

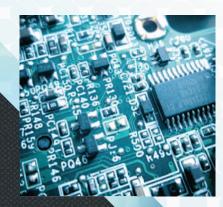
More Power, Less Noise TRAVELING WAVE TUBE AMPLIFIERS





Founded in 1987, Quarterwave is located in the heart of California's wine country, just 45 minutes from San Francisco and 90 minutes from Sacramento. Quarterwave is a full service company that provides Traveling Wave Tube Amplifiers, high voltage power systems and test equipment for microwave tubes. The company's first Traveling Wave Tube Amplifiers (TWTAs) were developed to meet the demanding requirements of radar cross-section measurement and simulation of target signatures essential to the development of advanced radar and stealth technology of the day. Today, Quarterwave's TWT Amplifiers have become the industry standard for reliable, stable, low noise amplifiers needed for radar parameter measurement and simulation of microwave signals for electronic warfare and training.

Quarterwave is dedicated to providing the highest quality Traveling Wave Tube Amplifiers with today's technology, including Commercial Off The Shelf (COTS), innovative custom system solutions, service and repair of older TWTA units, and leasing units for temporary use. Product applications range from aerospace and defense, to satellite, radar, communications, research and development, medical, and more. Quarterwave's TWTAs are FCC and CE certified for international markets. Our customers are based all over the world, including Japan, Singapore, India, Brazil, Korea, Greenland, Germany, the United Kingdom, and more.



Quarterwave strives to establish itself as a leading company in TWTA manufacturing, promoting innovation, quality, responsibility and trust in every aspect of our work. Our success depends on your satisfaction.

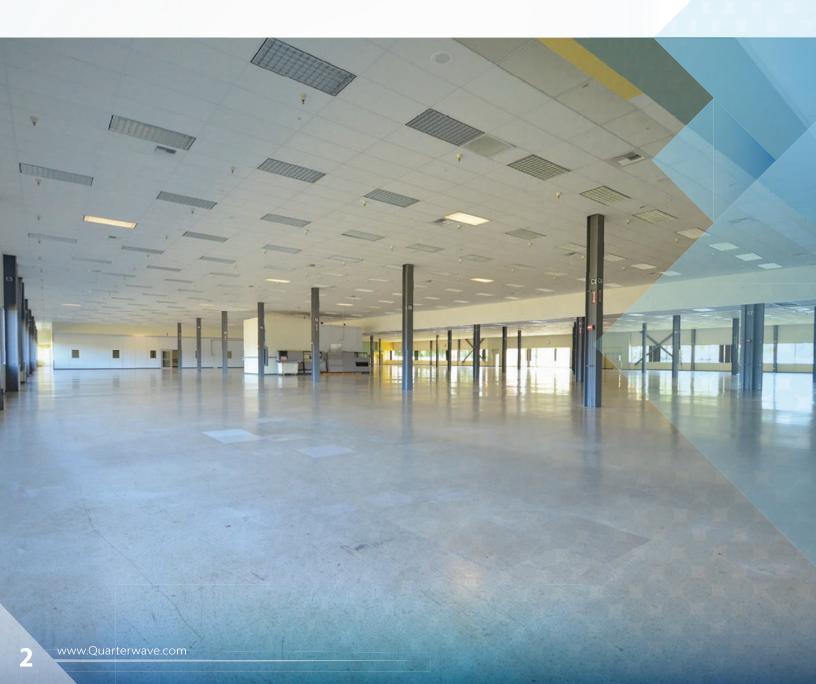
Our **Facility**

Quarterwave's production facility is located in a light industrial area shared by multiple larger local companies such as Keysight that all require high quality fabrication and assembly suites. Quarterwave's 12,000 square foot facility hosts specialized electronics labs, ideal for RF and electronics testing & development in addition to onsite manufacturing, engineering and repair.

Quarterwave teams its own state-of-the-art design engineering, assembly and microwave test facilities together with support from neighboring companies to shorten product development and manufacturing cycles. This neighborhood teamwork assures rapid response to unique customer specifications and demanding production schedules.



