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CONVERTER (AIOD-A2)
(J87416A)

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1. GENERAL INFORMATION

1.1 Description

1.11 This section provides a method for testing the J87416A Converter which is designed primarily for use in the PBX Automatic Identified Outward Dialing - Type A2 (AIOD-A2) equipment.

1.12 The J87416A converter circuit utilizes two standard 132 type power units to convert a -48 volt input to +24, +12, and +6 volts D.C. regulated outputs with output current capabilities of 0 to 1 ampere, 0 to 6 amperes, and 0 to 10 amperes, respectively. One of the two power units (132D), supplies the regulated +6 volt output; the other power unit (132C), supplies a regulated +12 volt and an unregulated +30 volt output. A series transistor type of linear regulator is used to obtain a regulated +24 volt output from the unregulated +30 volt output of the 132C power unit.

1.13 In addition to the two 132 type power units, the converter is equipped with four control and monitor boards, three output current meters, fuses, alarm lamps and pushbutton test switches for testing the HIGH and LOW limits of the three outputs.

1.14 The 132 type power units and the four monitor and control circuit packs in the converter are factory adjusted for

proper outputs and should not be readjusted in the field. If either of these units or packs are found to be defective, they should be replaced with factory adjusted spares.

WARNING: DO NOT REMOVE OR INSERT PLUG IN UNITS UNLESS THE CONVERTER ON-OFF RESTART SWITCH IS IN THE OFF-RESTART POSITION.

1.15 Converter 1 utilizes the 132C power unit used for the +12 volt and +24 volt outputs. Converter 2 utilizes the 132D power unit used for the +6 volt output.

1.16 A single converter failure will cause both units to be shut down and disconnects the converter assembly from the -48 volt battery. An alarm lamp will light indicating which power unit has failed.

1.17 The circuits tested in this section are:

- SD-82350-01 Power Systems Converter Circuit
- SD-82272-01 Power Systems, DC to DC Converter Circuit, 132 Type Power Units
- SD-1C236-01 Fuse, Alarm and Miscellaneous Circuit

1.2 Sequence of Operation

1.21 Unless instructed to do otherwise, all tests should be performed in the order in which they appear.

1.3 Test of Associated Equipment

1.31 The tests of this section are to be performed before the tests of Section 278, Handbook 59.

1.4 General Precautions

1.41 To protect the circuit packs during converter tests and fusing, when this circuit is used with PBX-AIOD-A2, disengage all circuit packs from their connectors (J-1C037D and J-1C037E units) and slide them approximately two inches forward (out). Use the 731A card extractor tool.

NOTE: The circuit packs will be re-engaged in Section 278, Handbook 59.

1.42 Do not remove or insert plug-in units unless the converter ON-OFF-RESTART switch is in the OFF-RESTART position.

1.43 If the power converter has to be restarted or powered down and restarted, wait 20 seconds before returning the ON-OFF-RESTART switch to the ON position.

2. RECORDS AND REQUIREMENTS

2.1 Records - Forms SD-97-1313 and SD-97-1315 are required for recording the results of these tests.

2.2 Requirements - Tests of this section are based on the requirements of SD and CD information.

3. TEST EQUIPMENT

| Amt | Code | Description |
|-----|----------|------------------------------------|
| 1 | 731A | Card Extractor Tool |
| 1 | ITE-5250 | Digital Multimeter (or equivalent) |
| 1 | ITE-4686 | Chandelier Load Set |
| 1 | ITE-4175 | Weatherproof Socket |

NOTE: ITE-4696 Resistors are supplied with the ITE-4686 Load Set.

3.2 Accessories - One 200 watt light bulb (obtained locally).

4. POWER AND FUSING TESTS

4.1 Remove the associated -48V fuse from the plant discharge fuse panel.

4.2 Remove all the fuses from the AIOD-A2 fuse panels. Also, remove the INPUT F1, CONT1-F2 and CONT2-F3 fuses from the converter.

4.3 Using the Volt-Ohmmeter, verify that all power leads are free of crosses between battery and ground.

NOTE: May have to reverse the multi-meter probes on some readings.

4.4 Disconnect the ground wire (8GA) from the isolated ground bus, at the top of the frame. Using the Volt-Ohmmeter, check for infinite resistance (10 MEG.) between frame ground and the isolated ground bus. Reconnect the ground wire (8 GA).

4.5 Using the Volt-Ohmmeter, verify that continuity exists between the isolated ground bus and the following terminals; terminal 3 of TS(A1) and terminals 6, 9, 11 and 13 of TS(A2) on the power converter.

