

**CONSTANT CURRENT
POWER SUPPLY
J87321
OPERATING METHODS**

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- 1.05 The abbreviations cw and ccw refer to clockwise and counterclockwise, respectively.
- 1.06 The instructions are based on circuit drawing SD-81901-01. For a detailed description of operation, refer to the corresponding circuit description.
- 1.07 The power supply functions with SD-5G142-01—Toll Systems, Cable Pressure Telemetry Central Control Circuit.

2. LIST OF TOOLS AND TEST APPARATUS

1. GENERAL

1.01 The J87321 constant current power supply provides a 1.0-milliampere and a 10.0-milliampere current output from a 117-volt 60-Hz ac source to supply both command and measurements currents to the cable pressure transducers in the L4 cable system.

1.02 This issue does affect the Equipment Test List.

1.03 The power supply consists of two separate current regulators. The 10.0-milliampere current regulator is preceded by an adjustable series voltage regulator, making adjustment of the maximum output voltage (150 to 200 volts dc) possible. The 1.0-milliampere current regulator provides an output current of 1 milliampere \pm 1 microampere. Both current regulator circuits have automatic short-circuit protection.

1.04 Keep the ventilating passages of the power supply unobstructed. This is especially important to ensure adequate cooling during operation.

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-Inch C Screwdriver
TEST APPARATUS	
—	Oscilloscope Tektronix, Model 535 (With vertical preamp sensitivity of 20 MV per centimeter) (or equivalent)
KS-8039	Volt-Milliammeter
KS-14510	Volt-Ohm-Milliammeter
—	Hewlett-Packard, Model 3460A Digital Voltmeter (or equivalent)
—	Resistor, 1000 Ω \pm 1 percent 1 watt
—	Potentiometer, 0 to 50,000 Ω 1 watt
—	Potentiometer, 0 to 20,000 Ω 1 watt

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3. OPERATION

3.01 The J87321 current controlled power supply provides 1 milliamperes \pm 1 microampere measurement current and 10 milliamperes command current to the toll systems cable pressure telemetry central control circuit. This circuit provides means of monitoring the gas pressure on cables as measured by remote stations, recording the pressures, and providing an alarm indication for pressures below pre-selected alarm levels.

3.02 Starting: To place the constant current power supply in service, operate the 1 MA switch and 10 MA switch to their ON positions.

3.03 When connected to the cable pressure telemetry central control circuit the 150/200V output voltage is adjusted for 180 volts dc with the cable circuit open-circuited. Rotate the 150/200V ADJ potentiometer cw to increase or ccw to decrease the output voltage (see note). Measure the voltage at the + and - 150/200V OUTPUT test jacks, using the KS-8039 volt-milliammeter, set to the 300-VOLT DC scale.

Note: The output voltage is a function of $I = E/R$ for the command current. The voltage value may be varied in order to obtain the correct command current of 10 milliamperes.

3.04 The J87321 constant current power supply should not require further adjustment for normal operation. However, Section 201-610-501 provides a testing procedure to determine the stability and accuracy of the 1 milliamperes \pm 1 microampere measurement current. The current is indicated by measuring the voltage drop across a 1-K ohm standard resistor using a digital voltmeter located in the cable pressure telemetry central control circuit.

3.05 Stopping: To remove the converter from service, operate the 1 MA switch and 10 MA switch to the off position. If the converter is to be left out of service, disconnect the ac input to the power supply.

4. ROUTINE CHECKS

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

4.02 Circuit packs and semiconductor devices should be maintained in accordance with Section 032-173-301.

4.03 Circuit Check: Periodically check the constant current power supply as follows.

- (1) Operate the 1 MA and 10 MA switches to their off position.
- (2) Disconnect the ac input to the power supply.
- (3) Disconnect the leads from terminals 1, 3, 4, and 5 on TB2.

Note: Mark the leads for each terminal.

- (4) Connect the 1-K ohm standard resistor in series with the 50-K ohm potentiometer between terminals 1 and 5 on TB2 (see Fig. 1).
- (5) Connect the ac input to the power supply and operate the 1 MA switch to the ON position.
- (6) Measure the dc voltage across capacitor C2 on CP3 using the 3460A digital voltmeter set to the 100-volt range.

Requirement: The voltage indication shall be 30 ± 0.05 volts.