BOEING Test & Evaluation uses our amplifiers for their EMC testing and cross section ranges,



Mission & Commitment

Quarterwave seeks to receive the highest standing within the microwave industry. By promoting responsibility and trust within the company, employees are encouraged to contribute to an atmosphere of ingenuity, openness and enthusiasm within the workplace.

Quarterwave products are convenially known for excellence in both longevity and quality thanks to regorous and throrough testing by our trained engineers. In addition to the wide range of applications for which our products are used, Quarterwave is committed to find one-on-one custom, innovative solutions that meet individual requrests of every customer.

Quarterwave strives to establish itself as a leading company in TWTA manufacturing, promoting innovation, quality, responsibility and trust in every aspect of our work. Our success depends on your satisfaction.

"We strive to achieve the highest standing as a leading company in TWTA manufacturing by promoting innovation, quality, reponsibility and trust in every aspect of our work."



- ▶ Satellite Uplink
- Communications



- **EMC**
- ► Electronics and Materials Testing



- Ship & Aircraft
 Radar
- Range Measurement
- Jamming, Detection & Targeting



- ▶ Radar Ranges
- Detection
- Threat Simulation



- Detection
- ▶ Targeting
- ▶ Communications



- Cross Section
- Synthetic
 Aperture Radar
- Jamming



Today's Applications

Popular **Products**

















9108 Units are designed to fit most standard TWTs and the associated power supply in the smallest volume compatible with standard rack-mount hardware.

RF Specifications

Frequency	0.8-40 GHz*
Power Ripple	0.1 (db maximum)
Output Peak Power	40 W - 8 kW
Load VSWR	2:1 (maximum)
Output VSWR Protection	100%
Duty Cycle	0-100%*
Gain (for rated output)	24 dB - 64 dB*
Gain Stability	0.25 dB/24 hrs (typical)
Input Power (for rated output)	0 dBm (optional)
Spurious Output 0-250 Hz > 250 Hz	-55 dBc (minimum) -60 dBc (minimum)
Noise Figure	22 dB (typical)

RF Sampling

RF Output Pulse Video Sample	10 mv/kw into 50Ω
RF Output Power Sample	-40 dB
RF Interstage Power Sample	-20 dB
RF Input Power Sample	-20 dB

Modulation

Pulse Width	up to 100 μ
Repetition Rate	0-0.1 MHz
Rise and Fall Time	15 ns (maximum)
Droop	0.01 dB/us (maximum)
Video/RF Throughput Delay	300 ns (maximum)
Pulse Jitter	± 2 ns
Environmental	

Operating Temperature	0.1° to +50°C Derate to 10°C for 10,000 foot Operation
Storage Temperature	-30° to +60°C
Humidity	0 to 95% non-condensing
Altitude	0 to 10,000 feet above sea level

Electrical

Primary Input Power Mains	230±10/1φ/60Hz (option) 120±10/1φ/60Hz (standard)
Primary Power Consumption	400 W - 260 kW*
Elapsed Time Meter	00,000.00 hours
Modulation Input Pulse	+5v TTL
Digital Interface	Ethernet (LAN)/RS-232

* Specifications may vary, please contact for details

Mechanical

Front Panel

Standard RETMA 1/8" thick with slotted mounting holes

Dimensions: Front Panel Depth

Width: 19", Height: 8 3/4"

Chassis: 26" Overall: 28"

Finish: Front Panel Chassis

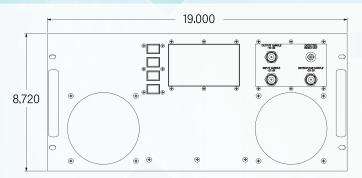
Anodize, Color Black Alodine, Color Gold

Weight

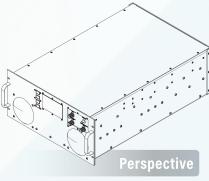
85 Pounds (Nominal)

