POWER SYSTEMS
"LINEAGE"® 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS, 400 AMPERES MAXIMUM

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded By
Data Set, 103J-LP, Universal Data Systems, B Option - App Fig 4	Data Set, 212A-LP, Universal Data Systems, A Option - App Fig 4
R2 Resistor, KS-20616, L1A,18.7 Kohms, B Option - CM1 (Note 4, ZE Option)	R2 Resistor, KS-20616, L1A,19.1 Kohms, A Option - CM1 (Note 4, ZE Option)

D. Description of Changes

D.1 The ohmic value of resistor R2 in ED-83104-30, GR1 (sheet note 4 on sheet J1) was changed to improve the manufacturing test yield.

D.2 Sheet Note 2 was added to sheets B1, B2, and B5.

D.3 FS2 was changed by the addition of a float/equalize (EQ) lead, option A, from the rectifier to the MCS controller. Also, the "TH" and "GRD" leads, option A, going from FS17 to the MCS controller were added in FS2.

D.4 FS17 Battery Reserve Predictor Thermistor Assembly, option A, was added.

D.5 Circuit Note 115 was expanded by the addition to option E.

D.6 Information Note 316 was added.

D.7 Information Note 303 was updated for drawing issue 6B.

D.8 Option Index table was updated by addition of options A and B.

D.9 FS3 was redrawn to depict the controller drawing.

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POWER SYSTEMS
"LINEAGE"® 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS, 400 AMPERES MAXIMUM

CHANGES

B. Changes in Apparatus

B.1 Superseded	Superseded By
Filter Charger Panel, ED-83102-30, G1 & G2 - App Fig 3	Filter Charger Panel, ED-83102-30, G1 & G2 or ED-83108-30 - App Fig 3
Circuit Breakers, KS-22010 (List as required up to 100 ampere) - App Fig 7 & 8	Circuit Breakers, KS-22010, L79 thru 99, as required - App Fig 7 & 8

D. Description of Changes

D.1 In App Fig 3, reference to "ED-83108-30" added to allow the mounting of the filter charge panel parts on the control unit hinged assembly.

D.2 In App Fig 7 and 8, the explicit circuit breaker list numbers 79 through 99 were added to KS-22010.

D.3 Circuit Note 113 was corrected.

D.4 Information Note 302 was updated by the addition of the 200-ampere rectifier information.

D.5 Information Note 303 updated for issue 5B.

D.6 Reference to Note 113 was added to the FS6 title.

D.7 Sheet Note 4 on sheet J1 was changed by specifying KS-16312, L4F resistors in place of KS-16764, L1F resistors.

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POWER SYSTEMS
"LINEAGE"® 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS, 400 AMPERES MAXIMUM

CHANGES

B. Changes in Apparatus

B.1 Removed

App Fig 15 - X, W, K, G Options

D. Description of Changes

D.1 The drawing has been changed by the removal and integration of FS 15 and App Fig 15 (options X, W, K, G) into FS 14 and App Fig 14.

D.2 Frame ground and SD-82604-01 and SD-82605-01 have been added to the rectifiers shown in FS 1, FS 2, and FS 10.

D.3 A sheet Note has been added in FS 1, FS 2, and FS 10.

D.4 Circuit Note 113 has been changed by a reference to the application of the K1 contactor.

D.5 Circuit Note 118 has been completely changed.

D.6 In Information Note 302, App Fig 14 (option G) has been changed.

D.7 In Information Note 303, option H has been designated MFR DISC.

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DEPT 54NJ340310-PDT-WJG

POWER SYSTEMS
"LINEAGE"® 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS, 400 AMPERES MAXIMUM

CHANGES

A. Changed and Added Functions

A.1 A filter fuse panel, which is to be used in place of a power distributing frame (PDF) to feed a 5A remote switching module (RSM) or any similar load, has been added on the drawing as FS 13, option K.

A.2 Capacitor charge circuits have been added on the drawing as FS 14 and FS 15, options X, W, K, and G.

A.3 A fuse block distribution panel has been added on the drawing as FS 16, option F.