Note: If the requirement in (6) is not met, adjust the 30V ADJ potentiometer until the voltage indication is 30 ± 0.05 volts.

- (7) Connect the 3460A digital voltmeter, set to the 1-volt range, across the 1-K ohm resistor and vary the 50-K ohm potentiometer between 0 to 50 K ohms while measuring the voltage drop across the 1-K ohm resistor.

Requirement: The voltage should not be more than 1.002 volts or less than 0.998 volt.

Note 1: These voltage values correspond to a current of 1 milliamperes \pm 2 microamperes.

Note 2: If the current requirement in (7) is not met, readjust the 1 MA FINE ADJ and 1 MA COARSE ADJ potentiometer for an indication of 1.000 volt with approximately a 30-K ohm load.

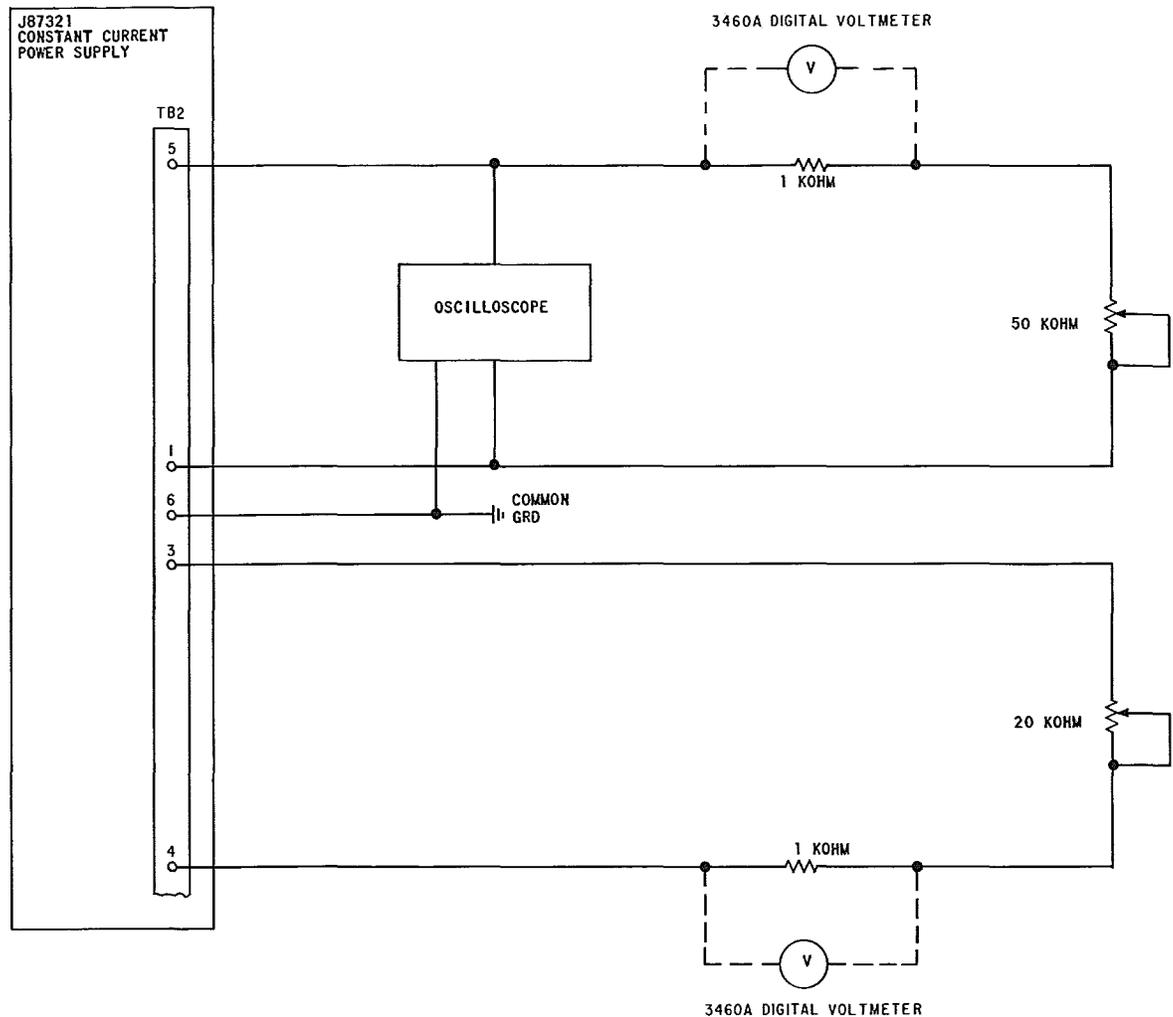


Fig. 1—Test Connections for J87321 Constant Current Power Supply

- (8) Adjust the 50-K ohm potentiometer for 50 K ohms.
- (9) Connect the oscilloscope to terminals 1 and 5 on TB2. Ground the oscilloscope at the common ground on terminal 6 of TB2.

Requirement: The ripple output shall be less than 120 millivolts peak to peak.
- (10) Operate the 1 MA switch to the off position and disconnect the ac input voltage.
- (11) Disconnect the oscilloscope, the 50-K ohm potentiometer and the 1-K ohm standard resistor.
- (12) Connect the 1-K ohm standard resistor in series with the 20-K ohm potentiometer between terminals 3 and 4 on TB2 (see Fig. 1).
- (13) Connect the 3460A digital voltmeter, set to the 10-volt range, across the 1-K ohm resistor.
- (14) Connect the KS-8039 volt-milliammeter, set to the 300-VOLT DC scale, to the + and - 150/200V OUTPUT test jacks.
- (15) Connect the ac input voltage and operate the 10 MA switch to the ON position.

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(16) Adjust the 150/200V ADJ potentiometer for an indication of 200 volts on the KS-8039 volt-milliammeter.

(17) Vary the 20-K ohm potentiometer between 0 to 19 K ohms while measuring the voltage drop across the 1-K ohm standard resistor.

Requirement: The voltage should not be more than 10.5 volts or less than 9.5 volts.

Note 1: These voltage values correspond to a current of 10 ± 0.5 milliamperes.

Note 2: If the current requirement in (17) is not met, readjust the 10 MA ADJ potentiometer for an indication of 10.0 volts with approximately a 10-K ohm load.

