tube damage. Overheating of a tube can lead to arcing, which will damage the tube, or will at a minimum lead to reduced life. Make sure your tube has sufficient airflow.

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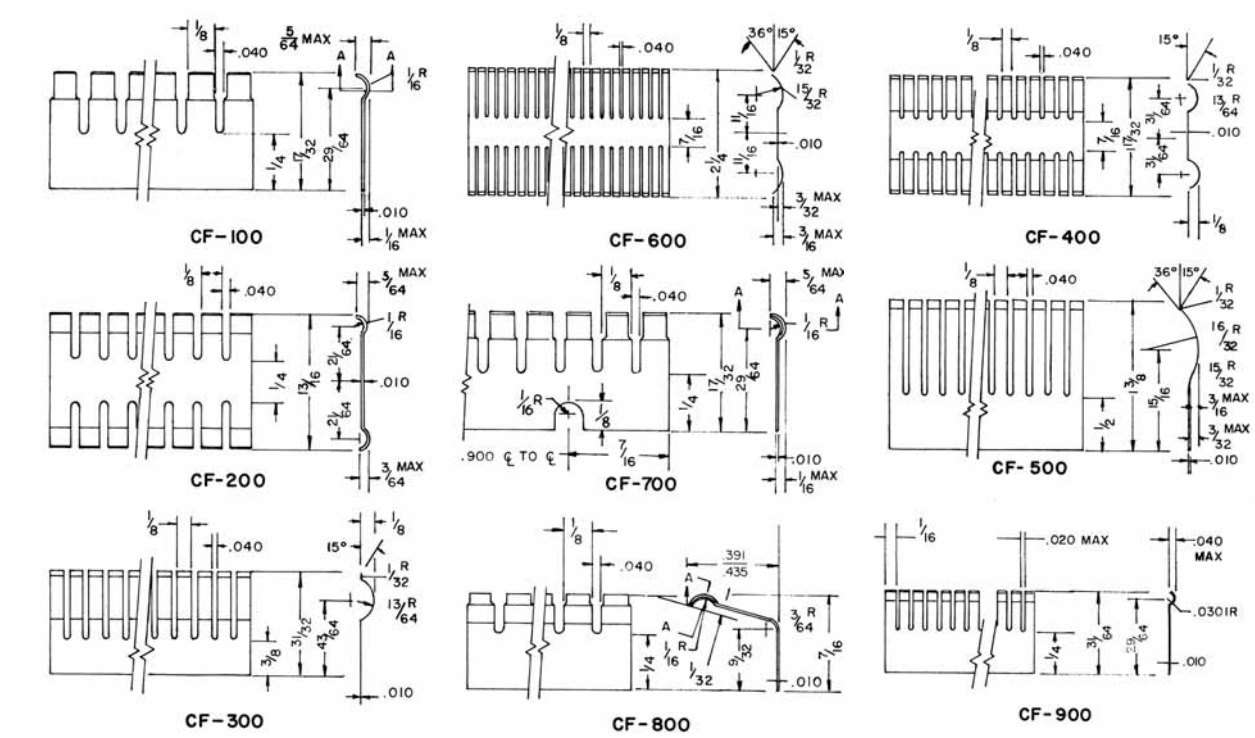
Finger Stock

Eimac pre-formed finger stock is a prepared strip of spring material, slotted and formed into a series of fingers, designed to make a sliding contact.

The base material is a non-ferrous spring alloy, heat treated for more positive spring action and silver plated for better RF conductivity. This contact finger stock is supplied in 36-inch lengths. Richardson Electronics also carries finger stock for TV applications.

Type	Minimum Deflection		Maximum Current		
	Inch	mm	Amps per finger	Amps per inch of finger stock	Amps per cm of finger stock
CF-100	.015	(.38)	7.8	47.2	18.7
CF-200	.015	(.38)	7.8	47.2	18.7
CF-300	.025	(.63)	5.7	34.6	13.6
CF-400	.025	(.63)	5.7	34.6	13.6
CF-500	.030	(.76)	7.8	47.2	18.7
CF-700	.015	(.38)	7.8	47.2	18.7
CF-800	.035	(.89)	6.4	38.7	15.3
CF-900	.015	(.38)	3.9	47.2	18.7



Quick TIP

It is usually recommended to replace the entire collet when more than 10% of the fingers are broken, or a number of adjacent fingers are broken. Call Richardson Electronics for the appropriate collet for your socket when applicable.

