651A POWER PLANT

OPERATING METHODS

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1. GENERAL

1.01 The 651A power plant converts negative 48-volt central office battery to a 130-volt dc output. It is designed primarily for small loads up to a maximum of 15 amperes.

1.02 This section is reissued to include information for the KS-19303 L3, KS-19815 L1, and KS-19886 L1 dc-to-dc converters which supersede all other 2-ampere and 5-ampere converters rated Mfr Disc. Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Checks and adjustments, other than those required by trouble conditions, should be made during a period when they will not interfere with service.

1.04 These instructions are based on drawing SD-81570-01. For a detailed description of how the circuit operates, refer to the corresponding circuit description.

1.05 For more detailed information on operation and maintenance of individual equipment or apparatus, refer to the appropriate Bell System Practice.

1.06 The following abbreviated terms are used to identify converters used in this power plant:

CST-1 – Lorain Model CST 1, 2-Ampere DC-to-DC Converter (Mfr Disc.)

CST-3 – Lorain Model CST 3, 5-Ampere DC-to-DC Converter (Mfr Disc.)

KS – KS-19303 L3, 2-Ampere DC-to-DC Converter

KS – KS-19815 L1, 5-Ampere DC-to-DC Converter

KS – KS-19303 L1, 2-Ampere DC-to-DC Converter (Mfr Disc.)

KS – KS-19304 L1, 5-Ampere DC-to-DC Converter (Mfr Disc.)

KS – KS-19886 L1, 5-Ampere DC-to-DC Converter

1.07 The abbreviations cw and ccw, used herein, refer to clockwise and counterclockwise, respectively.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-Inch C Screwdriver
TEST APPARATUS	
—	One 70-Type Fuse (blown)

3. OPERATION

3.01 The 651A power plant uses multiple 2-ampere or 5-ampere dc-to-dc converters to provide a positive or negative 130-volt dc supply. Converters of the same rated capacity are arranged for parallel operation. Up to four 2-ampere converters may be connected in parallel to deliver a maximum of 6 amperes and up to four 5-ampere converters may be paralleled to deliver a maximum of 15 amperes. Since there is no 130-volt battery associated with the 651A plant, one more converter than the number required to carry the peak load is provided so that failure of a single converter will not reduce the capacity of the plant.

3.02 A minor alarm is provided to indicate the failure of a single converter and a major alarm is provided to indicate low output voltage.

PREPARING TO START

3.03 Before putting the plant into service check that:

(a) The 48-volt fuses at the 48-volt power board are removed.

(b) All external connections are made in accordance with the SD drawings covering the circuits associated with the plant.

(c) The converters in the plant are connected for the proper output polarity.

(d) All circuit breakers are in the OFF position and the input fuses in the Model CST-1 converters are removed.

(e) The ADJ VOLTS potentiometer of each converter is rotated fully ccw.

(f) The output fuse of each converter is removed.

(g) All load fuses are removed.

STARTING

3.04 To place the plant in service, proceed as follows:

(1) Install the 48-volt fuses at the 48-volt power board.

(2) Operate the circuit breaker on the first converter to the ON position or insert the input fuse in the CST-1 converter.

(3) Insert the converter output fuse to connect the converter to the load bus.

(4) Rotate the ADJ VOLTS potentiometer cw until the converter output voltage is 130 volts dc.

(5) Repeat (1) and (2) for the second converter.

(6) Rotate the ADJ VOLTS potentiomenter of the second converter cw until the converter output voltage is 130 volts dc.

(7) Install the output fuse to connect the second converter to the load bus.

(8) Install the load fuses.

3.05 If the load is greater than the rating of one converter, additional converters are required. To place the additional converters in service, proceed as in 3.04 (5) through (7). For converters with current limiting, it is not necessary that the converters be adjusted to share the load equally. For plants using the KS-type converters and the CST-1 or CST-3 converters together, observe the adjustment procedures outlined in 3.07 and 3.08.

3.06 When adding a new standard converter to an existing plant, proceed as follows:

(1) Determine if the adjustment procedures in 3.07 and 3.08 apply and take the necessary action.

(2) Repeat 3.04 (1) and (2) and operate the converter for 30 minutes to allow the voltages to temperature-stabilize.

(3) After this time interval, rotate the ADJ VOLTS potentiometer cw until the output voltage is approximately 1 volt below the bus voltage.

(4) Install the converter output fuse to connect the converter to the load bus.

(5) Rotate the ADJ VOLTS potentiometer cw until the ammeter indicates the desired output current.

