

REPLACING PAGE ADDENDUM
Filing Instructions:

1. REMOVE FROM THE SECTION THE PAGES NUMBERED THE SAME AS THOSE ATTACHED TO THIS PINK SHEET.
2. INSERT THE ATTACHED PAGES INTO THE SECTION IN THEIR PLACE.
3. PLACE THIS PINK SHEET AHEAD OF PAGE 1 OF THE SECTION.

J86858

**DC POWER SUPPLY
OPERATING METHODS**

1. GENERAL

Added to TEST APPARATUS—

1.001 This addendum supplements Section 167-776-301, Issue 2. The attached pages must be inserted in accordance with the filing instructions above.

John Fluke
Model MODEL
8100A-01 Digital
Voltmeter

1.002 This addendum is issued to revise Part 2, LIST OF TOOLS, TEST APPARATUS, AND MATERIALS, and to add a method of calibrating the OUTPUT VOLTAGE meter in 4.08. This addendum does not affect the Equipment Test List.

4. ROUTINE CHECKS

The following changes apply to Part 4 of this section:

2. LIST OF TOOLS, TEST APPARATUS, AND MATERIALS

The following change applies to Part 2 of this section:

4.08(a)—added

(b)—added

Attached:

- Page 1 dated August 1971, reissued
- Page 2 dated August 1971, revised
- Page 17 dated August 1971, revised
- Page 18 dated August 1971, revised
- Page 19 dated August 1971, revised
- Page 20 dated August 1971, reissued

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DC POWER SUPPLY
OPERATING METHODS

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1. GENERAL

1.01 The J86858 dc power supply is designed for use with the L4 Coaxial System; however, it may be used wherever its characteristics and design are considered suitable. The power supply is powered from a negative 24-volt dc source. The output current is nominally 520 milliamperes direct current and is smoothly adjustable from 0 to 520 milliamperes. The J86858 dc power supply uses two or four J87303A converter power supplies to furnish two or four output voltages from 0 to 1800 volts direct current at rated current. The output voltage depends on the length of L4 coaxial cable used. Each 345-volt (or 360-volt) increment of the output voltage requires that one J87303B L1 (or J87303G L1) converter be added to each J87303A converter power supply. The power supply is stable and is automatically regulated against line

and load voltage changes. Provision is made for turning down the converter power supply from a remote location. High- and low-current alarm and shutdown circuits are provided with a means of in-service testing.

1.02 This section is reissued to:

- (a) Add information for the J87303G L1 converter.
- (b) Add information for the restrictive use of the J87303B L1 converter.
- (c) Revise operating procedures and routine checks.
- (d) Add information and procedures for troubleshooting the J87303A converter power supply.

Since this is a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 The L4 coaxial cable length to be energized determines the power feed arrangements. If the cable length is 75 miles maximum, the receive and transmit pipes are energized by two J87303A converter power supplies, positive and negative, connected in series in the same J86858 power supply. If the cable length is 75 to 150 miles maximum, the receive and transmit pipes are energized by four J87303A converter power supplies connected in series. Two of the converter power supplies must be located at each end of the power loop.

1.04 The J86858 power supply utilizes a J86858B or a J86858E L1 ground protector panel which provides either a floating ground with an overvoltage protection arrangement or a solid ground for the center points of the series connected positive

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and negative converters. To prevent corrosion in the cable circuit, only one solid ground is permissible in each power loop in normal operation. When only two converter power supplies are used with a cable length of 75 miles maximum, the solid ground shall be connected at the end where no power is applied. When four converter power supplies are used with a cable length of 75 to 150 miles maximum, at one end of the power loop the FLOATING GRD BUS shall be permanently connected to GRD BUS, or the S2 (or S6) SELECTOR switch shall be maintained in the GRD (or GROUND-RESET) position. At the other end of the power loop, the FLOATING GRD BUS and the GRD BUS are electrically separated by means of a ground protection circuit, and the S2 (or S6) SELECTOR switch is normally rotated to the NOR (or NORMAL) position.

Warning: Voltages over 150 volts are present within the power supply. Every precaution should be observed to avoid any contact with exposed metal parts or terminals when the power supply is in operation or when not in operation but connected to either line or battery. Do not allow a test pick to touch two metal parts at the same time, or dangerous and destructive short circuits may occur.

1.05 Keep the ventilating passages open and the power supply free of excessive dust to ensure adequate cooling during operation.

1.06 Routine checks are intended to detect defects in the equipment and to guard against circuit failures. Checks other than those required by trouble conditions should be made during a period when they will not interfere with service.

1.07 The instructions are based on circuit schematic drawings SD-81850-01 and SD-81856-01. For detailed descriptions of operation, see the corresponding circuit description.

