J86446 (105D) POWER PLANT

NEGATIVE 48-VOLT, 10-, 20-, AND 30-AMPERE SUPPLY

AND

J86251A REGULATED RECTIFIER UNIT

ELECTRON TUBE TYPE

1. GENERAL

1.001 This addendum supplements Section A301.808, Issue 2.

1.002 This addendum is issued to replace the Weston model 280 dc voltmeter; to omit references to the M9B meter, manufacture of which has been discontinued; to cover the automatic removal of the countercell or countercells from the discharge circuit during a power failure; to add information concerning the effect on the output current of the starting of additional rectifier units; to revise the instructions for initially adjusting the battery voltage to the correct float voltage; to revise the charging instructions; and to revise Fig. 1.

The following changes apply to Part 1 of the section:

(a) 1.09 - omitted

(b) 1.11 - revised

1.11 List of Tools and Gauges (Equivalents may be substituted)

Tools

Clips, No. 365 (2 reqd per cord)

Cord, 1W1AF

Test picks and cords, D-79650 and D-79651

Gauges

Voltmeter, ac Weston model 155, ranges 300-150

Voltmeter, dc Weston model 931, ranges 300-150-75-30

Voltmilliammeter, KS-8039

Volt-ohm-milliammeter, KS-14510

2. OPERATION

The following changes apply to Part 2 of the section:

(a) 2.02 - revised

(b) 2.04 - revised

(c) 2.06 - revised

(d) 2.08 - revised

(e) 2.17 - revised

(f) 2.18 - revised

(g) 2.30 - revised

(h) 2.31 - omitted

(i) Fig. 1 - revised

2.02 A 24-cell battery and one manually controlled countercell are furnished initially. Parallel strings of batteries are added as needed to meet reserve requirements, and a second countercell is added in parallel when the load exceeds 15 amperes. In case of power failure, the countercell or countercells, if previously inserted manually in the discharge circuit, are automatically removed. When the power is restored, the countercell or countercells are automatically reinserted in the discharge circuit.

2.04 For overcharging the battery under manual control at approximately 2.23 volts per cell, the OVERCHG switch (not shown) is operated to its MAN position to cause the countercell contactor to insert a countercell in the discharge circuit. This causes the battery voltage to rise by the amount of the drop over the countercell, since the regulating leads remain connected at the load.

2.06 Full load on rectifier 48V G1 causes relay ST1, when furnished, to operate from the potential across the ballast lamp. Through relays ST1, ST2, and ST3, rectifier 48V G2 is connected to the power supply. ST2 locks to ground and at the same time inserts resistor R1 in the regulating circuit of 48V G1, causing the circuit to operate at an output of approximately 10 amperes. This output decreases somewhat as 48V G2, after warming up, assumes its share of the load and assists 48V G1 in increasing the battery voltage to normal float voltage. If the load exceeds the combined capabilities of the two rectifiers, the battery supplies the excess, and its voltage decreases. When the load subsequently is lessened, the battery is charged, its

voltage is thereby raised, and the output current of 48V G2 decreases. When the battery reaches 52.5 volts, 48V G2 is at zero output, and voltmeter relay VR makes on its H contact to operate relay H, releasing ST2. This removes 48V G2 from the power supply and, by short-circuiting R1, returns regulation to 48V G1.

2.08 Rectifier 48V G3, when furnished, is ordinarily connected to the power supply as described in 2.07 for 48V G2 alone. Operation of relay L starts 48V G2 and 48V G3 simultaneously. Relay ST5 inserts resistor R2 in the regulating lead of 48V G2, causing 48V G2 to operate at an output of approximately 10 amperes. This output decreases somewhat as the battery voltage is being raised to normal float voltage. 48V G3 regulates the battery as long as the load is within its range. With decreasing load, the battery is charged and its voltage raised. At 52.5 volts, voltmeter relay VR makes on its high contact H, operating relay H. Relay H removes the battery from relays ST5 and ST2, releasing ST5, which disconnects 48V G3, removes the battery from relay HO, and short-circuits resistor R2. While the battery voltage is dropping to normal float voltage, relay HO, which is slow-releasing, holds the battery on ST2, thereby keeping 48V G2 in service. When the battery voltage reaches the normal float voltage, VR opens its H contact, releasing relay H, which then holds the battery on ST2, so that 48V G2 remains in service after relay HO releases. Relay ST2 continues operating and keeps 48V G2 in service until rising battery voltage causes VR to close its H contact again, disconnecting 48V G2 from the power supply.

