

GFELLER LINE CONCENTRATOR POWER SUPPLY PEC-8002 TESTS

1. GENERAL

1.01 This is one of a group of sections pertaining to the Gfeller line concentrator. This section covers information on the Power Equipment Company's PEC-8002 power supply for the line concentrator.

1.02 This section is reissued to add Part 6 which contains procedures for modification of the PEC-8002 power supply to eliminate beat frequency noise interference encountered in Gfeller concentrators powered by this power supply.

1.03 The equipment will supply 70 or 80 volts ac and 72 volts dc to a maximum of five Gfeller line concentrators. The power supply is completely transistorized and has one input. It is powered by 44 to 52 volts dc central office battery and therefore, does not require an emergency source of power. Figures 1, 2, and 3 show

the PEC-8002 from several views. A schematic of the power supply is shown in Figure 5.

1.04 As shown in Figure 1, the power supply is self-contained. The cover may be removed by turning the two screws one-quarter turn counterclockwise and withdrawing the cover. The back is removed in the same manner to gain access to the terminal strips for connections to the power supply.

1.05 Test points are available on the front of the unit for testing both potentials supplied by the PEC-8002.

2. SPECIFICATIONS

2.01 The current requirements for the PEC-8002 are as follows:

Input — 44 to 52 volts dc at 5 amperes
Output — 72 volts dc at 0.2 to 1 ampere
— 70/80 volts ac at 0.2 to 1.5 amperes

