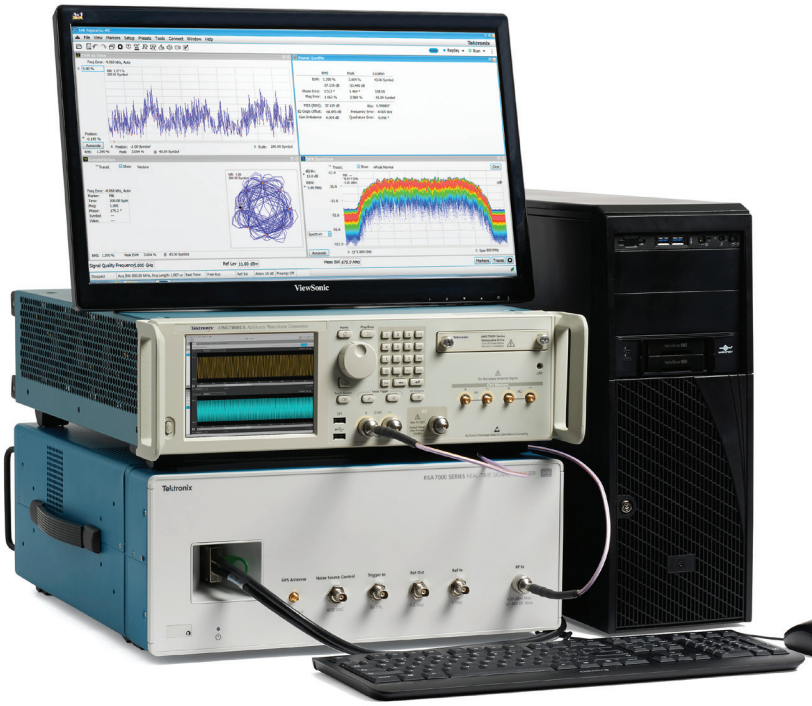
Tektronix®

Reduce Design Risk with High–Performance COTS EW/Radar Receivers

You are tasked with designing a test system for electronic warfare (EW) or radar production test, test and evaluation, or field maintenance. The requirement is to process in real time the output of a line-replaceable unit (LRU)/transmitter to quickly process the received information and feed it back to the system under test. This is often referred to as a hardware-in-the-loop (HIL) test system.

You've sketched out a basic system architecture, and now you have some decisions to make. What subsystem should use commercial off-the-shelf (COTS) equipment? Should you commission a custom design and issue a request for information (RFI)? Can you reuse any existing subsystems from previous projects, or should you design your own?

Most of your choices come with a certain level of risk in terms of delivery time, quality, durability and long-term support. You maybe be working on a very large program and you don't want to add risk to an already technically challenging and time-critical set of milestones. It may be a small program with limited resources and you need to look at how you can take design risk out of the schedule. With COTS equipment you can reduce design, schedule, and cost risks.



Customization or COTS

The industry has been trending more and more towards a COTS path for subsystems, and this has helped to reduce cost and drive down risk from heavy customization work (See Figure 1).

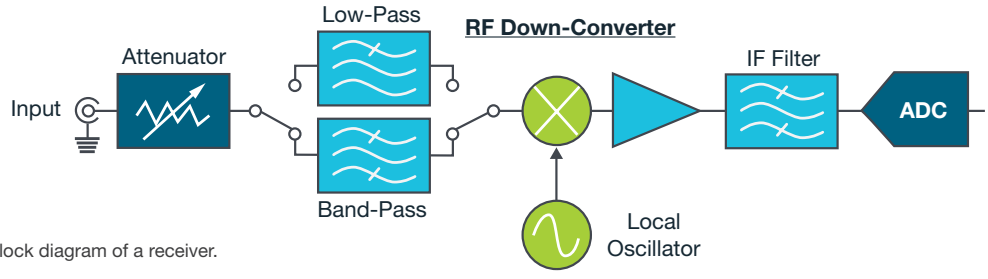


Figure 1: Typical block diagram of a receiver.

There is a lot of work involved when designing your own receiver. If you elect to buy a COTS synthesizer for the LO, you still need to select connectorized components for switching, attenuators, and amplifiers, then buy or commission filter designs and use a digitizer or oscilloscope to convert the analog signal to digital for further processing. Then, digitally you will need to implement filtering and maybe an IQ demodulator, plus design the signal path control logic and develop calibration for the receiver so it stays stable over temperature. This can take a significant amount of time and resources.

Integrated COTS Receiver Enables Real–Time Digital Signal Processing

Alternatively, you can purchase a COTS microwave receiver such as the Tektronix RSA7100A. Tektronix has integrated all the subsystems together, developed digital filtering and IQ demodulation, tested and calibrated the receiver over temperature, and guarantees performance to a published specification. The RSA7100A is a complete microwave downconverter, with signal conditioning and digital IQ demodulation. It has a frequency range of 26.5 GHz and a maximum receiver bandwidth of 800 MHz and outputs IQ data through multiple interfaces using Tektronix IQFlow™ technology.

IQFlow provides IQ streaming for the RSA7100A as it passes the down-converted baseband IQ signals to external equipment for either additional processing or storage (Figure 2). IQFlow includes options for simultaneous streaming to interfaces such as custom API, 40 GbE, and RAID. This makes it possible to perform real-time digital signal processing (DSP) and support hardware-in-the-loop (HIL) testing for radar and EW systems.