B. Changes in Apparatus

B.1 Added

App Fig 13 - K Option

App Fig 14 - X, W, K, G Options

App Fig 15 - X, W, K, G Options

App Fig 16 - F Option

B.2

Removed	Replaced By
R6 Resistor KS-14603 L1C, 681 - FS 5, App Fig 6	R6 Resistor KS-8512 L2A, 681 - FS 5, App Fig 6

D. Description of Changes

D.1 On the drawing, App Fig 1, 2, and 9 have been changed by the addition of J85503B-( ) [200 AMP 3 PHASE].

D.2 In FS 3 and App Fig 3, resistor designations have been changed from R1.1 through R1.4 to R1.1A through R1.4A on a no-record basis.

D.3 Option G leads have been added in FS 5 and FS 14.

D.4 On the drawing, FS 5 has been changed by the addition of a "DISR-" lead to the DISCHARGE GROUND BUS.

D.5 In App Fig 6, the code of resistor R6 has been changed from KS-14603 L1C, 681 ohms to KS-8512 L2A, 681 ohms on a no-record basis.

D.6 On the drawing, App Fig 7, 8, and 10 have been changed by the addition of code ED-83101-30, and App Fig 12 has been changed by the addition of code ED-83106-30.

D.7 The drawing has been changed by the addition of FS 13 and App Fig 13 (option K), FS 14 and App Fig 14 (options X, W, K, G), FS 15 and App Fig 15 (options X, W, K, G), and FS 16 and App Fig 16 (option F).

D.8 Circuit Note 104 has been changed by the addition of ATTP 802-001-180.

D.9 Diagram 1 of Circuit Note 114 has been changed by the addition of lead Gb.

D.10 Circuit Note 114 has been changed by the addition of Section 26.

D.11 Circuit Notes 116, 117, 118, 119, and 120 and a reference to Note 120 in FS 7 and FS 8 have been added on the drawing.

D.12 Equipment Note 201 has been changed by a reference to the use of 20 gauge KS-22247 L4 wire.

D.13 The DIS- entry in Equipment Note 202 has been changed.

D.14 Equipment Notes 209 and 210 have been added on the drawing.

D.15 Information Note 302 has been changed by the addition of App Fig 13 (option K), App Fig 14 (option G), and App Fig 16 (option F).

D.16 Information Note 303 has been changed by the addition of options K, G, F, and C (all STD) and reference to Notes 312, 313, and 120, and by the addition of option D (MFR DISC) and reference to Note 109.

D.17 In Information Note 304, "Discharge Circuit Breaker" has been changed to "Discharge Fuse or Circuit Breaker;" "Charge Fuse Operated" has been changed to "Charge Fuse or Capacitor Filter Fuse

Operated;" and "Discharge Circuit Breaker" has been changed to "Discharge Fuse or Circuit Breaker."

D.18 Information Notes 309, 310, 311, 312, 313, 314, and 315 have been added on the drawing.

D.19 On the drawing, CAD 2, CAD 3, and sheet Note 3 have been added.

D.20 The Option Index table has been changed by the addition of options K, G, and F.

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CD-83104-01
ISSUE 1
APPENDIX 1B
DWG ISSUE 2B
DISTN CODE 1M99

POWER SYSTEMS
"LINEAGE"® 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS, 400 AMPERES MAXIMUM

CHANGES

A. Changed and Added Functions

A.1 The plant capacity has been increased from 200 amperes maximum to 400 amperes maximum.

A.2 The low-voltage battery disconnect circuit option for -48 volt plants has been increased from 200 amperes maximum to 400 amperes maximum and designated option N. The original circuit has been designated option P.

A.3 A high-inrush 30-ampere circuit breaker has been added onto an existing plant distribution panel as option T.

A.4 High-inrush circuit breakers of 70 amperes, 100 amperes, and 175 amperes have been added on the drawing and designated option Q.

A.5 Three-port inverters that can use an ac or a dc input and produce an ac output have been added on the drawing and designated option L. These inverters provide a 1-kilovolt-ampere (kVA), 3-kVA, or 5-kVA output. The option Q circuit breakers can be used to feed the option L apparatus.

A.6 Additional low-voltage disconnect voltage values have been added in CPS 1 (options ZA through ZL).

