662A (J86905A)
CONVERTER POWER PLANT
OPERATING METHODS

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1. GENERAL

1.01 This section describes the operation of the 662A power plant which provides conversion from −48 volts dc to +48 volts dc. The plant employs pulse width controlled converters, each having an output rating of 2.3 amperes. Up to six converters may be operated in parallel in a plant configuration, or individual converters may be associated with specific loads in a dedicated configuration. The plant is intended for use in applications requiring relatively small amounts of +48 volt power such as dial tone first operator coin trunks and miniaturized dial long lines circuits.

1.02 This section is reissued for the following reasons:

(a) To update to standard format

(b) To change section number in paragraph 4.01

(c) To specify location of circular RTN terminal in sub-subparagraph 4.04(1)(a) and subparagraph 4.09(3)

(d) To replace KS-14510 volt-ohm-milliammeter with KS-20599, L4, digital multimeter.

(e) To clarify converter failure alarm test procedure in subparagraph 4.09(4) and redraw Table A.

Revision arrows are used to emphasize the more significant changes. This reissue does not affect the Equipment Test List.

1.03 The 662A power plant may be operated in the plant configuration or the dedicated configuration. The plant configuration is discussed in paragraphs 1.04 and 1.06 and the dedicated configuration is discussed in paragraph 1.07.

1.04 The ***plant*** configuration is intended for use when loss of +48 volt power, due to a converter failure, would result in direct loss of service. In this configuration, an installation may have one control and discharge panel (Fig. 1) and from two to six converters (132AD power units), with their outputs paralleled, which can supply loads from 2.3 to 11.5 amperes. The plant capacity is increased by 2.3 amperes as each converter is added. One more converter is provided than is necessary to supply the load so that failure of a single converter will not reduce the capacity of the plant.

1.05 Three optional versions of the control and discharge panel provide a means of observing power plant output conditions:

(1) Test jacks only—an external meter is used to indicate plant voltage and current

