

4/4/62

# 516E-2 28-VOLT D-C POWER SUPPLY

## 1.1 DESCRIPTION.

The 516E-2 converts 28-volt d-c energy from an automobile storage battery (negative terminalground) to B+ and bias voltages necessary for operation of mobile amateur equipments, such as the KWM-2 or KWM-2A. The 516E-2 may be used in a car, boat, or plane having a 28-volt d-c power system.

## 2.1 INSTALLATION.

a. Select a location in the vehicle, boat, or aircraft for mounting the 516E-2 where it will be as cool, clean, and dry as possible. Location under the seat or on the passenger side of the fire wall is usually satisfactory. **DO NOT** mount in the engine compartment.

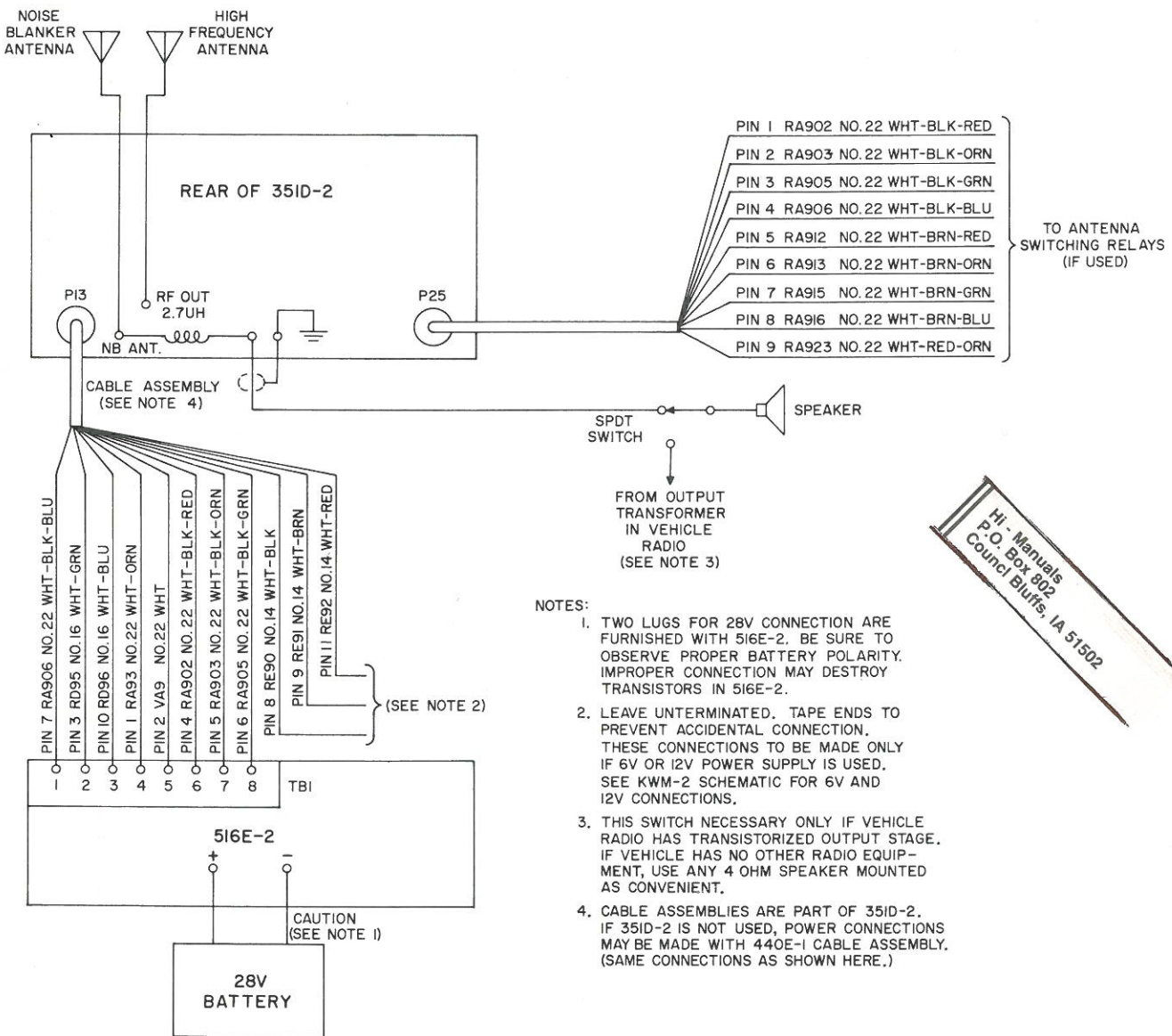


Figure 1. Interconnections to KWM-2/2A

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b. Determine the necessary length of power cable to connect the 516E-2 to the equipment which it is to operate. If the power supply is to supply voltages for the KWM-2/2A and the 351D-2 Mobile Mount is used, cut the required length of cable from that furnished with the mount. Consult figure 1 for installation information. If the 351D-2 is not used, it will be necessary to use a power connecting cable such as Collins type 440E-1. Wire color code and pin-terminal interconnecting information is the same for the 440E-1 as for the power cable furnished as part of the 351D-2. Other connections to the KWM-2/2A may be made as shown in the KWM-2/2A Instruction Book.

c. Remove the cover from the 516E-2 Power Supply terminal board, and make connections to the terminal board. Refer to figure 1.



Be sure to observe proper polarity of the battery when making connections to the 28-volt terminals of the power supply. DO NOT connect the 516E-2 to a system which has a positive ground unless the power supply has been modified to accept this change of polarity. Wrong polarity of connection will destroy all four transistors in the power supply. As an added precaution, remove the fuses before making connections to the terminal board. They may be replaced after all connections are made and checked.

After the power cable and the 28-volt leads are connected, replace the terminal board cover.

d. Prior to use, adjust the bias voltage according to the handbook covering the equipment with which the 516E-2 is to be used.

### 3.1 OPERATION.

Operation of the power supply is controlled from switches and relays in the equipments for which the 516E-2 supplies power. No other operating procedures are required.

