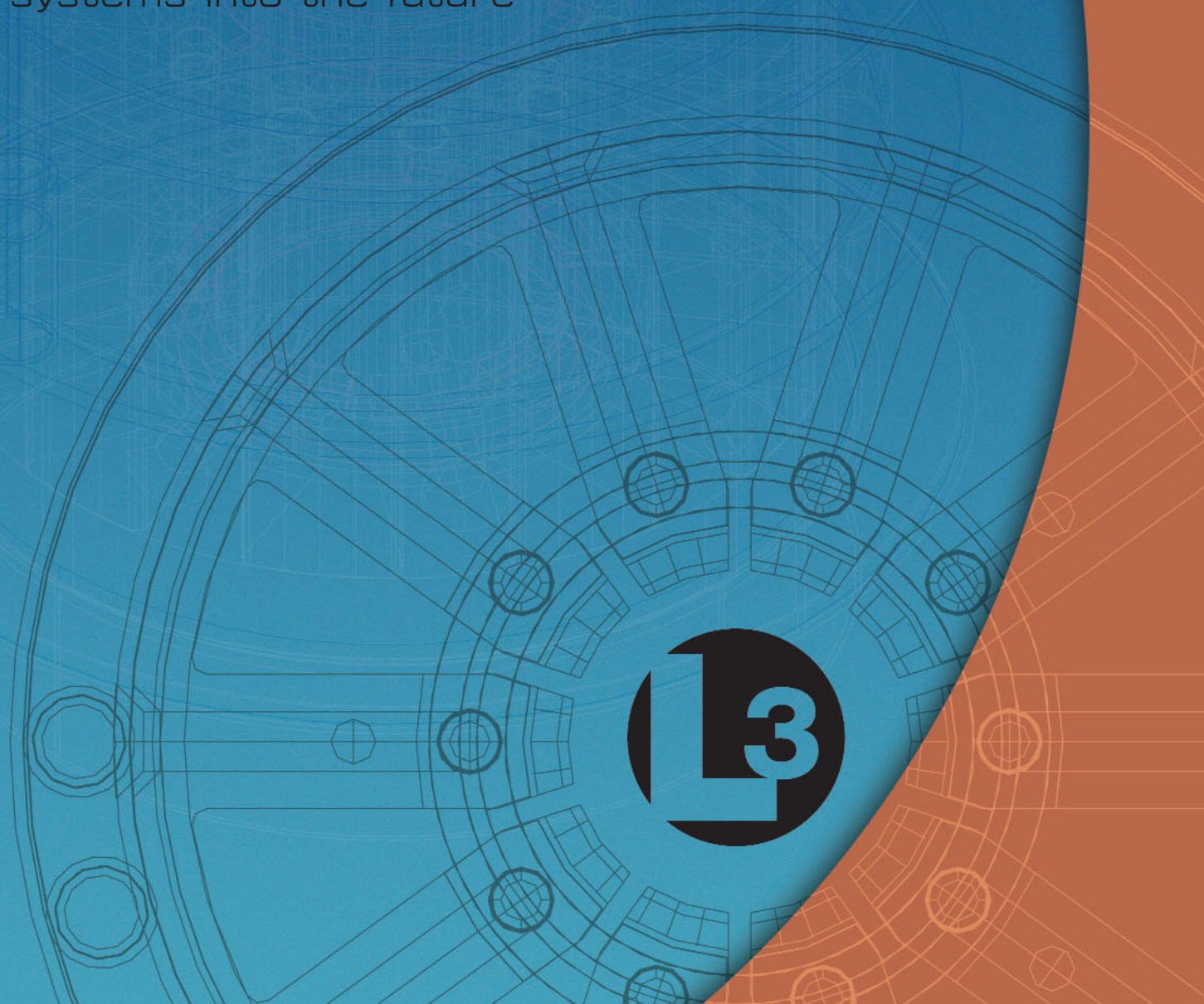
# Electron Devices

Powering microwave systems into the future



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# L-3 Electron Devices

**The Electron Devices Division of L-3 Communications (L-3 EDD) is a leader in the development and production of state-of-the-art microwave vacuum electron devices.**

## Military Capabilities

L-3 Electron Devices offers a complete line of products used in a variety of microwave and millimeter wave systems. These products meet and exceed the stringent requirements for operation and durability in today's advanced radar, ECM, missile and communication systems.