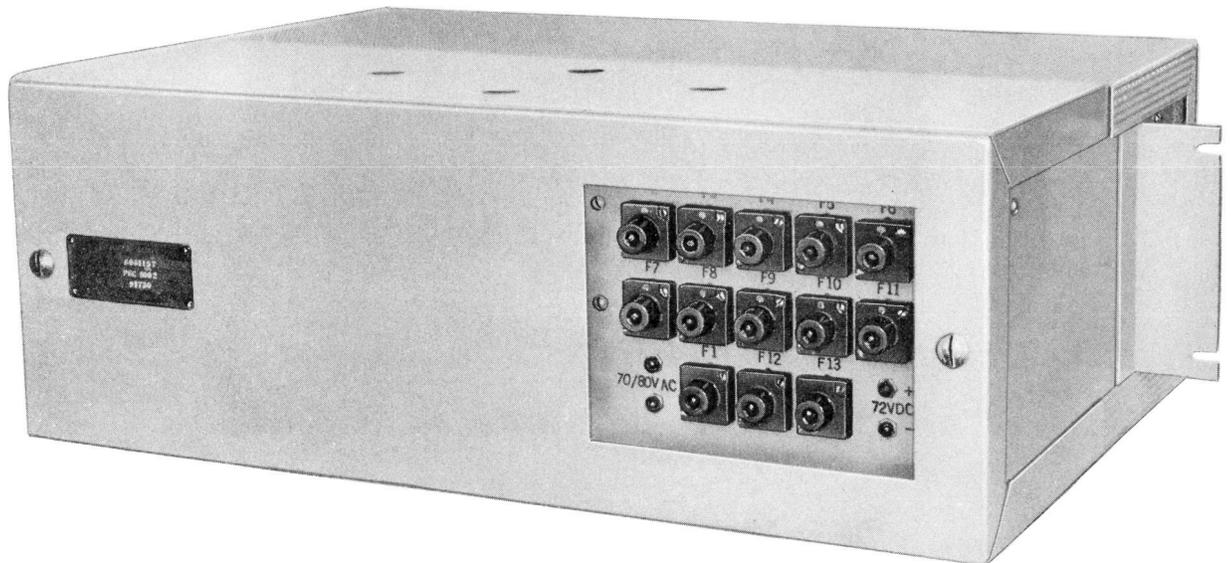


Fig. 1 — Power Supply, Front View

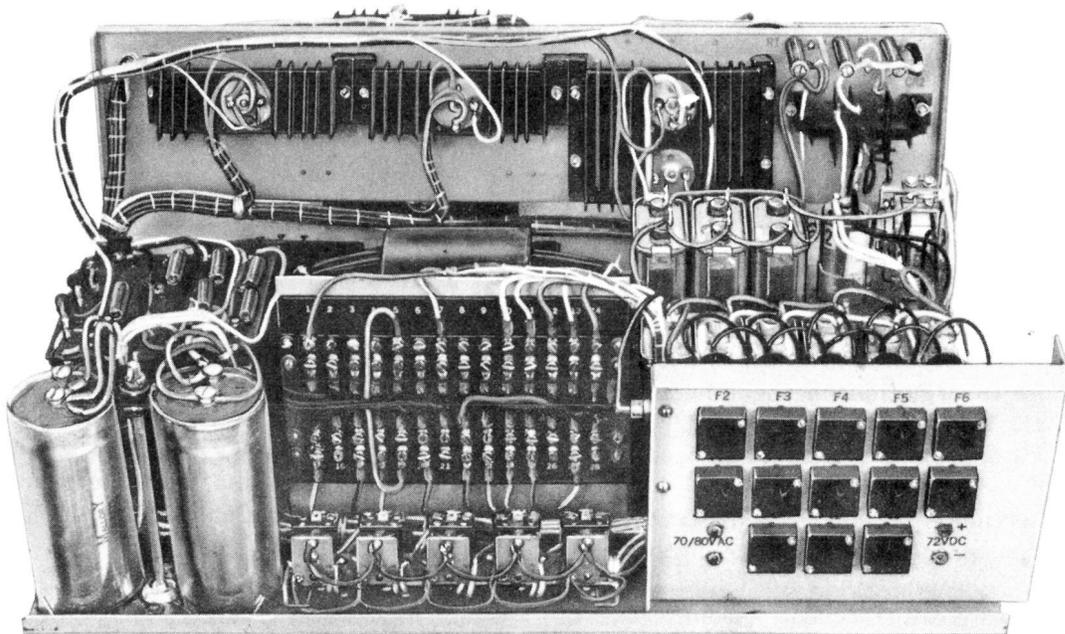


Fig. 2 — Power Supply, Covers Removed

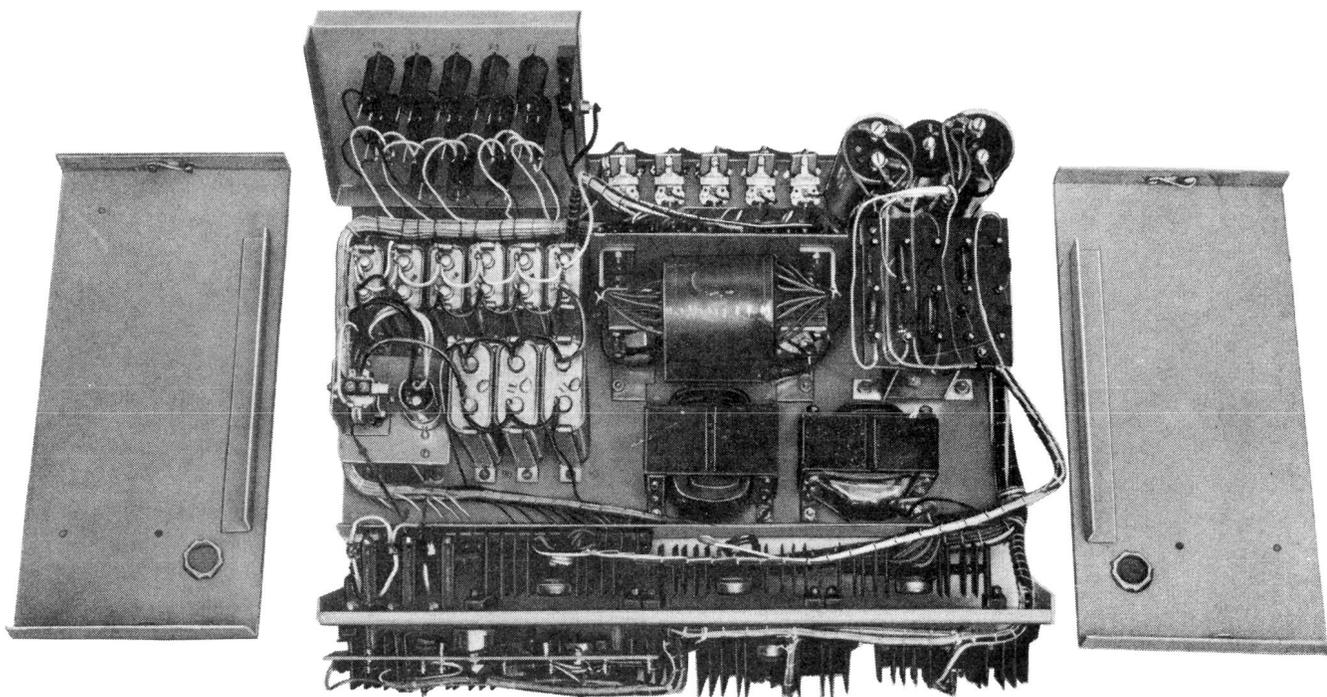


Fig. 3 — Power Supply, Top View, Sides Removed

TABLE A

FUSE DESIG	FUSE CODE	BEAD COLOR	FUSE SIZE	EQUIPMENT FUSED
F1	70D	Green	5A	Main input to PEC-8002—48 volts dc
F2	70A	White	1-1/3A	Concentrator No. 1—72 volts dc
F3	70A	White	1-1/3A	No. 2—72 volts dc
F4	70A	White	1-1/3A	No. 3—72 volts dc
F5	70A	White	1-1/3A	No. 4—72 volts dc
F6	70A	White	1-1/3A	No. 5—72 volts dc
F7	70G	Red	1/2A	Concentrator No. 1—70/80 volts ac
F8	70G	Red	1/2A	No. 2—70/80 volts ac
F9	70G	Red	1/2A	No. 3—70/80 volts ac
F10	70G	Red	1/2A	No. 4—70/80 volts ac
F11	70G	Red	1/2A	No. 5—70/80 volts ac
F12	70C	Blue	3A	AC Ground Return
F13	70C	Blue	3A	Main Discharge—72 volts dc

2.02 The fusing of the power supply is such that each concentrator has its own fuse for each potential. The fuses are accessible from the front of the power supply without removing the cover. The fuse numbering, size, and potential are given in Table A.

3. CIRCUIT DESCRIPTION

3.01 Referring to the schematic, the circuit of the PEC-8002 can be divided into three subsections:

- (a) Input filter section.
- (b) Regulator and frequency control section.
- (c) Inverter-converter section with an ac and dc output.

3.02 The input filter section consisting of F1 fuse, CR2 diode, L1 inductor, and C1 capacitor is used to prevent the switching transients of the inverter circuit from appearing as noise on the 48-volt input battery. Diode CR2 is used to prevent internal damage in the event the input terminals are connected to a circuit of reverse polarity.

3.03 The regulator portion consists of the series regulator transistors Q7 through Q11 in parallel together with their associated

resistors R20 through R24, driver transistor Q6 with the preloading resistors R3 and R5, reference transistor Q5 with reference zener diode CR1, sensing network consisting of R7, R8, R10, R11, potentiometer R9 and bridge circuit CR3, CR4, CR5, and CR6.