### 4.1 CIRCUIT DESCRIPTION.

Figure 4 is a schematic diagram of the 516E-2. The 516E-2 includes an 800-volt 250-ma supply for the power amplifier plate circuits, and a 260-volt 215-ma supply for all other plate circuits. The low-voltage supply is tapped for -60 to -80 volts bias. The transistors for each supply are connected in grounded-collector multivibrator circuit which switches the d-c input power to a-c power for application to the primary winding of the power transformer. Oscillation of the multivibrators is sustained by feedback from the transformer primary windings. Output from the transformer secondary is rectified in a silicon diode voltage doubler circuit. The voltage from the bias

tap on the 260-volt supply is rectified by a half-wave silicon diode rectifier. Input current requirement is 12.5 amperes (maximum) in TUNE or CW condition. Slo-Blo fuses are NOT recommended.

### 5.1 MAINTENANCE.

Maintenance of 516E-2 Power Supply consists of checking and replacement of silicon rectifiers and replacement of defective transistors. Silicon rectifiers are checked with an ohmmeter. Forward resistance is approximately 3 ohms and reverse resistance is approximately 200,000 ohms. When replacing rectifiers, be certain to observe polarity as shown in figure 4. When replacement of a transistor is necessary, provide a heat sink on leads when soldering. Using long-nosed pliers, hold transistor lead between the point being soldered and the transistor. Hold pliers on lead, even after soldering iron has been removed, to dissipate heat in connection. Excessive heat will damage transistors.

### 6.1 SPECIFICATIONS.

#### Input requirements

Voltage . . . . . 24 to 3 volts, 28 volts nominal

Current . . . . . Up to 15 amp

#### Outputs (nominal)

Heater voltage . . . . . 24 volts, 2-1/2 amp

Bias voltage . . . . . -50 to -80 volts (adjustable)

Low voltage . . . . . 265 volts, 210 ma

High voltage . . . . . 750 volts, 185 ma

#### Output regulation

Low voltage . . . . . 290 volts maximum at 170 ma  
265 volts minimum at 210 ma

High voltage . . . . . 860 volts maximum at 55 ma  
690 volts minimum at 250 ma

#### Ripple present on outputs

Filament . . . . . Less than 2.5 volts peak to peak

Bias . . . . . Less than 0.5 volt peak to peak

Low voltage . . . . . Less than 0.2 volt peak to peak

High voltage . . . . . Less than 10 volts peak to peak  
 Efficiency . . . . . Approximately 80%  
 Operating temperature . . . . . -30°C to +60°C  
 Humidity . . . . . 0 to 95% at 50°C for 48 hours

Weight . . . . . 12.5 pounds  
 Dimensions . . . . . 5-3/4 x 7-3/4 x 11-3/8 inches

**7.1 PARTS LIST.**

Figures 2 and 3 show parts location.