B. Changes in Apparatus

B.1 Added

CB1 thru CB18 Circuit Breaker, Heinemann Electric Co CF1-Z74-1 - FS 8, App Fig 10 - T Option

CB1 thru CB4 Circuit Breaker, Heinemann Electric Co CF1-Z75-8 - FS 12, App Fig 12 - Q Option

CB1, CB2 Circuit Breaker, Heinemann Electric Co CF1-Z75-14 - FS 12, App Fig 12 - Q Option

CB1 Circuit Breaker, Heinemann Electric Co GJ1-Z34-15 - FS 12, App Fig 12 - Q Option

K1 Contactor, HB Electrical Products JFA4011A - FS 6, App Fig 6 - N Option

Inverter, Powermark 5338-44 - FS 11, App Fig 11 - L Option

Inverter, Powermark 6234-44 - FS 11, App Fig 11 - L Option

Inverter, Powermark 6254-44 - FS 11, App Fig 11 - L Option

FS 11, App Fig 11 - L Option

FS 12, App Fig 12 - Q Option

R6 Resistor KS-14603 L1C, 681Ω - FS 5, App Fig 6

D. Description of Changes

D.1 In the title of the schematic drawing and the circuit description, LINEAGE™ has been changed to "LINEAGE"® and 200 AMPERES has been changed to 400 AMPERES, and in the title of the circuit description, the erroneously included J85500B has been removed.

D.2 On the drawing, FS 11 and App Fig 11 have been added and designated option L.

D.3 On the drawing, FS 12 and App Fig 12 have been added and designated option Q.

D.4 The KS-14603 L1C 681 ohm R6 resistor has been added in FS 5 and App Fig 6 on the drawing for alarm purposes.

D.5 Information Note 303 on the drawing has been changed by the addition of option P, option N, option J, option H, option T, option Q, and option L, all designated STANDARD (STD).

D.6 On the drawing, CPS 1 has been changed by the addition of options ZA through ZL, all designated STD.

D.7 The Option Index table has been changed by the addition of options P, N, J, H, T, Q, L, and ZA through ZL.

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DEPT 54NJ340310-PDT-WJG

POWER SYSTEMS
LINEAGE™ 2000 CHARGE AND DISCHARGE CIRCUIT
24 OR 48 VOLTS
200 AMPERES MAXIMUM
J85500B

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides a direct current output to power central office loads and maintain a battery at its float voltage for these options:

- The W option uses 24-cell batteries (KS-20472) to provide 48-volt reserve for loads being fed from the power plant.
- The Z option uses 12-cell batteries (KS-20472) to provide 24-volt reserve for loads being fed from the power plant.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The power plant can be controlled via a conventional LINEAGE™ 2000 control unit (option F), a LINEAGE™ 2000 small control unit (option V), or an MCS LINEAGE™ 2000 control unit (option E). With option E, a modem can be used (option M) for remote data transmission. Option S enables load filters to be charged through the distribution circuit breakers.

2.02 Option R provides for a low-voltage disconnect of the plant batteries. When the voltage between the CHARGE GROUND BUS and CHARGE BATTERY BUS falls below 43.1 ±0.50 volts (for the W and R options) or below 21.3 ±0.25 volts (for the Z and R options), the battery will be disconnected from the CHARGE BATTERY BUS.

2.03 The rectifiers normally maintain the battery at its float voltage and recharge it as required. The plant has several backup systems that monitor the output and send alarms for battery voltages that are too high or low. If the battery voltage exceeds the upper limit of 53.00 ±0.5 volts (W option) or 26.75 ±0.25 volts (Z option), the plant issues a major alarm and sends a high-voltage (HV) shutdown signal to all rectifiers. Rectifiers whose output current is over ten percent of their rating will shut down; after shutdown the HV alarm disappears and a minor alarm is sent.

2.04 If any distribution fuse operates or circuit breaker trips, a major alarm is sent and the appropriate LED on the control unit lights. Major alarms are also sent when the battery voltage drops to 51.25 ±0.5 volts (W option) or 25.50 ±0.25 volts (Z option). These low-voltage alarms include the SI(A), D, BD, PMJ, and PMJV. If the voltage drops to 48.25 ±0.5 volts (W option) or 24.00 ±0.25 volts (Z option), the very low-voltage alarm SI(D) is also sent.

