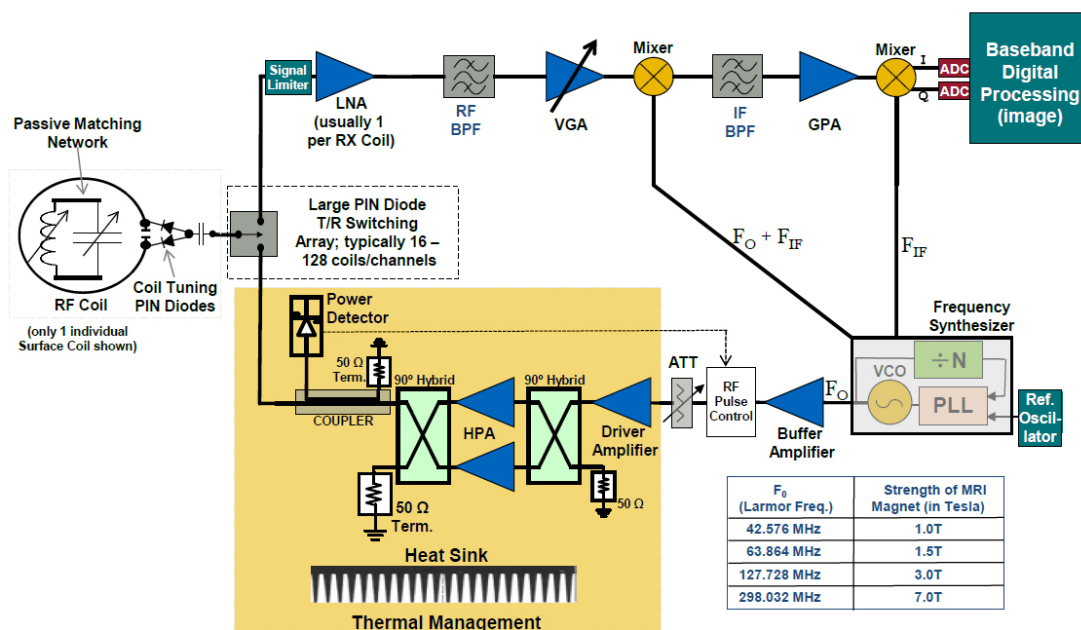


## The RF Sections of the Overall MRI System

The **MRI Receiver/Detector Section** starts with the tuned RF Coil receiving the signal released from the previously excited H-1 atoms, and then that signal is amplified by a Low Noise Amplifier (LNA). The LNA is typically placed very close to the RF Coil, and is usually a specially designed **non-magnetic** component (allowing it to be placed well within the strong magnetic field, adjacent to the RF coil). Indeed any RF cables, RF connectors, tuning diodes, capacitors, or inductors located in/near the RF coil are typically **non-magnetic** (i.e. non-ferrous) components. The signal is filtered and amplified once more before being down-converted by the first mixer to an intermediate frequency (IF). This IF signal is then filtered and amplified one more time before being down-converted by the second stage mixer into 2 quadrature baseband received channels (I and Q). I and Q are finally converted to digital signals by the A-to-D Converter (ADC) and processed by the sophisticated MRI System Computer, to produce the final images.

### MRI RF Sections



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The **MRI Transmitter Section** starts with a Reference Oscillator and Frequency Synthesizer used to produce a perfect RF Sine-wave signal, at the F<sub>0</sub> frequency. This RF signal is initially buffered and then very carefully shaped into a pulse of RF Energy (still at a fairly low power level). This pulse is amplified by the very high-gain Power Amplifier stages to become the high-power pulse (sometimes almost 2kW peak) needed to inject energy to the magnetic resonant H-1 atoms under target, causing them to “flip” to a new axis of rotation, along the same axis that the RF Pulse travels. It is important to detect and regulate the shape and the power level of the pulsed transmit signal.

Other important parts of the circuit include the PIN Diode switching array (which switches the RF Coils on and off, from transmit to receive and back again) and the Thermal Management hardware which safely dissipates excess heat generated by the high-power sections of the transmitter.

Contact your local sales representative or learn more about Richardson RFPD online at [www.richardsonrfpd.com](http://www.richardsonrfpd.com).

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## The RF Sections of the Overall MRI System (cont.)

### Electronic Components Needed for RF Section of MRI System

Richardson RFPD can provide just about any component designed into the radio frequency (RF) section of any MRI system or sub-system. We offer both commercial-grade and high-reliability parts. We maintain a complete line of discrete (diodes, transistors, etc.) and integrated (power amplifiers, digital attenuators, etc.) RF semiconductors for MRI systems, as well as the necessary passive RF components (tuning capacitors, tuning inductors, cables, connectors, fixed RF capacitors, couplers, combiners, splitters, gaskets, filters, resistors, etc.).