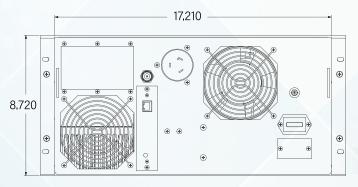
Cooling

Self Contained Forced Air

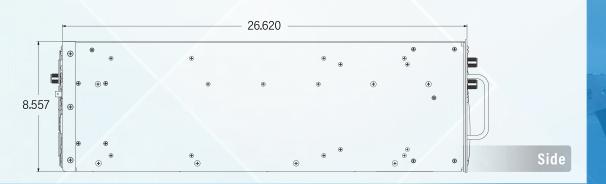








Back





9114 Units include separate enclosed volumes for teh TWT and power supply. This design supports solutions with higher power requirements than the 9108, allowing for installation of larger sized TWTs and independent airflow for colling the TWT and power supply.

RF Specifications

Frequency	0.8-40 GHz*
Power Ripple	0.1 (db maximum)
Output Peak Power	40 W - 21 kW
Load VSWR	2:1 (maximum)
Output VSWR Protection	100%
Duty Cycle	0-100%*
Gain (for rated output)	24 dB - 64 dB*
Gain Stability	0.25 dB/24 hrs (typical)
Input Power (for rated output)	0 dBm (optional)
Spurious Output 0-250 Hz > 250 Hz	-55 dBc (minimum) -60 dBc (minimum)
Noise Figure	22 dB (typical)

RF Sampling

RF Output Pulse Video Sample	10 mv/kw into 50Ω
RF Output Power Sample	-40 dB
RF Interstage Power Sample	-20 dB
RF Input Power Sample	-20 dB

Modulation

Pulse Width	up to 100 μ
Repetition Rate	0-0.1 MHz
Rise and Fall Time	15 ns (maximum)
Droop	0.01 dB/us (maximum)
Video/RF Throughput Delay	300 ns (maximum)
Pulse Jitter	± 2 ns

* Specifications may vary, please contact for details

Environmental

Operating Temperature	0.1° to +50°C Derate to 10°C for 10,000 foot Operation
Storage Temperature	-30° to +60°C
Humidity	0 to 95% non-condensing
Altitude	0 to 10,000 feet above sea level

Electrical

Primary Input Power Mains	230±10/1φ/60Hz (option) 120±10/1φ/60Hz (standard)
Primary Power Consumption	400 W - 260 kW*
Elapsed Time Meter	00,000.00 hours
Modulation Input Pulse	+5v TTL
Digital Interface	Ethernet (LAN)/RS-232

Mechanical

Front Panel	Standard RETMA 1/8" thick with slotted mounting holes
Dimensions: Front Panel Depth	Width: 19", Height: 14" Chassis: 26" Overall: 28"
Finish: Front Panel Chassis	Anodize, Color Black Alodine, Color Gold
Weight	85 Pounds (Nominal)
Cooling	Self Contained Forced Air

^{*} Specifications may vary, please contact for details





9117 units feature a larger separate enclosure than the 9114. The additional volume can house a variety of options such as an integrated RF Switch, Frequency Up-converter and more.

RF Specifications

Frequency	0.8-40 GHz*
Power Ripple	0.1 (db maximum)
Output Peak Power	40 W - 21 kW
Load VSWR	2:1 (maximum)
Output VSWR Protection	100%
Duty Cycle	0-100%*
Gain (for rated output)	24 dB - 64 dB*
Gain Stability	0.25 dB/24 hrs (typical)
Input Power (for rated output)	0 dBm (optional)
Spurious Output 0-250 Hz > 250 Hz	-55 dBc (minimum) -60 dBc (minimum)
Noise Figure	22 dB (typical)

RF Sampling

RF Output Pulse Video Sample	10 mv/kw into 50Ω	
RF Output Power Sample	-40 dB	
RF Interstage Power Sample	-20 dB	
RF Input Power Sample	-20 dB	

Modulation

Pulse Width	up to 100 μ		
Repetition Rate	0-0.1 MHz		
Rise and Fall Time	15 ns (maximum)		
Droop	0.01 dB/us (maximum)		
Video/RF Throughput Delay	300 ns (maximum)		
Pulse Jitter	± 2 ns		