(2) Ammeter with test jacks for external voltage measurement

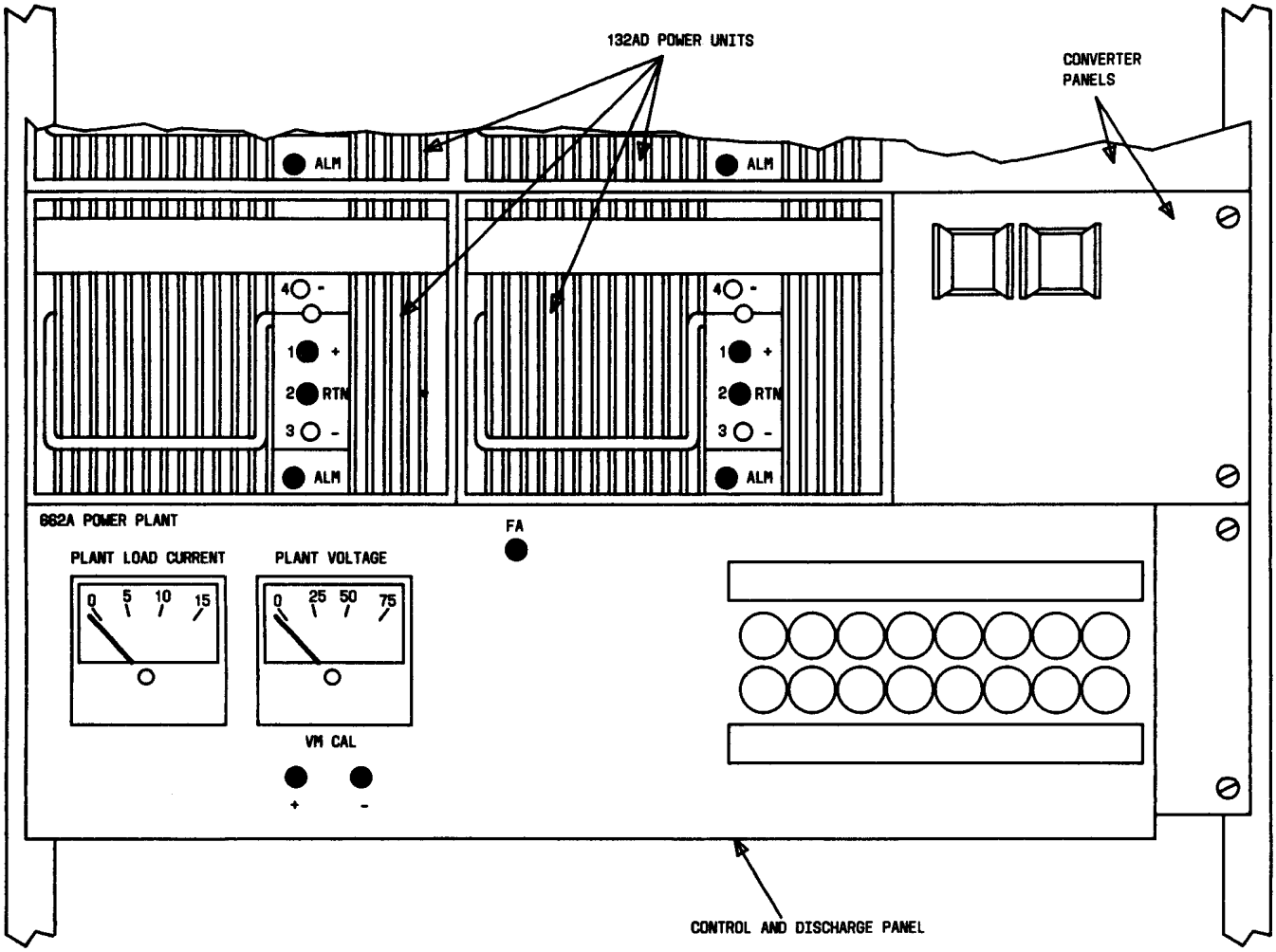

Fig. 1—662A Power Plant—Plant Configuration—Typical

(3) Ammeter and voltmeter.

Note: Ammeters are supplied in any of three ranges—0-5 amperes, 0-10 amperes, or 0-15 amperes as appropriate to the load current.

1.06 Alarm indications are generated by the release of normally operated relays associated with each of the converters. Failure of one converter will initiate minor alarm indications. Failure of two or more converters, plant output failure, or plant fuse operation will initiate major alarm indications. Removal of failed converters from their connectors will cut off the audible alarms. Removal of any converter will initiate and retain visible office alarms.

1.07 The ***dedicated*** configuration is intended for use in applications where loss of +48 volt power, due to converter failure, might impair but not deny service. In this configuration, each converter output is connected, unfused, directly to a specified load. The current limiting capability of the converter protects the output circuit from overload. In the dedicated configuration no plant capacitors, fuses, or meters are provided. A shunt resistor is provided in the output path to permit load current measurement with an external voltmeter. An alarm indication is initiated for a converter failure, a low-voltage condition, or when a converter is removed from its connector.

1.08 The converter panel (Fig. 1) which mounts two converters and their associated alarm relays and output resistors is equipped and internally wired the same for both plant and dedicated configuration

applications, allowing external wiring to provide for the configurations. The two converter positions on the panel, including associated apparatus, are designated A and B. When only one converter per panel is equipped, that converter shall occupy position A.

1.09 Routine checks should be performed during a period when they will cause the least service reaction.

1.10 This issue of the section is based on the following drawings:

SD-82404-01, Issue 2, for the 662A power plant

SD-82272-01, Issue 16, for the 132AD power units

For a detailed description of circuit operation, refer to the corresponding circuit description (CD). If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the SD and CD to determine the extent of the changes and the manner in which the section may be affected.