SECTION II - DETAILED DESCRIPTION

1. RECTIFIER AND CONVENTIONAL LINEAGE™ 2000 CONTROL UNIT

1.01 FS1 shows the connections required for a general type of rectifier to be controlled by a conventional LINEAGE 2000 control unit. J85502A, B, or C rectifiers (25, 50, or 100 ampere-single phase) or J85503A rectifiers (100 ampere-three phase) can be used with this control unit. The plant can work with a maximum of ten rectifiers. The standard rectifier connections to the plant are listed below:

Designation	Meaning
G	The main ground lead from the rectifier to the battery.
B	The main charging lead from the rectifier to the battery.
RG and RB	The rectifier senses the battery voltage over these leads.
BAT	This lead provides battery voltage to the rectifier for its internal needs.
GRD	This lead provides a ground to the rectifier for its internal needs.
RS and RSR	If a rectifier fails because of high voltage caused by transient conditions, the control unit will use these leads and try once to restart it.
LOA and LOAR	If the rectifier experiences a loss of ac, the rectifier provides a clean closure between these two leads for the control unit's use.
RFA and RFAR	The RFAR lead brings ground to the rectifier from the control unit. When a rectifier fails, a relay closes, applying the RFAR ground to the RFA lead. The ground on the RFA lead is then transmitted back to the control unit.
CB and CBR	If the rectifier's output circuit breaker trips, the rectifier provides a clean closure between these two leads for the control unit's use.
HV and HVR	High-voltage shutdown leads from the control unit to rectifier.
TR and TRR	Remote shutdown sent to the rectifiers through the control unit.
PMN and PMNR	If the rectifier fails or experiences a loss of ac, the rectifier provides a clean closure between these two leads for the control unit's use.
PMNV and PMNVR	If the rectifier fails or experiences a loss of ac, the rectifier provides a clean closure between these two leads for the control unit's use.

1.02 FS1 also shows a conventional LINEAGE 2000 control unit. The purpose of the leads not listed in 1.01 are explained in the following paragraphs.

1.03 These leads are from the charge and discharge buses to the control unit:

Designation	Meaning
BATSHG and BATSH	These leads are used to measure the voltage drop across a predetermined resistance (shunt R4) to indicate how much current is being delivered from the power plant to its loads.
DISCH BAT and DISCH GRD	These leads are used to measure the voltage between the CHARGE BATTERY BUS and the DISCHARGE GROUND BUS.
REG BAT and REG GRD	These leads are used to measure the voltage between the CHARGE BATTERY BUS and the CHARGE GROUND BUS.

1.04 This lead is from the circuit breakers to the control unit:

Designation	Meaning
FAJ	This input lead signals the control unit when a discharge circuit breaker has tripped.

1.05 This lead is from the filter charger circuit to the control unit:

Designation	Meaning
FAN	This input lead signals the control unit when the CHG fuse has operated.

1.06 These leads are from external circuitry to the control unit:

Designation	Meaning
TR 1 through 4	These leads control groups of rectifiers. They are the means to externally shut down rectifiers.

2. RECTIFIER AND MCS LINEAGE™ 2000 CONTROL UNIT

2.01 FS2 shows the connections required for a general type of rectifier to be controlled by an MCS LINEAGE 2000 control unit. J85502A, B, or C rectifiers (25, 50, or 100 ampere-single phase) or J85503A rectifiers (100 ampere-three phase) can be used with this control unit. The plant can work with a maximum of ten rectifiers. The standard rectifier connections to the plant are listed below:

