Tower Weather Sensor Stack – Rev A

Magnetic Rail Gun Campus – Heber–Overgaard, AZ | MECSAI Integrated

Mounting Heights & Instruments

- 500 m AGL: 3D Ultrasonic Anemometer (20 Hz raw), Temp/RH (shielded), Icing detector (opt.)
- 200 m AGL: 3D Ultrasonic Anemometer (20 Hz raw), Temp/RH
- 100 m AGL: 3D Ultrasonic Anemometer (20 Hz raw), Temp/RH
- 10 m AGL: 3D Ultrasonic Anemometer (20 Hz raw), Temp/RH, Present weather/visibility (opt.)
- Base (2 m): Barometer (±0.1 hPa), Reference Temp (RTD), Lightning field mill (10–20 m AGL)

Sampling & Publish Rates

- Wind: 20 Hz edge → publish 10 Hz (speed, direction, u/v/w, TI)
- Met (T, RH, Td, P): 1 Hz
- Health/Status: 1 Hz

Electrical / Networking

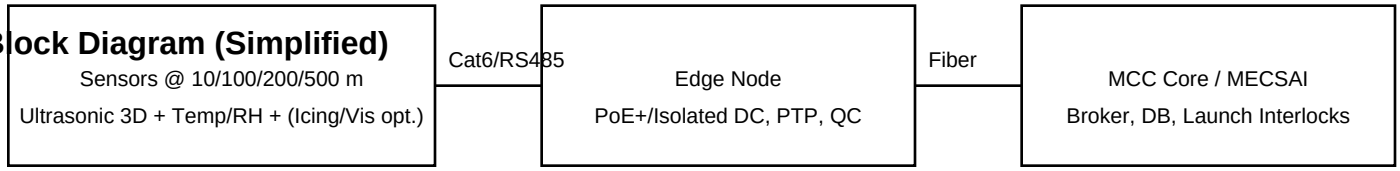
- Power: PoE+ or isolated DC at nodes; surge suppression; bonded to NFPA 780 down-conductors
- Data: Fiber uplink at tower base; dual rings to MCC; PTP (IEEE-1588) GNSS-disciplined OCXO
- Enclosures: NEMA 4X/6P; heaters for winter; hydrophobic vents

MECSAI Topics & QC

- mecsai/env/wind/{level}: {ts, u, v, w, speed, dir, TI, qc_flags} (10 Hz)
- mecsai/env/met/{level}: {ts, T, RH, Td, P, qc_flags} (1 Hz)
- mecsai/env/status: {ts, sensor_id, health, diag} (1 Hz)

QC: range/spike/step-change/stuck-bit; sensor voting across levels; auto-degrade if failures

Block Diagram (Simplified)



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