ITEM	DESCRIPTION	COLLINS PART NUMBER
	516E-2 28-VOLT D-C POWER SUPPLY	522-0984-005
C1	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf -10% +75%, 50 vdcw	183-1656-00
C2	NOT USED	
C3	CAPACITOR, FIXED, ELECTROLYTIC: 60 uf -10% +100%, 350 vdcw	183-1551-00
C4 thru C9	CAPACITOR, FIXED, ELECTROLYTIC: same as C3	183-1551-00
C10	CAPACITOR, FIXED, ELECTROLYTIC: same as C1	183-1656-00
C11	CAPACITOR, FIXED, ELECTROLYTIC: same as C3	183-1551-00
C12	CAPACITOR, FIXED, ELECTROLYTIC: same as C3	183-1551-00
C13	CAPACITOR, FIXED, ELECTROLYTIC: same as C3	183-1551-00
C14	CAPACITOR, FIXED, ELECTROLYTIC: 40 uf -10% +100%, 150 vdcw; P. R. Mallory part no. TC48	183-1044-00
C15	NOT USED	
C16	CAPACITOR, FIXED, CERAMIC: 0.02 uf -20% +100%, 500 vdcw; Solar Electric part no. CD20XD-203W	913-2142-00
C17	CAPACITOR, FIXED, PAPER: 0.1 uf ±10%, 400 vdcw; Sprague Electric part no. 160P10494	931-0299-00
CR1	SEMICONDUCTOR DEVICE, DIODE: low power, silicon; Sarkes-Tarzian part no. 40M(M500)	353-1567-00
CR2 thru CR9	SEMICONDUCTOR DEVICE, DIODE: same as CR1	353-1567-00
E1	TERMINAL LUG: bent soldering lug w/ Shakeproof locking hole for #4 size screw; Shakeproof, Inc. part no. 2104-04-01-2520	304-0317-00
E2	SOLDERING LUG: brass, 0.045 in. by 1/2 in. by 1-3/32 in.; Patton MacGuyver Co. part no. 2050	304-1500-00
E3	SOLDERING LUG: phosphor bronze w/ Shakeproof hole to fit 1/4 in. bolt; Shakeproof Lock Washer Co. part no. 2109-1/4	304-1000-00
E4	TERMINAL LUG: same as E1	304-0317-00
E5	TERMINAL STUD: insulated; brass silver plated terminals; 1/4 in. hex by 0.587 in. lg including terminals; Whitso, Inc. part no. 2B1-DB12	306-0234-00
E6	TERMINAL LUG: same as E1	304-0317-00
E7	TERMINAL STUD: same as E5	306-0234-00
E8	TERMINAL STUD: same as E5	306-0234-00
E9	TERMINAL STUD: same as E5	306-0234-00
E10	TERMINAL LUG: same as E1	304-0317-00
E11	TERMINAL STUD: same as E5	306-0234-00
E12	TERMINAL STUD: same as E5	306-0234-00
E13	TERMINAL LUG: same as E1	304-0317-00
E14	TERMINAL LUG: same as E1	304-0317-00
E15	TERMINAL STUD: same as E5	306-0234-00
E16	TERMINAL STUD: same as E5	306-0234-00
E17	TERMINAL LUG: same as E1	304-0317-00
E18	TERMINAL LUG: same as E1	304-0317-00
E19	TERMINAL LUG: same as E1	304-0317-00
F1	FUSE, CARTRIDGE: glass enclosed, 1/4 in. dia by 1-1/4 in. lg; Littelfuse Laboratories part no. 1330	264-4170-00
F2	FUSE, CARTRIDGE: same as F1	264-4170-00
K1	RELAY, ARMATURE: 1A contact arrangement; 15 amp at 28 v dc or 115 v ac resistive; 24 v dc nom coil voltage	970-1875-00
