

“LINEAGE” 2000
MICROPROCESSOR CONTROLLED SYSTEM BATTERY PLANT
RECTIFIER DESCRIPTION

	PAGE		PAGE
1. GENERAL	1	4. J87438A/J87439A Rectifier—Front View, Cover Opened	6
2. PHYSICAL DESCRIPTION	3	5. Rectifier Interface Block Diagram	7
A. J87436A and J87437A Rectifiers	3	6. Signal Flow Between Rectifier and Smart Plant Controller	8
B. J87438A and J87439A Rectifiers	3	7. Signal Flow Between Rectifier and Conventional Plant Controller	9
C. Printed Circuit Packs	5		
3. FUNCTIONAL DESCRIPTION	5	Tables	
A. General	5	A. Rectifier Capacity	2
B. Rectifier Controls	5		
C. Rectifier/Controller Interface and Addressing (Smart Plant)	8	1. GENERAL	
D. Rectifier/Controller Interface and Addressing (Conventional Plant)	9	1.01 This practice describes the physical and functional characteristics of the rectifiers used in the LINEAGE 2000 Microprocessor Controlled System (MCS) battery plant. Included in this practice are the J87436A, J87437A, J87438A, and J87439A rectifiers.	
4. ACCESSIBILITY	9	1.02 Whenever this practice is reissued, the reason for reissue will be given in this paragraph.	
5. MAINTENANCE AIDS	9	1.03 The rectifiers are designed to provide power to loads and charge and float storage batteries automatically by providing regulated dc power from an ac power service. The J87436A and J87438A rectifiers provide positive or negative 24 volts. The J87437A and J87439A rectifiers provide positive or negative 48 volts	
Figures		1.04 The rectifiers are designed to operate from a 3-phase, 60 ±3 Hz input. The input and output	
1. J87436A/J87437A Rectifier — Front View	3		
2. J87436A/J87437A Rectifier—Front View, Cover Removed	4		
3. J87438A/J87439A Rectifier—Front View	5		

* Trademark of AT&T Technologies

capacity for each rectifier, according to the J-code and list number, is listed in Table A.

TABLE A
RECTIFIER CAPACITY

RECTIFIER J-CODE	LIST NUMBER	INPUT AC (VOLTS)	OUTPUT DC (VOLTS)	AMPERAGE (AMPS)
J87436A	L1, L5	208/240	24	100
J87436A	L2, L5	480	24	100
J87437A	L1, L5	208/240	48	100
J87437A	L2, L5	480	48	100
J87438A	L1, L8	208/240	24	200
J87438A	L2, L8	480	24	200
J87439A	L1, L5	208/240	48	200
J87439A	L2, L5	480	48	200

1.05 The output polarity of the rectifiers is determined by wiring Options Y and Z. Option Z is required for those applications in which the positive side of the battery is grounded. Option Y is required in those applications in which the negative side is grounded.

1.06 ***DANGER: When the rectifier is in service, voltages inside the rectifier exceed 150 volts to ground. Care should be taken to avoid contact with all components.***

1.07 The rectifiers may be used in either a micro-processor controlled smart plant or a conventional plant.

1.08 This practice is based on the following circuit schematic drawings:

SCHEMATIC	TITLE
SD-82397-01, Iss 8B	Power Systems, Rectifier, J87436A
SD-82398-01, Iss 8B	Power Systems, Rectifier, J87437A
SD-82399-01, Iss 6D	Power Systems, Rectifier, J87438A

SCHEMATIC	TITLE
SD-82400-01, Iss 8B	Power Systems, Rectifier, J87439A

If this practice is to be used with equipment or apparatus that is associated with earlier or later issues of the drawings, refer to the SDs to determine the extent of the changes and the manner in which the practice may be affected.

1.09 Some of the more important features common to the J87436A, J87437A, J87438A, and J87439A rectifiers are:

- (a) Electronic current-limiting
- (b) Inherent current-limit if the output is shorted
- (c) Selective high-voltage shutdown
- (d) A back-up high-voltage shutdown
- (e) Shutdown from blown fuse
- (f) A remote shutdown and restart capability
- (g) Interlocks to prevent rectifier operation if the printed circuit packs are not in place
- (h) Automatic crossover to internal sensing if external sense lead(s) open
- (i) Manual starting
- (j) Visual indication of rectifier failure
- (k) Manual output voltage adjustment
- (l) Test jacks for reading output voltage at the point of regulation
- (m) Walk-in circuit to control the length of time for the rectifier to reach regulated output voltage after initial turnon
- (n) Output circuit breaker (optional for J87436A and J87437A)
- (o) Output current ammeter
- (p) No load - full load test switch

- (q) Protected dc output battery bus
- (r) Voltage proportional to load current [circuit pack (CPS) SP7].