(18) Readjust the 150/200V ADJ potentiometer for an indication of 180 volts on the KS-8039 volt-milliammeter.

(19) Operate the 10 MA switch to the off position and disconnect the ac input voltage.

(20) Disconnect the 1-K ohm resistor and the 20-K ohm potentiometer.

(21) Disconnect the KS-8039 volt-milliammeter.

(22) Reconnect the leads disconnected in (3).

(23) Connect the ac input voltage to the power supply.

(24) Operate the 1 MA and 10 MA switches to their ON position.

5. TROUBLES

5.01 All components, with the exception of fuses, switches, and transformers are mounted on three printed wiring boards, one mother board (CP1) and two boards (CP2 and CP3) that plug into the mother board. It is recommended that spare circuit packs be stocked to aid in repairing a defective unit. If a malfunction occurs and replacement circuit packs are not available, follow the procedure in Part 6 to determine which circuit components are defective.

5.02 If troubles occur in the J87321 constant current power supply, check for a blown fuse in the power supply (F1, F2, and F3 fuses for the 1 MA circuit and F4 and F5 fuses for the 10 MA circuit). If the fuses are not blown and it is suspected that the power supply is defective, it should be checked as outlined in Part 4. This will determine whether or not the trouble is caused by a malfunction of the associated equipment. If the trouble is isolated to the J87321 constant current power supply, the rectifier output voltages should be checked as given in Table A. If these voltages are correct, it is recommended that the circuit packs (CP2 or CP3) be replaced and/or components checked as covered in Part 6.

5.03 Use an oscilloscope to check for excessive noise or ripple at the output of the power supply. The oscilloscope should be grounded at a

TABLE A

SET KS-14510 VOLT-OHM-MILLIAMMETER TO FOLLOWING RANGE	CONNECT KS-14510 VOLT-OHM-MILLIAMMETER ACROSS CAPACITOR ON CP1	VOLTAGE INDICATION SHOULD BE	IF INCORRECT, CHECK THE FOLLOWING COMPONENTS*
60 VOLTS DC	C1	43 ± 2 Volts DC	CR1, R1, C1
300 VOLTS DC	C2	90 ± 5 Volts DC	CR2, R3, C2
60 VOLTS DC	C3	26 ± 2 Volts DC	CR3, C3
60 VOLTS DC	C4	26 ± 2 Volts DC	CR4, C4
300 VOLTS DC	C5	258 ± 5 Volts DC	CR5, CR6, R4, R5, C5.1, C5.2

* An incorrect voltage indication may also be caused by a defective component on CP2 or CP3.

common ground (terminal 6 on TB2) to reduce induced noise and ripple.