2. APPARATUS

2.01 ***List of Tools and Test Apparatus:***

TOOLS	DESCRIPTION
—	Testing Cord (Equipped with a KS-6780 Connecting Clip on each end)
W1AF	Testing Cord (Equipped with a 360A Tool at each end)
141	Cord Tip
411C	Test Pick
720A	Battery Pickup Tool (or one KS-6278 Connecting Clip)
TEST APPARATUS	
KS-20599, L4	Digital Multimeter (or equivalent, with millivolt capability)

3. OPERATION

3.01 ***Preparing to Start:*** When preparing to put the power plant in service, check the following:

(1) All external connections are made in accordance with the schematic drawing which covers the associated circuits.

(2) No fuses are installed in their respective fuse holders,including the input fuse at the battery distribution fuse board (BDFB).

3.02 ***Starting:*** To place the plant in service proceed as follows:

(1) Insert the converter (132AD power unit) into its cage and assure that it is fully engaged with the connector.

(2) Install the input fuse at the BDFB of the -48 volt source serving the plant.

Requirement: ALM lamp on converter unit is lighted and associated alarm relay (A or B) is released.

(3) Raise latch to turn converter on, then lower plastic designation strip.

Requirement 1: ALM lamp on converter unit is extinguished.

Requirement 2: Associated alarm relay A or B on converter panel is operated.

Requirement 3: Plant voltage is between 48 and 50 volts.

Note: In the ***plant*** configuration, plant voltage is indicated on the PLANT VOLTAGE meter, if provided. (If the plant voltage is out of limits, verify the converter output using a ▶KS-20599, L4, digital multimeter, ◀or equivalent, at the VM CAL test jacks.) If a PLANT VOLTAGE meter is not provided, measure the plant voltage between PLANT VOLTAGE (+) and (-) test jacks using a ▶KS-20599, L4, digital multimeter.◀ In the ***dedicated*** configuration, measure the converter voltage between the (+) and RTN test jacks on the converter.

(4) Perform (1) through (3) for each converter.

(5) Install associated load fuses in their respective fuse holders.

Note: Plant load current is indicated on the PLANT LOAD CURRENT meter, if provided. If

the plant is not equipped with a PLANT LOAD CURRENT meter, the output current can be measured across the plant load current (+) and (−) test points located on the front of the control and discharge panel. In the dedicated configuration, the output current can be measured across the SH (+) and (-) test points,located in back of the converter panel. Use a KS-20599,L4, digital multimeter or equivalent,set to measure millivolts. The multimeter will indicate 10 millivolts per ampere of converter load.

Requirement: In the plant configuration, the plant load current shall not exceed a value equal to 2.3 times one less than the number of converters. In the dedicated configuration, the plant load current shall not exceed 2.3 amperes.

3.03 ***Stopping:*** To remove the power plant from service, perform the following:

(1) Raise the plastic designation strip and lower the latch to turn the first converter off.

Requirement: ***(Plant Configuration):*** An audible/visible alarm will occur. ***(Dedicated configuration):*** A major visible/audible alarm will occur.

(2) Unplug the converter from its connector.

Requirement: The audible alarm is silenced.

(3) Remove the input fuse from the battery distribution fuse panel.

(4) Perform (1) and (2) for any remaining converters.

4. ROUTINE CHECKS

4.01 Electrolytic capacitors should be maintained in accordance with Section ▶032-110-701.◀

4.02 Routine checks are made on this plant to determine whether the features, indications, and alarms are in proper operating condition. The plant should be checked periodically in accordance with the Equipment Test List. It should also be checked after any troubles have been corrected, or if the plant has been out of service.

Note: Because the converters have no provision for field adjustment, the meters to be calibrated in paragraphs 4.03 and 4.04 serve only to give approximate indications of plant operation; consequently, the meters should be calibrated at their normal operating voltages rather than at zero.

4.03 ***Voltmeter Calibration:*** The PLANT VOLTAGE meter, when provided, should be calibrated periodically as follows:

(1) Insert and turn on at least one converter per paragraph 3.02.

