CNC Controller Battery Replacement Procedure

1.0 Maintenance Objective & Frequency

The objective of this procedure is to replace the backup battery on the CNC controller to prevent loss of critical machine data including parameters, offsets, tool data, and part programs during power-off conditions. This PM is performed on an annual basis or when the battery voltage drops below the OEM-specified threshold (typically 3.0V DC for lithium coin cells or 3.6V for lithium D-cell packs). Proactive replacement avoids unplanned downtime and costly re-commissioning.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect main power to the CNC machine at the disconnect switch. Lock and tag the disconnect in the OFF position.
- Capacitor Discharge: Wait 5 minutes after power removal to allow internal capacitors to discharge fully.
- ESD Precautions: Wear an anti-static wrist strap connected to a verified earth ground. Use an ESD-safe mat if available.
- Mandatory PPE: Safety glasses, insulated gloves (rated for electrical work), and closed-toe steel-toed boots.

3.0 Required Tools, Parts & Lubricants

- Replacement battery: OEM-approved lithium battery (e.g., CR2032 coin cell, BR-2/3A, or D-cell pack as per controller manual)
- Digital multimeter with DC voltage measurement capability
- Small flathead screwdriver (2mm tip) or appropriate size for battery compartment
- Anti-static wrist strap with grounding cord
- ESD-safe tweezers (for coin cell removal)
- Isopropyl alcohol (99%) and lint-free swabs for cleaning contacts
- Label maker or permanent marker for date labeling
- Camera or smartphone for documenting wiring before removal

4.0 Step-by-Step Maintenance Procedure

1. Perform full backup of all CNC parameters, offsets, tool data, and part programs to a USB drive or network location using the controller's data export function. Verify the backup file is readable and complete.
2. Execute LOTO procedure: disconnect main power at the disconnect switch, lock and tag, and wait 5 minutes for capacitor discharge.
3. Don anti-static wrist strap and connect to a verified earth ground point on the machine frame.
4. Open the controller cabinet door or access panel using the appropriate tool. Locate the battery holder or pack. Refer to the controller wiring diagram if needed.

5. Using the digital multimeter, measure the voltage of the existing battery at the connector terminals (red probe to positive, black to negative). Record the voltage. If voltage is below 3.0V DC (for lithium cells), proceed immediately. If above, note the value for trending.

6. Carefully disconnect the battery connector from the controller board. For coin cell holders, use ESD-safe tweezers to gently pry the cell out. Avoid shorting the contacts with the screwdriver.

7. Inspect the battery contacts and holder for corrosion or debris. Clean with isopropyl alcohol and a lint-free swab if necessary. Allow to dry completely.

8. Install the new battery, observing correct polarity. For coin cells, insert with the positive (+) side facing up as marked. For wired packs, connect the plug firmly until it clicks. Ensure no wires are pinched.

9. Measure the voltage of the new battery at the connector terminals to confirm it is within specification (typically 3.0-3.6V DC for lithium cells). Record the value.

10. Close the controller cabinet door or access panel. Remove LOTO tags and locks. Restore main power to the machine.

11. Power on the CNC controller. Observe the startup sequence. If the controller prompts for a data restore, use the backup file created in step 1. Verify that all parameters, offsets, and programs are intact.

12. Affix a label to the controller cabinet with the replacement date and the next scheduled replacement date (one year from current date).

5.0 Verification & Return to Service

1. Cycle power to the CNC controller twice to confirm that parameters are retained after a full power-off/power-on sequence.

2. Run a test program that exercises all axes and the spindle at low speed for 5 minutes. Monitor for any alarms or abnormal behavior.

3. Check the controller's battery voltage display (if available) to confirm the new battery is reading correctly.

4. Document the replacement in the CMMS (ServiceGrid) including the old battery voltage, new battery voltage, and any observations. Attach the backup file to the work order.

5. Sign off on the PM work order in ServiceGrid and return the machine to production.