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Cavities

Looking to replace your existing cavity? Richardson Electronics carries the full line of **BURLE** cavities. In addition, BURLE will look at customize solutions for those hard-to-find or discontinued types.

Look to Richardson Electronics if you have an existing BURLE, Thales or discontinued Eimac cavity in need of repair.

See page 9 for details on the comprehensive repair program now available.

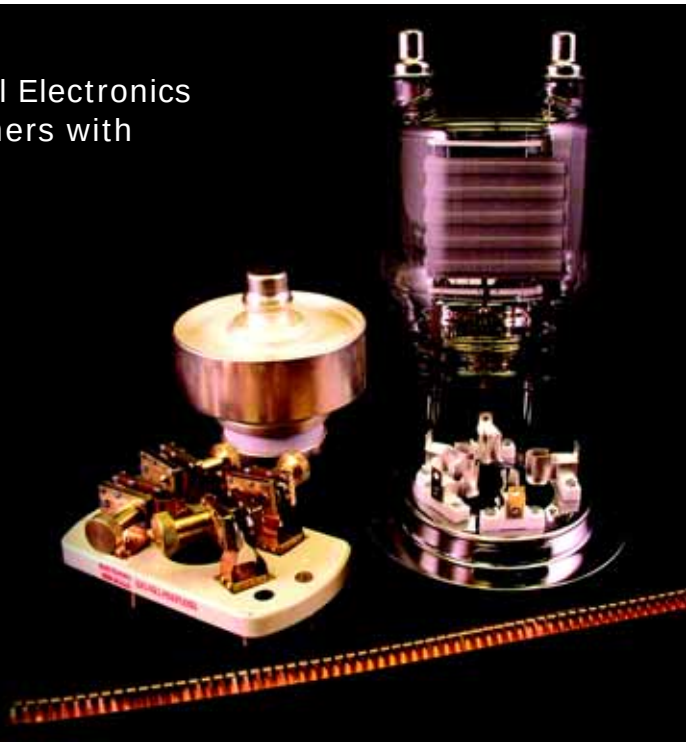
NEW AND REPAIRED CAVITY TYPES

Part No.	Used with:	Socket	Freq. Band	Type
Y1266	8794	89-088	VHF	high band
Y1277	8974	CALL	VHF	low band
Y1376	8976	89-085	VHF	high band
Y1390	8984	89-085	VHF	—
Y1393V1	8986	89-059	FM	—
Y1393V3	9011	J6001	FM	—
Y1398	8976	89-085	VHF	low band
Y1400	9017	CALL	UHF	low power
Y1401	9007	89-094	VHF	low band
Y1402	9007	89-094	VHF	high band
Y-SPECIAL	ANY	CALL	ANY	customized

Originally a division of Varian, National Electronics has a long history of supplying customers with reliable product and affordable prices.

- Power Tetrodes
- Power Triodes
- Sockets
- Finger Stock
- Accessories

NATIONAL ELECTRONICS



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Vacuum Capacitors

Richardson Electronics has partnered with **Jennings Technology** to provide high-quality, non thermionic, vacuum components. These high quality capacitors offer an *industry leading 3-year warranty*! Richardson is working with customers to identify their needs to stock proper levels of all types, thus reducing the long leadtimes customers have experienced from capacitor suppliers in the past. Let us know your future needs, to build our inventories properly.