3.04 The emitter of Q5 is at approximately -6 volts with respect to ground as a result of the voltage across CR1 zener diode. The base of Q5 is at a slightly more negative potential (-0.04 to -0.2 volts) with respect to the emitter. This base voltage has two components, a portion of the dc input voltage to the switching network of the inverter and a rectified portion of the output of the inverter. Any change in this emitter to base voltage is compensated for by the series regulators such that the output voltage remains essentially constant for all conditions of line and load.

3.05 Transistors Q1 through Q4, together with resistor R14 through R19, form the switching network of the inverter. The positive input of this "switch" is between the emitters of Q1 and Q4 and the negative connection is to the collectors of Q2 and Q3. Under normal operating conditions, this voltage will be 39.5 to 40 volts.

3.06 A portion of the ac output of transformer T1 is rectified by CR11, filtered by L2 and C3, and added to the regulated dc output across

C2 to obtain the 72 volts dc for the concentrators. Positions are available to connect a total of five concentrators on dc output terminals 1 through 5.

3.07 Relay K1 is used to insure that the inverter circuit will start operation. Its normally closed contact shunts the capacitors in the secondary circuit of the ac section. When sufficient voltage is present on the output of CR11, K1 relay operates and opens its contact allowing capacitors C4 through C12 to charge and govern the frequency of the alternating current.

3.08 A second portion of the ac output of transformer T1 appears on the wave shaping network C4 through C12, L3, and L4. Sine-wave voltages of 70 and 80 volts ac are then available at the 70 and 80 optional terminals. Suitable strapping of optional terminals 1, 2, 3, 4, or 5 to either 70 or 80 terminals, will place either 70 or 80 volts ac between the ac output terminals 1, 2, 3, 4, or 5 and ac ground terminal. To provide ground return for ac signaling, strap the ac ground terminal, AC GRD, to the common ground terminal, COM GRD. (On earlier units the ac ground terminal was designated 70-80.)