(2) Connect an external voltmeter, such as the ▶KS-20599, L4, digital multimeter,◀ set to the 60 volts dc range,to the VM CAL (+) and (-) test jacks.

(3) Adjust the PLANT VOLTAGE meter to agree with the indication on the ▶KS-20599, L4, digital multimeter◀.

(4) Disconnect the meter leads from the VM CAL test jacks.

4.04 ***Ammeter Calibration:*** The PLANT LOAD current ammeter, when provided, should be calibrated periodically as follows:

Note: The plant should be in operation and serving a normal load when performing the ammeter calibration.

(1) At the rear of the control and discharge panel, connect KS-20599, L4, digital multimeter, or equivalent,set to measure millivolts,as follows:

(a) Negative lead to circular RTN terminal ▶located on back of converter plant.◀

(b) Positive lead to GRD bus bar nearest RTN terminal.

Note: One or three resistors connected between RTN and GRD terminals serves as a meter shunt. Voltage measurement across the shunt determines the current.

(2) Observe the voltage reading and interpret as follows (10 MV = 1 ampere):

METER RANGE	SHUNT	CURRENT
0-5 Amperes	1 Resistor	10 MV = 1 Ampere
0-10 Amperes	1 Resistor	10 MV = 1 Ampere
0-15 Amperes	3 Resistors	3.33 MV = 1 Ampere

(3) Adjust PLANT LOAD CURRENT meter to agree with current value derived from the KS-20599, L4, multimeter reading.

(4) Disconnect multimeter leads from rear of control and discharge panel.

4.05 ***Output Voltage Check:*** To verify that the plant is supplying the required output voltage to the load, periodically check the output voltage in accordance with paragraph 3.02.

4.06 ***Converter Contribution Check:*** Perform the following check periodically on each converter in the plant configuration to determine how the load is distributed among the converters.

(1) At the rear of the converter panel at TB1, connect a KS-20599, L4, digital multimeter, or equivalent, set to measure millivolts, as follows:

MULTIMETER LEADS	WHEN TESTING CONVERTER	
	A	B
(+) Pos.	RTN(+), Term 9	RTN(+), Term 2
(—) Neg.	(—), Term 6	(—), Term 5

Note: If the load is continuously varying, a simultaneous observation of the plant ammeter, if provided, may be required to qualify the individual converters.

(2) Repeat for each converter in each panel.

(3) Any converter not making a contribution should be checked to determine if a malfunction exists.

4.07 ***Output Current Check:*** There is no requirement that converters in the plant configuration share the load equally. Accordingly, some converters may contribute more current than others. It is possible that, under normal operating conditions, at least one converter will contribute nothing to the load. A periodic check should be made of converters which indicate no output to be sure that a malfunction does not exist. Turning off one converter should cause the output current in the others to rise; however, do not turn off more than one converter at a time. Monitor the plant output voltage as each converter is turned off. If the voltage drops below 48 volts, promptly turn the converter on again. The drop in voltage indicates a malfunction among the remaining converters.

4.08 ***Load Fuse Failure Alarm Check:*** To verify that a major alarm occurs in the event of a load fuse failure, proceed as follows:

Note: A test point is provided at the front of the fuse cap for 70-type fuses (Fig. 2). This test point should be used to test the fuse alarm.

(1) Prepare an alarm test cord (Fig. 3) by connecting one end of a W1AF testing cord to a 141 cord tip and a 720A voltage pickup tool. (The KS-6278 connecting clip may be used to replace the 720A voltage pickup tool.) On the opposite end of the W1AF testing cord, connect a 411C test tool.

