RF, Microwave and Millimeter Wave Integrated Assemblies
While renowned in the industry since 1991 for our passive and active components, and sub-systems, Renaissance has been providing higher order assemblies to fulfill custom application needs in the Military and Commercial market place. Renaissance and its subsidiary, HXI, have provided unique solutions for applications ranging from 70 MHz through 110 GHz. Our success has been in aligning with the customer’s goals and supporting them with highest quality products and delivering in a timely manner to meet cost and schedule.

Renaissance/HXI are both AS9100 quality standard certified companies and are equipped to handle engineering prototypes to volume production of reliable high performance products. We continually live up to the industry quality standards of reliability that exemplify the Renaissance/HXI name. Our products are used in communication links between the ground and airborne units that share data at a much higher speed and clarity. We have products designed and used in battlefield radars that can accurately determine the location and speed of a target. We have products that are widely used on Missiles for wireless guidance towards the target and elimination using pin point accuracy. In the recent past, we have successfully designed products for Space applications that enable efficient data links between satellite and ground stations.

We are also capable of partnering and manufacturing build-to-print integrated products and assemblies assuring affordable customization.

We have an excellent reputation in the industry as component suppliers, and by using mostly components in the integrated assemblies, Renaissance/HXI are cost competitive and pass the savings to our customers. We have the people, technology, equipment, and quality standards to be of full service to your custom needs. So, when you think of integrated assemblies, THINK OF RENAISSANCE/HXI.
About REC/HXI

Renaissance/HXI is a turnkey solution provider of highest quality RF, Microwave and Millimeter Wave components and sub-systems.

Design and Technical Capabilities

We provide optimized cost and performance solutions for all RF, Microwave and Millimeter Wave based components, sub-assemblies, integrated assemblies, and sub-systems. We offer design and engineering capabilities and solutions for integrated RF, Microwave and Millimeter Wave hybrid modules and sub-assemblies employing SMT or chip and wire assembly techniques plus an expanded line of best-in-class high quality and high performance mixed-signal sub-system products.

Engineering and Product Development

Our engineering and product development teams convert concepts to working solutions. From MEMS based SPDT for ATE application to Millimeter Wave Radar Front Ends for surveillance applications, the Renaissance/HXI design teams can help provide solutions for all levels of integration. Our products are used on the majority of military programs.

Focused Market Applications

The focused markets are Military Radar, Communications and Surveillance. Renaissance/HXI prides itself in saying that our products are on platforms like the PAC-3, THAAD, Patriot, TOW, GBR, JLENS, SLAMRAAM, UEWR, CLAWS, Space Fence and many more. Renaissance/HXI has been the preferred supplier for many years and has a good quality record thanks to you and your support. Being in constant and clear communication with the customer, Renaissance/HXI has demonstrated customer support in meeting challenging schedules on complex products. We have been chosen to work on upgrades and next generation Radars and Missiles due to continued innovation and higher standards of quality.

Applications Engineering Support

We have design teams with expertise in the area of RF, Microwave and Millimeter Wave devices, circuit design, Electronics Engineering and Mechanical Design. We have the necessary software tools required to verify EM interactions and to mechanically package the concept using SolidWorks. For small scale production, we utilize prototyping PCB and metal milling machines that aid in quick concept verification and validation.

Facilities

World Class design and manufacturing facilities located in Harvard, MA. The town is located 25 miles west-northwest of Boston, in eastern Massachusetts.

Manufacturing Capabilities

The combined manufacturing expertise includes assembly and test work centers supported by fully loaded tool kits and fixtures along with required RF characterization equipment. We cover all topologies including surface mount (wire bond), drop-in, coaxial and waveguide assemblies and sub-assemblies.

Test Capabilities

Our test work centers include PNAS, VNAAs, Spectrum Analyzers, IM test sets, High Power Test Sets, Temperature chambers and Thermal Shock chambers.

Quality Assurance

AS9100 certification with a security cleared facility.
RF to Millimeter Wave Sub-System Solutions

Renaissance/HXI supplies Millimeter Wave sub-systems and custom-designed components to support military and commercial systems worldwide. Sub-systems include transceivers for UAV and helicopter landing systems, surveillance receivers, active sensors for medical research and specialized communication links for a wide range of applications. Custom components include variations of many of our catalog products, such as LNAs, power amplifiers and power combiners, frequency multipliers, mixers, switches and isolators.