K2	RELAY, ARMATURE: same as K1	970-1875-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
L1	COIL, RADIO FREQUENCY: 5.5 uh ±20%; approx 15-3/4 turns #9 AWG, powdered iron core; Morey Corp. part no. 10X610	240-0002-00
L2	REACTOR: 0.75 henry measured at 10 v rms, 60 cps w/ rated dc current, 210 ma dc, 25 ohms max; 1400 v rms; Chicago Std. Trans. part no. 26456-A	668-0270-00
L3	COIL, RADIO FREQUENCY: single layer wound, 26 turns #14 AWG formvar or double insulated copper wire	240-0021-00
L4	COIL, RADIO FREQUENCY: 120.0 uh ±10%, 425 ma dc, 400 ohms dc resistance; Jeffers Electronics part no. 10404-36	240-0194-00
L5	COIL, RADIO FREQUENCY: 500 uh ±10%, 100 milliamp, 500 v rms; 10 ohms max dc resistance; #36 AWG copper wire, three universal wound pl sections; National Coil Co. part no. 0-0047109	240-0073-00
Q1*	TRANSISTOR: hermetically sealed, germanium, PNP power transistor; Delco Radio part no. 7276207	352-0043-00
Q2* thru Q4	TRANSISTOR: same as Q1	352-0043-00
R1	RESISTOR, FIXED, COMPOSITION: 2200 ohms ±10%, 2 w	745-5666-00
R2	RESISTOR, FIXED, COMPOSITION: same as R1	745-5666-00
R3	RESISTOR, FIXED, COMPOSITION: 10 ohms ±10%, 1 w	745-3268-00
R4	RESISTOR, FIXED, COMPOSITION: same as R3	745-3268-00
R5	RESISTOR, FIXED, COMPOSITION: same as R1	745-5666-00
R6	RESISTOR, FIXED, COMPOSITION: same as R1	745-5666-00
R7	RESISTOR, FIXED, WIREWOUND: 100 ohms ±5%, 3 w	747-5103-00
R8	NOT USED	
R9	NOT USED	
R10	NOT USED	
R11	RESISTOR, FIXED, COMPOSITION: 33 ohms ±10%, 2 w	745-5589-00
R12	RESISTOR, FIXED, COMPOSITION: 0.22 megohm ±10%, 1 w	745-3450-00
R13 thru R16	RESISTOR, FIXED, COMPOSITION: same as R12	745-3450-00
R16	RESISTOR, FIXED, COMPOSITION: 0.27 megohms ±10%, 1 w	745-3454-00
R17	RESISTOR, FIXED, COMPOSITION: same as R16	745-3454-00
R18	RESISTOR, FIXED, COMPOSITION: same as R16	745-3454-00
R19	RESISTOR, VARIABLE: composition; 5000 ohms ±20%, 2 w	380-0614-00
R20	RESISTOR, FIXED, COMPOSITION: 6800 ohms ±10%, 1 w	745-3387-00
R21	RESISTOR, FIXED, COMPOSITION: 33 ohms ±10%, 1 w	745-3289-00
R22	RESISTOR, FIXED, COMPOSITION: 3300 ohms ±10%, 1 w	745-3373-00
R23	RESISTOR, FIXED, COMPOSITION: 47 ohms ±10%, 1 w	745-3296-00
R24 thru R26	RESISTOR, FIXED, COMPOSITION: same as R23	745-3296-00
R27	RESISTOR, FIXED, COMPOSITION: same as R3	745-3268-00
R28	RESISTOR, FIXED, COMPOSITION: same as R3	745-3268-00
T1	TRANSFORMER, POWER, STEP-UP: one 60 ohm primary, two 1 ohm secondaries; 500 ma current; 15/16 in. by 15/16 in. by 1-7/16 in.; Ballastran part no. BC-2262	667-1006-00