### MRI Coil-LNA-Diode RF Components (Non-Magnetic)

Equally important are the specialized non-magnetic components required for use near the main MRI magnetic field. Richardson RFPD can help you design-in these important components:

Non-Magnetic PIN Diodes (M/A-COM, Microsemi)

Non-Magnetic LNAs (WanTcom Inc., Richardson RFPD)

Non-Magnetic Connectors (Emerson Network Power, Radiall, Huber+Suhner)

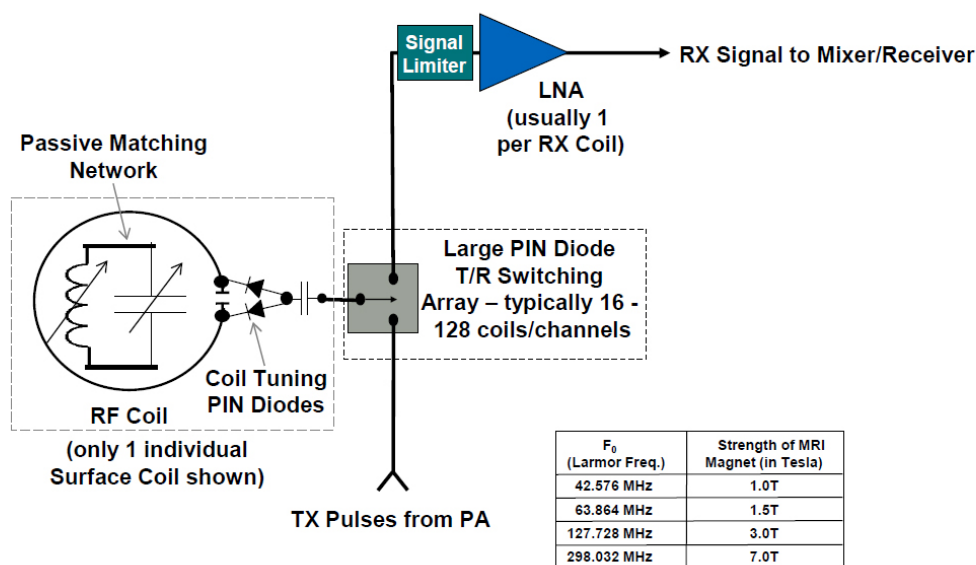
Non-Magnetic Cables (Gore, Huber+Suhner)

Non-Magnetic Tuning Inductors (Johanson Manufacturing)

Non-Magnetic Tuning Capacitors (Johanson Manufacturing)

Non-Magnetic RF Capacitors (American Technical Ceramics – ATC)

## MRI RF-Coil, LNA, and Diode Section



[Non-Magnetic](#) components are often specified for this section of the overall MRI System.

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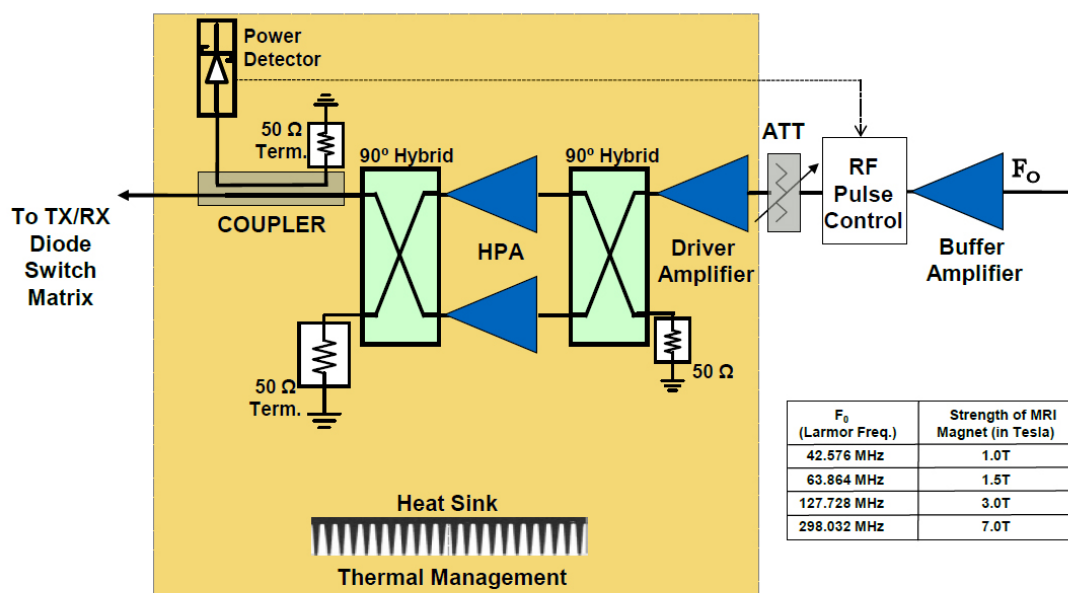
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## The RF Sections of the Overall MRI System (cont.)

### MRI Power Amplifier Components (Power Transistors, etc.)

Richardson RFPD also truly specializes in helping you design-in the best component alternatives in the RF Power Amplifier section of the overall MRI system design. We feature complete RF Power Amplifiers as well as discrete RF Power Transistors (many from Freescale™ Semiconductor, M/A-COM, Microsemi, and ST Microelectronics), RF capacitors from ATC (American Technical Ceramics), variable capacitors/inductors from Johanson Manufacturing, digitally-controlled attenuators (M/A-COM, Peregrine, and TriQuint) and other needed RF components (terminations, attenuators, splitters/combiners, couplers, etc.) from Anaren, ATC, Johanson, M/A-COM, and TriQuint.

### MRI RF Power Amplifier Section



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