Variants of existing catalog components are quickly produced and new sub-assembly requirements are addressed comprehensively by the appropriate set of component hardware and system engineers to arrive at the optimum design configuration. A working knowledge of radar and communications systems allows Renaissance/HXI to understand and address the affects of complex problems and subtle component performance and interaction issues. Our broad experience allows us to assume system integration tasks where appropriate, freeing our customers resources for other aspects of product development. The use of SolidWorks as our primary mechanical design tool provides a smooth transition when inserting our products into our customers systems.

**Integrated Switch 18A1NAI**

Renaissance/HXI’s new 18A1NAI switch matrix is designed for applications that require reverse low level signals to interfere with forward high power going through the through paths. The through path can be stepped in intervals of 1.0 dB up to 120 dB. Various models for different frequency bands are designed with high isolation and directivity. The components are designed for highest performance and reliability. The matrices are 1U in height in a standard 19” rack.

**35 GHz Integrated Transceiver**

Renaissance/HXI produces two highly integrated transceivers to support the ground-based and flight units for a UAV landing system application. The program has been in production for 10+ years using our parts, and is now used on 3 different UAV platforms. The ground-based unit integrates 17 individual Millimeter Wave and IF circuit functions, including one 3.5W Ka-band power amplifier and a SP4T non-reflective switch matrix.

**60 GHz Integrated Receiver**

The integrated receiver to the left has been used in our Gigalink radios. The receiver is based on individual circuit functions which are also available from our standard component catalog. The receiver design provided us with a reduced size and parts count, two common objectives of integration efforts.
RF to Millimeter Wave Sub-System Solutions

FMCW Front Ends
Renaissance/HXI has produced a number of FMCW radar front ends, with applications ranging from simple obstacle detection through highly sophisticated, high resolution coherent radar for contraband detection. At left is shown a receiver which sweeps from 70 to 77 GHz with the use of a Renaissance/HXI closed-loop linearized VCO with 0.01% linearity, providing about 2 cm target resolution. The radar can also accommodate multiple transmitters and receivers, providing another element of image optimization.

77 GHz Pulsed Radar Prototype for Intelligent Cruise Control Applications
The forward looking radar (FLR) prototype to the left was developed by Renaissance/HXI within a few months and was used by a French car manufacturer as a prototype for a new Intelligent Cruise Control. The prototype used mostly standard catalog components along with a microstrip patch antenna to provide a unit that was mounted in the front of a test vehicle to collect data in preparation of the design of a production unit.

94 GHz Pulsed Radar Prototype
Using our vast library of standard and custom-designed components, we can quickly build prototype front ends for system performance verification. Later, we can optimize parameters and integrate the front end for production. The plate-mounted transceiver assembly to the left was designed and integrated within a few months and actually served as an initial flight unit for a helicopter landing radar. The transceiver was later integrated for a pre-production unit and the size was reduced by a factor of 5.

94 GHz Sub-System for Medical Research
This custom-designed sub-system consisted of many active and passive components at 94, 60 and 35 GHz. The sub-system includes two 94 GHz LNAs and four 94 GHz power amplifiers, as well as a wideband VCO at 60 GHz with extremely fine mechanical tuning control. The sub-system also features interchangeable hardware to support 16 different test configurations.

80 to 100 GHz Receiver Prototype
Recently, Renaissance/HXI produced a number of integrated receivers for use in surveillance activities. In addition to a normal down conversion function, the receivers also offer an optional radiometric mode for higher sensitivity. Frequency coverage and bandwidths were selected based on available semiconductor devices, which were obtained from a wide variety of sources, including commercial foundries, research labs and universities.
Base Station Solutions

Fully Integrated Assemblies
- Transceivers and Repeaters: Miniature high performance Tx and Rx modules from 100 MHz to 6 GHz. Microcell/Picocell base stations and RF repeaters for WiMAX and LTE applications.
- DAS Solutions – Components and custom assemblies, embedded antenna arrays for Bluetooth, WiFi, ZigBee, etc., applications.
- Switch Matrices – Covering UHF up to Ka-band, reciprocal and non-reciprocal, blocking/non-blocking and with the reliability to sustain ground or air transport operating conditions.
- MEMS: From SPST, SPDT to 8 x 8 MEMS based matrix to meet reliability and size constraints for battlefield communications, wireless networks and ATE systems and platforms.
- Receiver Multi-Couplers: LNA with n-port division to provide unity gain with ultra low noise figure for satellite communication system applications.