3.09 To prevent a false ac alarm, optional terminals 1 through 5 that are not being used for concentrators must be electrically connected to either 70 or 80 terminals to operate ac alarm relays K2 through K6.

Caution: Care should be taken that a short, through strapping, does not occur between the 70 and 80 terminals.

3.10 The ac output voltage is dependent on the load; therefore, if the load on the power supply is two concentrators or less, connection Y to transformer T1 shall be used. If the load is three to five concentrators, connection X shall be used. When the PEC-8002 is shipped from the factory, connection X is made.

3.11 When the range of the Gfeller line concentrator is to be extended by the application of 72 volts dc, a lead from one of the DC OUTPUT CONC terminals should be run to the power block of the central office unit designated 72V. When 72-volt operation is specified by the loop resistance exceeding 751 ohms, the central

office unit of the Gfeller must be dual powered. That is, both 72 volts dc and 48 volts dc will be used.

3.12 The connections of the power block on the Gfeller line concentrator central office unit are as follows:

For 48-volt Operation —

70 volts ac connects to 70~ terminals.

48 volts dc connects to negative (—) terminal.

Strap from negative (—) terminal to 72V terminal.

Central office ground connects to positive (+) terminal.

For 72-volt Operation —

70 volts ac connects to 70~ terminals.

72 volts dc connects to 72V terminals.

48 volts dc connects to negative (—) terminal.

Central office ground connects to positive (+) terminal.

Use 80 volts ac only when the associated concentrator has 1000-ohm windings in the RA through RF marking relays and the cable used to connect the concentrators together exceeds 5 miles. When using 80 volts ac, reference should be made to Section 067-201-103 — Extending the AC Signaling Range.

4. APPARATUS

4.01 4-inch D Screwdriver.

4.02 KS-14510, List 1 volt-ohm-milliammeter (or meter of at least 1000-ohms-per-volt sensitivity suitable for measuring 72 volts dc and 80 volts ac).

5. TESTS AT TIME OF INSTALLATION

5.01 For the following tests, it is assumed that straps and connections have been placed in accordance with 3.12 and the notes on the schematic drawing. If the leads on the ac fuse alarm have been connected to terminals 6 and 7 and the concentrators connected to any of the ter-

minals 1 through 5 of the AC OUTPUT and 1 through 5 of the DC OUTPUT, these should be disconnected until the tests are completed.

5.02 In these tests, the 70- and 80-volt ac and 72-volt dc outputs are nominal values and are measured without concentrator load. It is not expected that changes in output when the load is connected will affect the performance of the con-

centrators. However, it may be well to recheck these voltages after the load is reconnected but before the concentrators are put in service.

Caution: Remove F1 fuse (5 amp) before starting these tests.

5.03 To remove the fuse, turn the fuse holder cap one-quarter turn counterclockwise and remove the cap; the fuse can then be withdrawn.

STEP	ACTION	VERIFICATION
AC Section		
1	Check that F7 through F11 fuses are installed.	Correct capacity (0.5 amp) indicated by red bead.
2	If any of the terminals 1 through 5 on optional terminal strip are not connected — Strap unused terminals 1 through 5 to terminal 70.	
3	Check that F12 fuse is installed.	Correct capacity (3.0 amp) indicated by blue bead.
4	Install F1 fuse.	Correct capacity (5.0 amp) indicated by green bead.
5	Connect ac voltmeter to J1 and J2 pin jacks (70/80 VAC).	Voltmeter reads 70 volts ac.
6	If voltmeter reading is not 70 volts ac — Remove F1 fuse.	
7	Remove front cover of power supply.	
8	Check strapping of transformer T1.	Blue wire shall be on terminal: one for one or two concentrators — Y option, two for three or more concentrators — X option.
9	Replace front cover.	
10	Replace F1 fuse.	Voltmeter reads 70 volts ac.
	Caution: The setting of the R9 potentiometer, which determines both voltage and frequency of the output, is critical and is made at the factory. This setting should not be disturbed.	
11	Remove ac voltmeter connections from pin jacks.	