L-3 EDD products used in military applications include:

- **Helix Traveling Wave Tubes** (TWTs) — missile data links and seekers, ECM systems and medium-range radars
- **Coupled Cavity TWTs** — airborne radar and ground-based radar systems
- **Crossed-Field Amplifiers** (CFAs) — shipboard radars
- **Klystrons** — long-range radars
- **Microwave Power Modules** (MPMs) — airborne satcom systems

L-3 EDD has significantly reduced the size of amplifiers by the introduction of microwave and millimeter wave power modules (MPMs and MMPMs). In these new system building blocks, low noise and high efficiency are achieved by integrating miniature power booster TWTs, high gain solid state amplifiers and electronic power conditioners.

## Commercial Capabilities

L-3 EDD products are not limited to military applications — many are utilized in more familiar commercial systems, including:

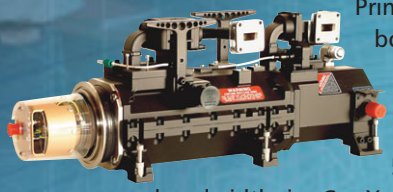
- **Klystrons** — airport surveillance and weather radar and linear accelerators used in medical and scientific systems
- **Inductive Output Tubes (IOTs)** — UHF TV transmitters
- **TWTs** — wireless communication systems
- **X-ray tubes** — nondestructive testing and sterilization systems

With a proud heritage of producing microwave devices for over 70 years, L-3 Electron Devices continues to design and develop products that will be used to power future military and commercial systems.

**In 1932**, Charles Litton started a small microwave tube operation in San Carlos, CA. as the Electron Devices Division of Litton Industries. In the mid-sixties, Electron Devic PA. Since 2002, Electron Devices has been a division of L-3 Communications and th for the microwave, broadcast and medical communities.

# L-3 Electron Devices San Carlos, CA

## Coupled Cavity Traveling Wave Tubes



Primarily used in ground-based or airborne radar applications, L-3 EDD's coupled cavity Traveling Wave Tubes (TWTs) are available at power levels up to 150 KW peak, 5 KW of average power and 10% bandwidth in C-, X- and Ku-bands. Our tubes have found use in a wide variety of radar systems, both in the U.S. and abroad.

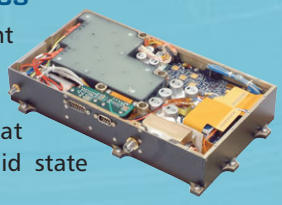
## Helix Traveling Wave Tubes

L-3 EDD is widely recognized as an industry leader in the design and manufacture of high-power pulsed and CW helix and ring-loop TWTs for radar, ECM and missile applications. These TWTs operate in the standard bands over the 2 to 18 GHz frequency spectrum and provide superior performance and reliability. L-3 Electron Devices is a tube supplier for ECM systems, shipboard helicopter radar and missile systems. The Williamsport operation manufactures a line of ring bar tubes in UHF and L-band with output powers up to 200 KW. These are used in long-range array, space surveillance, shipboard surveillance and airport surveillance radars.

## Miniature Traveling Wave Tubes

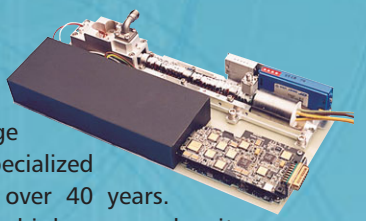
L-3 EDD has a complete line of mini tubes, covering multi-octave bandwidths over the frequency range of 2 to 46 GHz, with output powers of up to 150 Watts. The tubes have multi-stage collectors for high efficiency, are of rugged thermal design and offer long life through superior gun optics and beam magnetics. Our mini tubes are used in ECM systems for the U.S. Navy and foreign navies and are also used in airborne decoy systems. A special line of low gain, high efficiency vacuum power booster (VPB) tubes was developed for use in our line of Microwave Power Modules (MPMs).

## Microwave Power Modules



The MPM is a recent advancement in medium-power microwave amplifiers. The MPM is a complete microwave amplifier that includes a miniature TWT, a solid state driver amplifier (SSA) and a high density electronic power conditioner (EPC). All three components are housed in a small, compact, lightweight package. Compared to traditional TWT amplifiers, the MPM is significantly smaller, lighter and more efficient and has a greater signal-to-noise ratio. Both military and commercial versions are available.

## Power Supplies



L-3 EDD's ISO 9001:2000 San Carlos facility has built custom military high-voltage TWT power supplies and specialized electronic subsystems for over 40 years. High-voltage, low noise, high-power density power supplies are available for CW or pulse applications with our line of helix and ring-loop TWTs and are designed with full automatic protection. Our power supplies and subsystems are used in surveillance radar, shipboard helicopter radar and helicopter ECM systems.