2. PHYSICAL DESCRIPTION

A. J87436A and J87437A Rectifiers

2.01 The framework for the J87436A and J87437A rectifier (Fig. 1 and 2) mounts on a 23-inch relay rack or in a cabinet or frame with a similar mounting arrangement. The rectifiers have a hinged front door and a recessed control panel above the door. The door and cabinet are painted white and the control panel is black. Multiple units can be stacked two per rack. The rectifiers are 30.9 inches high, 4.84 inches deep from front to mounting surface, and 11.84 inches deep from front to rear. The J87436A rectifier weighs approximately 290 pounds. The J87437A rectifier weighs approximately 390 pounds.

2.02 An optional output circuit breaker is available by ordering List 3 in addition to the original List 1 or 2. The output circuit breaker is optional only for the J87436A and J87437A rectifiers.

2.03 At the top left-side wall of the rectifiers are two knockouts for bringing in ac leads either in front or in back of the mounting surface. Each is a multiple knockout to accept 1/2-inch or 3/4-inch conduit. The dc and alarm leads enter the upper right-side wall either in front or in back of the mounting surface. The ac leads are connected to contactor ST1 via three pressure terminal connectors. A separate 1/4-20 stud is provided for frame ground. The dc output bus bars contain 5/16-18 studs on 7/8-inch centers to accommodate 2-hole lugs. The ac input and dc output cables are furnished with the plant.

B. J87438A and J87439A Rectifiers

2.04 The J87438A and J87439A rectifiers (Fig. 3 and 4) have two hinged doors, one above the other, and a faceplate mounted (with two screws) above the doors. The top door is cut to expose a recessed control panel which is mounted to the cabinet with four screws. Multiple units may be bolted side-by-side or back-to-back. The doors are painted white, the control panel is black, and the cabinet and faceplate are finished in textured blue enamel. The rectifiers are 84 inches high, 15 inches deep (16.38

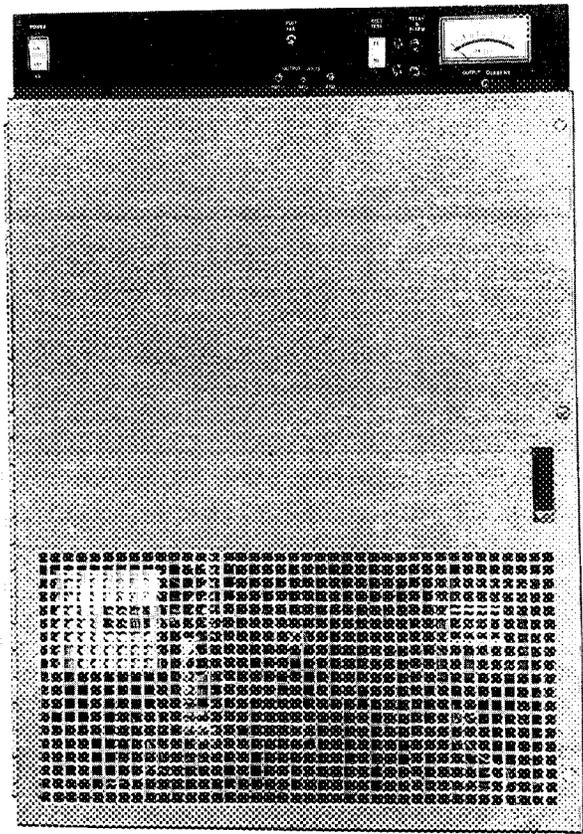


Fig. 1—J87436A/J87437A Rectifier — Front View

including front doors), and 13 inches wide. The J87438A rectifier weighs approximately 550 pounds. The J87439A rectifier weighs approximately 750 pounds.

2.05 The input and output connections enter and exit through the top of the unit. A 1-1/8 inch and 1-3/8 inch multiple knockout is provided on top of the unit to accept 3/4-inch and 1-inch conduit for the ac input leads. A cutout is provided in the top of the unit for the dc output, test and alarm cables. The top-front faceplate must be removed to make all internal connections. The ac leads are connected to contactor ST1 via three pressure terminal connectors. Separate 1/4-20 studs are provided for the frame ground and ac ground leads. The dc output bus bars contain 3/8-16 studs on 1-inch centers to accommodate 2-hole lugs. The ac input and dc output cables and lugs are furnished with the plant.