1.08 The power supply will function with the following circuits:

(a) SD-50766-01—L4 Carrier System Line Transmission Application Schematic

(b) SD-6G010-01—Maintenance Order Wire Circuit.

1.09 The abbreviations cw and ccw refer to clockwise and counterclockwise, respectively.

1.10 For more detailed information on the operation and maintenance of individual equipment or apparatus, refer to the appropriate Bell System Practices.

2. LIST OF TOOLS, TEST APPARATUS, AND MATERIALS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
—	3-Inch C Screwdriver
KS-19355 L5	Adjusting Tool
TEST APPARATUS	
—	John Fluke Model 8100A-01 Digital Voltmeter (or equivalent)
KS-8039	DC Volt-Milliammeter, Weston Model 622
KS-14510	Volt-Ohm-Milliammeter
—	Oscilloscope, Tektronix 545B (or equivalent)
—	Current Probe and Amplifier, Tektronix Type 131 (or equivalent)
—	Frequency Counter, Hewlett-Packard 5224L (or equivalent)
ED-82256-30	Extenders
GR1, 2, and 3	(for use with J87303D, E, or F units)
ED-82257-30	Extender
	(for use with J87303B, C, or G units)
—	Shorting Strap Composed of a 3-Inch #16 Gauge Insulated Wire Terminated in H. H. Smith #201 Pin Plug Connectors
MATERIALS	
KS-14666	Cloth

3. OPERATION

DESCRIPTION

3.01 The J86858 dc power supply consists of two or four J87303A converter power supplies. The J87303A converter power supply draws its input power from a 24-volt battery and consists

in a standby status during this test since an automatic shutdown of the J86858 power supply is possible.

- (1) Connect the KS-14510 volt-ohm-milliammeter, set to the 600 DC VOLTS range, to the J1 and J3 jacks on the J86858B ground protector panel.
- (2) Balance the output voltage of the converter power supplies to obtain a minimum floating ground potential as indicated on the KS-14510 volt-ohm-milliammeter.
- (3) Slowly rotate the OUTPUT CURRENT ADJUST COARSE control of the positive converter power supply cw until the KS-14510 volt-ohm-milliammeter indicates 200 volts.
- (4) Observe the KS-14510 volt-ohm-milliammeter and slowly rotate the OUTPUT CURRENT ADJUST COARSE control of the negative converter power supply ccw until the GROUND ALARM lamp just lights.

Caution: Do not exceed a KS-14510 volt-ohm-milliammeter indication of 500 volts direct current.

Requirement: Just before the GROUND ALARM lamp lights, the KS-14510 volt-ohm-milliammeter should indicate between 200 and 500 volts. When the GROUND ALARM lamp lights, the KS-14510 volt-ohm-milliammeter indication should drop to below 60 volts dc and the office minor alarm should sound.

- (5) Rebalance the converter power supply output voltages so that the GROUND ALARM lamp extinguishes.
- (6) Slowly rotate the OUTPUT CURRENT ADJUST COARSE control of the positive converter power supply cw until the KS-14510 volt-ohm-milliammeter indicates 200 volts.
- (7) Observe the KS-14510 volt-ohm-milliammeter and slowly rotate the OUTPUT CURRENT ADJUST COARSE control of the negative converter power supply cw until the GROUND ALARM lamp just lights.

Caution: Do not exceed a KS-14510 volt-ohm-milliammeter indication of 500 volts direct current.

Requirement: Same as in (4).

- (8) Rebalance the converter power supply output voltages so that the GROUND ALARM lamp is extinguished and there is a minimum voltage indication on the KS-14510 volt-ohm-milliammeter.

- (9) Disconnect the KS-14510 volt-ohm-milliammeter.

4.07 Output Current Meter: Periodically check and adjust the OUTPUT CURRENT meter as follows.

- (1) Connect the KS-8039 volt-milliammeter, with the MILLIAMPERE switch set to the SHORT position and the VOLTS switch set to the MA position, to the AMMETER calibrate jacks of the converter power supply to be checked.
- (2) Rotate the MILLIAMPERE switch of the KS-8039 volt-milliammeter to the 750-milliamperere position.
- (3) Adjust the output of the converter power supply until the KS-8039 volt-milliammeter indicates 520 milliamperes.
- (4) Adjust the OUTPUT CURRENT meter, using the zero adjust, to indicate 520 milliamperes.
- (5) Rotate the MILLIAMPERE switch of the KS-8039 volt-milliammeter to the SHORT position.
- (6) Disconnect the KS-8039 volt-milliammeter.
- (7) Rebalance the output voltages (V_o) of the converter power supplies and recalibrate the alarm circuits, if necessary.