## High-Power Klystrons

Since the development of the first 2.2 megawatt L-band klystron in 1952, Electron Devices has been a leader in support of the superpower radar community. Today, state-of-the-art Cluster Cavity™ klystrons provide the wideband multi-megawatt capability for the U.S. airborne warning system. Other megawatt klystrons are used in weather radar, medical radiation therapy and high-energy plasma research applications.

## Accelerator Devices

L-3 EDD offers FDA-certified medical klystrons as replacement parts for medical accelerators. These klystrons have frequencies ranging from 2.856 to 2.990 GHz, peak power output levels of up to 6 megawatts and gains of up to 50 dB. Focusing is controlled by electromagnet, cooling is achieved through liquid and tuning is preset to a customer-desired frequency. Both new and rebuilt klystrons are available. We also offer high-energy electron guns for use in medical and research accelerator systems.

Mr. Litton sold his company in 1952 and for years it was known
ces acquired the GTE Sylvania Electron Tube facility in Williamsport,
e two facilities have continued to supply high-quality power devices

## L-3 Electron Devices Williamsport, PA

### Constant Efficiency Amplifiers

L-3 EDD's Constant Efficiency Amplifier (CEA), the world's most efficient UHF TV transmitting tube, continues to set milestones in the broadcast industry. First fielded in April 2003, the oil-cooled Multistage Depressed Collector Inductive Output Tube (MSDC IOT) has proven its reliability, performance and power-saving capabilities in over 100 stations throughout the United States. In any environment and in any OEM transmitter, the CEA is a first choice among TV transmitter chiefs who understand and appreciate the value of a well-tested and proven transmitter tube.

### Inductive Output Tubes

L-3 EDD IOTs continue to set the mark for service and reliability all over the world. Now operating in over 150 transmitters, our IOTs have accumulated several million hours of operation. Customers praise the service and attention they receive from our engineering staff, which keeps their transmitting plants on the air. Our technical staff understands the transmitting environment and can offer solutions that are timely, cost-effective and reliable.

### Thyratrons

Thyratrons are hydrogen-gas-filled devices used for switching high currents in high-voltage applications. They are used extensively as pulse drivers in radar equipment by all branches of military services. Other devices are used in high-energy gas lasers found in the scientific and defense communities, as the switching tube in radio therapy treatment machines used in hospitals and clinics and in broadcast television transmitters to protect the high-power RF amplifier tube from high-voltage faults. L-3 EDD engineers can design to any specification and offer a cost-effective solution that will provide reliable, long-life service.

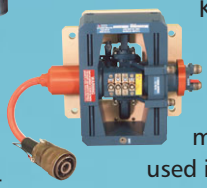
### Magnetrons

The magnetron remains one of the most economical solutions for microwave equipment designers who require reliability, power density and simplicity. L-3 EDD magnetrons are used in all types of radars, missile seekers, industrial heating and medical therapy equipment. They are also custom-designed for weather radar applications in commercial and military aviation and are available as frequency tunable and agile types for threat simulation and ECM jamming. Whether for a demanding military application with stringent environmental requirements or a commercial application where long life and low cost are the priorities, L-3 EDD can provide effective solutions that match your needs.

### Crossed Field Amplifiers

L-3 Electron Devices is the world leader in Crossed-Field Amplifier (CFA) production and development, delivering devices from L-band to X-band, with power levels from 60 kW to 5 MW peak. Our CFAs are currently being produced for several missile systems. At L-3 EDD, the latest technology serves as a starting point for continuous innovation. Our engineers are now designing the next generation of devices employing the latest processing techniques to improve performance and reliability at a reasonable cost.

### Medium Power Klystrons



Klystrons continue to be the designer's first choice when considering a high gain amplifier with superior linearity, noise and compact size. L-3 EDD's line of medium-power klystrons are currently used in scientific accelerators, military communications links and radar systems. Power levels up to 10 kW from L-band to X-band can be custom designed for most applications.

### Transmitters

L-3 EDD provides a broad spectrum of "build to spec" and "build to print" capabilities for mid- and high-power transmitters. These transmitters are rugged, reliable components for any advanced RF system. Capabilities include magnetron-, TWT- or klystron-based circuitry from UHF to J-band. Power levels range from 25 kW to 1.5 megawatts. All transmitters use a standard VME-based system architecture for control and monitoring and include a standard BIT capability that is easily enhanced for more stringent appli-

Electron Devices

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*Characteristics and operating conditions are based upon performance tests. These values may change as the result of further data or product refinement. L-3 Electron Devices should be consulted before this information is used for product design. 8/10*