

414B POWER PLANT

J86892

OPERATING METHODS

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Caution: Voltages inside the power plant are over 150 volts to ground. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time as destructive or dangerous short circuits may occur. Disconnect the ac input power and the 59-cell battery from the power plant before performing maintenance on the plant.

1. GENERAL

1.01 The 414B (J86892) power plant is primarily intended to float and charge a 59-cell battery that is used to power the automatic switchgear and the automatic system control equipment (when required) for 900-type power plants.

1.02 This issue does affect the Equipment Test List.

1.03 The 414B power plant maintains the voltage of the 59-cell battery at 128.03 volts. The power plant contains two J87228A rectifiers, discharge fuses for one alternator, a plant control circuit, and a meter controlled discharge circuit for the operation of the 900-type power plants automatic system control equipment (when required). The 414B power plant may also contain a supplementary bay that provides additional discharge fuses for one to two more alternators.

1.04 The 414B power plant activates alarms if the battery gets out of limits, if a rectifier fails, or if a fuse operates. During a power failure, the 414B power plant operates the circuit breakers of the emergency alternators and when required, also provides power for the operation of the automatic system control equipment. If during a power failure, the voltage from the 59-cell battery drops below the level required for the operation of the circuit breakers, the power plant will activate alarms.

1.05 Routine checks should be made during a period when they will not interfere with service.

1.06 These instructions are based on the following circuit schematic drawings. For detailed descriptions of the operation of individual circuits, refer to the corresponding circuit descriptions.

SD-81100-01 — Issue 11AC — Alarm Circuit, AC Low Voltage and Engine Failure Alarms with Power Restore Alarm Feature, J86725E

SD-81576-01 — Issue 8B — Regulated Rectifier, 130 Volts, 10 Amperes DC, Semiconductor Type, J87228A

SD-81938-01 — System Control Circuit, 900 Type Plants, J86740

SD-82012-01 — Issue 1 — Engine Alternator Control

SD-82040-01 — Issue 1 — Charge and Discharge Circuit, Positive 125 Volts, 10 Amperes, 59-Cell Battery, 414B Type Power Plant, J86892

If this section is to be used with equipment or apparatus that is associated with later issues of the schematic drawings, reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

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2. LIST OF TOOL AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
411B	Test Pick
KS-6278	Connecting Clip (4 required)
TEST APPARATUS	
W1AF	Cord (8-1/2 feet long, equipped with one 360A tool at each end) (2 required)
2W17A	Cord (W2W cord equipped with one 310 plug and two 360 tools) (2 required)
—	35-Type Test set
—	Dry Cells (as required)
KS-8039	DC Volt-Milliammeter
KS-14510	Volt-Ohm-Milliammeter

3. OPERATION

3.01 Preparing to Start: When preparing to start the power plant, proceed as follows.

- (1) Verify that the AC INPUT (CB1) circuit breakers on the rectifiers are in the OFF position.
- (2) Verify that the 59-cell battery is connected to the output of the power plant.
- (3) Verify that all external connections are made in accordance with the schematic drawings covering the circuits associated with the power plant.
- (4) Verify that all associated fuses are installed in their respective fuse holders.
- (5) Verify that the ac input voltage to the rectifiers in the power plant is within ± 10 percent of the nominal (measured with the KS-14510 volt-ohm-milliammeter) value.

Note: The rectifiers in the power plant are equipped with taps on the input transformers to allow the rectifiers to be connected for nominal ac input voltages of 200, 210, 220,

230, 240, or 250 volts. The taps on the rectifiers in the power plant should be properly set at the time of installation.

3.02 Starting: To start the power plant, proceed as follows.

- (1) Operate the AC INPUT (CB1) circuit breakers on the rectifiers in the power plant to the ON position.

Requirement: The BATTERY (M1) voltmeter on the power plant indicates 128.03 volts and the OUTPUT (M1) ammeters on the rectifiers indicate that the rectifiers are supplying equal current to the batteries.

Note: If the requirement in (1) is not met, continue with (2).

- (2) Alternately adjust the VOLT ADJ (R17) potentiometers on the rectifiers until the BATTERY (M1) voltmeter on the power plant indicates 128.03 volts and the OUTPUT (M1) ammeters on the rectifiers indicate that the rectifiers are supplying equal current to the batteries.

3.03 Stopping: To remove the power plant from service, proceed as follows.

- (1) Operate the AC INPUT (CB1) circuit breakers on the rectifiers in the power plant to the OFF position.

Note: If it is desired to have the power plant completely disconnected from the ac input power and the batteries, follow the procedures in (2) and (3).

- (2) Remove all associated fuses from their respective fuse holders.
- (3) Manually disconnect the ac input power and the batteries from the power plant.