* Specifications may vary, please contact for details

Environmental

Operating Temperature	0.1° to +50°C Derate to 10°C for 10,000 foot Operation
Storage Temperature	-30° to +60°C
Humidity	0 to 95% non-condensing
Altitude	0 to 10,000 feet above sea level

Electrical

Primary Input Power Mains	230±10/1φ/60Hz (option) 120±10/1φ/60Hz (standard)
Primary Power Consumption	400 W - 260 kW*
Elapsed Time Meter	00,000.00 hours
Modulation Input Pulse	+5v TTL
Digital Interface	Ethernet (LAN)/RS-232

Mechanical

Front Panel	Standard RETMA 1/8" thick with slotted mounting holes
Dimensions: Front Panel Depth	Width: 19", Height: 17 ½" Chassis: 26" Overall: 28"
Finish: Front Panel Chassis	Anodize, Color Black Alodine, Color Gold
Weight	85 Pounds (Nominal)
Cooling	Self Contained Forced Air

^{*} Specifications may vary, please contact for details





9121 units are Quarterwave's largest form-factor chassis, housing two separate power supplies for solutions requiring more power than a single TWT can provide. The TWTs and power-combining hardware are installed in a separate volume.

RF Specifications

Frequency	0.8-40 GHz*		
Power Ripple	0.1 (db maximum)		
Output Peak Power	80 W - 26 kW		
Load VSWR	2:1 (maximum)		
Output VSWR Protection	100%		
Duty Cycle	0-100%*		
Gain (for rated output)	24 dB - 64 dB*		
Gain Stability	0.25 dB/24 hrs (typical)		
Input Power (for rated output)	0 dBm (optional)		
Spurious Output 0-250 Hz > 250 Hz	-55 dBc (minimum) -60 dBc (minimum)		
Noise Figure	22 dB (typical)		

RF Sampling

RF Output Pulse Video Sample	10 mv/kw into 50Ω	
RF Output Power Sample	-40 dB	
RF Interstage Power Sample	-20 dB	
RF Input Power Sample	-20 dB	

Modulation

Pulse Width	up to 100 μ	
Repetition Rate	0-0.1 MHz	
Rise and Fall Time	15 ns (maximum)	
Droop	0.01 dB/us (maximum)	
Video/RF Throughput Delay	300 ns (maximum)	
Pulse Jitter	± 2 ns	

* Specifications may vary, please contact for details

Environmental

Operating Temperature	0.1° to +50°C Derate to 10°C for 10,000 foot Operation
Storage Temperature	-30° to +60°C
Humidity	0 to 95% non-condensing
Altitude	0 to 10,000 feet above sea level

Electrical

Primary Input Power Mains	230±10/1φ/60Hz (option) 120±10/1φ/60Hz (standard)
Primary Power Consumption	400 W - 260 kW*
Elapsed Time Meter	00,000.00 hours
Modulation Input Pulse	+5v TTL
Digital Interface	Ethernet (LAN)/RS-232

Mechanical

Front Panel	Standard RETMA 1/8" thick with slotted mounting holes
Dimensions: Front Panel Depth	Width: 19", Height: 21" Chassis: 26" Overall: 28"
Finish: Front Panel Chassis	Anodize, Color Black Alodine, Color Gold
Weight	85 Pounds (Nominal)
Cooling	Self Contained Forced Air

^{*} Specifications may vary, please contact for details





Quarterwave's first Traveling Wave Tube (TWT) Amplifiers were designed to meet the demanding requirements of radar cross-section measurement and simulation of target signatures that are essential to the development of advanced radar and stealth technology. Now, Quarterwave's TWT Amplifiers have become the industry standard for reliable, stable, low noise amplifiers required for radar parameter measurement and simulation of microwave signals for electronic warfare and training.

