ELI FIELD CHECKLIST • L2 HAZARD

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# Transfer Switch Commissioning: Verification & Maintenance Field Checklist

**Specification through commissioning — verifying the overlap mechanism that protects against floating neutrals**

A 4-pole automatic transfer switch is engineered to maintain a continuous neutral reference during source transition. When that engineering fails — through specification error, mechanical degradation, or undersized conductors — the result is a floating neutral, and the downstream equipment pays the price in seconds.

Use Section A on every new ATS at installation and during commissioning. Use Section B on the documented maintenance cycle for every ATS in the plant. The overlap mechanism is the protection — verifying it is the discipline that separates a system that survives a transfer from one that destroys itself during one.

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**COMPANION RCA**

What Happens When the Neutral Floats: A Failure Mode Deep Dive on 4-Pole ATS Transitions

**AUDIENCE**

E&I journeymen, commissioning agents, plant maintenance, specifying engineers

**STANDARDS**

NEC 250.30, NFPA 110, NFPA 70B, CSA C282, IEEE 446, NETA MTS

**Use this checklist on every transfer switch at installation, during commissioning, and on a documented maintenance cycle.** Each item must be verified by a qualified person and signed off on the work order. The procedures here are general industry guidance — verify your site's specific torque values, transfer dynamics, and acceptance thresholds from the equipment data sheets and your governing standards before relying on them in the field.

## A.1 SPECIFICATION VERIFICATION (PRE-INSTALL)

- [ ] **Overlap requirement justified by ground-fault relay coordination.**
  Document the engineering justification for 4-pole gear at the design stage. If 4-pole was specified to manage ground-fault relay coordination, the switch must be overlapping (make-before-break) — not standard non-overlapping. Justification recorded in the project file.

- [ ] **ATS data sheet matches specified configuration.**
  Verify the as-supplied ATS data sheet specifies overlapping neutral. Many ATS product lines offer both configurations under similar model numbers — verify the specific suffix or option code matches the spec.

- [ ] **Neutral pole engineering reviewed.**
  Confirm the manufacturer's documentation describes the neutral pole as making first and breaking last. Save the relevant data sheet section with the project record.

- [ ] **Project specification retained.**
  The original specification, the supplier's submittal, and the data sheet are filed together. Future maintenance, repair, or replacement decisions depend on this audit trail.

**OVERLAPPING VS. NON-OVERLAPPING — WHAT TO VERIFY**

An **OVERLAPPING NEUTRAL** 4-pole ATS makes contact on the new source *before* the phase poles close, and breaks contact on the old source *after* the phase poles have opened. A **NON-OVERLAPPING** 4-pole ATS opens and closes all four poles at the same instant. Verify which design is specified and which is supplied — they are not interchangeable for applications requiring continuous neutral reference.

## A.2 PRE-ENERGIZATION MECHANICAL INSPECTION (COMMISSIONING)

- [ ] **Overlap mechanism visible and intact.**
  With the switch de-energized and locked out, inspect the overlap mechanism per the manufacturer's commissioning manual. The neutral pole timing relationship to the phase poles must be visually verified before energization.

- [ ] **No field modifications to neutral pole.**
  Check for evidence of prior service work, pole replacement, or linkage modifications on the neutral pole. Any modification voids the factory overlap timing and requires re-verification by the manufacturer's technical service.

- [ ] **Lug torque verified per termination.**
  Apply the termination torque checklist (see companion document: Termination Verification — Torque + Thermographic Field Checklist). Neutral terminations get the same calibrated-torque-tool treatment as phase terminations — no exceptions.

- [ ] **Anti-oxidant compound verified on aluminum terminations.**
  Aluminum-conductor neutral terminations require listed anti-oxidant compound applied per manufacturer procedure. Verify presence at QC walk-down before energization.

> **MECHANICAL VERIFICATION BEFORE ENERGIZATION**
>
> Pre-energization inspection is the only opportunity to verify the overlap mechanism without the safety constraints of energized work. Document the inspection on the commissioning record. **IF THE OVERLAP MECHANISM CANNOT BE VISUALLY CONFIRMED, DO NOT RELEASE THE SWITCH TO SERVICE.**

## A.3 DYNAMIC TRANSFER VERIFICATION UNDER LOAD (COMMISSIONING)

- [ ] **Minimum 50% load present during transfer test.**
  Dead-bus handle-throw is not a valid commissioning test. The overlap mechanism must be verified under real load to confirm dynamic operation. If real plant load is unavailable, install a load bank for the test.

- [ ] **Transfer source A → source B under load.**
  Initiate a real automatic transfer from the primary source to the alternate source. Log voltage and current on every phase and on the neutral throughout the transition. Capture the sequence-of-operations from the controller.

