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◆ Design Drivers

- Small targets at 5 meters distance : Good system detection sensitivity
- Precision Ranging capability : MUST have large radiated bandwidth
- Wideband FCC frequency allocations demand very low transmitter power
- Low transmit power + good system sensitivity means
  - » Sensitive receiver required
  - » Efficient waveform for detection is necessary

◆ Waveform

- Continuous Wave radiation modulated in phase by a high speed pseudo noise code
- Phase modulation is binary phase shift key (BPSK)
- Code modulated continuous wave provides efficient waveform and good range precision

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◆ Range Bin Definition

  – As a target range (time delay) varies slightly about the time (range) delay imparted to the receive code, the receiver output (voltage) varies to less than maximum. The range response of the system for a fixed return signal power is as follows

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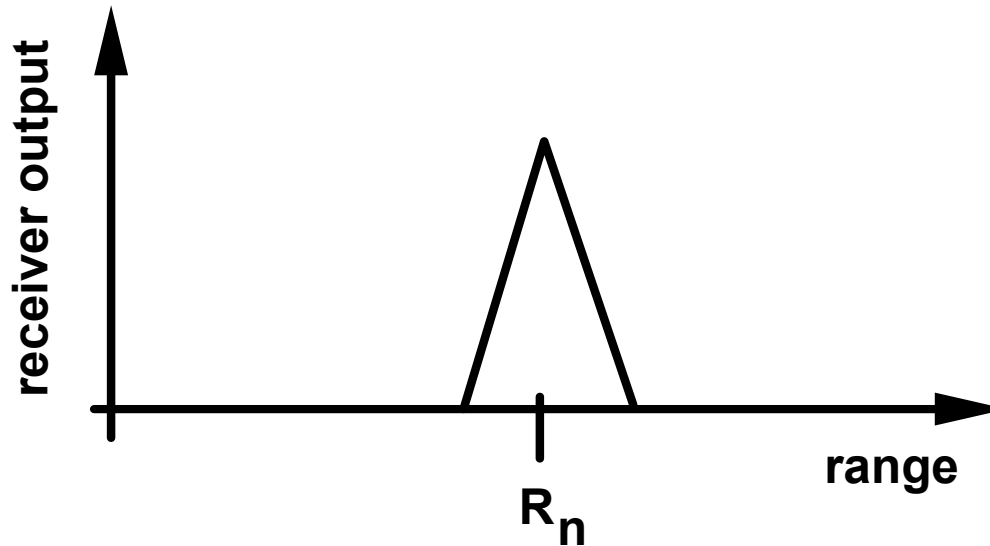
- **The POSITION of the range bin in space is determined by the time delay of the receive code**
  - The entire range is covered by scanning the single range bin in range
  - Scanning is accomplished by adjusting the time delay value of the receive code

- **The WIDTH of the range bin (depth of bin in space) is determined by the <u>period</u> of one bit of the pseudo noise code sequence**
  - high speed code clocks = thin range bins

◆ Achieving Receiver Sensitivity

– Direct detection of the LO signal which comes out of the receive phase modulator cannot provide adequate receiver sensitivity

– The transmit LO signal is further modulated by a *data* stream to provide an AC signal after down conversion for detection.

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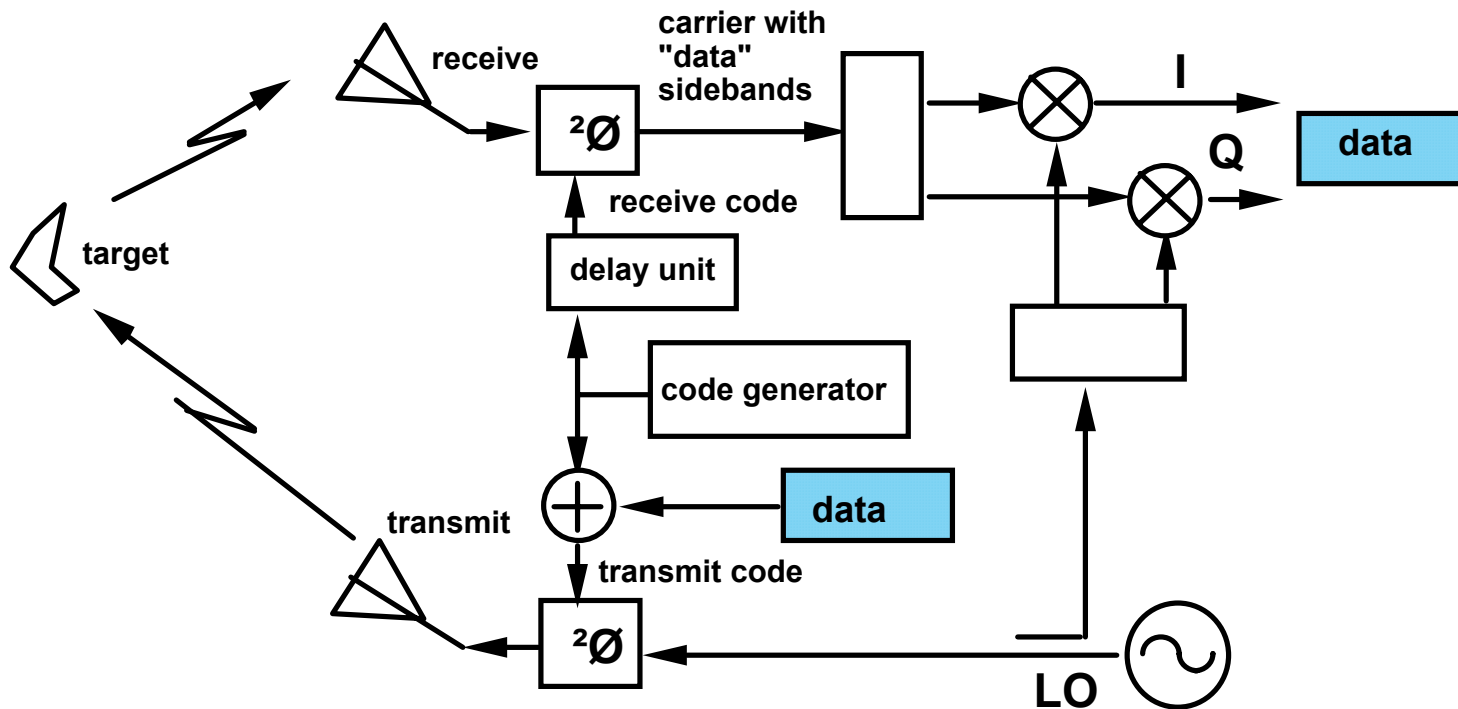
◆ Diagnostics

– There is an "End to End" diagnostic function implemented, which gives very high coverage of detecting failures

– This feature is accomplished by positioning the system range bin such that it contains the transmit and receive antennas.

– Direct coupling between antennas provides a reliable signal injection into the receiver

range bin positioned over antennas with the proper delay value

receive

LO with "data" sidebands

I

²Ø

Q

data

receive code

direct coupling provides Diagnostic signal

delay unit

code generator

transmit

data

transmit code

²Ø

LO