Since its founding, Quarterwave has focused on the development of microwave amplifiers that incorporate state-of-the-art performance that match the initial amplifiers with integral microprocessors. The company's TWTA line has expanded to include both CW and pulsed TWT amplifiers covering most of the microwave spectrum as well as versatile power conversion systems and test equipment for traveling wave tubes. All of Quarterwave's new TWTAs contain embedded microprocessors, which provide leading edge RF performance with high speed control that is addressable through standard industry communication protocols including ethernet.

Power & Frequency:

Quarterwave stocks TWTs and amplifiers with power levels ranging from 40 watts to 2 kilowatts and frequencies from 1 GHz to 18 GHz. Other standard Quarterwave TWT amplifiers are capable of power levels from 10 watts to 50 kilowatts and frequencies from 1.0 GHz to 95 GHz. Custom TWTAs and OEM TWTA modules are also available.

Commercial Off The Shelf (COTS):

Quarterwave manufactures a line of Commercial Off The Shelf (COTS) Traveling Wave Tube Amplifiers that range in power from 5 Watts CW to 50 kW pulsed. These TWT Amplifiers cover the frequency range from 1 GHz to 96 GHz. The CW amplifiers are typically in octave bandwidths; pulsed amplifiers cover multi-octave and narrow band frequency ranges.

Power Systems:

At Quarterwave, we understand that providing a gentle and protective environment for TWTs is essential to producing long lived TWT amplifiers. Quarterwave's power system technology is based upon patented power conversion circuits and fast fault detection circuits that limit the energy available to a TWT fault to less than a joule. Efficient air-cooling systems have been developed to keep the TWT operating temperature within the manufacturer's specified limits under worst case conditions. Quarterwave now includes these same features in OEM power supplies and test equipment for operating TWTs.

Model	Frequency Low	Frequency High	Duty cycle	Power dBm	Power Watts
9102/96002-E20F40	2	4	2.00%	60	1000
9102/96002-E20H80	2	8	2.00%	60	1000
9108/95300-E20H80	2	8	100.00%	53	200
9108/95300-E25J80	2.5	8	100.00%	53	200
9108/95300-H80J18	8	18	100.00%	53	200
9108/95325-C80D20	0.8	2	25.00%	53	200
9108/95335-C80D20	0.8	2	35.00%	53	200
9108/95335-E20F40	2	4	35.00%	53	200
9108/95335-E25H80	2.5	8	35.00%	53	200
9108/95335-I80J18	8	18	35.00%	53	200
9108/95350-E20H80	2	8	50.00%	53	200
9108/95350-E25H80	2.5	8	50.00%	53	200
9108/95350-H80J18	8	18	50.00%	53	200
9108/95395-E20H80	2	8	95.00%	53	200
9108/95395-H80J18	8	18	95.00%	53	200
9108/95300-E20H80	2	8	100.00%	53	200
9108/95300-H65J18	6.5	18	100.00%	53	200
9108/95300-H80J18	8	18	100.00%	53	200
9108/95600-G60I80	6	8	100.00%	56	400
9108/96000-E20F40	2	4	100.00%	60	1000
9108/96002-H80J18	8	18	2.00%	60	1000
9108/96004-C10D20	1	2	4.00%	60	1000
9108/96004-C70D20	0.7	2	4.00%	60	1000
9108/96004-E20F40	2	4	4.00%	60	1000
9108/96004-E20G40	2	4	4.00%	60	1000
9108/96004-E20H80	2	8	4.00%	60	1000
9108/96004-G40H80	4	8	4.00%	60	1000
9108/96004-H80J12	8	12	4.00%	60	1000
9108/96004-H80J18	8	18	4.00%	60	1000