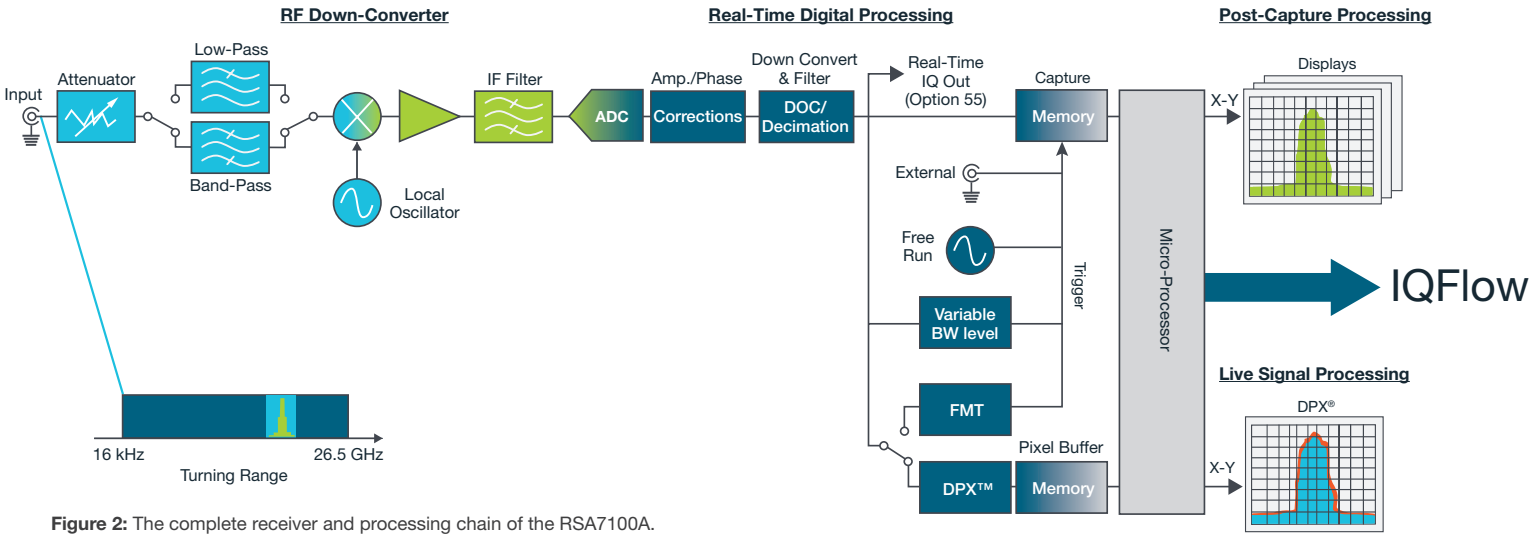


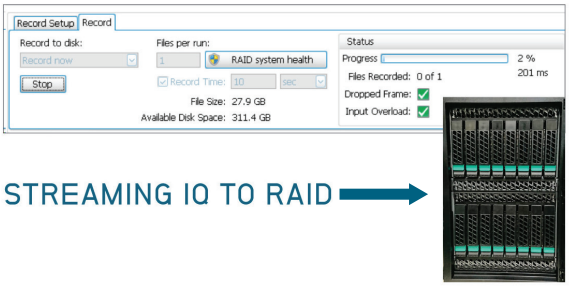
Figure 2: The complete receiver and processing chain of the RSA7100A.

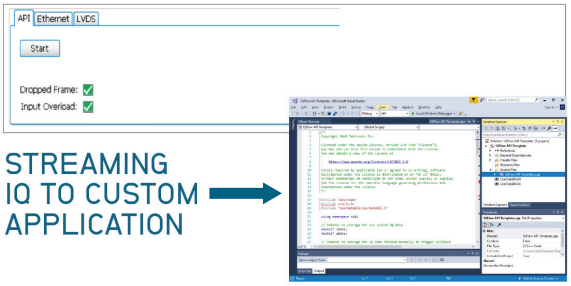
KEY SPECIFICATIONS

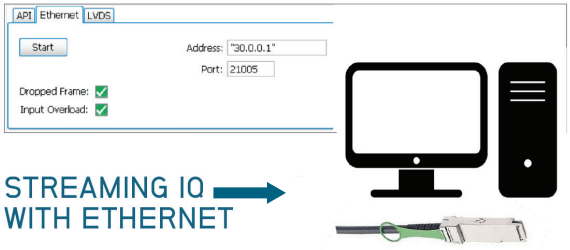
Frequency Range	16 kHz – 26.5 GHz
Receiver BW	800 MHz
POI	0.419 µs
SFDR	<-80 dBc to 3.6 GHz <-65 dBc to 26.5 GHz
Phase Noise @1 GHz, 10 kHz	-134 dBc/Hz

THE SAMPLING RATE AND BITS DEPEND ON THE ACQUISITION BANDWIDTH

Acquisition bandwidth	Sample rate (for I and Q)	Significant bits (I and Q each)
800 MHz	1,000 MS/s	12
320 MHz	500 MS/s	12
160 MHz	250 MS/s	13
100 MHz	150 MS/s	13
50 MHz	75 MS/s	13
40 MHz	62.5 MS/s	14
20 MHz	31.25 MS/s	15
10 MHz	15.625 MS/s	15







Simplify to Remove Risk and Save

Streamline your EW/Radar test system design when developing your next hardware-in-the-loop system. The Tektronix RSA7100A provides a complete calibrated receiver system across all frequencies from 16 kHz to 26.5 GHz, with a maximum receiver bandwidth of 800 MHz. With IQFlow you can access the receiver's API directly, or stream high-fidelity IQ data across 40 GbE for post processing.

To learn more about reducing your risk, contact your local sales person or visit:

www.tek.com/spectrum-analyzer/rsa7100a

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