4.6 Insert the -48V fuse at the plant discharge fuse board and verify the presence of -48V at terminal 1 of TS(A1) on the converter.

4.7 Insert the -48V FE and MISC. AF fuses, verify the presence of -48V at L of the ACO relay.

4.8 Assure that the ON-OFF-RESTART (S1) switch is in the OFF-RESTART position. Insert the CONT1-F2, CONT2-F3 and INPUT-F1 fuses into the converter.

5. OUTPUT VOLTAGE TESTS

5.1 Preparation

5.11 Start the converter as follows:

a) Operate the ON-OFF-RESTART (S1) switch to the ON position.

b) CONV1 FAIL and CONV2 FAIL lamps shall light and, after about one-half second, they shall extinguish.

NOTE: If the converter fails to start, consult the trouble shooting guide of this handbook section.

- 5.12 Observe that the M1, M2 and M3 output current meters all indicate 0 ampere.

NOTE: A slightly perceptible meter reading may occur.

5.2 6 Volt Output Voltage Test

- 5.21 Set the ITE-5250 Digital Multimeter to the 10 Volt DC scale.

- 5.22 Connect the digital multimeter between the 6 volt +(TP1) and -(TP2) test jacks on the front panel of the converter.

NOTE: Ensure that correct polarity is observed.

- 5.23 The digital multimeter should indicate between 5.9 and 6.5 volts. If this requirement is not met, refer to the trouble shooting guide.

- 5.24 Also, verify that these voltage limits are present at TS(A2) pin 14(+) and pin 13 (-); if not present, check the wiring to the terminal strip.

5.3 12 Volt Output Voltage Test

- 5.31 Set the ITE-5250 Digital Multimeter to the 100 volt D.C. scale.

- 5.32 Connect the digital multimeter between the 12 volt +(TP3) and -(TP4) test jacks on the front panel of the converter.

NOTE: Ensure that correct polarity is observed.

- 5.33 The digital multimeter should indicate between 11.6 volt and 12.4 volts. If this requirement is not met, refer to the trouble shooting guide.

- 5.34 Also, verify that these voltage limits are present at TS(A2) pin 12(+) and pin 13(-); if not present, check the wiring to the terminal strip.

5.4 24 Volt Output Voltage Test

- 5.41 Ensure that the ITE-5250 Digital Multimeter is set to the 100 volt D.C. scale.

- 5.42 Connect the digital multimeter between the 24 volt +(TP5) and -(TP6) test jacks on the front panel of the converter.

NOTE: Ensure that correct polarity is observed.

- 5.43 The digital multimeter should indicate between 23.6 volts and 25.2 volts and should not be erratic. If this requirement is not met, refer to the trouble shooting guide.

- 5.44 Also, verify that these voltage limits are present at TS(A2) pin 10(+) and pin 13(-); if not present, check the wiring to the terminal strip.

6. HIGH AND LOW VOLTAGE SHUTDOWN TESTS

6.1 General

- 6.11 High and low voltage checks can be performed on the converter under normal operation conditions without converter shutdown. The converter shutdown circuit is disabled by operating a test key. Then, by operating one of the six additional keys, either a high or a low voltage condition is simulated.

- 6.12 If the expected results are not obtained, refer to the trouble shooting guide.

6.2 24 Volt High and Low Voltage Test

- 6.21 Depress and hold the TST key and 24V HV TEST key.

- 6.22 Observe that the CONV1 FAIL lamp on the front panel of the converter is lighted.

- 6.23 Release the TST and 24V HV TEST key.

- 6.24 Observe that the CONV1 FAIL lamp extinguishes.

- 6.25 Depress and hold the TST key and 24V LV TEST key.

- 6.26 Observe that the CONV1 FAIL lamp is lighted.

- 6.27 Release the TST and 24V LV TEST key.

- 6.28 Observe that the CONV1 FAIL lamp extinguishes.

6.3 12 Volt High and Low Voltage Test

- 6.31 This test is conducted in the same manner as Paragraph 6.2 except the 12V HV TEST key and the 12V LV TEST KEY are

substituted in place of 24V HV TEST key and 24V LV TEST key, respectively.

NOTE: The CONV1 TEST lamp is the lamp to be observed.

6.4 6 Volt High and Low Voltage Test

6.41 This test is conducted in the same manner as Paragraph 6.2, except the 6V HV TEST key, 6V LV TEST key and CONV2 FAIL lamp are substituted for the 24V HV TEST key, 24V LV TEST key and CONV1 FAIL lamp, respectively.

