

System Overview: Gigavolt PowerStation G-3500 Commercial Storage Unit

General Description

The **Gigavolt PowerStation G-3500** (Model: **G-3500**) is a mid-scale commercial and industrial (C&I) energy storage system designed for peak shaving, demand management, and solar photovoltaic integration. The system houses four modular battery racks connected in parallel to an integrated bi-directional inverter, providing 875 kW continuous power and 3,500 kWh total storage capacity.

Technical Specifications

- **Model Identifier:** **G-3500**
- **Equipment Series:** Commercial PowerStation Mid-Tier
- **Nominal Output Power:** 875 kW
- **Bus Nominal Voltage:** 750 V DC (Operating Range: 620 V - 860 V DC)
- **Cell Chemistry:** Nickel Manganese Cobalt Oxide (NMC-811)
- **Cooling Architecture:** Forced-air ducted HVAC with micro-channel closed-loop chillers
- **Weight:** 24,500 kg fully outfitted
- **Communication Protocols:** Modbus TCP/IP, CAN 2.0B, DNP3

Critical Safety Protocols

Arc Flash and High Energy Hazard

ARC FLASH HAZARD PRESENT.

INCIDENT ENERGY AT 450MM DISTANCE: 18.4 CAL/CM².

MINIMUM ARC FLASH PPE CATEGORY 3 REQUIRED. LOCKOUT/TAGOUT (LOTO)

MANDATORY ON MAIN BREAKER CB-301 PRIOR TO SERVICING.

NMC Cell Handling Precautions

Because the G-3500 utilizes high-nickel NMC chemistry (811), cell-level physical integrity is critical:

- Never subject battery module trays to mechanical impact or torsion.
- If an individual module exhibits swelling or structural deformation exceeding 1.5 mm across the pouch casing, immediately isolate the module in an outdoor sand-quench drum and log an urgent field incident report.

Diagnostic Procedures & Troubleshooting Trees

Diagnostic Code Table

Fault Code	Telemetry Name	Severity	Primary Root Cause	Corrective Action
ERR_BMS_301	Module Communication Lost	High	CAN bus transceiver failure, severed ribbon cable, noise injection	Check CAN bus termination resistance (must read 60 Ω between CAN-H and CAN-L with power removed). Replace wiring harness HAR-CAN-35.
ERR_ISO_109	Low Isolation Resistance	High	Insulation breakdown, moisture ingress in high-voltage conduit	Perform insulation test with 1000V Megohmmeter. Minimum acceptable threshold: 100

Fault Code	Telemetry Name	Severity	Primary Root Cause	Corrective Action
				MΩ. Dry cabinet and reseal grommet G-4.
ERR_HVAC_502	Chiller Compressor Overload	Warning	Condenser coil obstructed, refrigerant leak (R410A)	Clear exterior condenser grilles. Inspect refrigerant sight glass for moisture or bubble streams.
ERR_PRE_003	Pre-Charge Circuit Failure	High	Blown pre-charge resistor, welded pre-charge contactor	Test pre-charge resistor RES-PR-50 resistance (50 Ω ± 5%). Inspect auxiliary contacts on contactor CON-PR-12.

Decision Tree: Diagnosing Isolation Faults (ERR_ISO_109)

1. **Has system tripped on DC Isolation Resistance < 100 kΩ?**
 - **YES:** De-energize system. Execute LOTO on Breaker CB-301.
2. **Disconnect Battery String Isolation Disconnects (Switches S1, S2, S3, S4):**
 - Measure insulation resistance between positive DC bus and chassis ground.
 - Measure insulation resistance between negative DC bus and chassis ground.

3. Is the fault on the DC side or the Inverter side?

- If DC side reads $> 100\text{ M}\Omega$ to ground when isolated, fault is internal to Inverter **INV-3500-AC**. Check output IGBT snubber capacitors.
- If fault isolates to Battery String 2, uncouple individual modules until the faulty tray drops below the $100\text{ M}\Omega$ threshold. Replace failed module tray (Part Number: **MOD-NMC-24V**).

Field Replacement Procedures: Inverter Gate Drive Board

1. Ensure full LOTO status. Measure with high-voltage multimeter to verify 0.00 V DC across DC bus capacitors C1 through C6.
2. Disconnect optical fiber drive triggers labeled **OPT-G1** through **OPT-G6**. Handle fiber ends with clean caps.
3. Remove 8 Torx T20 mounting screws from the gate drive card assembly (Part Number: **PCB-DRV-3500**).
4. Apply thermal compound (Part: **THM-PST-05**) uniformly (0.1 mm film) to heat-sink mating face before seating new replacement PCB.
5. Re-torque fasteners in star pattern to $2.2\text{ N}\cdot\text{m}$. Re-engage optical fiber interfaces and run calibration diagnostic test routine via Gigavolt Service Tool v4.1.