2.17 To calibrate voltmeter relay VR, plug in a recently calibrated KS-8039 volt-milliammeter or Weston model 931 dc voltmeter at the LOAD VOLTS jacks, thereby connecting it in parallel with VR. With the ADJ VOLTS rheostat, bring the voltage to 51.6 volts as indicated by the portable instrument. Adjust the supporting arm of the torsion spring to bring the indication of the relay to the same value. See Section A462.005 for the adjustment procedure for Weston model 534 relays. After calibrating VR, recheck its H and L contacts.

2.18 To adjust rectifier 48V G1 to the correct float voltage, rotate the ADJ VOLTS rheostat in a cw direction until the battery voltage, as indicated by the voltmeter relay, is 51.6 volts with the output current within the limits given in the following table. These limits depend upon the power service voltage at the time the adjustment is made. Use a Weston model 155 portable ac voltmeter for reading the service voltage and observe the rectifier ammeter. Since the output voltage will be higher at light loads, the average voltage will be slightly higher than 51.6 volts.

Power Supply			Output	
Nominal	Observed Volts		Amperes	
Volts	Min	Max	Min	Max
105	102	113	5	7
	97	102	4	5.5
115	112	124	5	7
	106	112	4	5.5
125	121.5	135	5	7
	115	121.5	4	5.5
190	185	203	5	7
	175	185	4	5.5
210	204	226	5	7
	194	204	4	5.5
230	224	248	5	7
	212	224	4	5.5
250	243	270	5	7
	230	243	4	5.5

Note: The rectifier regulation is such that the output voltage is high at light loads with high power service voltage, and that conversely, the output voltage is low at heavy loads with low power service voltage. Accordingly, if the float voltage is adjusted to 51.6 volts during the day when the load is heavy and the power service voltage low, the average float voltage over a 24-hour period is expected to be close to the recommended value of 2.17 volts per cell, since the load is light and the power service voltage high during the night.

2.30 Boost Charge: Check individual-cell voltage, individual-cell corrected specific gravity, and pilot cell corrected specific gravity periodically, as detailed in Section A301.005. Keep all records specified in Section A301.005 and make reports to the supervisor in accordance with that section. A boost charge shall be given annually, when ordered by the supervisor, and when otherwise required, using the OVERCHG switch as in 2.04. Boost charges are required in this plant as follows:

(a) A boost charge should be given to the main battery if any individual-cell voltage, uncorrected for temperature, is more than 0.03 volts below the average individual cell voltage for the entire string.

(b) A boost charge should be given to the individual cell or to the entire string if a drop, in 3 months, of more than 4 points (0.004) in the corrected specific gravity of any cell cannot be explained by the recent addition of water, a low electrolyte level at the previous reading, or any emergency discharge.

(c) A boost charge should be given to the main battery and to the emergency cells if they have had any appreciable discharge, or if it is known that there has been one emergency discharge or a series of short discharges which (1) were the equivalent

of 1/2 hour or more during the heavy-load period of the day, or (2) caused the corrected specific gravity to drop 15 per cent or more of the cell's gravity range for full discharge.

(d) A boost charge should be given under certain other conditions, as outlined in Section A301.005, 1.06.

3. ROUTINE CHECKS

The following changes apply to Part 3 of the section:

(a) 3.03 - added note

(b) 3.04(2) - revised

3.03 (Add at the end of this paragraph)

Note: Use a Weston model 931 dc voltmeter or a KS-8039 voltmilliammeter to read the voltage across the regulating potentiometer circuit when making the above adjustment.

3.04

(2) Disconnect all rectifiers by removing the ac supply fuses. The manually controlled countercell or countercells, if previously inserted manually in the discharge circuit (see 2.03 and 2.04), are automatically removed by the removal of the ac supply fuses. When the fuses are restored, the countercell or countercells are automatically reinserted in the discharge circuit.

4. TROUBLES

The following change applies to Part 4 of the section:

(a) 4.03 - revised

4.03 Large fluctuations or "kicks" of the ammeter needle may be due to a depleted grid battery even when the ADJ VOLTS rheostat has not been turned to its extreme cw position. Any grid battery whose voltage, as read on a Weston model 931 dc voltmeter, + is less than 41.9 volts should be replaced. Similarly, if full output cannot be obtained with the ADJ VOLTS rheostat in its extreme cw position, the grid battery should be replaced.

5. POINT-TO-POINT VOLTAGE

The following changes apply to Part 5 of the section:

(a) 5.03 - revised

(b) Table - revised

5.03 The readings given in the table are approximate and typical of a rectifier unit adjusted as indicated. They are made with a KS-14510 volt-ohm-milliammeter, ← which is accurate to ±5 per cent on alternating current and to ±2 per cent on direct current. It will not seriously affect the output of the rectifier unit when connected for making the readings.

Caution: The readings shown in the following table are for a typical rectifier in good working condition. A defect in a rectifier may leave a high-voltage charge on a capacitor and other parts of the circuit with the power off. A defective rectifier with the power connected may have quite different voltages than those shown. Therefore, it may be desirable to use a higher voltage jack in the meter until readings indicate the proper jack to use for the defective condition.