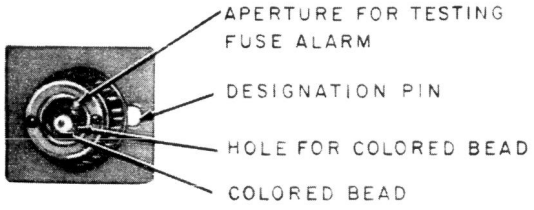

Fig. 2—70-Type Alarm Fuse With Alarm Test Point

(2) Install the 720A voltage pickup tool in a spare 70-type fuse position. (If the 720A tool is not available, obtain the same magnitude voltage supply by connecting the KS-6278 connecting clip with the W1AF test cord to the fuse block bus bar.)

Caution: Test only the fuses associated with the same magnitude voltage supply.

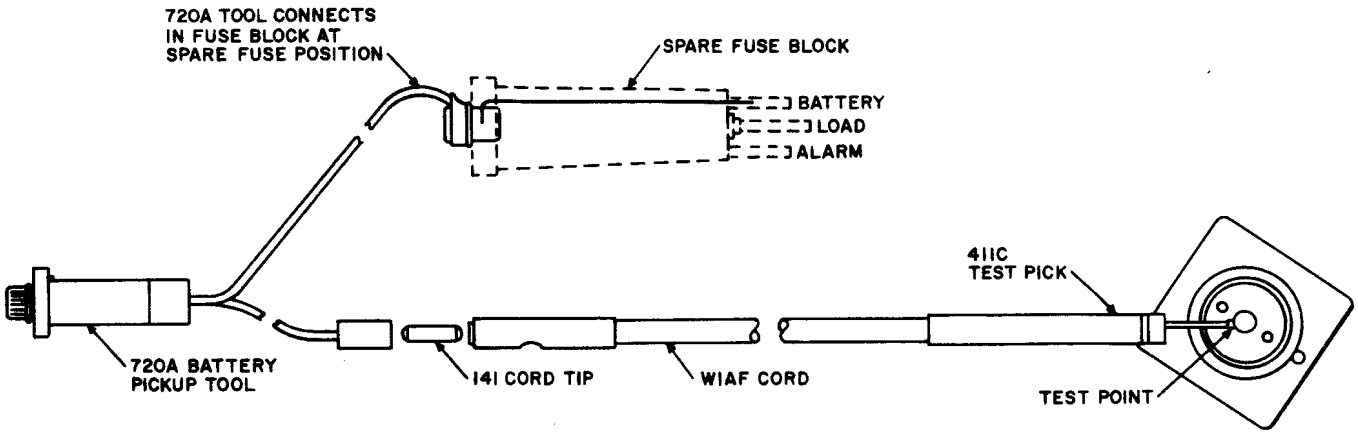

Fig. 3—Fuse Alarm Testing Cord—Tool Connection

(3) With the tip of the 411C test pick (attached to the battery connected W1AF cord), touch the exposed alarm test point on the fuse cap (Fig. 2) for one fuse.

Requirement: The fuse alarm relay releases, the FA alarm lamp lights, and an audible alarm is activated.

(4) Remove the test pick from the fuse cap.

Requirement: The fuse alarm relay operates, the FA alarm lamp extinguishes, and the audible alarm is silenced.

(5) Repeat (3) and (4) for each fuse.

(6) Remove the 720A tool from the spare fuse position. (If the KS-6278 connecting tool is used, disconnect the clip from the bus bar.)

4.09 ***Converter Failure Alarm (Plant Configuration):*** Perform the following check to verify that a minor alarm is activated if one converter fails and a major alarm is activated if two converters fail. Perform the testing during periods of light traffic to minimize service reaction.

(1) Verify that when one converter is removed from service the remaining converters have the capacity to provide the bus load current.

(2) Prepare a test cord using a 3-foot length of 20-gauge insulated wire with an alligator clip, such as the KS-6780 connecting clip, on each end.

(3) Connect one end of the test cord to the circular RTN terminal ▮located on back of the converter plant.◖

▮(4) Perform test steps in Table A, as follows:

(a) Determine the number of converters equipped in the plant and locate the converter number in Table A.