SECTION 067-201-502

STEP	ACTION	VERIFICATION
12	Connect leads from ac alarm circuit to terminals 6 and 7.	Alarms not actuated.
13	Remove F7 fuse.	Prescribed visual and audible alarms actuated.
14	Replace F7 fuse.	Alarms retired.
15	Repeat Steps 13 and 14 substituting F8 through F11 fuses.	
16	At rear of unit — Remove cover.	
17	Apply one lead of ac voltmeter to metal chassis of unit.	
18	Apply other lead in turn to terminals 1 through 5 on AC OUTPUT strip.	Voltmeter reading at each terminal same as that obtained in Step 5 or 10.
19	Remove ac voltmeter connections.	

DC Section

1	Check that F2 through F6 fuses are installed.	Correct capacity (1-1/3 amp) indicated by white bead.
2	Check that F13 fuse is installed.	Correct capacity (3.0 amp) indicated by blue bead.
3	Connect dc voltmeter to J3 and J4 pin jacks (72VDC, + to red, - to black).	Voltmeter reads 72 volts $\pm 0.5V$.
4	Remove voltmeter connections from pin jacks.	
5	At rear of unit — Apply positive lead of dc voltmeter to framework of assembly.	
6	Apply negative lead in turn to each of the DC OUTPUT terminals 1 through 5.	Voltmeter reading same as that obtained in Step 3.
7	Replace cover.	

6. ELIMINATION OF BEAT FREQUENCY NOISE INTERFERENCE

General

6.01 When the PEC-8002 power supply is connected to the concentrator marker circuit control wires and the outside plant is exposed to moderate or severe power induction, two things may happen.

(a) If the exposure is moderate and the fundamental frequency of the induced voltage is not exactly 60 cps, a beat frequency noise induction problem is created. This is very noticeable and frequently annoying to customers even though the measured noise may be within established limits.

(b) If the exposure is severe and the power supply is asynchronous, the concentrator may become completely inoperative due to slowly changing, cancelling, and reinforcing effects of the fundamental 60 cycles. The measured noise on the trunks will usually be out of bounds.

6.02 This beat frequency problem can be overcome by synchronizing the PEC-8002 with the commercial power at the central office using an auxiliary transformer.

6.03 The auxiliary transformer should have a voltage ratio of 117/2.5 with a current rating on the 2-1/2 volt side of not less than 3.0 amperes.

6.04 If for any reason the commercial power should fail with the auxiliary transformer connected, the PEC-8002 will continue to operate from the 48-volt central office battery in a normal manner.