POINT-TO-POINT VOLTAGES

Voltage Across	Connection to Apparatus +V Jack App	+V Jack Term.	-V Jack App	-V Jack Term.	Typical Reading Volts Output 1 Amp	Output 8 Amp
Filament	V1	2	V1	3	2.6	2.6
Bias	Term.	A+	GR	2T	3.8	2.6
Varistor	RV1	2	RV1	3	8.3	8.2
Varistor	RV1	1	RV1	4	10.0	9.6
Output	Jack	J1	Jack	J2	51.6	51.6
Grid Battery	R4	C+	R4	C-	46.5	46.5
Ballast Lamp	V3	Term.	V3	Term.	0.2	4.4

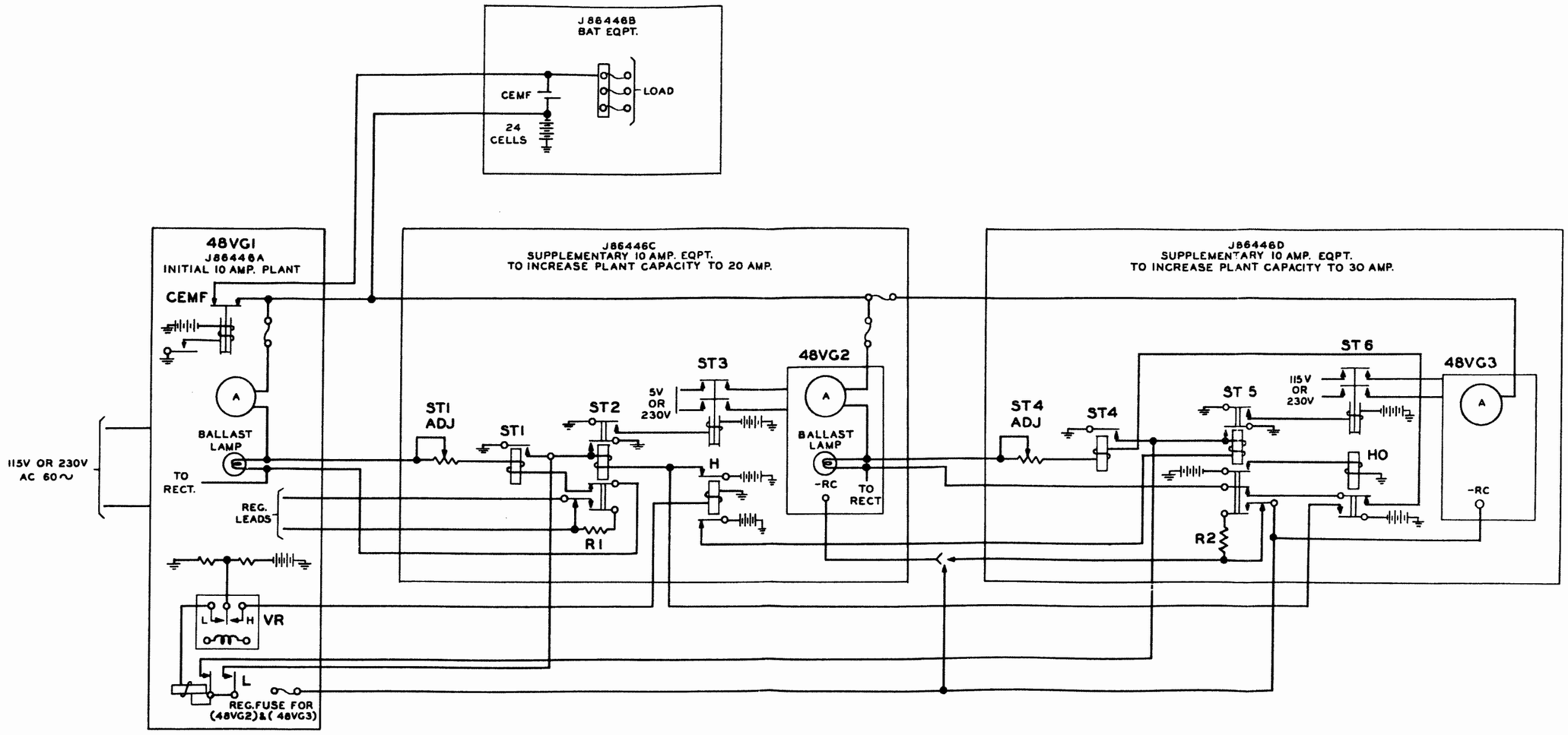

FIG. 1 105D POWER PLANT
SIMPLIFIED SCHEMATIC