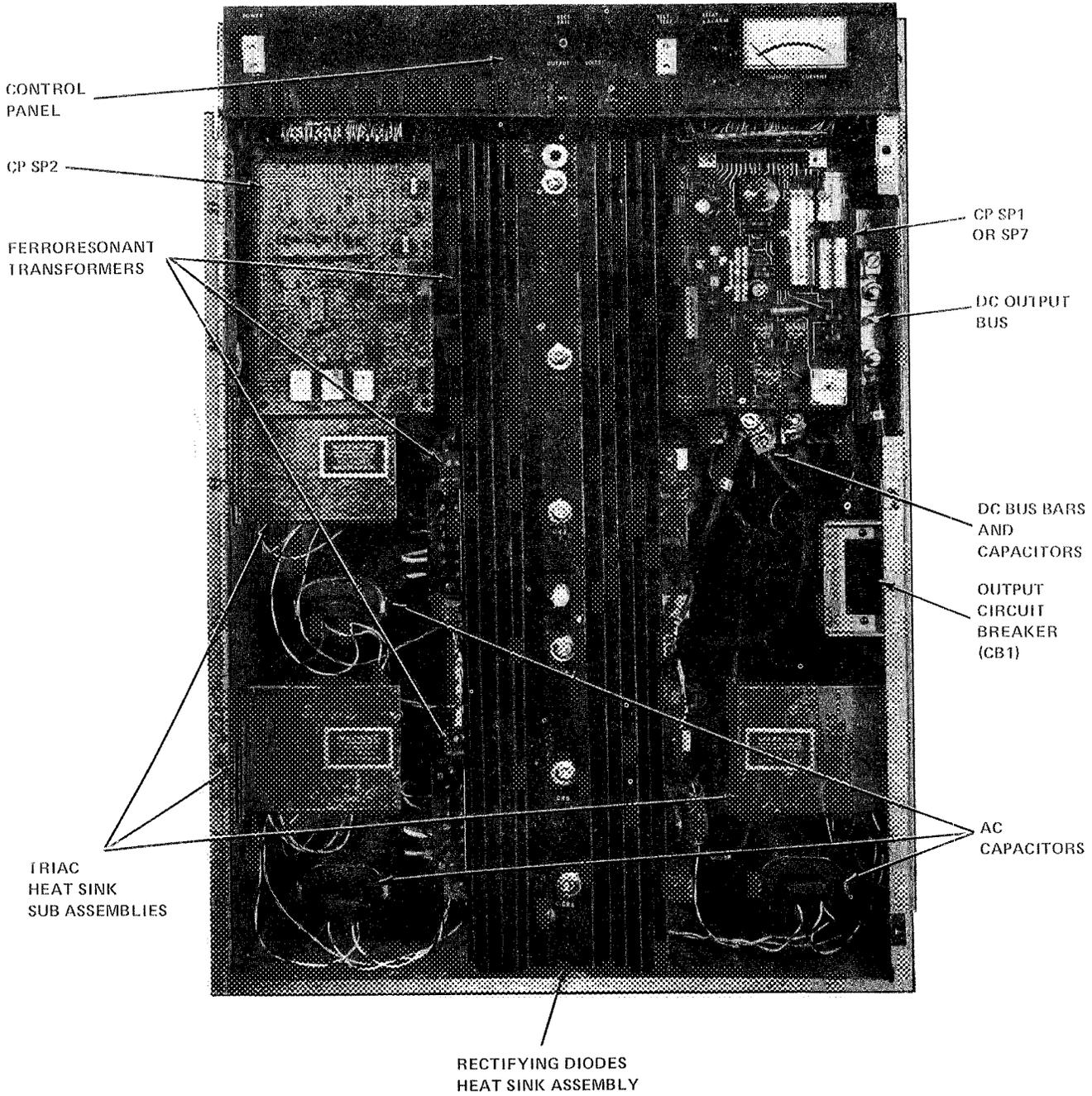


Fig. 2—J87436A/J87437A Rectifier—Front View, Cover Removed

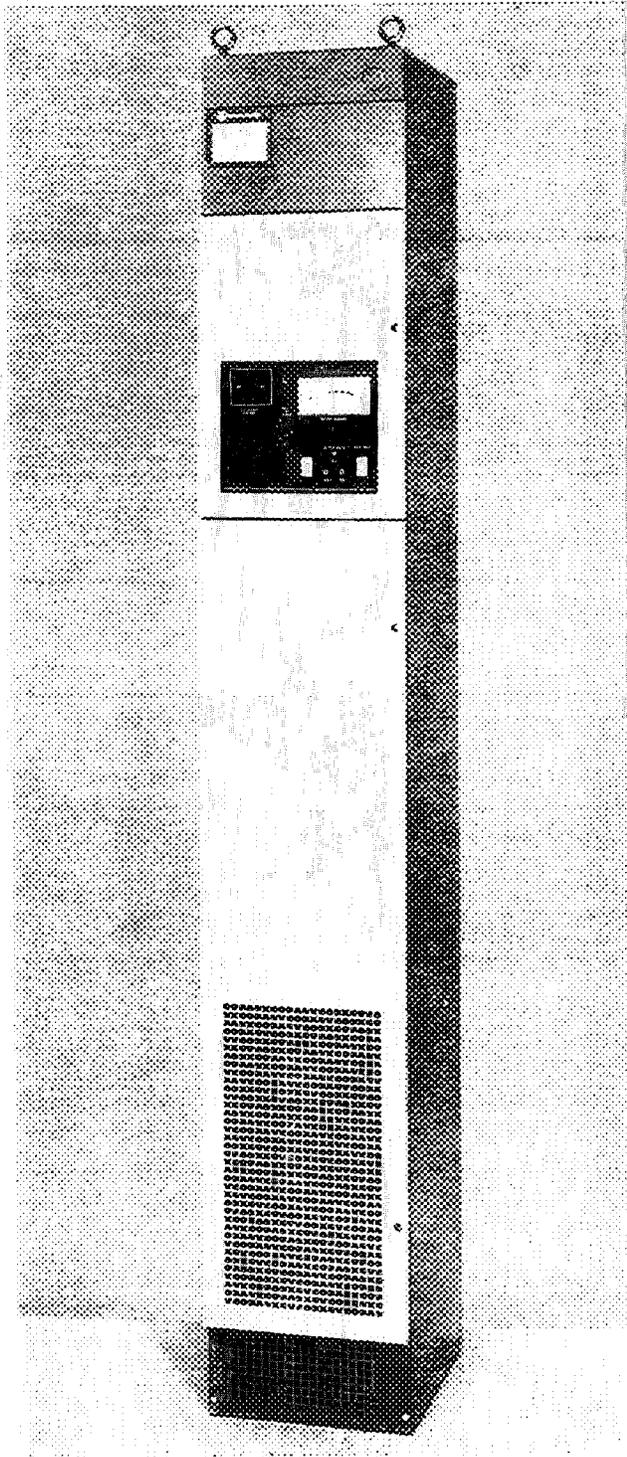


Fig. 3—J87438A/J87439A Rectifier—Front View

C. Printed Circuit Packs

2.06 To simplify maintenance, the circuits associated with alarm, power control, voltage regulation, current limiting, voltage walk-in, and restart are mounted on replaceable circuit packs CPS SP2 and CPS SP1/SP7. The CPS SP1 and CPS SP7 circuit packs are interchangeable. The CPS SP1 circuit packs are used in conventional plant rectifiers and CPS SP7 circuit packs are used in smart plant rectifiers. Each CPS SP2 circuit pack has a unique coding slot to prevent interchange with a CPS SP1 or CPS SP7 circuit pack. The clips on the holder mate with the slots on the circuit pack. The circuit packs can be easily removed by disengaging the clips and sliding the circuit pack out of the connector.

3. FUNCTIONAL DESCRIPTION

A. General

3.01 The function of the rectifiers is to power loads and charge and float storage batteries automatically by providing regulated dc power from an ac power service. The rectifiers can provide either positive or negative direct current voltage. Rectifier power and control signal flow are given in Fig. 5.

B. Rectifier Controls

3.02 The rectifier controls located on the instrument panel are common to each of the rectifiers. The controls have the following functions:

- (a) **Circuit Breaker CBI:** Circuit breaker CBI protects the rectifier from rectifier malfunction overcurrent conditions. It can also be used to remove the battery from the rectifier for test purposes. If the breaker is operated to the open position by an overcurrent condition, a closure signal is transmitted to the power plant controller via the rectifier CPS SP7 (smart plant) or CPS SP1 (conventional plant) circuit pack.
- (b) **NL/FL Switch S2:** The NL/FL switch S2 provides a manual test of the rectifier regulation. When the S2 key is in the center position, the rectifier is in the normal state. In the NL position, the key reduces the rectifier output voltage causing a decrease in the load current. In the FL position, the rectifier output voltage increases causing an increase in the load current.