Switch Product Group
Renaissance/HXI has successfully designed a DC-18 GHz RF Switching Matrix Unit. This unit will direct RF and Microwave frequency signals from general and special purpose test equipment to the system under test (SUT) as well as RF and Microwave signals from the SUT to the test equipment. In general, the unit is used as an input/output switching matrix for RF transmitted/received signals. Additionally, it provides the capability to monitor its switches operational status continuously by the ATE controller. This matrix consists of terminated electro-mechanical switches, programmable attenuators, couplers, circulators and power dividers to synthesize the RF signals. The layout and choice of components were optimized to achieve lower loss (<4 dB) and highest isolation (>90 dB). The VSWR on all ports were better than 1.5:1. The unit is fully controlled by a GPIB interface and has a built-in initialization and check routine. The matrix is 7U in height, 22” deep and mounts on a standard 19” rack. It weighs about 30 lbs. and has telescopic rails that help in servicing the inside without dismounting from the rack.

Switch/Combiner, 4 Port DC 4 GHz, TTL
Need an integrated switch with combiner to do modulated signal testing on your new radios/amplifiers? Renaissance/HXI’s new 10A4BV combines and then switches two RF ports with over 120 dB isolation and can handle up to 2W CW on each port.

48 x 4 Switch Matrix - 18A6BAB
Renaissance/HXI’s System Group has designed a dual 48 x 4 switch matrix for ATE applications that can cover from 700 MHz (LTE) to 6 GHz (Wi-Fi) frequencies. Using high reliability solid state switches, the switching speed is on the order of nanoseconds helping test handsets and other portable communication devices with minimum delay time. The switch layout and mechanical integrity is to provide more than 60 dB channel to channel isolation for accurate measurements. If you would like more information please contact sales at 978-772-7774, sales@rec-usa.com or visit www.rec-usa.com.
Integrated/Multi-Function Assemblies

60/70/80 GHz Radio Links
Renaissance/HXI has released E-Band Dual Band, Dual Capacity radio models that carry two independent GigE channels for a total throughput of 2.5 Gbps. The model HLS8654 (24” antenna) and HLS8454 (12” antenna) radio links contain many of the same features that our other E-Band radios have:

- Extremely low latency (2 nS per terminal)
- High transmit power (+23 dBm) for long range
- Web-based management and RSSI monitoring
- Clip-on antennas for ease of installation

In addition to the two dual capacity models, this product development has spun off four other radio models to add to our baseline 71-76 GHz radios:

- HLS8652 Dual band (71-76/81-86 GHz) radio link, 24” antenna, 1.25 Gbps
- HLS8452 Dual band (71-76/81-86 GHz) radio link, 12” antenna, 1.25 Gbps
- HLS8651 81-86 GHz radio link, 24” antenna, 1.25 Gbps
- HLS8451 81-86 GHz radio link, 12” antenna, 1.25 Gbps

Multi-Band Combiner
Renaissance/HXI has designed a multi-band combiner for GSM 800/900/1800/1900 & UMTS schemes. This is ideal for in-building distributed antenna systems where different operators require simultaneous coverage without interference.

ADC/DAC Switch Matrix
Renaissance/HXI has released a new DC to 500 MHz Switch Matrix with two inputs and six outputs. The 18A1NA will support the high level of integration required during qualification testing for digital and analog assemblies operating at microwave frequencies. In addition, the separate analog and digital USB control ports, combined with software, allows for the development of a complete Automatic Test Program (ATP) to verify and measure all possible paths.

RSMH Hermetic Series Switches Laser Welded, No Epoxy
Renaissance/HXI RSMH series of switches offer the same dependability of our standard design in a truly Hermetic Laser Welded package. All seals are glass to metal or metal to metal, NO EPOXY used on these switches. These SPDT switches are sealed in a dry environment and will operate at -55° to +85°C in the most severe conditions. The RSMH series of switches are available in break before make, latching or failsafe configurations. They also offer low insertion loss, minimal VSWR and high isolation.

Tri-Band Attenuator for DAS
Renaissance/HXI’s universal interface panels will provide on-site adjustment of various receive and transmit links to ensure equalized signal strengths thereby reducing interference noise.
Other Renaissance/HXI Products include:

- Ferrite Isolators and Circulators
- Power Dividers and Combiners
- Electro-Mechanical Switches
- Low Noise and Power Amplifiers
- Mixers, Upconverters and Detectors
- Frequency Multipliers
- PIN Diode-Based Switches and Attenuators
- Gunn Oscillators and VCOs
- 60 GHz and E-Band Radio Links (Gigalink)
- Wireless transmission of HD-SDI HDTV