7. OUTPUT TESTS UNDER LOAD

7.1 Setup Information

7.11 Operate the ON-OFF-RESTART switch on the converter to the OFF-RESTART position.

7.12 On the ITE-4686 Load Set, install the ITE-4696 resistors in Sockets A1, A2, A3, D1, D2, E1 and E2. Operate switch S5 on the ITE-4686 Load Set.

7.13 Using the ITE-5250 digital multimeter, verify that the resistance between BP1 and BP2 on the Load Set is approximately 1 ohm. Also, verify that the resistance between BP2 and BP4 is approximately 3 ohms.

7.14 Connect the ITE-4682 Load Set as shown in Table A.

TABLE A

| RECTIFIER VOLTAGE | FROM TS(A2) ON UNIT, TERMINAL | TO ITE-4686 TERMINAL |
|-------------------|-------------------------------|----------------------|
| +6 | 14 | BP1 |
| GRD | 13 | BP2 |
| +12 | 12 | BP4 |

7.15 Insert the 200 watt bulb in the ITE-4175 Weatherproof Socket and connect the pigtail leads to TS(A2) terminal 10 and 11 (24 volt load).

7.16 Start the converter by operating the ON-OFF-RESTART switch to the ON position.

NOTE: If the converter shuts down, refer to the trouble shooting guide.

7.2 Output Current Tests Under Load

7.21 Observe that the approximate current indications are obtained on the output current ammeters on the front of the converter. Refer to Table B.

7.3 Output Voltage Tests Under Load

7.31 The output voltage range for each of converter outputs is listed in Table B. Each converter output is measured one at a time. Refer to Table B for the proper output voltage test jacks and proper ITE-5250 multimeter D.C. voltage range. If any of the voltage output requirements are not met, refer to the trouble shooting section.

NOTE: Ensure that proper polarity is observed.

8. CONCLUSION

8.1 Power down the converter by placing the ON-OFF-RESTART switch to the OFF-RESTART position.

8.2 Observe that all the fail lamps on the converter are extinguished.

NOTE: The CONV1 and CONV2 lamps on the converter and the small 'ALM' lamps on both of the 132 type power units may flash momentarily.

8.3 Disconnect the ITE-4686 Load Set and the ITE-4175 Weatherproof Socket from TS(A2).

8.4 This paragraph marks the end of the testing requirements for this handbook section.

TABLE B

| RECTIFIER VOLTAGE | CURRENT IN AMPERES | OUTPUT VOLTAGE RANGE | OUTPUT VOLTAGE TEST JACKS | ITE-5250 MULTIMETER D.C. VOLTAGE RANGE |
|-------------------|--------------------|----------------------|---------------------------|--|
| +6 | 6A | 5.9 - 6.5V | +(TP1), -(TP2) | 10V |
| +12 | 4A | 11.6 - 12.4V | +(TP3), -(TP4) | 100V |
| +24 | .32A (Approx.) | 23.6 - 25.2V | +(TP5), -(TP6) | 100V |

9. TROUBLE SHOOTING GUIDE9.1 General

9.11 The plug-in units for the J87416 converter are factory adjusted and no field replacement of individual discrete components should be made.

9.12 Replace defective plug-in unit(s) with factory adjusted spares and handle the defective unit(s) in accordance with locally provided instructions.

9.13 A light-emitting diode (CONV1 and CONV2) is associated with each of the two power units. If a failure occurs after the normal start-up sequence, one of the two light-emitting diodes light to indicate which power unit has failed. If a trouble occurs before the start-up sequence is completed, both light-emitting diodes remain lighted.

9.14 The small 'ALM' light-emitting diodes on the 132 type power units should only flash momentarily during start-up or power down. If an 'ALM' light is obtained, it indicates a low voltage condition at the output of the 132 power unit and would indicate that the associated 132 type power unit is defective and should be replaced.

9.15 Should any of the following troubles develop, it is suggested that the possible causes be checked in the order listed. Before attempting to replace any plug-in units, be sure that the ON-OFF-RESTART switch is in the OFF-RESTART position. After a plug-in unit has been replaced, attempt to start the converter by operating the ON-OFF-RESTART switch to the ON position. If the trouble continues, replace the original plug-in unit and proceed to the next step in the trouble locating paragraph. If the trouble is not located in this manner, check for loose or open circuit connections or shorted circuits due to foreign matter lying across wiring terminals.