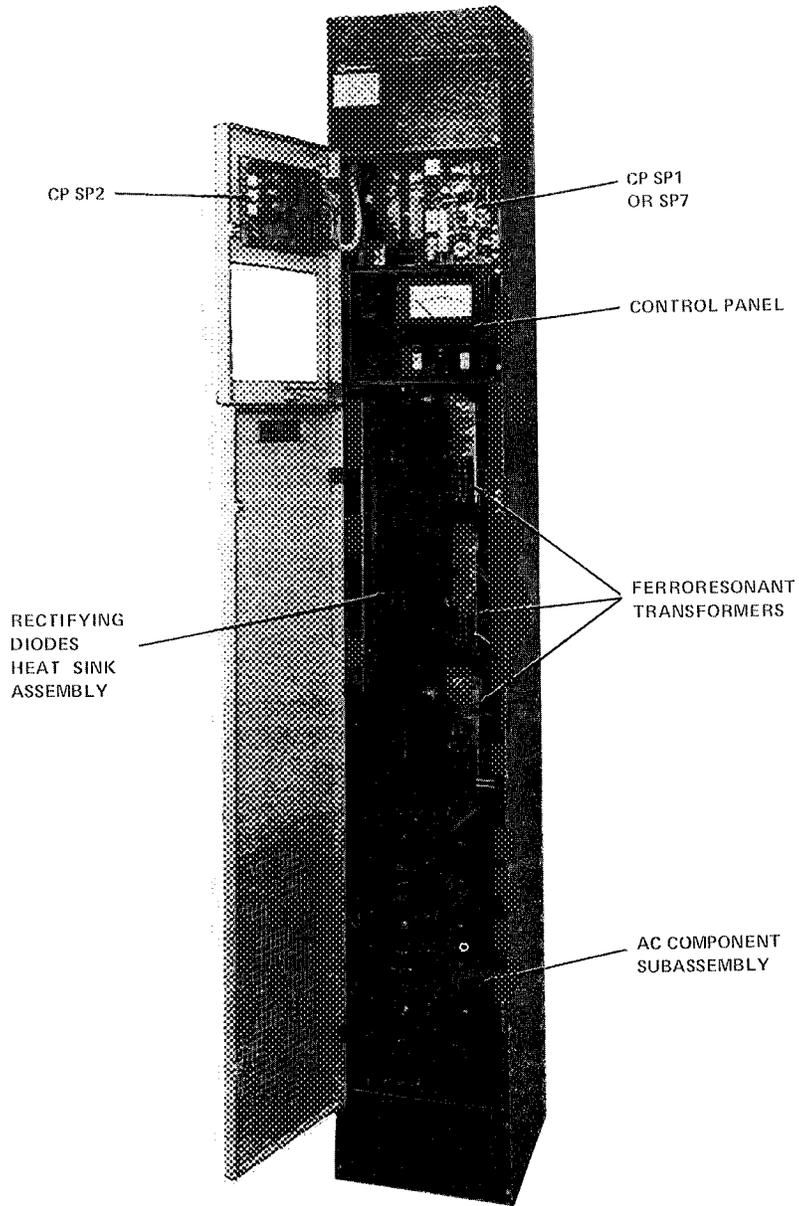


Fig. 4—J87438A/J87439A Rectifier—Front View, Cover Opened

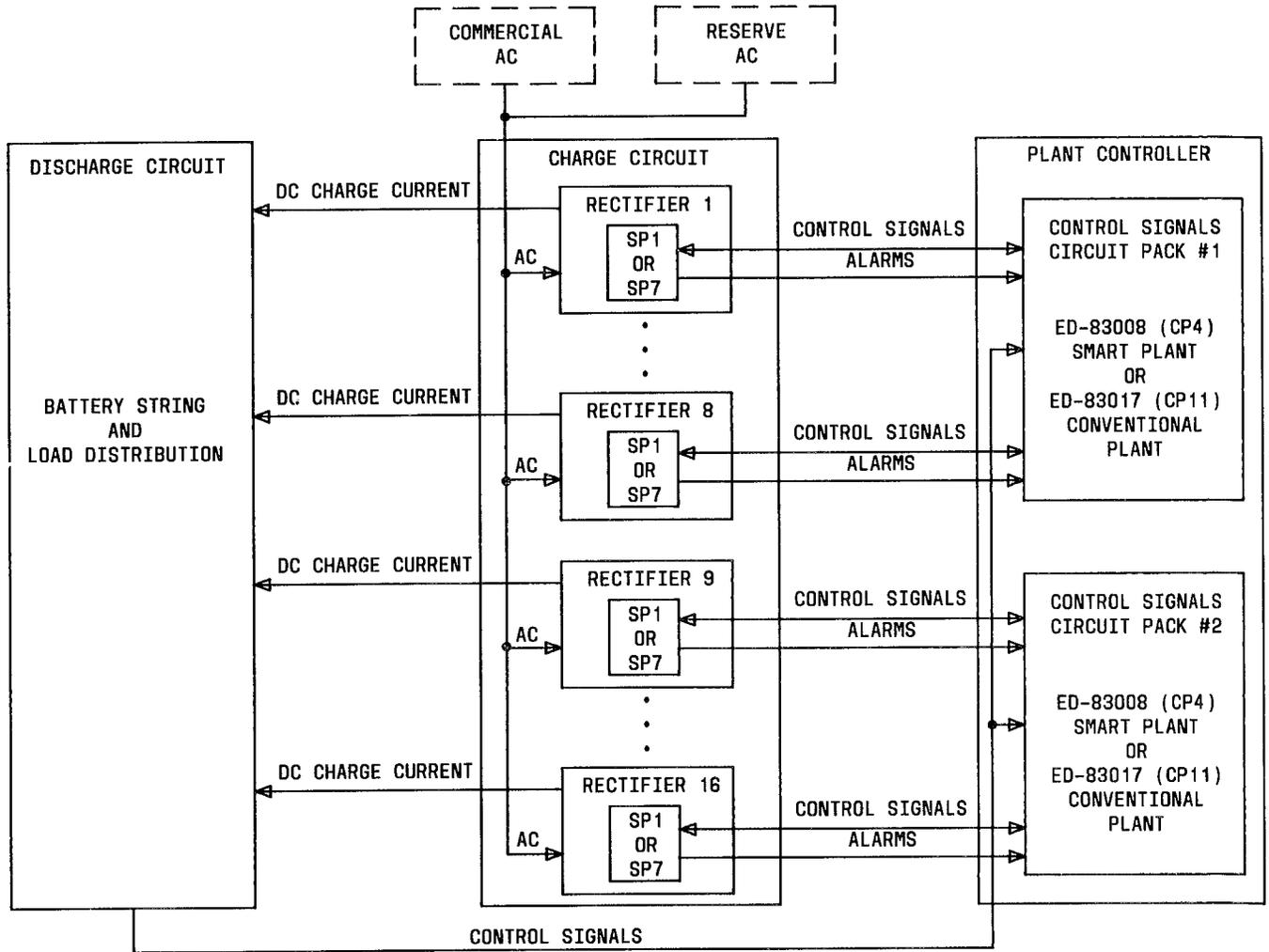


Fig. 5—Rectifier Interface Block Diagram

(c) **Output Current Meter M1:** The output current meter M1 indicates the output current of the rectifier.

(d) **Fuses F1 and F2:** Fuses F1 and F2 protect voltage sense leads to the rectifier control circuit. Fuse F1 is for the positive output and F2 is for the negative output. Both are 70G type, 1/2-ampere, indicating fuses.

(e) **Test Points REG+ and REG-:** Test points REG+ and REG- monitor the output voltage at the point of regulation. If the point of regulation is external, battery voltage is observed. If the point of regulation is internal (ie, external leads

open), the voltage observed is, at most, 2 volts lower than the output voltage of the rectifier.

(f) **Output Volts ADJ Potentiometer R11:** The output volts ADJ potentiometer R11 is used for manual adjustments of the output voltage.

(g) **ON/OFF Switch S1:** The ON/OFF switch S1 is the main power switch.

(h) **Rectifier Fail LED DS1:** The rectifier fail LED DS1 provides visual indication of a rectifier shutdown because of external or internal high voltages or a blown fuse.

C. Rectifier/Controller Interface and Addressing (Smart Plant)

3.03 The smart plant uses a microprocessor controller to continuously monitor each rectifier for rectifier data, alarms, and malfunctions. A maximum of 16 rectifiers may be controlled and monitored by the smart plant controller

3.04 The rectifiers used with a smart plant are controlled according to the output voltage at the point of regulation and the plant efficiency algorithm. The smart plant will compare the actual current requirement with the capacity of the rectifiers on line. The controller will then turn off the least efficient rectifier not needed to supply the load. When the load current increases, the controller will turn on

the most efficient of the available rectifiers to meet the demand. In addition, each rectifier is turned on at least once a month to ensure proper operation. Should the microprocessor system ever fail, the efficiency algorithm turnoff signal is removed and all rectifiers automatically turn on. All rectifiers will be on as long as the efficiency algorithm is disabled.