A small representation of our FIXED BROADCAST CAPACITORS

Product Number	CAP (pF)	Peak Voltages (kV)	Current/Amps RMS Max	Length (mm)	Diameter (mm)
CKT-6-XX	6	35	47	165.1	58.9
CFHD-18-XX	18	45,50,55,60	120	131.6	62
CAEC-30-XX	30	25,30,35	37	149.4	34.04
CKT-250-XX	35	35	82	165.1	58.9
CFED-150-XX	150	30	135	88.14	61.96
CKT-250-XX	250	30	100	165.1	67.5
CVED-500-XX	500	25	160	96.77	115.82
CVED-750-XX	750	25	170	96.77	115.82
CFHP-1000-XX	1000	50	350	157.48	182.88
CFFM-2000-XX	2000	40	400	147	208.3

A small representation of our VARIABLE BROADCAST CAPACITORS

Product Number	CAP (pF)	Peak Voltages (kV)	Current/Amps RMS Max	Length (mm)	Diameter (mm)
CVFP-250-XX	15-250	30, 35, 40	140, 150, 160	243.84	142.8
CVFP-250-XX	10-250	45, 50, 55	190, 200, 210	302.26	182.88
CVFP-450-XX	25-450	30, 35, 40	150, 160, 170	243.84	141.22
CVFP-450-XX	25-450	45, 50, 55	200, 210, 220	302.26	182.88
CVEP-500-XX	25-500	20	160	231.9	142.8
CAV3-650-XX	30-650	45, 50, 55	375, 400, 425	302.3	193
CVHP-650-XX	30-650	45, 50, 55	220, 230, 240	302.26	182.88
CVFP-750-XX	20-750	30, 35, 40	200, 210, 220	297.18	182.88
CVFP-1000-XX	35-1000	30, 40	215, 225	297.18	182.88
CVHP-1000-XX	60-1000	40, 45, 50	230, 240, 250	368.3	203.2
CVFP-1500-XX	100-1500	30, 35, 40	215, 220, 225	350.52	182.88

A small representation of our WATER COOLED VARIABLE BROADCAST CAPACITORS

Product Number	CAP (pF)	Peak Voltages (kV)	Current/Amps RMS Max	Length (mm)	Diameter (mm)
CWV3-450-XX	15-450	40, 45, 50	700, 725, 750	419.1	193.04
CWV3-650-XX	30-650	40, 45, 50	760, 780, 800	420	193
CWV5-1000-XX	100-1000	40, 45, 50	660, 680, 700	455	217
CWV5-1300-XX	40-1300	40, 45, 50	700, 725, 750	550	218
CWV1-1600-XX	100-1600	50, 60, 65	1000	584.2	320.04

XX = Test Voltage

***Note**: The data supplied in the enclosed tables is for general reference only. As data was collected from a number of sources, Richardson Electronics, Ltd. and its affiliates are not liable for its accuracy. Richardson Electronics, Ltd. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Richardson Electronics makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Richardson Electronics assume any liability whatsoever arising out of the use or application of any product(s) or information.*

- *Industry leading – 3 year warranty!*
- *Made in USA – 140,000 sq. ft state-of-the-art facility*
- *Military Grade QA Systems in accordance with MIL-I-45208A*
- *Superior quality/reliable — proprietary processes*
- *Short lead-times and immediate availability*

Jennings offers over five decades of expertise in state-of-the-art vacuum technology. Jennings holds the notable recognition of creating the first high voltage, vacuum, variable capacitor. This revolutionary discovery in 1942 (by Jennings Radio Manufacturing Company) resulted in a capacitor offering application flexibility with its variable tuning capability and its small size.

Today, Jennings is known worldwide as a leader in non-thermionic vacuum components, offering a full line of products including:

- **Capacitors**
- **Relays**
- **Interrupters**
- **Contactors**
- **Coaxial Relays**

As the original designer and manufacturer of the vacuum variable capacitor, Jennings has amassed over five decades of proven reliability and quality. With over 500,000 capacitors installed worldwide, Jennings' industry leadership in design and field experience has led to many technological breakthroughs.

Jennings offers a broad range of high power, vacuum, and gas-filled capacitors:

- Fixed
- Variable
- Hand Adjustable
- Non-Magnetic

Key benefits of Jennings capacitors are:

- Long life, high reliability
- High voltage ratings
- High current ratings
- High speed tuning
- Wide tuning ranges
- Self-healing
- High altitude operation
- Compact sizes / low weight

50 years of proven performance…

With our highly advanced equipment we are able to produce components with a vacuum greater than 10-7 torr in a contamination free environment.