Procedure For Connecting Auxiliary Transformer

6.05 Remove the strap wire which is connected between terminals 26 and 10 of transformer T1 (see Fig. 4).

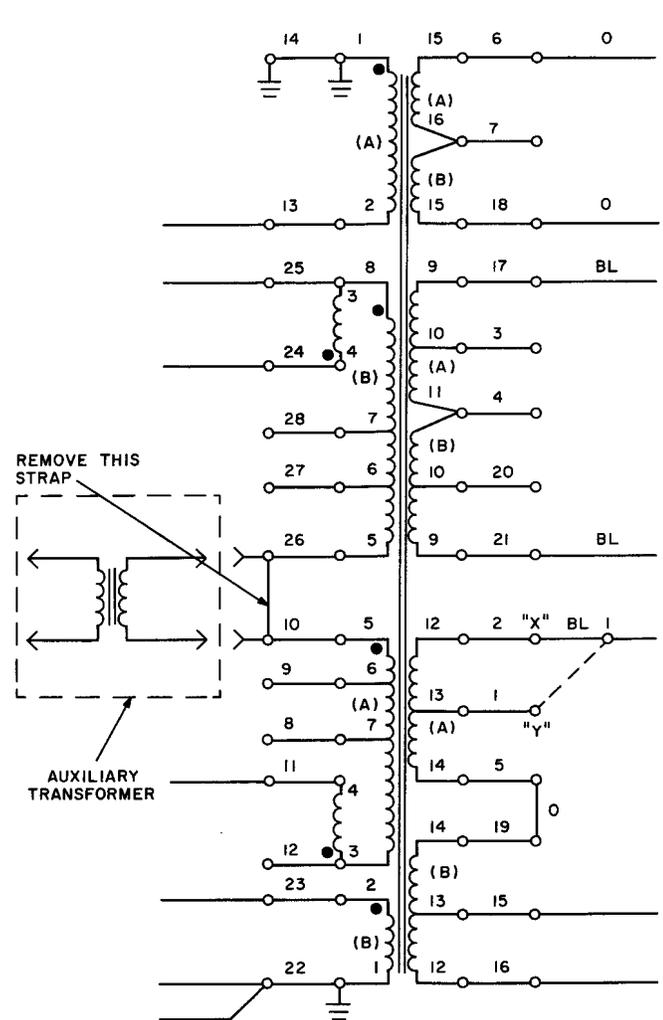
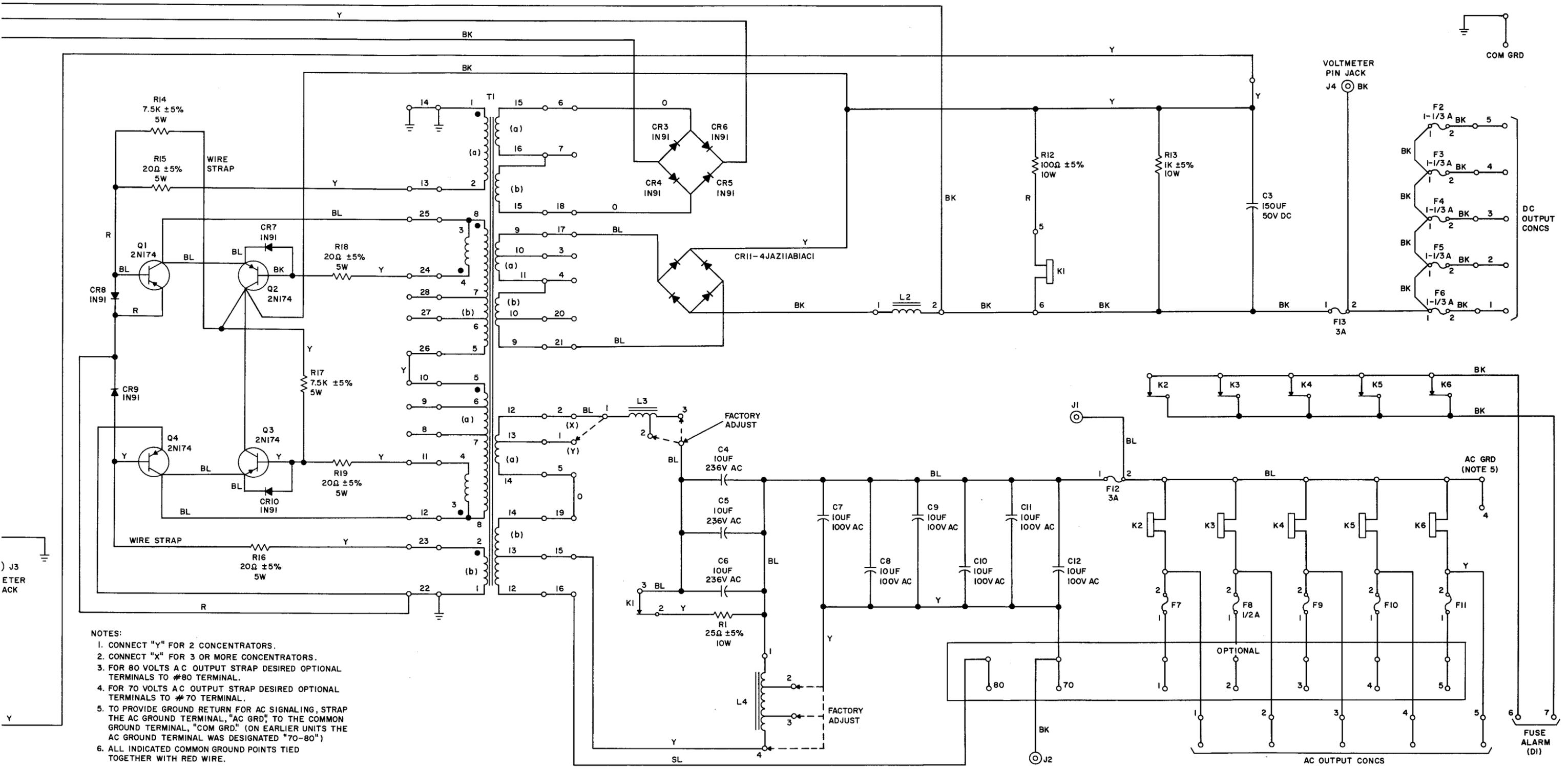