4. ROUTINE CHECKS

4.01 Keep the ventilating passages of the power plant unobstructed to ensure adequate cooling during operation.

4.02 Inspect the relays for the condition of contacts and clean if necessary.

4.03 Calibrate the power plant BATTERY (M1) voltmeter in accordance with Section 100-510-701.

4.04 *Output Voltage Check:* To check the power plant output voltage, proceed as follows.

- (1) Observe the indication on the power plant BATTERY (M1) voltmeter and the indications on the rectifier OUTPUT (M1) ammeters.

Requirement: The BATTERY (M1) voltmeter on the power plant indicates 128.03 volts and the OUTPUT (M1) ammeters on the rectifiers indicate that the rectifiers are supplying equal current to the batteries.

Note: If the requirement in (1) is not met, continue with (2).

- (2) Alternately adjust the VOLT ADJ (R17) potentiometers on the rectifiers until the BATTERY (M1) voltmeter on the power plant indicates 128.03 volts and the OUTPUT (M1) ammeters on the rectifiers indicate that the rectifiers are supplying equal current to the batteries.

4.05 *Fuse Alarm Checks:* To check the power plant fuse alarms, proceed as follows.

- (1) Using a WIAF cord equipped with one 411B test pick and one KS-6278 connecting clip, connect the KS-6278 connecting clip to TP1 of the power plant.
- (2) Insert the 411B test pick through the aperture of either of the 70-type fuse holders of the main power plant bay until contact is made with the alarm surface of the fuse cap.

Requirement: An audible alarm is activated and the FUSE ALARM and ALM lamps on the main power plant bay light.

- (3) Remove the 411B test pick from the 70-type fuse holder.

Requirement: The audible alarm and FUSE ALM and ALM lamps on the main power plant bay extinguish.

- (4) Repeat (2) and (3) on all remaining 70-type fuse holders in the main power plant bay.

Note: If the power plant does not have a supplementary bay, proceed to (8). If the power plant does have a supplementary bay, continue with (5).

- (5) Insert the 411B test pick through the aperture of either of the 70-type fuse holders of the supplementary power plant bay until contact is made with the alarm surface of the fuse cap.

Requirement: An audible alarm is activated and the FUSE ALARM and ALM1 lamp on the supplementary power plant bay light.

- (6) Remove the 411B test pick from the 70-type fuse holder.

Requirement: The audible alarm and FUSE ALARM and ALM1 lamps on the supplementary power plant bay extinguish.

- (7) Repeat (5) and (6) on all remaining 70-type fuse holders in the supplementary power plant bay.

- (8) Disconnect the KS-6278 connecting clip from TP1.

4.06 *Rectifier Failure Alarm Check:* To check the rectifier failure alarm, proceed as follows.

- (1) Connect a jumper between terminals 6 and 7 of terminal strip 1 (TS1).

Requirement: An audible alarm is activated and the RECT FAIL and ALM lamps light.

- (2) Disconnect the jumper from terminal strip 1 (TS1).

Requirement: The audible alarm, the RECT FAIL lamp, and the ALM lamp extinguish.

4.07 *HLV Relay Alarm Checks:* To check the HLV relay alarms, proceed as follows.

- (1) Set the locking levers of the No. 1 through No. 4 keys on the 35-type test set to the open position.

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- (2) Move all of the resistance sliders of the 35-type test set to their extreme right.
- (3) Position the controls of the 35-type test set as follows.

CONTROL	POSITION
BAT & GRD CO Key	Operated
REV Key	Normal
VM Key	Normal
G Switch	Open

- (4) Connect dry cells to the BAT and GRD terminals of the 35-type test set until between 8 and 10 volts is connected to the test set, as measured with the KS-8039 volt milliammeter. Connect the GRD terminal of the 35-type test set to the negative terminal of the dry cells and connect the BAT terminal of the 35-type test set to the positive terminal of the dry cells.
- (5) Close the locking lever of the No. 3 key and move the No. 3 resistance slider to the extreme left.
- (6) Close all resistance knife switches in the 35-type test set to cut out all resistance.
- (7) Connect the KS-8039 meter, set on the 150 VOLTS scale, between the + and LR terminals on the HLV relay.
- (8) Using a 2W17A cord, connect the T terminal of the 35-type set to the battery side of the HLV fuse (B lead) and connect the R terminal of the 35-type test set to the ground side of the HLV fuse (G lead).
- (9) Remove the HLV fuse from its respective fuse holder.
- (10) Slowly move the No. 3 sliders of the 35-type test set to the right until the L contact of the HLV relay makes and operates the L relay.

Requirement: The KS-8039 meter indicates 120 ± 0.25 volts, a minor alarm is activated, a major alarm is activated for a moment, and the HLV ALARM and ALM lamps light.