3.05 The interface between the rectifier and the smart plant controller is the CPS SP7 circuit pack located in each rectifier. Refer to Fig. 6 for a block diagram of the signals monitored between the rectifier signals circuit pack(s) ED-83008 (CP4) in the smart plant controller and the CPS SP7 circuit pack in each rectifier. The CPS SP7 circuit pack in each rectifier receives commands from the controller to turn the rectifier on and off.

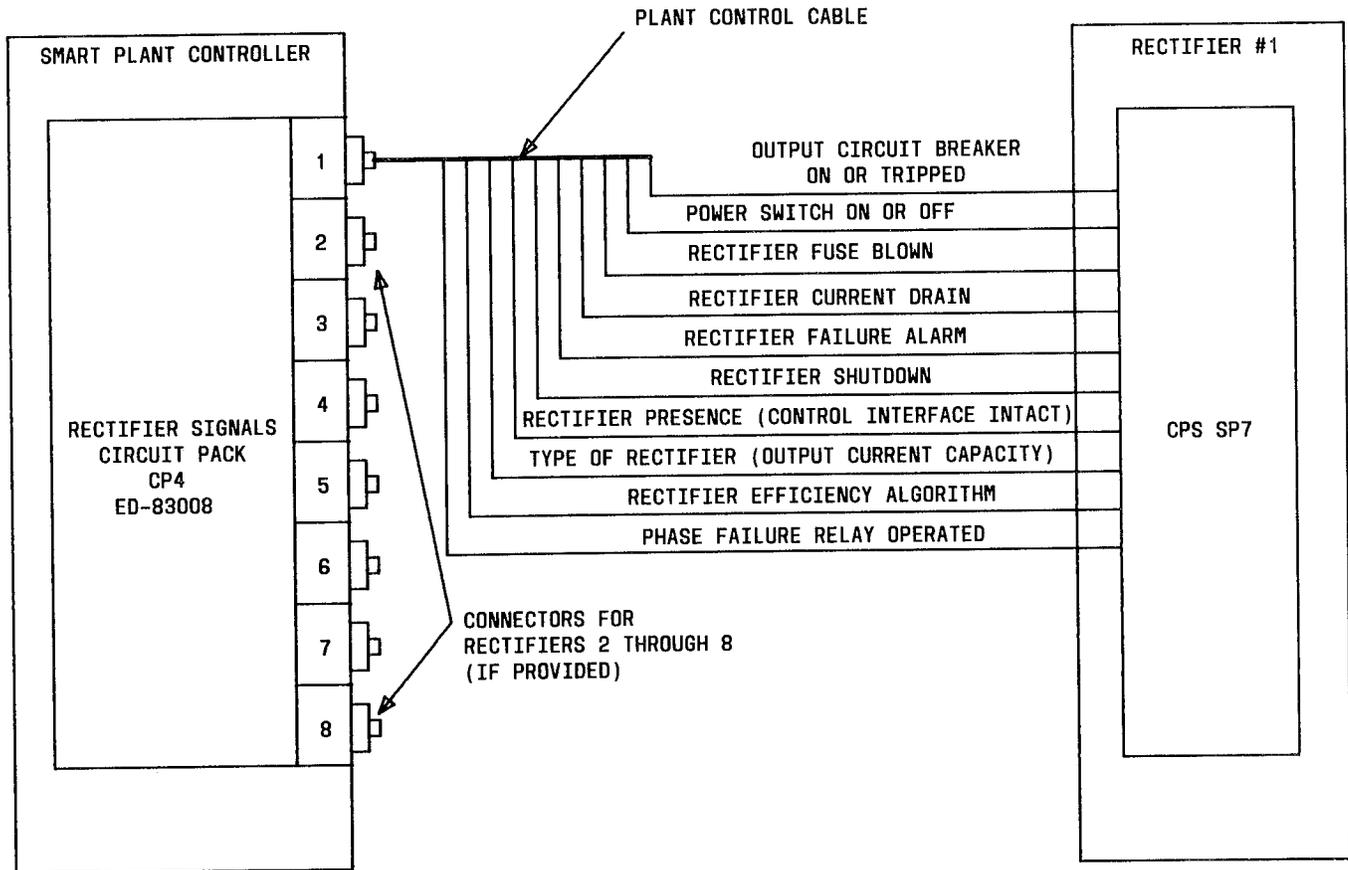


Fig. 6—Signal Flow Between Rectifier and Smart Plant Controller

D. Rectifier/Controller Interface and Addressing (Conventional Plant)

3.06 The conventional plant uses a connectorized plant control unit. A maximum of 16 rectifiers can be controlled and monitored by the plant controller.