Additional **Products** continued

	Model	Frequency Low	Frequency High	Duty cycle	Power dBm	Power Watts
	9108/96004-J12J18	12	18	4.00%	60	1000
	9108/96006-E20H80	1	8	6.00%	60	1000
i	9108/96006-E20H80	2	8	6.00%	60	1000
	9108/96006-G40H80	4	8	6.00%	60	1000
	9108/96006-G40I82	4	8.2	6.00%	60	1000
	9108/96006-H80J18	8	18	6.00%	60	1000
	9108/96006-I80J18	8	18	6.00%	60	1000
	9108/96008-J14J15	14	15	8.00%	60	1000
9	9108/96008-J14J18	14	18	8.00%	60	1000
	9108/96204-E20F40	2	4	4.00%	62	1600
Œ L	9108/96205-G50H11	5	11	5.00%	62	1600
	9108/96206-E20H80	2	8	6.00%	62	1600
	9108/96206-H65J18	6.5	18	6.00%	62	1600
Ī	9108/96206-H65J18-F	6.5	18	6.00%	62	1600
	9108/96206-H80J18	8	18	6.00%	62	1600
	9108/96206-J12J18	12	18	6.00%	62	1600
	9108/96206-J80J12	8	12	6.00%	62	1600
	9108/96208-H62I10	6.2	10	8.00%	62	1600
	9108/96208-H65I10	6.5	10	8.00%	62	1600
	9108/96208-H68I10	6.8	10	8.00%	62	1600
	9108/96301-J13J14	13	14	1.00%	63	2000
	9108/96306-E20H80	2	8	6.00%	63	2000
	9108/96306-E30H18	3	18	6.00%	63	2000
	9108/96306-E30H80	3	8	6.00%	63	2000
	9108/96306-H65J18	6.5	18	6.00%	63	2000
	CONTROL OF THE PARTY OF THE PAR					

Model	Frequency Low	Frequency High	Duty cycle	Power dBm	Power Watts
9108/96306-H80J18	8	18	6.00%	63	2000
9108/96306-I80J18	8	18	6.00%	63	2000
9108/96308-H60J80	6	8	8.00%	63	2000
9108/96308-J13J15	13	15	8.00%	63	2000
9108/96506-G40H80	4	8	6.00%	66	4000
9108/96602-C11D14	1.1	1.4	2.00%	66	4000
9108/96602-E20F40	2	4	2.00%	66	4000
9108/96606-E20H80	2	8	6.00%	66	4000
9108/96606-J12J18	12	18	6.00%	66	4000
9108/96610-X90X10	9	10	10.00%	66	4000
9108/96660-C10D20	1	2	60.00%	66	4000
9108/96660-E20F40	2	4	60.00%	66	4000
9108/96660-G40H80	4	8	60.00%	66	4000
9108/96660-H80J12	8	12	60.00%	66	4000
9108/96660-J12J18	12	18	60.00%	66	4000
9108/96803-E20E22	2	2.2	3.00%	66	4000
9114/96510-G40H80	4	8	10.00%	68	6400
9114/96602-D10D15	1	1.5	2.00%	66	4000
9114/96606-E20F40	2	4	6.00%	66	4000
9114/96606-H80J12	8	12	6.00%	66	4000
9114/96606-J12J18	12	18	6.00%	66	4000
9114/96706-G40H80	4	8	6.00%	67	5100
9117/96010-K34K36	34	36	10.00%	60	1000
9117/97006-E28F33	2.8	3.3	6.00%	70	10000
9121/96506-H80J18	8	18	6.00%	65	3200

Unit Options

Quarterwave offers additional options to support individual unit requirements. Below is a chart displaying current options.

