Instruction Book

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INSTALLATION AND STARTUP PROCEDURES

FOR

UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEMS

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Westinghouse Electric Corporation
Industrial Systems Division
Electronic Power Conversion
Buffalo, New York

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PART ONE - MECHANICAL INSPECTION CHECK LIST

Cubicle Inspection

The roughest mechanical abuse which the inverter is subjected to has already occurred, namely that during loading, shipping, unloading, and installation. Inspect the cubicle thoroughly for evidence of mechanical strain or damage, and spot-check the tightness of bolts, cable, and wiring. Remove any packing items such as blocking wedges for relays, contactors (if used), shipping braces, etc. If any component or sub-assembly requires repair or replacement, notify the Carrier immediately so that he can make resitituion.

Prior to System Assembly

Before putting shipping sections in place, refer to the system outline and interconnection diagrams for special steps that must be taken prior to assembling shipping sections (such as removing certain side sheets, making certain interconnections, etc.).

Buswork (If Used)

See that the lineup of cubicle is made properly, and bolted together. Where buswork is utilized, see that intercubicle bus links are securely fastened to the bus bars. Where specified, these joints should be made with Coolamp bus joint compound.

Interconnections

For more complex systems, the interconnection information is given on a separate interconnection diagram. For other systems, the interconnection information will be found on the system scheme and cubicle wiring diagrams or on the system outline drawing.

Battery

The battery should be installed and checked in accordance with the manufacturer's instructions.

Sub-System Inspection

Prior to placing the power modules, logic drawer, or logic boards into the cubicle (if previously shipped separately), give each sub-system a thorough examination for any kinds of damage or strain. Check the tightness of all connections, terminal connections, plugs, and devices.

PART TWO - DC POWER SUPPLY CHECK LIST

1. Check mechanical operation of all breakers, contactors, relays, switches, blowers, air-vane relays, door interlocks, trigger fuse switches, etc., to be certain that they are free to operate properly.

2. Be sure that DC bus is clear of all loads, inverters, batteries, etc.

3. Check incoming supply voltage. Set transformer taps accordingly. On new installation, high line voltage is typical prior to loading up a substation, power center, etc., and with the rectifier not being fully loaded during startup, the DC bus voltage is likely to be high. See that the specified DC bus voltage at this time stays within the voltage range on the order.

4. Measure cubicle voltages to blower motors, control circuits, and main rectifier circuits. Verify that phase sequence is as specified.

5. Check fans or blowers for fallen parts, tools, etc. Check fan or blower rotation for proper direction of air flow. Note that even with incorrect blower rotation, air flow is still in the same direction as desired, however, only a small amount of air is moved.

6. Refer to regulated rectifier instruction books for specific step-by-step start instructions.

7. Check out batteries according to manufacturer's specifications, cell voltage, specific gravity, tightness of connections, etc.

8. Confirm proper polarity of battery connection to DC power supply and close battery breaker.

9. Close main input breaker to power supply and confirm that battery charging takes place at the proper voltage level.

PART THREE - INVERTER CHECK LIST

1. Remove any packing, shipping braces, etc. Spot check for tightness of connections.

2. Check mechanical operation of all breakers, relays, switches, blowers, air vane relays, trigger fuse switched, etc. to be sure that they are free to operate properly.

   NOTE: Breakers with UV-trip coils must not be operated manually without control voltage on the coils. Otherwise the trip mechanism may be damaged.

3. Check all external wiring connections thoroughly to be sure that these have been in compliance with the external connection diagram.

4. Check distribution system from inverter to critical bus to be sure no shorts or grounds are present. Check both load and line side of breakers.

   WARNING: Do not use Megger for this equipment since the semiconductor devices may be damaged.

5. Connect any logic plugs which may have been removed prior to shipping. Be sure all boards are fully seated.

   Withdraw power drawers to first detent position.

   WARNING: DRAWERS MUST NEVER BE WITHDRAWN OR INSERTED WHILE DC BUS VOLTAGE IS APPLIED. Fuses will blow and semiconductors will be damaged.