Fig. 4—Transformer T1 Showing Connections For Auxiliary Transformer

6.06 Connect the output side (secondary) of the auxiliary transformer to terminals 26 and 10 of transformer T1.

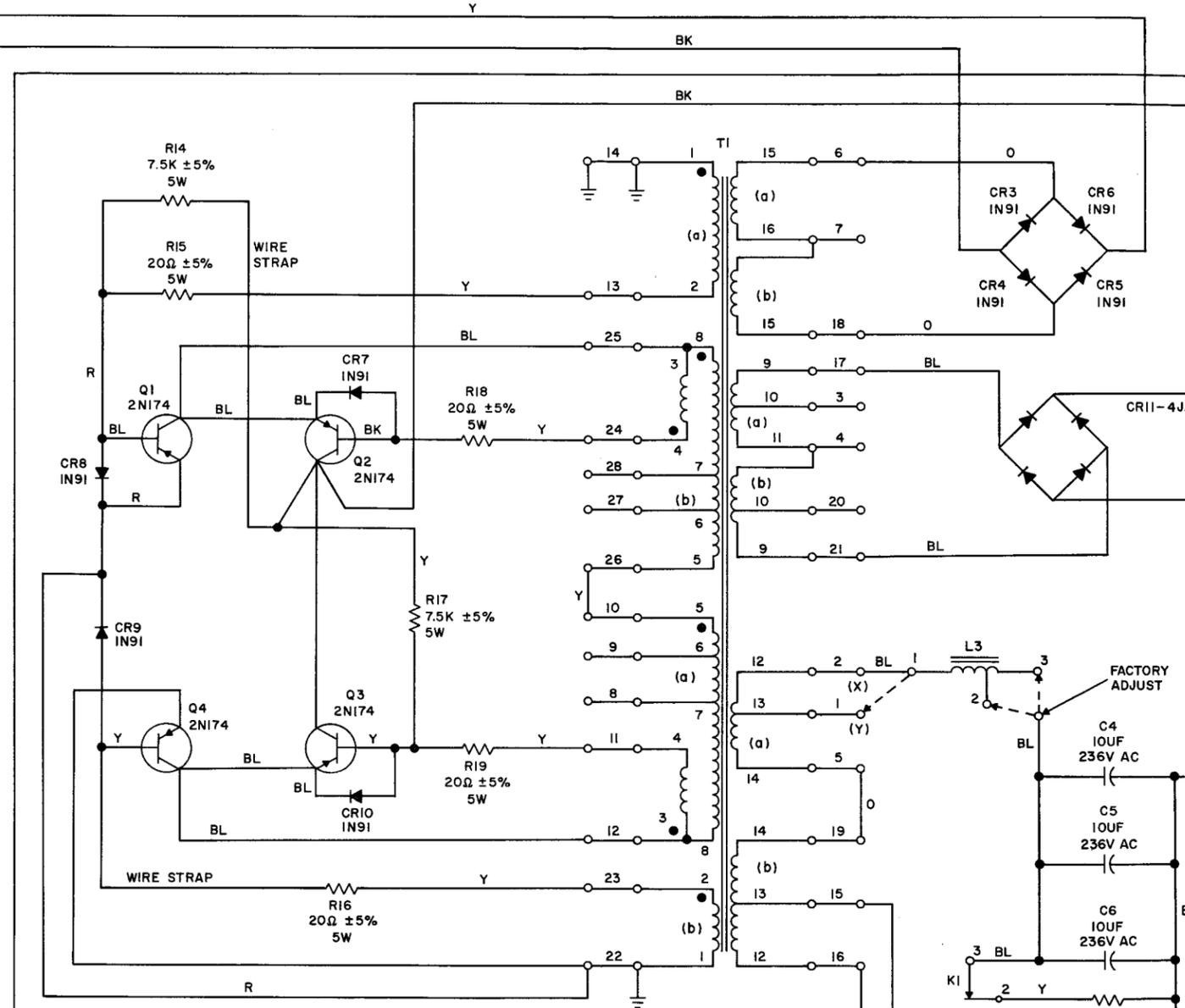
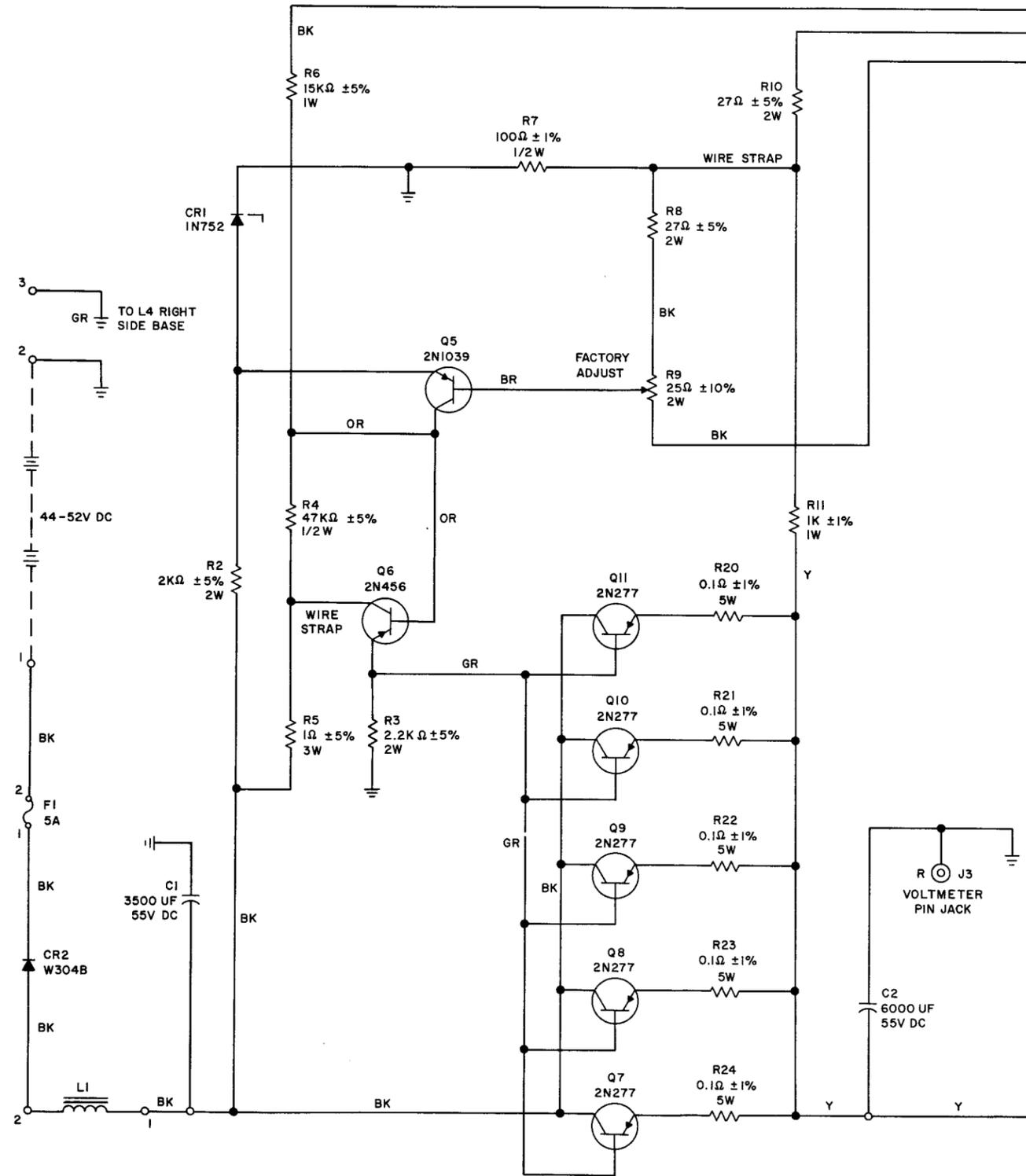
6.07 Connect the input side (primary) of the auxiliary transformer to 117 ac commercial power.





- NOTES:
1. CONNECT "y" FOR 2 CONCENTRATORS.
 2. CONNECT "x" FOR 3 OR MORE CONCENTRATORS.
 3. FOR 80 VOLTS AC OUTPUT STRAP DESIRED OPTIONAL TERMINALS TO #80 TERMINAL.
 4. FOR 70 VOLTS AC OUTPUT STRAP DESIRED OPTIONAL TERMINALS TO #70 TERMINAL.
 5. TO PROVIDE GROUND RETURN FOR AC SIGNALING, STRAP THE AC GROUND TERMINAL, "AC GRD," TO THE COMMON GROUND TERMINAL, "COM GRD." (ON EARLIER UNITS THE AC GROUND TERMINAL WAS DESIGNATED "70-80")
 6. ALL INDICATED COMMON GROUND POINTS TIED TOGETHER WITH RED WIRE.

Fig. 5 — Power Supply PEC-8002, Schematic Diagram



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