Option Tag	Option Name	Description
Option RM	Rack Mounting	Allows the unit to be mounted in a standard EAL 19" rack cabinet, incorporating side mounted sides.
Option 400	400 Hz Operation	Provides for 400 Hz AC frequency operation.
Option 150	Output Isolator	Protects the TWT from varying load VSWR conditions. Insertion less of the isolator will lower the output power slightly (0.5 dB typically) from normal. Call the factory for configuration and dimensions (Isolator may be provided externally).
Option PP	Reflected Power Protection	Protects the TWT from high load VSWR and intended for use on ultra wide band or high power units for which isolators are not normally available. Consists of a coupler and detector that turns the WTA off when excessive reflected power is sensed. Typical insertion loss is 0.5 dB.
Option FPM	Forward Power Monitoring	Takes sample of RF output and converts sample to a power reading that can be read on Digital Display or PC Interface.
Option DD	Digital Display	A four line digital display allows the user to scroll through all the monitored conditions, forward and reflected power indication can be simultaneously displayed. In addition, the display provides the user with the cumulative total hours of high voltage operation.
Option RAF	Airflow Direction	Depending where the cool air is - behind or in front of unit - the airflow can be adjusted to take the cool air and push it through the unit.
Option LC	Liquid Cooling	Provides cooling for when there is no cold air near the unit. There is typically less noise in keeping the unit cool. Internally, unit will be more organized.
Option RPH	Remote Power Head	The traveling wave tube is mounted in a remote weatherproof enclosure. All power supply and control circuits are housed in the 9100 Series rack mount chassis. The traveling wave tube and modulator circuits as well as the built in forced air cooling are in a housing measuring 24x8x10 inches. Fiber optic as well as high and low voltage cables connect the two assemblies. These cables have been made as long as 100 feet.
Option RV	Rugged - Vibration	Typically done as an option for an airborne unit, numerous upgrades are done internally to the unit(s) to help prevent damage from excessive vibration from external conditions.
Option HH / HA (separate)	High Humidity / High Altitude	For high humidity and high altitude conditions, adjusting fan limits and conformally coating the boards and components will help your unit perform in these conditions.
Option IPM	Input Power Monitoring	Takes a sample of Input power and converts that sample to a power reading that can be read on the Digital Display or PC Interface

Custom Orders

Custom TWTAs and OEM TWTA modules are considered on an individual basis. Quarterwave's popular TWTA units are categorized by Octave Bandwidth Power Levels. Within each category, Narrow Bandwidth amplifiers generally deliver more RF power and Wide Bandwidth amplifiers general deliver less power. Frequency coverage is dependent on each power level.

Distictive Features:

Reliable Operation

Value Engineered

20 Watts - 50,000 Watts

Versatile Modulation

Low AM & PM Noise

Standard RS232 Interface or Ethernet

.5 - 100 GHz Frequency

Pulsed and CW Operated

Extended RF Performance

Flexible, Expandable

Sales

Lead Time

Lead time for Quarterwave Amplifiers heavily depends on TWT manufacturers. Typically lead time ranges between 4-8 months. In some cases, a loan or leased unit can be provided to address customer needs in addition to off-the-shelf solutions for immediate use.

Remote Control

Quarterwave Amplifiers can be operated from a PC or through serial commands. Quarterwave supports a range of protocols including Ethernet, RS-232 serial, and more.

Our amplifiers support provided control software as well as NAPI or commands for integration for existing software systems.

Export Capability

Many of our products are available worldwide. We follow ITAR regulations for specific frequency bands and power levels. In addition, our team of expert engineers may work with customers' unique needs to fulfill ITAR compliance for export.

Warranties & Repair

Quarterwave's customer care team is available to work with customers through every situation. All Quarterwave TWTAs are backed by an unconditional 12 month warranty that includes initial training, documentation and continued online or on-site support, as required to assure smooth installation and long term customer satisfaction.

Service and Support

We have been building and supporting units for over 30 years.

Rapid repair and turnaround for RMA with optional 24 hour service. Most repairs completed within 48 hours.

Experienced in remote diagnostics and field repair with onsite technicians.

Field replaceable components for minimal downtime.

Currently supporting customers in North America, Asia and Europe.

Warranties

All TWTAs include a full-coverage 12-month warranty.

Customer support offers on-site and online training for Quarterwave units, documentation and continued repair work for long term customer satisfaction.

Quarterwave is accustomed to rapid response repair work to meet our customers demanding production schedules.

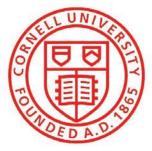
Quarterwave Customers











































A select few of Quarterwave Corporation customers.



Contact Us



Quarterwave Corporation 1500 Valley House Dr. #100 Rohnert Park, CA 94928, USA



T. 1 (707) 793-9245

F. 1 (707) 7939245

Sales@quarterwave.com



www.Quarterwave.com