Our state-of-the-art test labs are capable of performing MIL, environmental and RF qualified tests. Consequently, the Jennings' product withstands millions of operating cycles.

- High current & high voltage ratings
- Inventory on all standard values
- Offered in tolerances of 5-20%
- Turn to Richardson Electronics for 24 hour service — product in stock
- Competitively price

High Voltage RF Ceramic Capacitors

Richardson Electronics has a full line of RF ceramic capacitors that are used in high frequency applications such as semiconductor equipment, HV power supplies, broadcast transmitters, antennas, induction and dielectric heating, X-ray, MRI, diathermy, welding equipment and lasers. Voltages range from 5 to 40 KV and capacitance from 1 to 10,000 pF. **High Energy** is the premier manufacturer of ceramic capacitors in the United States. From the raw powder, which we blend in the plant, throughout every step of the entire manufacturing process, each lot of capacitors is carefully tested to exacting electrical, dimensional and appearance standards. Richardson Electronics carries a large volume of inventory and provides 24 hour service.

Part Number	Capacitance (pF)	Tolerance	Diameter (in)	Length (in)	Max. KVAr	Rated Voltage (kV)	RMS Current
HT50V101JA	100	±5%	.82	.89	10	7.5	9.7
HT50V101KA	100	±10%	.82	.89	10	7.5	9.7
HT50V101MA	100	±20%	.82	.89	10	7.5	9.7
HT50V121JA	120	±5%	.82	.89	10	7.5	9.9
HT50V150JA	15	±5%	.82	.89	10	7.5	7.3
HT50V151MA	150	±20%	.82	.89	10	7.5	10.2
HT50V171KA	170	±10%	.82	.89	10	7.5	10.4
HT50V201JA	200	±5%	.82	.89	10	7.5	6.9
HT50V201MA	200	±20%	.82	.89	10	7.5	6.9
HT50V250KA	25	±10%	.82	.89	25	7.5	7.9
HT50V250MA	25	±20%	.82	.89	10	7.5	7.9
HT50V251MA	250	±20%	.82	.89	10	7.5	7.1
HT50V300JA	30	±5%	.82	.89	10	7.5	8
HT50V500JA	50	±5%	.82	.89	50	7.5	8.5
HT50V500KA	50	±10%	.82	.89	50	7.5	8.5
HT50V500MA	50	±20%	.82	.89	10	7.5	8.5
HT50V750KA	75	±10%	.82	.89	10	7.5	9.7
HT50V750MA	75	±20%	.82	.89	10	7.5	9.7
HT57Y100KA	10	±10%	1.187	1.89	35	15	11.3
HT57Y101KA	100	±10%	1.187	1.89	35	15	13.7
HT57Y101MA	100	±20%	1.187	1.89	35	15	13.7
HT57Y151KA	150	±10%	1.187	1.89	35	15	14.5
HT57Y201KA	200	±10%	1.187	1.89	35	15	15
HT57Y201MA	200	±20%	1.187	1.89	35	15	15
HT57Y250KA	25	±10%	1.187	1.89	35	15	12.5
HT57Y250MA	25	±20%	1.187	1.89	35	15	12.5
HT57Y301KA	300	±10%	1.187	1.89	35	15	7
HT57Y500JA	50	±5%	1.187	1.89	35	15	13
HT57Y500KA	50	±10%	1.187	1.89	35	15	13
HT57Y501KA	500	±10%	1.187	1.89	35	15	6.9
HT57Y750KA	75	±10%	1.187	1.89	35	15	13.1

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- 5KV to 40KV
- 1PF to 10,000PF
- Ideally suited for high voltage and high current applications
- Renowned for over 40 years for quality, durability and long operating life

Ceramic RF Power Capacitors

Ceramic RF Power Capacitors

Richardson Electronics has an extensive line of Ceramic RF Power Capacitors including Plate, Barrel, Feed Through, Tubular and Pot styles to meet the Broadcast customer's needs. **Vishay Draloric** takes pride in their quality process to ensure that the highest quality products are being manufactured. These Ceramic RF-power capacitors have capacitance values which extend from the lower picofarad range up to the nanofarad range. Richardson stocks over 150 different types of Draloric RF ceramic power capacitors on a global basis to support the customer's needs.