- (11) Slowly continue to move the No. 3 sliders of the 35-type test set to the right until the L contact of the HLV relay makes again and operates the L relay.

Requirement: The KS-8039 meter indicates 115 ± 0.25 volts, a major alarm is activated, and the HLV ALARM and ALM lamps are lighted.

Note: If the voltage across the HLV relay is not lowered enough to operate the L contact of the HLV relay when both No. 3 sliders have reached the extreme right, slide them fully back to the left. Then cut in 25,000 ohms by opening one or more of the No. 3 knife switches and slowly moving the No. 3 sliders to the right to recheck (10) and/or (11).

- (12) Move the No. 3 sliders of the 35-type test set to the extreme right.
- (13) Verify that the voltage indicated on the KS-8039 meter is down to at least 115 volts. If the voltage is not down to at least 115 volts, cut in additional resistance on the 35-type test set by opening one or more of the No. 3 knife switches.
- (14) Operate the BAT & GRD CO key on the 35-type test set to its normal position.
- (15) Slowly move the No. 3 sliders of the 35-type test set to the left to remove resistance from the circuit until the H contact of the HLV relay makes and operates the H relay.

Requirement: The KS-8039 meter indicates 127 to 127.25 volts and all lamps and alarms are extinguished.

- (16) Slowly continue to move the No. 3 sliders of the 35-type test set to the left until the H contact of the HLV relay makes again and operates the H relay.

Requirement: The KS-8039 meter indicates 132 to 132.25 volts, a major alarm is activated, the HLV ALARM and ALM lamps light, and either rectifier that was delivering 30 percent or more of rated output current will shut down.

Note: If the voltage across the HLV relay is not raised enough to operate the H contact of the HLV relay when both No. 3 sliders have reached the extreme left, slide them fully back to the right. Then cut out 25,000 ohms by closing one or more of the No. 3 knife switches and slowly move the No. 3 sliders to the left to recheck (15) and/or (16).

- (17) Operate the BAT & GRD CO key on the 35-type test set to the operated position.
- (18) Install the HLV fuse in its respective fuse holder.
- (19) Disconnect the 35-type test set from the power plant.
- (20) Disconnect the KS-8039 meter from the power plant.
- (21) If either of the rectifiers were shut down in (16), operate the ACO key on the rectifier that was shut down, operate the AC INPUT (CB1) circuit breaker on the rectifier to the OFF position, and restore the rectifier to service in accordance with 3.02.

5. TROUBLES

5.01 The following list contains the power plant alarm lamps and describes the function of each lamp.

LAMP	FUNCTION
ALM (on main power plant bay)	Indicates that a fuse in the main power plant bay is blown
	Indicates that a high or low voltage condition is present
	Indicates that a rectifier has failed

LAMP	FUNCTION
ALM1 (on supplementary power plant bay)	Indicates that a fuse in the supplementary power plant bay is blown
FUSE ALARM (on main power plant bay)	Indicates that a fuse in the main power plant bay is blown
FUSE ALARM (on supplementary power plant bay)	Indicates that a fuse in the supplementary power plant bay is blown
HLV ALARM (on main power plant bay)	Indicates that a high or low voltage condition is present
RECT FAIL ALARM (on main power plant bay)	Indicates that a rectifier has failed

Caution: In making continuity checks, use the ohmmeter portion of the KS-14510 volt-ohm-milliammeter. Do not use the X10,000 position for testing semiconductors, as the higher voltage may damage them.

Note: When it is necessary to replace blown supply and alarm fuses (alarm fuses in parallel with supply fuses), replace the blown supply fuses first and then replace the associated alarm fuses.

5.02 Various trouble conditions that occur in the power plant, their lamp indications, and their possible causes are listed in the following list. This list is not all-inclusive and is meant only to be an aid in locating possible trouble conditions. Refer to Section 169-254-301 for the possible trouble conditions that occur in the rectifiers of the power plant.

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TROUBLE	LAMP INDICATION	POSSIBLE CAUSE
(a) No output voltage from the power plant	HLV ALARM ALM	AC INPUT (CB1) circuit breakers on the rectifiers operated to the OFF position No input voltage to the rectifiers VOLT ADJ (R17) potentiometers on the rectifiers not properly adjusted HLV relay defective Both rectifiers defective
(b) Low output voltage from the power plant	RECT FAIL ALARM ALM	Low input voltage to the rectifiers
(c) High output voltage from the power plant	HLV ALARM ALM	VOLT ADJ (R17) potentiometers on the rectifiers not properly adjusted High input voltage to the rectifiers VOLT ADJ (R17) potentiometers on the rectifiers not properly adjusted