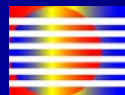# Multispectral Solutions, Inc

Range Measurement Radios
for
GPS Denied Navigation and Radio Tracking

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www.multispectral.com

MULTISPECTRAL SOLUTIONS, INC.

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Range Measurement Radios

- Ranging Sensor
  - UWB pulse round trip time of flight measurement
  - C-Band UWB operation 6.15 – 6.55 GHz
  - Single reading 0.5 nanosecond propagation resolution (~0.5 ft)
  - Multiple readings improve range resolution (0.125 ft)
- Demonstrated Measurement Performance
  - 600+ meters Line-of-Sight with antennas 1 meter above ground level
    - Accuracy within 30 cm
    - Government use only model with omni-directional antennas at each end of the link
  - Commercial Part 15 compliant version
    - 50+ meters with omni-directional antennas
    - 300+ meters with gain antenna
- Estimated Range of Ground-to-Air Link with Gain Antenna in Air, Omni on the Ground
  - Government use only
  - 13 km Line of Sight
  - 4 km with margin to pass through stone wall

Current Packaged Design

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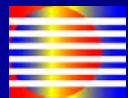
MSSI Range Measurement OEM Module Hardware
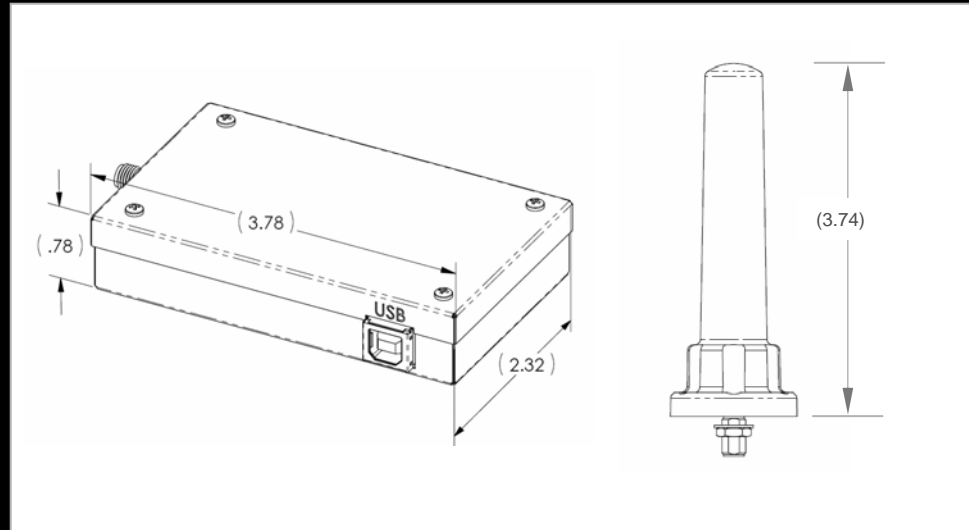
- Single Circuit Card Design Enclosed in Shielded Box
  - UWB transmitter and signal processing on card top
  - UWB receiver on card bottom
  - Box the size of a deck of playing cards, weight 120 grams
  - Antenna weight 20 grams with radome enclosure
- Four NiMH (AA) batteries provide eight-ten hours operation
- RS-232 and USB Data Electrical Interface