\*The transistor manufacturer has changed 2N174 from flexible leads to solder lug connections. The 727-6207 type listed is the house number for original units with flexible leads. DO NOT order type 2N174 for replacement.

ITEM	DESCRIPTION	COLLINS PART NUMBER
T2	TRANSFORMER, POWER, STEP-UP: primary 27 v. ct; 850 v secondary; 400 cps; continuous duty cycle; Ballastran part no. BC-2261	664-0284-00
T3	TRANSFORMER, POWER, STEP-UP: one primary, three secondaries; 220 ma max current; 1-7/8 in. by 2 in. by 3-1/16 in.; Ballastran part no. BC-2260	664-1009-00
TB1	TERMINAL BOARD: phenolic, 8 terminals, barrier type w/ lug for back connection	367-0016-00
TB2	TERMINAL BOARD: barrier type terminal strip w/ double ended solder terminals eyeletted to strip; 21 terminals, phenolic insulation; Howard B. Jones part no. 21-240-W	367-0829-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
TB3	TERMINAL BOARD: barrier type w/ double ended solder terminals eyeletted to strip; 8 brass terminals; phenolic insulation; Howard B. Jones part no. 8-240-W	367-0819-00
TB4	TERMINAL BOARD: plastic laminated; 1/8 in by 1-3/8 in. by 7-5/8 in.; w/ 18 clips, 26 terminal lugs & 26 rivets	542-7572-002
XF1	FUSEHOLDER: bakelite, extractor post type for 3AG fuses; 1/16 in. locking slug to be furnished	265-1002-00
XF2	FUSEHOLDER: same as XF1	265-1002-00