(b) In Table A block out or cover all vertical columns to the right of the column representing the converter number determined in (a).

(c) Proceed from left to right through the table, completing the required test steps (shown in parenthesis) in row A before proceeding to row B.

Example: If only two converters are equipped in the plant, perform Step (a) for converter 1 and Steps (b) and (c) for converter 2. Since there is no converter 3 in the plant, proceed to row B. Perform Step (d) for converter 1 and Step (a) for converter 2. There are no converters 3 and 4, so proceed to row C and perform Step (d) for converter 2. This completes the test sequence for a two converter plant configuration.◖

(5) Remove the test cord from the RTN terminal.

4.10 ***Converter Failure Alarm (Dedicated Configuration):*** Perform the following check to verify that a major alarm occurs if the converter fails or, if two converters are wired together, failure of one converter will initiate a major alarm.

◆TABLE A◆

CONVERTER FAILURE ALARM TEST STEPS

ROW	CONVERTER NUMBER					
	1	2	3	4	5	6
A	(a)	(b), (c)	(b), (c)	—	—	—
B	(d)	(a)	(b), (c)	(b), (c)	—	—
C	—	(d)	(a)	(b), (c)	(b), (c)	—
D	—	—	(d)	(a)	(b), (c)	(b), (c)
E	—	—	—	(d)	(a)	(b), (c)
F	—	—	—	—	(d)	(a)
G	—	—	—	—	—	(d)

TEST STEPS

(a) Raise plastic designation strip and lower latch to turn converter off. Associated A or B relay releases and audible and visible minor alarms occur.

(b) At associated resistor (A or B) connect other end of test cord to *upper* end of resistor. Associated A or B relay releases and audible and visible major alarms occur.

(c) Remove test cord from upper end of resistor. Major alarms cut off.

(d) Raise latch to turn converter on and lower plastic designation switch. Associated relay (A or B) operates and minor alarms cut off.

Note: Perform the following test during periods of light traffic when service will be least interrupted.

(1) Raise the plastic designation strip and lower the latch to turn the first converter off.

Requirement: A major audible/visible alarm occurs.

(2) Unplug the converter from its connector.

Requirement: The major audible alarm is silenced and the visible alarm remains on.

(3) Reconnect the converter to its connector, raise the latch to turn the converter on, and lower the plastic designation strip.

Requirement: The major visible alarm is extinguished.

(4) Repeat (1) through (3) for each converter on the panel, if so equipped.

5. TROUBLES

5.01 Because of the arrangement of the 662A power plant, most troubles will be caused by the individual converters. If the plant malfunctions, determine which converter or converters are malfunctioning and perform the corrective action as outlined in the appropriate Bell System Practices and CD-SD 82272-01 covering the converter.

5.02 Various troubles which may be encountered in the power plant are given in the following list. If the trouble is not found, check for loose or open connections or short circuits due to foreign matter lying across wiring terminals. This list is not all inclusive and is meant only as an aid in locating possible trouble conditions that might occur.

TROUBLE CHART

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
A. FA alarm lamp lights	(1) Operated 70-type fuse	Replace defective fuse
	(2) Capacitor C1 or C2 shorted	Shut down the plant and disconnect the defective capacitor. If a replacement capacitor is not readily available, the plant can be placed in service with the defective capacitor disconnected until a replacement is available.
B. High or low output (major alarm occurs)	(1) Improper battery input. (Input voltage range is −42.5 to −52.5 volts.)	Check for correct battery input to unit.
	(2) Faulty converter	Replace converter.
C. Minor office alarm	Failure of one converter in a plant configuration	Replace faulty converter.
D. Major office alarm	(1) Plant configuration:	
	(a) Failure of two or more converters	Replace faulty converters.
	(b) Plant fuse operation	Replace operated fuse.
	(2) Dedicated Configuration:	
	(a) Failure of one converter	Replace faulty converter.
	(b) Low-voltage condition	Correct low-voltage condition.