



Equipment Maintenance Protocol Updates: Q3 2025 Implementation Summary

Distribution: Site Technical Staff, Maintenance Teams, Operations Oversight

Date

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Classification

Internal Operations

Issues By

North Array Operations
Coordinator

Executive summary

This memorandum summarizes hardware replacement activities and calibration schedule updates implemented during Q3 2025 at North Array monitoring facilities. Maintenance activities included replacement of aging capacitor banks, RF cabling upgrades, and installation of revised grounding configurations in accordance with updated electrical safety standards.

All replacement components were sourced from approved vendors and installed by certified personnel following established protocols. Post-installation verification testing confirmed nominal performance across all affected systems. Calibration schedules for North Array receivers have been updated to reflect new hardware baselines and environmental monitoring requirements.

Routine operational documentation. No anomalies reported.

1. Background

North Array monitoring facilities operate continuous signal observation equipment requiring regular maintenance to ensure measurement accuracy and system reliability. Quarterly maintenance cycles address component aging, calibration drift, and implementation of updated safety and performance standards.

Q3 2025 maintenance activities focused on power supply infrastructure upgrades and RF signal path improvements identified during Q2 performance reviews.

2. Component Replacements

2.1 Capacitor Bank Replacement

Affected Equipment:

- Primary power supply units (Receivers 1-6)
- Backup power systems (UPS units A and B)

Replacement Reason:

Routine capacitor aging assessment identified electrolytic capacitors approaching end-of-service life (8-year rating). Preventive replacement scheduled to avoid potential failure during critical observation periods.

Components Installed:

- Manufacturer: Industrial Power Solutions
- Part Number: IPS-CAP-450V-2200uF
- Quantity: 48 units
- Installation Date: July 12-14, 2025

Verification:

Post-installation testing confirmed:

- Ripple voltage within specification (<50mV)
- ESR measurements nominal
- Thermal performance acceptable under full load

2.2 RF Cabling Upgrades

Affected Equipment:

- Antenna feed lines (North Array sectors 1-4)
- Receiver input connections

Replacement Reason:

Cable attenuation measurements during Q2 calibration cycle showed degradation exceeding acceptable thresholds. Moisture ingress suspected in junction boxes exposed to winter conditions.

Components Installed:

- Manufacturer: RF Systems International
- Cable Type: Low-loss coaxial, double-shielded
- Part Number: RFSI-LMR-400-UV
- Total Length: 850 meters
- Installation Date: August 5-9, 2025

Verification:

Post-installation measurements:

- Attenuation: <3.2 dB per 100m at 5 MHz (within spec)
- VSWR: <1.3:1 across operational bandwidth
- Shield integrity: >90 dB isolation

2.3 Grounding System Revision

Affected Equipment:

- All receiver equipment racks
- Antenna support structures
- Facility electrical distribution

Revision Reason:

Implementation of updated IEEE grounding standards for sensitive instrumentation. Previous configuration met requirements but new standards provide improved lightning protection and EMI mitigation.

Modifications:

- Installation of enhanced ground grid (copper mesh, 2m spacing)
- Addition of secondary ground rods (10 units, 3m depth)
- Upgraded bonding connections (copper strap, brazed joints)
- Implementation Date: August 15-22, 2025

Verification:

Ground resistance measurements:

- Primary ground: 1.2 ohms (requirement: <2 ohms)
- Secondary grounds: 1.8-2.5 ohms (requirement: <3 ohms)
- Inter-building bonding: <0.1 ohm

3. Calibration Schedule Updates

Following hardware upgrades, receiver calibration schedules have been updated to account for new component baselines:

Previous Schedule:

- Full calibration: Quarterly
- Gain verification: Monthly
- Noise figure measurement: Semi-annually

Updated Schedule:

- Full calibration: Quarterly (no change)
- Gain verification: Bi-weekly (increased frequency)
- Noise figure measurement: Quarterly (increased frequency)
- Power supply ripple check: Monthly (new)

Rationale:

Increased calibration frequency during initial 6-month post-upgrade period allows monitoring of new component stability and early detection of any installation-related issues.

4. Post-Installation Performance

Continuous monitoring since completion of Q3 upgrades (September 1-30, 2025) shows:

System Performance:

- Receiver sensitivity: Improved 1.2 dB average across all units
- Noise floor: Reduced 0.8 dB (attributed to improved RF cabling)
- Power supply stability: Ripple voltage reduced 40% (new capacitors)
- System uptime: 99.97% (no unplanned outages)

Environmental Performance:

- Lightning strike protection: No equipment damage during September storms
- EMI susceptibility: Reduced interference from facility power systems
- Thermal management: Improved with enhanced ventilation access during grounding work

5. Vendor Performance

All component suppliers met delivery schedules and quality requirements:

Industrial Power Solutions:

- Delivery: On schedule
- Quality: All units passed incoming inspection
- Documentation: Complete and accurate

RF Systems International:

- Delivery: 2 days early

- Quality: No defects identified
- Documentation: Complete with test certificates

Electrical Contractors:

- Installation quality: Excellent
- Schedule adherence: Completed 1 day ahead of plan
- Safety compliance: No incidents reported

6. Budget and Scheduling

Actual Costs:

- Capacitor replacement: \$4,850
- RF cabling upgrade: \$12,300
- Grounding system revision: \$18,500
- Labor (contractor): \$8,200
- Total: \$43,850

Budgeted Amount: \$45,000

Variance: -\$1,150 (under budget)

Schedule Performance:

- Planned completion: August 31, 2025
- Actual completion: August 29, 2025
- Variance: 2 days ahead of schedule

7. Recommendations

1. Maintain increased calibration frequency through Q1 2026
 2. Monitor capacitor performance during winter temperature extremes
 3. Schedule similar upgrades for remaining array sectors in Q2 2026
 4. Document lessons learned for application to other site maintenance cycles
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Distribution:

- Site Technical Staff
- Maintenance Teams
- Operations Oversight
- Budget Office