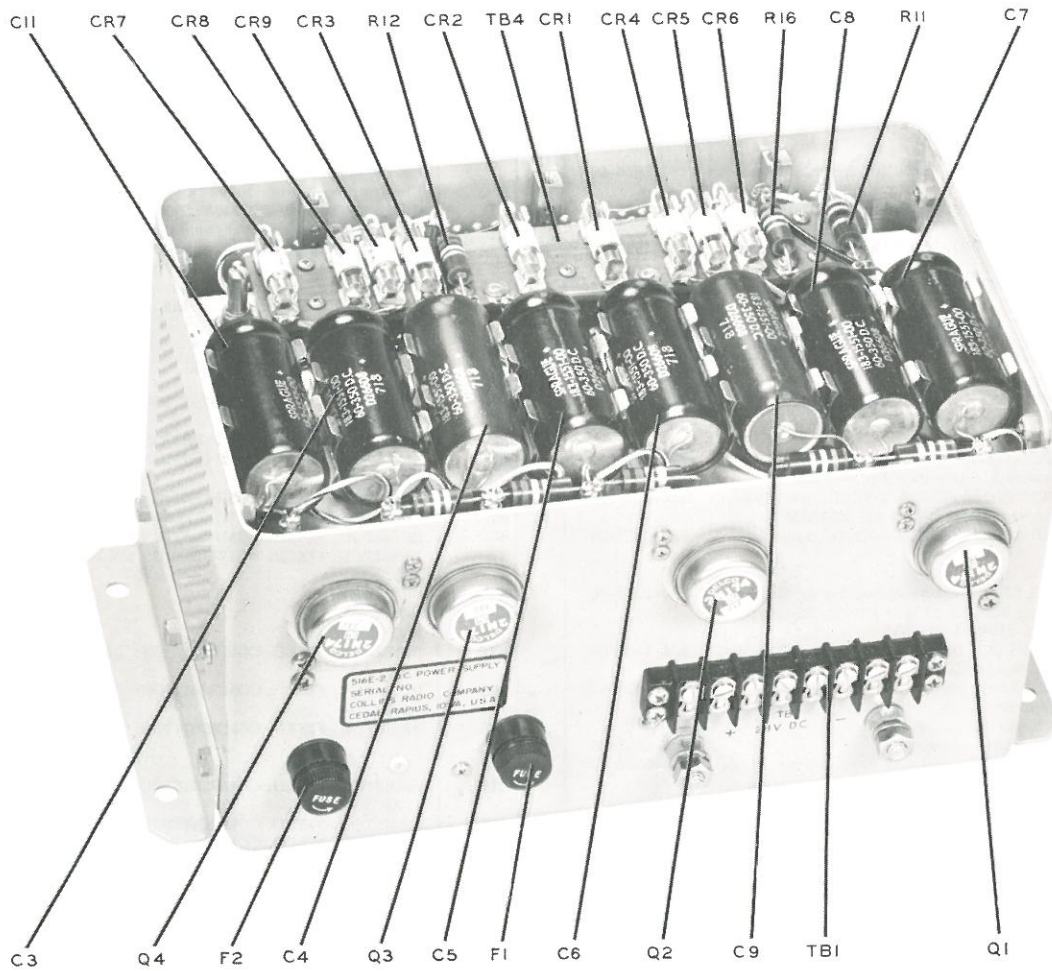


Figure 2. Top View, Cover Removed, Parts Identified

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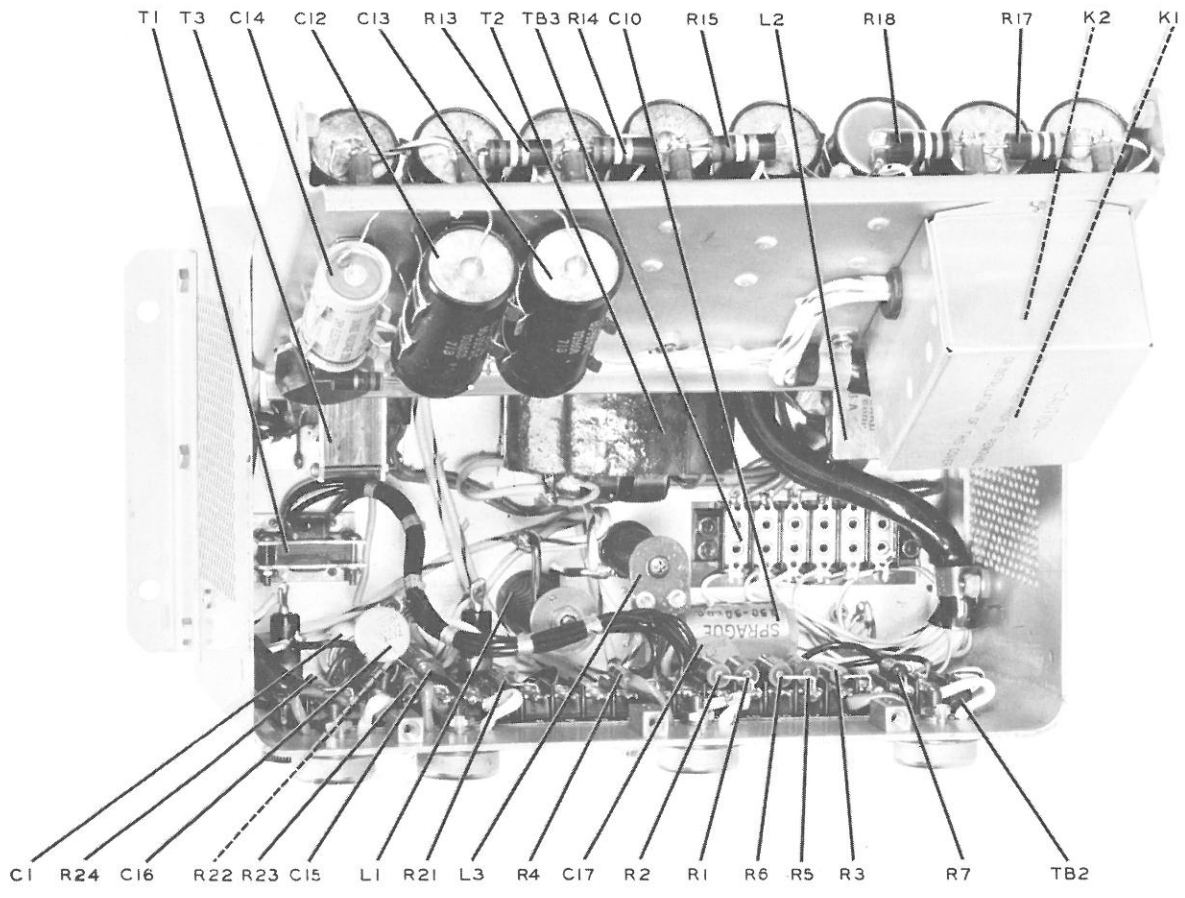