Plate Capacitors

Part Number	Voltage (V)	Rated Voltage [kVp]	Capacitance (pF)	Rated Power [KVA_r]	Rated Current [A]
PD100-250	14000	14	250	40	25
PD100-500	14000	14	500	40	25
PD70-200	14000	14	20	20	16
PD70-300	14000	14	300	20	16
PE100-1000	13000	13	1000	40	35
PE100-1600	11000	11	1600	40	35
PE100-600	14000	14	600	40	35
PE100-800-20%	14000	14	800	40	35
PE140-1000	14000	14	1000	90	45
PE140-2000	13000	13	2000	90	45
PE140-3000	14000	12	3000	90	45
PE200-4000	13000	13	4000	150	60
PE200-5000	13000	13	5000	150	60
PE200-6000	12000	12	6000	150	60
PEF220-10000	13000	13	10000	140	100
PEF220-2500PF	20000	20	2500	140	60
PEF220-8000	15000	15	8000	140	100
PS40-1000	5000	5	1000	20	15
PS55-2000	5000	5	2000	25	18
PS55-82PF	5000	5	82	40	18

Barrel Capacitors

TOS30X33-Capacitance-Tolerance Series

Ceramic	Capacitance Value (pF)	Rated Voltage [kV_{DC}]	Rated Power [KVA_r]			Rated Current [A_{rms}]		
			1 MHz	10 MHz	30 MHz	1 MHz	10 MHz	30 MHz
NPO	10	15	7	35	35	0.7	4.7	8.1
NPO	25	15	18	35	35	1.7	7.4	13
NPO	50	15	35	35	35	3.3	11	18
N750	75	15	35	35	35	4.1	13	22
N750	100	15	35	35	35	4.7	15	26
N750	150	15	22	22	22	4.6	14	25
N750	200	15	15	15	15	4.3	14	24
N3300	300	15	5	5	5	3.1	10	17
N3300	400	15	5	5	5	3.6	11	19
N3300	500	15	5	5	5	4.0	13	22
R2000	750	15	.5	.5	.5	1.5	5.0	8.4
R2000	1000	15	.5	.5	.5	1.8	6.0	9.7
R2000	1200	15	.5	.5	.5	2.0	6.0	12
R2000	1500	15	.5	.5	.5	2.2	6.0	12

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Transmitting Mica Capacitors

- 250V to 35KV
- 47 pf to 1,000,000 pf (1 UF)
- Ideally suited for high voltage and high current applications
- Seven basic case sizes to select from
- Encapsulated in a high quality thermo setting compound which eliminates moisture intrusion
- Highly shock resistant

Richardson's line of transmitting mica capacitors are supplied in seven basic case sizes. They are encapsulated in a high quality thermo setting compound which eliminates moisture intrusion and makes them highly shock resistant. These capacitors are designed for frequencies ranging from 100 kHz to 3 MHz and are ideally suited for high current and high voltage circuits.

Richardson Electronics is the Master Mica Transmitting distributor for **Cornell-Dubilier** that supports the broadcast industry on a global basis.

Mica Capacitors Part Numbering System

Case Part Numbering System

271 30 B 470 J 0 0

Mounting Style

Operating Temperature Range: Standard capacitors are supplied for operating temperature range "0" (-55° C to +125° C).

Capacitive Tolerance: Standard capacitors are supplied with +-5% (J) tolerance.

Capacitance: The capacitance is designated with 3 digits. The first two indicate the first two significant figures of the capacitance in picofarads and the third digit indicates the number of zero which follow.

Characteristic

Rated Peak Voltage: The rated peak voltage is indicated by two digits and is given in hundreds of peak working units.

Type: The type designation indicates the case size and physical configuration of the capacitor.