4.08 Output Voltage Meter Calibration:

- (a) **Option XX:** Connect the John Fluke Model 8100A-01 digital voltmeter to the J20 and J21 VOLTMETER CALIBRATE jacks. The digital voltmeter will indicate one millivolt for each volt of output voltage. Adjust the OUTPUT

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VOLTAGE meter, using the zero adjust, to indicate the correct output voltage as read on the digital voltmeter. Disconnect the digital voltmeter from the VOLTMETER CALIBRATE jacks.

(b) If no calibration circuit is provided for the OUTPUT VOLTAGE meter and it is suspected that the meter indicates incorrectly, the meter and its dropping resistor (R19) should be checked periodically at a qualified meter shop. Turn down the converter power supplies as covered in 3.14 or 3.15 before removing the meter and its dropping resistor (R19). After the meter and dropping resistor are checked and installed or substitute units are installed, turn up the converter power supplies as covered in 3.10 or 3.11.⚡

4.09 Oscillator (J87303C): Periodically check the oscillator circuit as follows.

(a) **Option YB:**

- (1) Using the shorting strap terminated in H. H. Smith #201 pin plug connectors, short-circuit the J13 and J14 pin jacks.
- (2) Clamp the Tektronix current probe around the shorting clamp. Set the vertical sensitivity of the 545B Tektronix oscilloscope at 0.05 volt per centimeter. Set the current probe amplifier at 50 milliamperes.

Requirement: The oscilloscope presentation should be similar to Fig. 6. The waveform should be 58 to 142 milliamperes peak-to-peak at $20,000 \pm 200$ Hz (50 ± 0.5 microseconds between successive cycles).

- (3) If the internal frequency is not $20,000 \pm 200$ Hz, use the KS-19355 L5 adjusting tool to adjust the FREQ ADJ control of the oscillator to set the internal frequency of the converter at $20,000 \pm 200$ Hz (50 ± 0.5 microseconds between successive cycles).

(b) **Option YC:**

- (1) Connect the Hewlett-Packard 531D frequency counter between J13 and the frame grounded.

TIME / CM = 5 MICROSECONDS / DIVISION
CURRENT / CM = 50 MILLIAMPERES / DIVISION

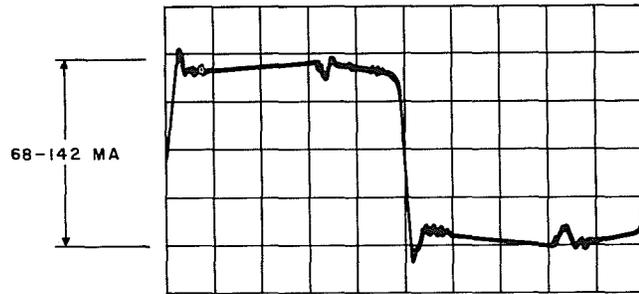


Fig. 6—Oscilloscope Presentation—J87303C L1 Oscillator Option YB

Requirement: The internal frequency of the converter shall be $20,000 \pm 200$ Hz.

- (2) If the internal frequency is not $20,000 \pm 200$ Hz, use the KS-19355 L5 adjusting tool to adjust the FREQ ADJ control of the oscillator to set the internal frequency of the converter at $20,000 \pm 200$ Hz.
- (3) Disconnect the Hewlett-Packard 531D frequency counter.
- (4) Using the shorting strap terminated in H.H. Smith #201 pin plug connectors, short-circuit the J13 and J14 pin jacks.
- (5) Clamp the Tektronix current probe around the shorting clamp. Set the vertical sensitivity of the 545B Tektronix oscilloscope at 0.05 volt per centimeter. Set the current probe amplifier at 10 milliamperes.

Requirement: The oscilloscope presentation should be similar to Fig. 6. The waveform should be between 10.8 and 18.0 milliamperes peak-to-peak as indicated in Fig. 7.

Note: The internal frequency of the converter may be measured using the oscilloscope if a frequency counter is not available.

5. TROUBLES

5.01 The circuit packs and semiconductor devices used in the J86858 dc power supply should be maintained in accordance with Section 032-173-301.

Refer to this section before starting troubleshooting procedures. See Fig. 8.

5.02 Cleaning and dusting of the power supply should be done periodically. Use a clean, dry KS-14666 cloth to clean all high-voltage components and wiring. Vacuum clean the chassis and cabinet, if necessary.

Warning: Turn down the converter power supplies as covered in 3.14 or 3.15 before working on the equipment. The OUTPUT CURRENT meter on the converter power supply is an indirect reading instrument and indicates zero whenever the associated converter power supply is turned off, although other converter power supplies in the series loop may be furnishing power. To de-energize the power loop, turn off all connected converter power supplies and check that all associated voltmeters indicate zero. DO NOT EXCEED $1.1 \times V_o$ during turndown.