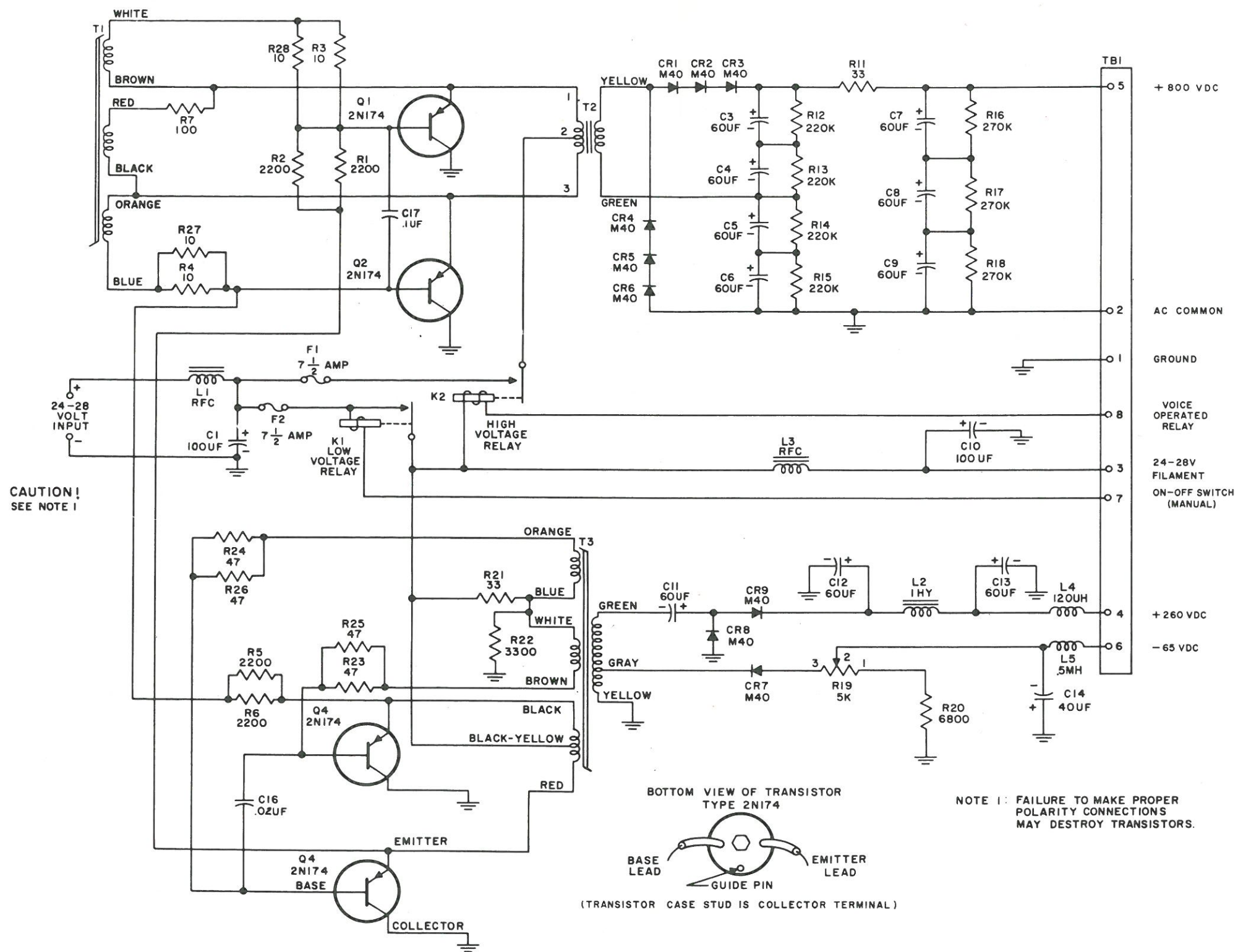


Figure 3. Top View, Chassis Swung Out, Parts Identified

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Figure 4. 516E-2 28-Volt D-C Power Supply, Schematic Diagram