3.07 The interface between the rectifier and the conventional plant controller is the CPS SP1 circuit pack located in each rectifier. Refer to Fig. 7 for a block diagram of the signals monitored between the rectifier signals circuit pack(s) ED-83017 (CP11) in the conventional plant controller and the CPS SP1 circuit pack in each rectifier. The circuit pack receives signals from the plant controller to shut down

and restart the rectifier. The circuit pack transmits a signal to the controller in the event of a rectifier alarm.

4. ACCESSIBILITY

4.01 Each of the rectifiers can be maintained and serviced from the front. In general, most of the parts in the rectifier are easily accessible and removable. In some cases, to gain access to certain parts, others must first be taken out or moved.

5. MAINTENANCE AIDS

5.01 Routine, acceptance, and trouble-clearing procedures for the rectifiers are contained in Task Oriented Practice (TOP) 167-790-100.

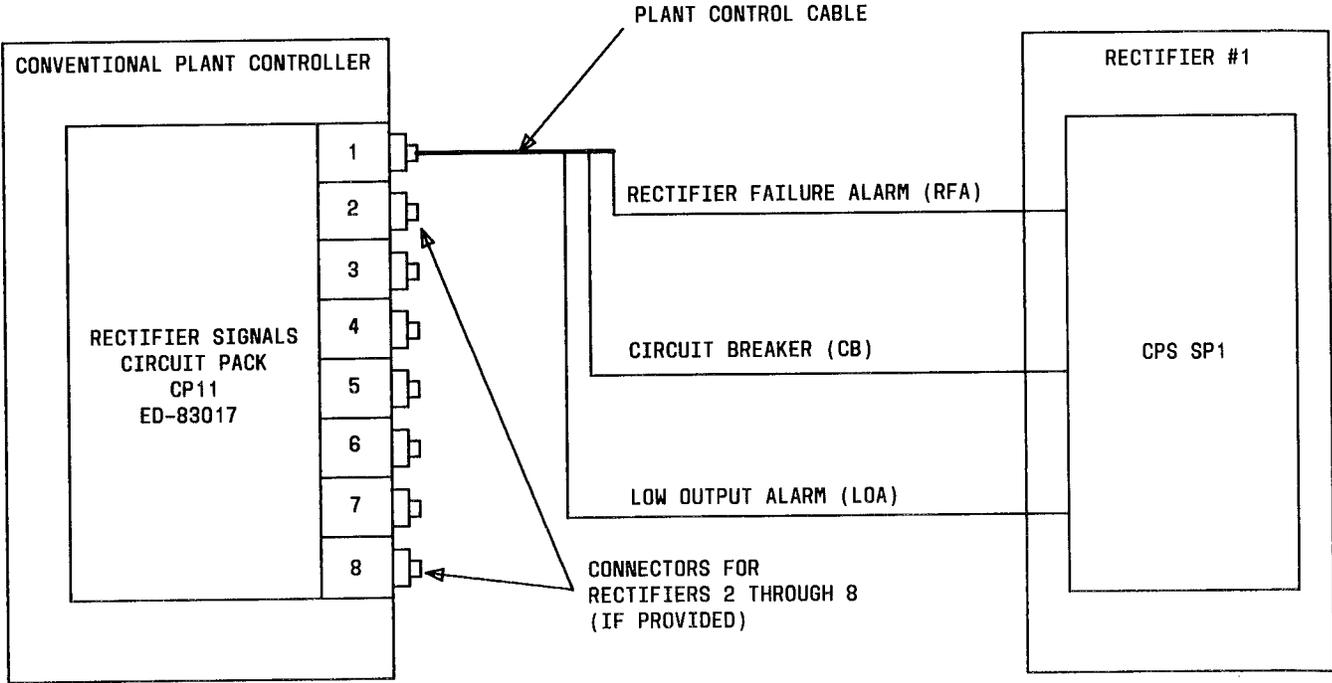


Fig. 7—Signal Flow Between Rectifier and Conventional Plant Controller