TIME / CM = 10 MICROSECONDS / DIVISION
MILLIAMPERES / CM = 10 MILLIAMPERES / DIVISION

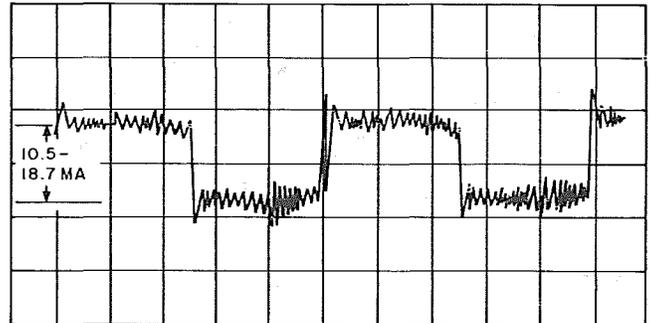


Fig. 7—Oscilloscope Presentation—J87303C L1 Oscillator Option YC

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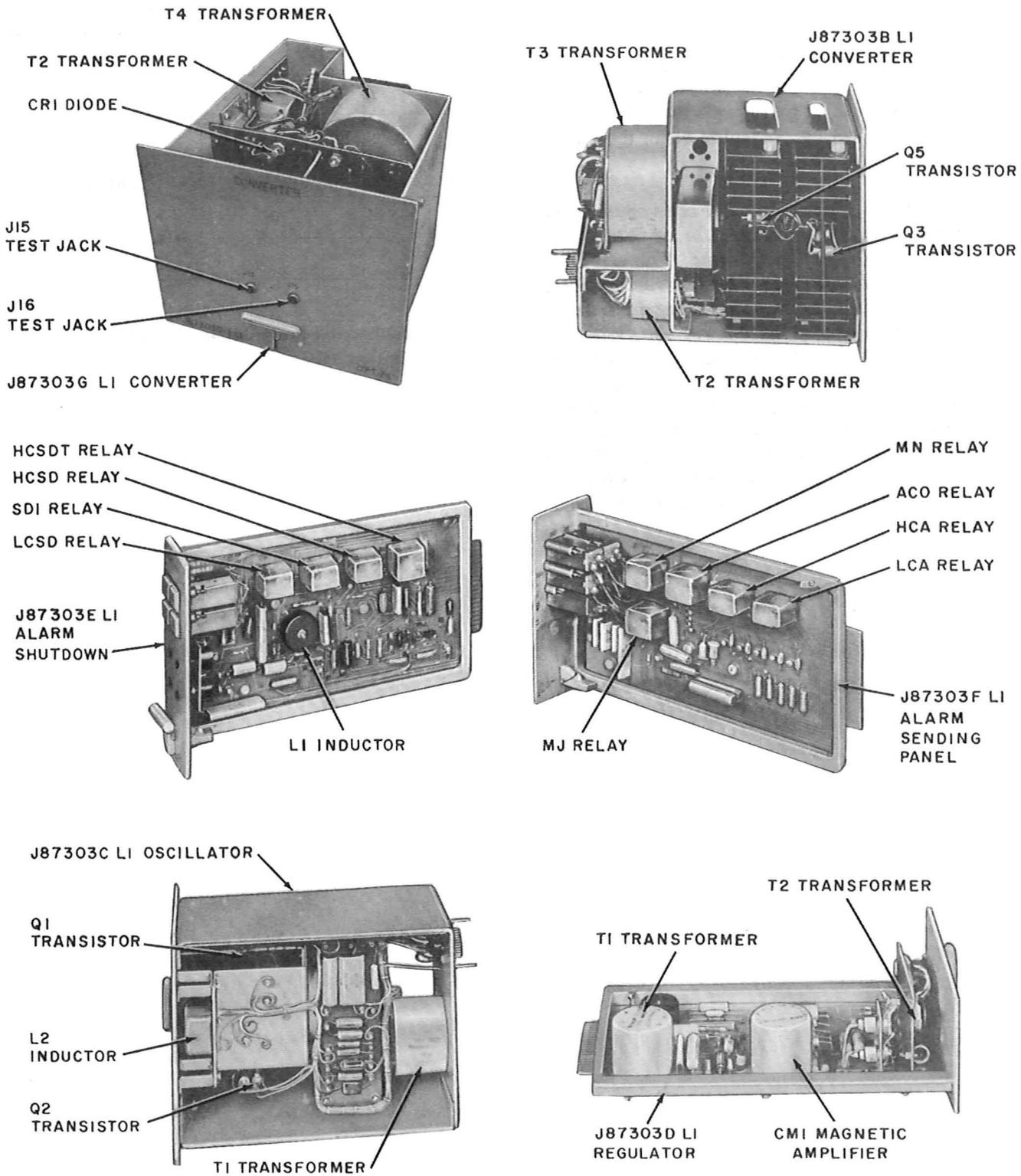


Fig. 8—J87303A Converter Subunits