Designation	Meaning
C	The main ground lead from the rectifier to the battery.
B	The main charging lead from the rectifier to the battery.
RG and RB	The rectifier senses the battery voltage over these leads. The RB and RG leads are converted to R+ and R- in the rectifier.
BAT	This lead provides battery voltage to the rectifier in order to operate its alarms.
DPG	Digital plant ground.
RS and RSR	If a rectifier fails because of high voltage caused by transient conditions, the control unit will use these leads and try once to restart it.
HV	High-voltage shutdown leads from the control unit to rectifier.
APG	The applied plant ground (APG) is a separate ground used for IC circuit ground. This lead provides the return signal for the VI power supply.
VI	This lead supplies voltage to the plant from the rectifiers.
RFA and RFAR	The RFAR lead brings ground to the rectifier from the control unit. When a rectifier fails, a relay closes, applying the RFAR ground to the RFA lead. The ground on the RFA lead is then transmitted back to the control unit.
PH	Phase monitor alarm.
CB and CBR	Circuit breaker trip alarms.
TR	Remote shutdown sent from engine control.
MAN	This lead indicates manual shutdown of a rectifier.
GRD	This lead provides ground for relays and LEDs and for monitoring the battery voltage to the control unit.

2.02 FS2 also shows an MCS LINEAGE 2000 control unit. The purpose of the leads not listed in 2.01 are explained in the following paragraphs.

2.03 These leads are from the charge and discharge buses to the control unit:

Designation	Meaning
BATSHG and BATSH	These leads are used to measure the voltage drop of a predetermined resistance (shunt R4) to indicate how much current is reaching the loads of the power plant.
DISCH BAT and DISCH GRD	These leads are used to measure the voltage between the CHARGE BATTERY BUS and the DISCHARGE GROUND BUS.
REG BAT and REG GRD	These leads are used to measure the voltage between the CHARGE BATTERY BUS and the CHARGE GROUND BUS.

2.04 This lead is from the circuit breakers to the control unit:

Designation	Meaning
FAJ	This input lead signals the control unit when a discharge circuit breaker has tripped.

2.05 This lead is from the filter charger circuit to the control unit:

Designation	Meaning
FAN	This input lead signals the control unit when the CHG fuse has operated.

2.06 These leads are from external circuitry to the control unit:

Designation	Meaning
TR 1 through 4	These leads control groups of rectifiers. They are the means to externally shut down rectifiers.

3. RECTIFIER AND LINEAGE™ 2000 SMALL CONTROL UNIT

3.01 FS10 shows the connections required for a general type of rectifier to be controlled by a LINEAGE 2000 small control unit. J85502A, B, or C rectifiers (25, 50, or 100 ampere-single phase) or J85503A rectifiers (100 ampere-three phase) can be used with this control unit. The plant can work with a maximum of six rectifiers. The leads shown in FS10 are identified in paragraphs 1.01 through 1.06.

4. FILTER CHARGER

4.01 FS3 shows the circuit used to charge load filters when the S option is selected. The S option includes one filter charger panel (App Fig. 3). If a circuit breaker panel contains load filters that need to be charged, use App Fig. 7. Use switch S2 to select which circuit breaker's load filters will be charged. Switch S1 actually applies charging current to the filters. R1.1, R1.2, R1.3, R1.4, R2, and R3 are current-limiting resistors. LED DS1 lights to indicate that the circuit is charging a load filter. If LED DS1 remains lit for more than five seconds when a load filter is being charged, there is a problem with either the circuit or the load being fed. Discontinue the use of the filter charging circuit until the problem is corrected.

5. MODEM

5.01 FS4 shows the connections that are required between the MCS LINEAGE 2000 control unit, a phone jack, and the modem in order to use the M option. With option M, the MCS LINEAGE 2000 can be accessed from remote locations.

6. CHARGE BATTERY BUS, CHARGE GROUND BUS, BATTERY BUS, CONTACTOR K1, AND DISCHARGE GROUND BUS

6.01 FS5 shows the CHARGE BATTERY BUS, CHARGE GROUND BUS, BATTERY BUS, contactor K1, and DISCHARGE GROUND BUS. Shunt R4 provides a millivolt signal to the control unit to monitor the load current. Contactor K1 is part of the R option. It is used with FS6 to disconnect the plant batteries when the battery voltage is low.

7. LOW VOLTAGE DISCONNECT

7.01 FS6 shows the LOW VOLTAGE DISCONNECT CIRCUIT used with the R option. This circuit disconnects the battery from the CHARGE BATTERY BUS when the voltage between CHARGE BATTERY BUS and CHARGE GROUND BUS falls below:

- 43.1 ±0.50 volts (W and R options), or
- 21.3 ±0.25 volts (Z and R options).