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System Architecture
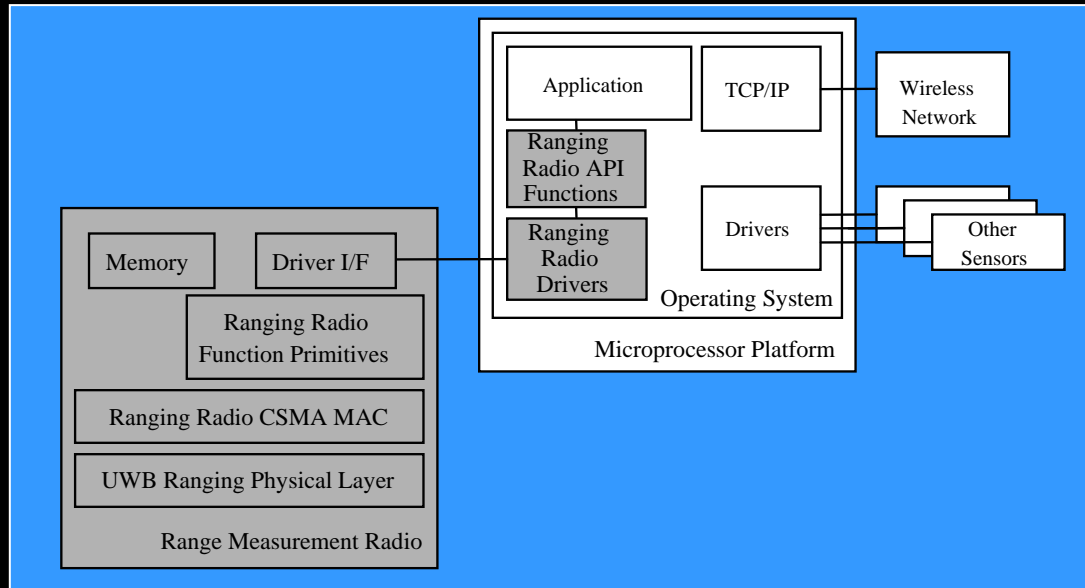
- **Range Measurement Radio Components**
  - Hardware
  - Microprocessor OS Level Function Calls
- **User Interface**
  - Operating System Level APIs
  - Unix and Windows

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Radio Functions

- Discover
  - Two bytes of Radio ID number
    - Subnet ID and Radio ID in subnet
    - Radios only respond to common subnet IDs
  - Search for radios in address space of a specific subnet ID
- Read or Write to Memory Locations on Radios
  - 16 x 32 Bytes of memory on each radio
  - Supports applications of geolocation, security, user alerts, text messaging communications, etc.
- Measure Distance to Another Radio
- Network These Functions up to Four Radio Hops away
  - Sourced based routing
  - Supports networking applications of ranging and communicating

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Ranging Radio Applications

Ranging Radios
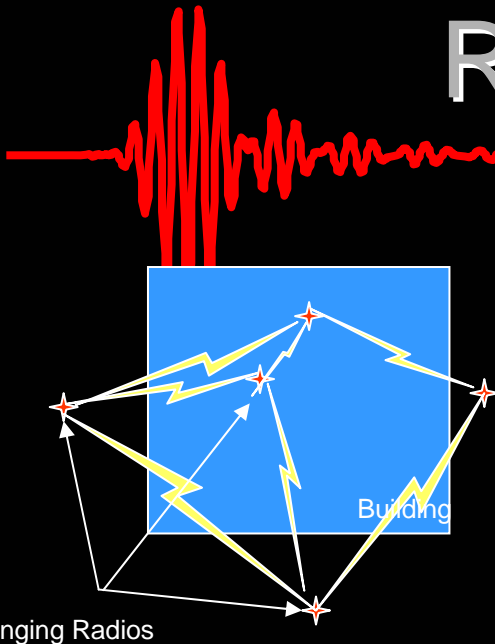
- **Industrial Safety**
  - Miner Tracking
  - Construction Site Safety
- **Situational Awareness**
  - Blue Force Tracking
  - Border Guard Tracking
  - First Responder Tracking
- **GPS-Independent Precision Navigation**
  - Urban Operations Navigation
  - Robotic Farming
  - Non-Line of Sight Surveying
- **Smart House**
- **Wireless Network Security**
  - Location-Based MAC and Network Protocols

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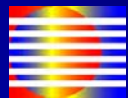
Future Development

- Reduce Size, Weight, Power and Cost
  - Radio Frequency Integrated Circuit (RFIC) receiver baseband signal processor
  - Application Specific Integrated Circuit (ASIC) of FPGA (processor) and logic
  - Ceramic Multi-Chip Module (MCM) of high power transmitter for government use designs
  - New compact circuit card layout
- Goals
  - Circuitry size: 2.7 x 1.8 x 0.4 inches (70% reduction)
  - Circuitry weight: 50 grams (60% reduction)
  - Power: 800 mwatts (33% reduction, 50% increase in battery life)
  - Cost: Less than $500 per unit in low volume (85% reduction)

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