Characteristic

Letter Designation	Temperature Coefficient (ppm/°C)	Capacitive Drift
B	not specified	not specified
C	-200 to +200	+- (0.5% +0.1pF)
D	-100 to +100	+- (0.3% +0.1pF)
E	-20 to +100	+- (0.1% +0.1 pF)

Please note other types are available:
272, 273, 291, 292, 293, 294

Mounting Style

The mounting style preferred shall be designated by a single digit as shown in the following table:

Number Designation	Mounting Style
0	No Mounting Plates
1	Mounting Plate on Bottom Only
2	Mounting Plates on Top and Bottom

Capacitive Tolerance

Letter Designation	Capacitive Tolerance
G	+-2%
J	+-5%

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Oil-Filled Capacitors

Turn to Richardson Electronics for your oil-filled capacitor needs. Oil-filled capacitors are offered with capacitance values starting at 100pf up to 50 microfarad and voltage values 250vdc to 200kvdc. One of our key suppliers, **Plastic Capacitors Inc.**, manufactures a wide variety of standard catalog, plastic film and/or paper dielectric oil-filled capacitors, high-voltage transformers, AC to high-voltage DC power packs, pulse forming networks and specialty L/C/R networks.

Richardson Electronics offers the flexibility to purchase one piece or larger production quantities. Many of the standard products are available from stock. Please call Richardson Electronics for any of your inventory needs.

- 250VDC to 200KVDC
- 100PF to 50 UF
- Full line of DC filter, bypass and coupling capacitors for broadcast applications
- Hermetically sealed
- Long life
- Competitive price with short lead-time

Part Number	Voltage (vdc)	Capacitance (uF)	Diameter (in)	Height (in)	Length (in)
LK100-104	10,000	0.1	—	3.25	3.75
LK100-105	10,000	1.0	—	7.25	3.75
LK100-205	10,000	2.0	—	6.75	4.56
LK100-254	10,000	0.25	—	3.75	3.75
LK100-504	10,000	0.5	—	5.75	3.75
LK150-104	15,000	0.1	—	3.75	1.75
LK20-105	2,000	1.0	—	3.25	2.50
LK20-106Y	2,000	10.0	—	4.5	3.75
LK20-126Y	2,000	12.0	—	4.0	3.75
LK20-205	2,000	2.0	—	3.50	2.50
LK20-405Y	2,000	4.0	—	3.75	3.75
LK300-254Z	30,000	0.25	—	6.0	6.00
LK30-254	3,000	0.25	—	2.5	1.75
LK50-104	5,000	0.1	—	2.12	1.75
LK50-105	5,000	1.0	—	5.0	2.50
LK50-254	5,000	0.25	—	3.0	1.75
LK50-405	5,000	4.0	—	6.25	3.75
LK50-504	5,000	0.5	—	4.75	1.75
OF100-103	10,000	0.01	0.906	—	2.25
OF100-502	10,000	0.005	0.812	—	1.75
OF150-103	15,000	0.1	1.125	—	3.75
OF200-103	20,000	0.01	1.125	—	4.5
OF200-502	20,000	0.005	1.125	—	3.5
OF20-103	2,000	0.01	0.59	—	1.18
OF20-254	2,000	0.25	0.9	—	2.00
OF20-503	2,000	0.05	0.75	—	1.75
OF300-202	30,000	0.002	0.906	—	5.0
OF300-501	30,000	0.0005	0.594	—	4.563
OF30-104	3,000	0.1	1.125	—	1.75
OF30-203	3,000	0.02	0.75	—	1.75
OF50-102	5,000	0.001	0.594	—	1.188
OF50-104	5,000	0.1	1.375	—	2.25

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Services & Support

- 70 worldwide sales locations
- 33 global stocking warehouses
- ISO 9002 registered
- $7 million of broadcast-related inventory
- Same day shipments for orders placed by 4 PM CST
- 24 hours/7 days per week "on call" support — 1-800-348-5580
- Upgrades, conversions and rebuilds
- Installation services
- Ship scheduling to meet JIT or future planned need dates
- Special product testing
- Special selection and value-added capabilities
- Unique in-house manufacturing capabilities
- Cross referencing
- Electronic data interchange
- Inventory management program
- Coordination with our customers' freight carriers
- Consolidated shipments (domestic and international locations)
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- Consolidated purchasing services

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