CONFIGURATIONS OF CONVERTER TYPES

3.07 Where two CST-1 type converters are installed, the addition of another converter or converters, either a KS-type, 2-ampere converter or a CST-1 type converter for loads over 2 amperes, requires that a modification kit be added to each CST-1. This kit, Current Limiting Circuit Kit No. 1448AS, is manufactured by the Lorain Products Corporation. Instructions for mounting and connecting this feature are furnished with the kit. The kit provides a current limiting feature for the CST-1 to prevent possible loss of the 130-volt supply in case of a single converter failure. CST-1s used in any plant with a load in excess of 2 amperes require the current limiting feature, since the CST-1 may attempt to assume all the load of the plant.

3.08 Where the CST-3 type dc-to-dc converters are installed, the addition of KS-type 5-ampere converters require voltage adjustment of the KS converters to a value high enough to assure full output from the KS converters in the event of a failure of one of the CST-3s. Loss of the 130-volt supply can be prevented by adjusting each KS converter as outlined below:

(1) Remove the converter output fuse.

(2) Operate the circuit breaker to the ON position and operate the converter for 30 minutes to allow the voltage to temperature-stabilize.

(3) Rotate the ADJ VOLTS potentiometer cw until the converter voltage is 1 volt below the bus voltage.

(4) Install the converter output fuse.

(5) Rotate the ADJ VOLTS potentiometer cw until the ammeter indicates 4.5 to 5 amperes.

(6) Remove the converter output fuse.

(7) Rotate the ADJ VOLTS potentiometer cw until the output voltage is increased between 1 to 2 volts.

(8) Install the output fuse.

Note: Steps (7) and (8) are performed with the input battery at float voltage to compensate for high input battery conditions.

OPERATION OF THE PLANT

3.09 With all input and output fuses in place and circuit breakers closed, the converters should continuously operate in parallel to supply a regulated voltage to the load.

3.10 ***Stopping and Restarting Converters:***

(a) To stop an individual converter, proceed as follows:

Caution: Before disconnecting any converter, a working spare unit should be connected to the load bus to prevent overloading the remaining converters.

(1) Remove the converter output fuse to disconnect the converter from the load bus.

(2) Operate the circuit breaker to the OFF position or remove the CST-1 input fuse.

(3) Remove the 48-volt input fuse to disconnect the converter from the battery bus.

(b) To restart the converter, follow the procedure in 3.04 (5) through (7).

3.11 To restart the plant in the event of a fault which has caused complete plant shutdown, proceed as follows:

(1) Remove the load fuses.

(2) Remove the converter output fuses.

(3) Operate the converter circuit breakers to the OFF position or remove the CST-1 input fuse.

(4) Repeat the procedures in 3.04 (2) through (8). If necessary, repeat 3.05.

3.12 ***CHG Key or CHG SEL Switch:*** To install load fuses for plants with decentralized filters, the CHG key or CHG SEL switch is operated. This places the CHG resistor in series with the load to limit the filter charging current to prevent fuse operation. To install a load fuse in these plants, proceed as follows:

(a) ***CHG key:***

(1) Operate the CHG key for the selected load (LOAD 1 or LOAD 2).

(2) Install the load fuse.

(3) Release the CHG key.

(b) ***CHG SEL Switch:***

(1) Operate the CHG SEL switch to the selected load position (LOAD 1 or LOAD 2).

(2) Install the load fuse.

(3) Operate the CHG SEL switch to the center position.

4. ROUTINE CHECKS

4.01 ***Load Bus Bar Alarm Fuses:*** Check the FA alarm associated with these fuses as follows:

(1) Remove the 70-type fuse from the alarm fuse socket.

(2) Install the blown 70-type fuse in the alarm fuse socket.

Requirement: The FA alarm will operate.

(3) Remove the blown 70-type fuse.

(4) Install the original 70-type fuse in the alarm fuse socket.

4.02 ***Converter Failure Alarms:*** Periodically check these alarms by stopping and starting the converters as covered in 3.10. Check that when one converter is stopped a minor alarm is given, and that when the first two converters are stopped or a low voltage condition occurs, a major alarm is given.

4.03 Since it is not necessary that the converters equally share the load, a periodic check should be made on converters indicating no output current to be sure that no malfunction exists. Raising the output voltage of the converter in question should cause it to deliver output current.

5. TROUBLES

5.01 The troubles listed below pertain to the supply circuit. Troubles in the converter units are covered in sections on operating methods for the converters.

TROUBLE	POSSIBLE CAUSE
(a) Output voltage low.	Converter(s) overloaded.
(b) Output voltage high.	Converter(s) out of adjustment.
(c) No output current.	Input supply open (fuse blown or converter malfunction).