6. COMPONENT CHECKING PROCEDURES

6.01 The test procedures covered in 6.03 through 6.07 are given to aid in determining the defective components in a failed unit. In general, the components most likely to become defective with use are the semiconductor devices and capacitors. If, after checking the semiconductor devices and capacitors, the trouble has not been determined, it is advisable to check all the resistors in the unit, as covered in Section 100-520-101, for the resistance values specified on the schematic drawing covering the unit.

6.02 The performance of these tests should be made with the unit disconnected from the input power. Since it may be possible to locate a defective component without disconnecting it from the circuit, check each component in the unit as covered in 6.03 through 6.07 before disconnecting any leads. If the trouble cannot be determined in this manner, disconnect the leads as specified and recheck the components. When a component is found to be defective, replace it and check the other components in the circuit to make certain that they are not defective. Unless otherwise specified, use the KS-14510 volt-ohm-milliammeter to perform the checks as follows. Before connecting the meter, set the meter to indicate on the X1000 ohm scale. Then, when making measurements, gradually decrease the ohms scale setting until the optimum setting is obtained.

Caution 1: *Before unsoldering or soldering leads of transistors, diodes, or varistors, reference should be made to Section 069-140-811 covering soldered connections on pigtail apparatus.*

Caution 2: *Before checking circuits which contain electrolytic capacitors, reference should be made to Section 032-110-501.*

6.03 Capacitors: Check capacitors in accordance with Section 100-520-101. On mylar or polystyrene capacitors, check for burned spots on the capacitors.

6.04 Diodes: To check a diode, apply the meter across the diode leads. Then reverse the meter connections across the diode. The meter

should indicate high resistance in one direction and low resistance in the opposite direction. Low resistance or high resistance in both directions is an indication that the diode may be defective. If the diode is suspected of being defective, disconnect one of its leads and recheck the resistances.

6.05 Varistors: To check a varistor, apply the meter across the varistor leads. Then reverse the meter connections across the varistor. The meter should indicate low resistance of approximately equal values in both directions. If the varistor is suspected of being defective, disconnect one of its leads and recheck the resistances.

6.06 Transistors: To check a transistor, set the KS-14510 meter to indicate on the X10 ohm scale and proceed as follows.

(a) Connect the meter between the emitter and collector leads of the transistor. Then reverse the meter connections to the emitter and collector leads. The meter should indicate a high resistance (50 to 100 ohms) in one direction and a much higher resistance in the opposite direction. Low or zero resistance in either direction is an indication that the transistor is defective. If the transistor is suspected of being defective, disconnect the emitter or collector lead and recheck the resistances.

(b) Connect the meter between the emitter lead and base of the transistor. Then reverse the meter connections to the emitter lead and base. The meter should indicate a low resistance (under 50 ohms) in one direction and a high resistance (over 100 ohms) in the other direction. If a short or open is indicated in either direction, disconnect the emitter lead and recheck the resistances.

(c) Connect the meter between the collector lead and the base of the transistor. Then reverse the meter connections to the collector lead and base. The meter should indicate a low resistance (under 50 ohms) in one direction and a high resistance (over 100 ohms) in the other direction. If a short or open is indicated in either direction, disconnect the collector lead and recheck the resistances.

6.07 Transformers: If a trouble condition still exists after checking and ascertaining that the other components in the unit are in satisfactory

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condition, check the inductors and transformers as follows.

(a) Using the meter, check whether the resistance across each winding of the transformer is in accordance with the resistance value on the associated circuit drawing. If a short or open is indicated, disconnect the lead from one of the winding terminals and recheck the resistance.

(b) Check for shorts between the case and each winding of the inductor or transformer by applying the meter between the case and one of the terminals of the winding. If low or zero resistance is indicated, the transformer is defective.