- [ ] **Transfer source B → source A under load.**

Repeat the transfer in the opposite direction. Both directions must be verified — overlap timing can differ between transfer directions in some designs.

- [ ] **Voltage and current logs reviewed for anomalies.**
  Examine the recorded data for any voltage excursion or neutral current discontinuity during the transfer window. Anomalies require investigation before the equipment is released to service.

- [ ] **Sequence-of-operations recorded.**
  Time-stamped log of contactor operation, source detection, and transfer command sequence. Save with the commissioning record as the baseline for future maintenance comparison.

> **WHY DYNAMIC TRANSFER TESTING MATTERS**
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> A dead-bus handle test verifies that the operating shaft moves. It does not verify the overlap timing, the mechanical interlock under load, or the electrical behaviour of the neutral pole during the transition. The failure mode this checklist exists to prevent is *only visible under load*. If you cannot test under load at commissioning, you cannot confirm the system will survive its first real transfer.

## B.1 PERIODIC RE-VERIFICATION (MAINTENANCE)

- [ ] **Monthly no-load transfer test (per NFPA 110).**
  Functional verification of automatic transfer command and source detection. Logged on the equipment maintenance record. This is the minimum NFPA 110 requirement for emergency power systems.

- [ ] **Annual transfer test under load.**
  Full dynamic transfer under real or simulated plant load, mirroring the commissioning protocol from Section A.3. Voltage, current, and sequence-of-operations logged. Compared against commissioning baseline.

- [ ] **Neutral termination IR scan included.**
  Every neutral termination at the ATS, the source side, and the load side included in the scheduled thermographic survey. Apply NETA MTS Table 100.18 action thresholds (see companion document). Trend hot spots over time.

- [ ] **Neutral current trending reviewed.**
  Compare neutral True-RMS current readings against the equipment baseline at similar load conditions. An unexpected drop or rise warrants investigation — it can indicate a developing termination failure or a developing imbalance.

## B.2 ACTION THRESHOLDS FOR ANOMALIES (MAINTENANCE)

- [ ] **Voltage excursions during transfer beyond manufacturer spec.**

Most ATS controllers specify acceptable voltage excursion windows during transfer. Excursions beyond the spec window indicate a developing problem with the overlap mechanism or with neutral continuity. Investigate before the next scheduled transfer.

- [ ] **Neutral current anomalies on trending review.**
  Sudden drops in neutral current can indicate a developing high-resistance termination. Sudden rises can indicate harmonic load growth approaching neutral conductor capacity. Both warrant investigation per the companion termination-verification checklist.

- [ ] **Overlap timing margins from manufacturer spec.**
  Manufacturer documentation provides nominal overlap times — the duration during which the neutral is connected to both sources. Field-measured overlap times outside the spec window indicate mechanical wear and require manufacturer service.

- [ ] **Thermographic findings classified per NETA MTS Table 100.18.**
  Apply the same thresholds as for any other distribution termination: 1–10°C ambient differential warrants investigation, 11–20°C requires repair as time permits, >40°C requires immediate repair.

**WHEN TO ESCALATE BEYOND ROUTINE MAINTENANCE**

**ANY VOLTAGE ANOMALY DURING A LOGGED TRANSFER EVENT, ANY THERMOGRAPHIC FINDING ABOVE NETA TABLE 100.18 'REPAIR AS TIME PERMITS' THRESHOLD ON A NEUTRAL TERMINATION, AND ANY OVERLAP-TIMING DRIFT OUTSIDE MANUFACTURER SPEC — ESCALATE TO MANUFACTURER TECHNICAL SERVICE BEFORE THE NEXT SCHEDULED TRANSFER.**

The cost of an engineering review is trivial compared to the cost of a floating neutral event.

## REFERENCE STANDARDS

- **NFPA 70 (NEC) §250.30** — Grounding of separately derived AC systems; 4-pole ATS requirement
- **NFPA 110** — Emergency and standby power systems; transfer equipment requirements
- **NFPA 70B** — Recommended Practice for Electrical Equipment Maintenance
- **CSA C282** — Emergency electrical power supply for buildings
- **IEEE 446 (Orange Book)** — Recommended practice for emergency and standby power systems
- **ANSI/NETA MTS-2023 §7** — Switchgear, switchboards, and panelboards inspection and testing
- **ANSI/NETA MTS-2023 §9** — Thermographic survey procedure; Table 100.18 action thresholds
- **CSA C22.1 (CEC) §12** — Wiring methods; conductor terminations; torque to manufacturer specification

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