When this low voltage level occurs, a Darlington pair of transistors in CP1 turns off, changing the voltage at terminal 3 of CP1 from ground to approximately the battery voltage. This voltage change de-energizes contactor K1, forcing the batteries to disconnect from the CHARGE BATTERY BUS. If the voltage between the CHARGE BATTERY BUS and CHARGE GROUND BUS rises above the disconnect level, the batteries will reconnect to the CHARGE BATTERY BUS via contactor K1. An alarm contact is available to indicate whether the batteries are connected or disconnected from the plant.

8. DISCHARGE CIRCUIT

8.01 FS7 and FS8 show the DISCHARGE CIRCUIT. This circuit represents discharge panels used to feed load from the power plant. The plant can have up to four panels, and each panel can contain up to 18 circuit breakers as shown in FS8 (15 on panels using the S option in FS7). If any circuit breaker trips for any reason, battery is connected through resistor R5 via the FAJ lead to the control unit (FS1, FS2, or FS10). The control unit then converts this signal to an alarm. In FS7 the FC_ leads are used with option S to charge load filters.

9. BATTERY OPTIONS

9.01 FS9 shows the battery options for the power plant. These batteries provide battery reserve for all loads being fed from the power plant. The Z,Y option provides for +24 volt batteries. The Z,X option provides for -24 volt batteries. The W,X option provides for -48 volt batteries.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 See SD-82588-01 or SD-82646-01 for all limits, except for the following:

When the R option is included and the voltage between the CHARGE BATTERY BUS and CHARGE GROUND BUS falls below 43.1 ±0.50 volts (for the W and R options) or 21.3 ±0.25 volts (for the Z and R options), the battery will be disconnected from the CHARGE BATTERY BUS.

2. FUNCTIONAL DESIGNATIONS

2.01 Leads

Designation	Meaning
DIS1 through DIS4	Distribution leads from the CHARGE BATTERY BUS to the DISCHARGE BUSES.
GR	GROUND RETURN from CP1.
LVD1	Lead from contactor K1 to CHARGE BATTERY BUS or CHARGE GROUND BUS.
LVD2	Feed to CP1 (Low Voltage Disconnect Circuit Pack) from CHARGE BATTERY BUS.
LVD3	Lead from CP1 (Low Voltage Disconnect Circuit Pack) to contactor K1.
P-	POWER leads from batteries.
PR-	POWER RETURN leads from batteries.
FC-	Load FILTER CHARGE leads.

2.02 Circuit Pack

Designation	Meaning
CP1	Low Voltage Disconnect Circuit Pack.

2.03 See CD-82588-01 or CD-82646-01 for additional designations.

3. FUNCTIONS

3.01 Control circuit functions for FS1 and FS2 are contained in CD/SD-82588-01.

3.02 Control circuit functions for FS10 are contained in CD/SD-82646-01.

3.03 25, 50, and 100 ampere, 24/48 volt (single phase) rectifier (J85502A, B, or C) functions are contained in CD/SD-82604-01.

3.04 100 ampere, 24/48 volt (three phase) rectifier (J85503A) functions are contained in CD/SD-82605-01.

4. CONNECTING CIRCUITS

4.01 (a) SD-82588-01 MCS LINEAGE™ 2000 Controller

(b) SD-82646-01 LINEAGE™ 2000 Small Controller

(c) SD-82604-01 Rectifier Circuit

(d) SD-82605-01 Rectifier Circuit

5. MANUFACTURING TESTING REQUIREMENTS

5.01 X-79596

6. TAKING EQUIPMENT OUT OF SERVICE

6.01 To take the J85501A control unit out of service, disconnect the DISCH BAT and REG BAT leads from their bus bar connections. Refer to AT&T Practice 167-609-310 for details.

6.02 To take the J85502A, B, C and J85503A rectifiers out of service, 1) disconnect the rectifier input power and control unit power, and 2) electrically isolate the rectifier output from the power plant buses by removing fuses, operating circuit breakers, and removing the rectifier control cable. Refer to AT&T Practice 167-609-310 for details.

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