6. CHECK ALL FUSES: LOGIC POWER SUPPLY, STAGE, CAPACITOR DRAWERS, OUTPUT CONTROL CIRCUIT, ETC. WITH A VOLT-OHM-MILLIAMMETER FOR CONTINUITY.

7. Energize the DC bus input, and listen for operation of the logic power supply (LPS). Measure the output voltages of the LPS at the terminal block behind the logic doorfront. The following should be present and regulated: +40, +20, -20, and SWA-SWB (which is the square wave output at approximately 80 volts peak-to-peak and 10 KHz).

   CAUTION: NEVER REMOVE OR INSERT LOGIC BOARDS WHEN LOGIC POWER SUPPLY IS RUNNING. Printed circuit board or LPS damage may result.

8. Turn test switch in logic to position #2. This unlocks the ring counter and allows the logic to operate. Observe the counter/driver board waveforms at their testpoints. Do not adjust. Observe all gate modulator board signals at their testpoints, verifying that all are present and clean. Return test switch to position #1.

9. Confirm that logic plugs are well seated and bolted to the power drawers, and push the power module drawers to the fully closed position.

10. Verify that main output circuit breaker is open and that bus is clear.

11. Turn the MANUAL OVERRIDE pot which is located in the logic drawer to the full clockwise position.

12. Operate START/PRECHARGE pushbutton to initiate normal inverter startup. Inverter should now be producing a reduced three phase balanced output voltage. Increase output voltage by slowly turning the MANUAL OVERRIDE pot to the extreme counter clockwise position. The voltage regulator should have taken over control, at approximately 50% of the MANUAL OVERRIDE pot range, to produce rated output. Adjust the pot on the voltage refulator board if output voltage is not within +2% of rated output voltage. Verify correct rotation of blowers and correct if necessary.

13. Go through normal shutdown sequence, checking for proper action of capacitor or discharge relay and resistor for bleeding the capacitor.

14. Restart inverter and after reasonable warm-up time, make final checks on the output voltage (all phases), and frequency.

15. If a synchronizing circuit is included, verify that when the synchronizing switch is closed the inverter output synchronizes to the sync source (provided it is within the specified frequency limits).

16. Check out proper operation of any special options such as: line sync, transfer systems, instrumentation, or alarm circuitry.

17. Check to see that the phase sequence at the output terminals agrees with cable identification. When connecting load to inverter, be sure that it is connected in a manner which assures application of power in the proper phase sequence.

18. Units should be left running either loaded or unloaded as desired by the customer. This will enable the logic compartment to come up to temperature, stabilizing the system frequency.

NOTE: If difficulty is encountered at any step, refer to the "Trouble Shooting Guide", or to the "Service Manual".

PART FOUR - MAKE-BEFORE-BREAK (MBB) LOAD TRANSFER SWITCH CHECK LIST

1. This part can be ignored if a make-before-break transfer switch is not included.

2. Install and interconnect the transfer switch in accordance with the system interconnection information.

3. If the transfer operation sequence on the specific system under consideration is such that it is not possible to synchronize the UPS to the bypass line without also initiating the power transfer, then it will be necessary to de-activate the MBB by disconnecting the closing coils or motor operators of the MBB.

4. With the UPS system and bypass line de-energized connect a volt-ohm-milliammeter with a full scale reading of at least twice the RMS output voltage from phase A of UPS system input to MBB to phase A of bypass input to MBB switch.

5. Energize the UPS and the bypass line.

6. Close the SYNC SWITCH (BUT DO NOT ALLOW THE MBB TO OPERATE - SEE STEP 3). Observe the voltage on the VOM of step 4; it should not exceed 15% of the system output voltage. If this voltage does exceed 15% then either the synchronizing circuit or the external voltage control circuit is not adjusted properly or the phase rotation of the UPS and the bypass line do not match.

7. Repeat steps 4, 5 and 6 for phases B and C.

8. When steps 4 through 7 check out properly, reconnect the coils or motor operators if they were disconnected in step 3.

9. Try a MBB load transfer sequence, per operating instructions, at no load. Try the transfer from UPS to bypass and from bypass to UPS to check out the sequencing.

10. Note that later when this transfer is performed under load there will be different phase displacements observed between UPS and bypass due to a small phase shift in the AC filter of the UPS under load. This is normal.