9.2 Converter Fails to Start

9.21 The J87416 converter with no load on the output terminals may look as though it did not start-up. Using the

digital multimeter, on the appropriate voltage range, check for the proper voltages at the output terminal test points.

9.22 Insure that the ON-OFF-RESTART switch is in the ON position.

9.23 Check for blown input fuses F1, F2 or F3.

9.24 Verify the presence of -48 volts at TS(A1) terminals 1(-) and 3(+).

9.25 If the CONV1 and CONV2 light-emitting diodes are lighted, replace the CP1 (SIT/SD) circuit pack. Ensure that CP1 is mated firmly in its connector.

9.26 If only one of the CONV1 or CONV2 light-emitting diodes is lighted it indicates that the converter shut down after the start-up sequence was completed. Refer to other trouble shooting paragraphs.

9.3 Converter Shuts Down with CONV1 Lighted

9.31 Check for a blown input F1, F2 or F3 fuse.

9.32 Replace the 132C power unit (CONV1).

9.33 Replace the CP3 (H-L/DET) circuit pack.

9.34 Replace the CP2 (REG/APS) circuit pack.

9.35 Check for a loose or broken wire in the converter.

9.4 Converter Shuts Down with CONV2 Lighted

9.41 Check for a blown F1, F2 or F3 fuse.

9.42 Replace the 132D Power Unit (CONV2).

9.43 Replace the CP3 (H-L/DET) circuit pack.

9.44 Check for a loose or broken wire in the converter.

9.5 Erratic or Out-Of-Limit 24 Volt D.C. Output

9.51 The 24 volt limits should be between 23.6 volt and 25.2 volts.

9.52 Replace the CP2 (REG/APS) circuit pack.

9.53 Replace the CP4 (TST/REF) circuit pack.

- 9.54 Check for a loose or broken wire in the converter.
- 9.55 Replace the 132C power unit (CONV1).
- 9.56 If limits are not met, the Digital Multimeter may be defective or improperly set up.
- 9.6 Converter Fails any of the High or Low Voltage Tests
- 9.61 Replace the CP4 (TST/REF) circuit pack.
- 9.62 Replace the CP3 (H-L/DET) circuit pack.
- 9.63 Check for a loose or broken wire in the converter.
- 9.7 Out-of-Limit 6 Volt D.C. Output
- 9.71 The 6 volt limit should be between 5.9 volts and 6.5 volts.
- 9.72 Replace the 132D power unit (CONV2).
- 9.73 The digital multimeter may be defective or improperly set up.
- 9.8 Out-of-Limit 12 Volt D.C. Output
- 9.81 The 12 volt limit should be between 11.6 volt and 12.4 volts.
- 9.82 Replace the 132C power unit (CONV1).
- 9.83 The digital multimeter may be defective or improperly set up.
- 9.9 Converter Shuts Down During Tests Under Load
- 9.91 Power down the converter by operating the ON-OFF-RESTART switch to the OFF-RESTART position.
- 9.92 Check for the proper connections to the ITE-4686 Load Set and the ITE-4175 weatherproof socket.
- 9.93 Using the Volt-Ohmmeter verify that the proper resistance values are obtained between the terminals on the Load Set as specified in the test.
- NOTE: The connections at the terminals on the load box must be removed from the load box before making resistance measurements.
- 9.94 Try to determine which voltage source is causing the converter shut down. If more than one voltage source is under load at one time, remove the load from one of the voltage sources and try a start-up. If the converter starts, power down the converter, reconnect the load which was removed, remove the load from the other voltage source and try another converter start-up.
- 9.95 If the 6 volt output is determined to cause the converter shut-down. First, try replacing the 132D power unit. Then try replacing the CP3 (H-L/DET) circuit pack. Then try replacing the CP1(SIT/SD) circuit pack.
- 9.96 If the 12 volt output is determined to cause the connector shut-down. First, try replacing the 132C power unit. Then try replacing the CP3(H-L/DET) circuit pack. Then try replacing the CP1(SIT/SD) circuit pack.
- 9.97 If the 24 volt output is determined to cause the converter shut-down. First, try replacing the 132C power unit. Then try replacing the CP2(REG/APS) circuit pack. Then, try replacing the CP3(H-L/DET) circuit pack. Then, try replacing the CP1(SIT/SD) circuit pack.

No changes are indicated due to extensive revision.

Manager, Product Engineering
Control Center

Reason for Reissue

Provide Installation Procedures for the new J87416A Power Converter. The J87332 Power Converter is no longer used.