PROPAGATION TIME / RESOLUTION

1. ROUND TRIP RANGE: $R = \frac{ct}{2}$ with t = time to reach target

Rules of Thumb

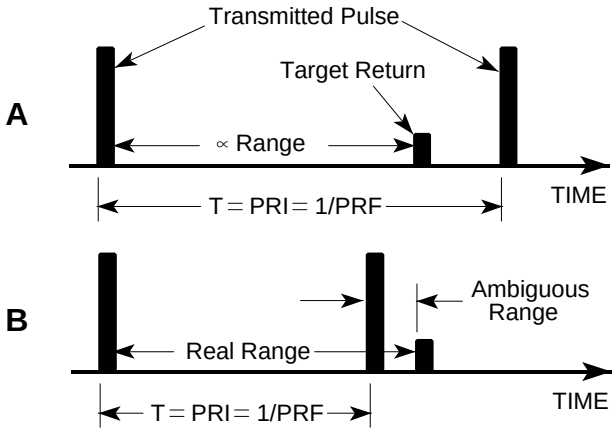
In one μsec round trip time, a wave travels to and from an object at a distance of:	The time it takes to travel to and from an object at a distance of:
≅ 150 m	1 m ≅ 0.0067 µsec
≅ 164 yd	1 yd ≃ 0.006 µsec
≅ 500 ft	1 ft ≃ 0.002 µsec
≃ 0.08 NM	1 NM ≃ 12.35 µsec
≅ 0.15 km	1 km ≅ 6.7 µsec

2. ONE WAY RANGE: $\boldsymbol{R = ct}$ with t = time to reach target

Time	Distance Traveled	Distance	Time it Takes
1 milli sec (ms)	165 NM	1 NM	6.18 µsec
1 micro sec (µs)	1000 ft	1 km	3.3 µsec
1 nano sec (ns)	1 ft	1 ft	1 nsec

3. UNAMBIGUOUS RANGE (DISTANCE BETWEEN PULSES): $R = \frac{c \cdot PRI}{2}$

Normally a radar measures "distance" to the target by measuring time from the last transmitted pulse. If the inter-pulse period (T) is long enough that isn't a problem as shown in "A" to the right. When the period is shortened, the time to the last previous pulse is shorter than the actual time it took, giving a false (ambiguous) shorter range (figure "B").



Rules of Thumb

$R_{NM} \cong 81P_{ms}$

$R_{Km} \cong 150P_{ms}$

Where P_{ms} is PRI in milliseconds

4. RANGE RESOLUTION

Rules of Thumb

500 ft per microsecond of pulse width

500 MHz IF bandwidth provides 1 ft of resolution.

5. BEST CASE PERFORMANCE:

The atmosphere limits the accuracy to 0.1 ft

The natural limit for resolution is one RF cycle.