

ESCON
ASSEMBLY INSTRUCTIONS
MODEL E-B
POWER SUPPLY

ESCON PRODUCTS, INC.
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ESCON
ASSEMBLY INSTRUCTIONS

MODEL E-B
POWER SUPPLY

GENERAL

Work in a clean, well-lighted place.

Read the instructions all the way through before starting work.

Check off the instructions as they are completed. Follow the sequence given; short cuts can lead to trouble.

Wear glasses or goggles when soldering or cutting wires.

The following tools are recommended:

Soldering iron, 1/16-inch tip

Screwdriver, 3/16-inch blade

Long-nosed pliers

Wire stripping pliers

Diagonal cutting pliers

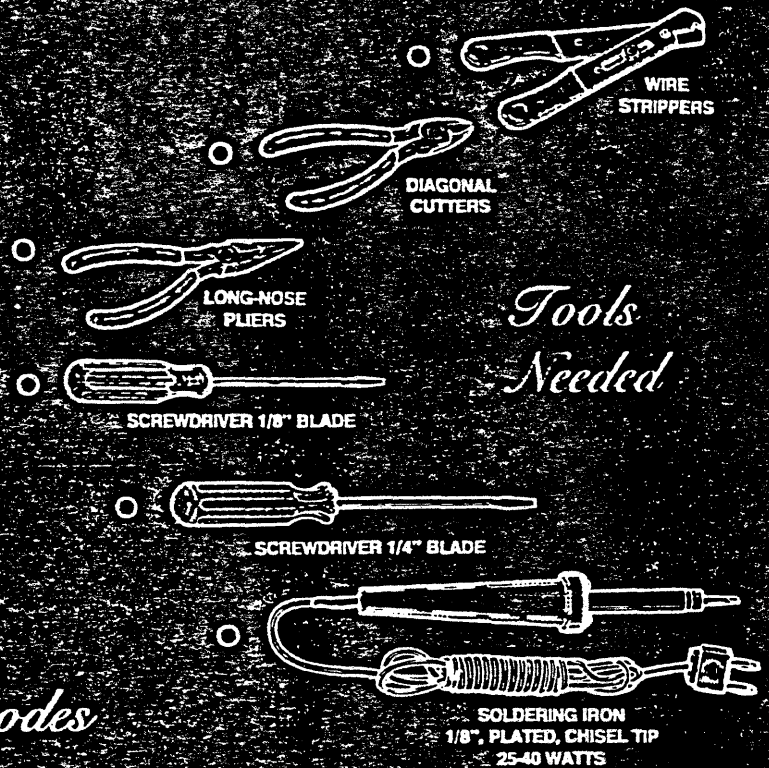
Check the parts against the parts list before starting work.

The

ESCON

Kit Builder's Guide To:

Installing parts
Proper soldering
Resistor & capacitor codes



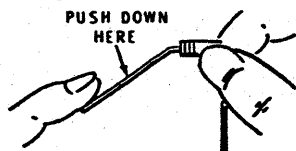
CIRCUIT BOARDS

To Install a Part:

The following example uses a resistor, since resistors are usually installed first.

1. Position the circuit board as shown in the Manual with the printed side (not the foil side) up.

2. Hold the resistor by the body as shown and bend the leads straight down.

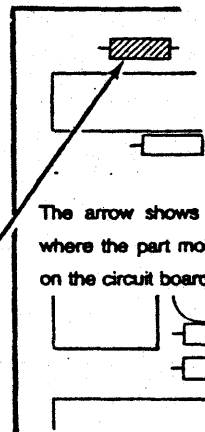


3. Push the leads through the holes at the proper location on the circuit board. The end with color bands may be positioned either way.

4. Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



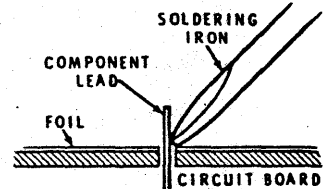
EXAMPLE CIRCUIT BOARD



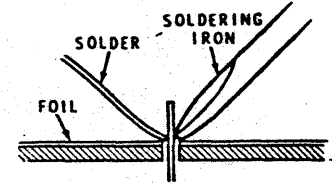
NOTE: A pencil-type soldering iron, as shown above, will give the best results.

To Solder a Connection:

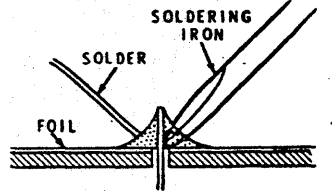
1. Place the soldering iron tip against both the lead and the circuit board foil. Heat both for 2 or 3 seconds.



2. Then apply solder to the other side of the connection. IMPORTANT: Let the heated lead and the circuit board foil melt the solder.



3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



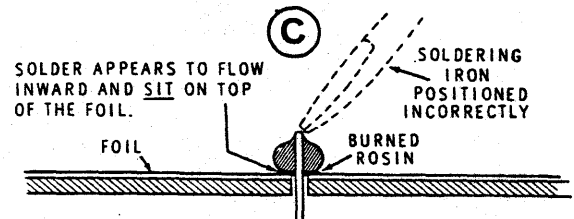
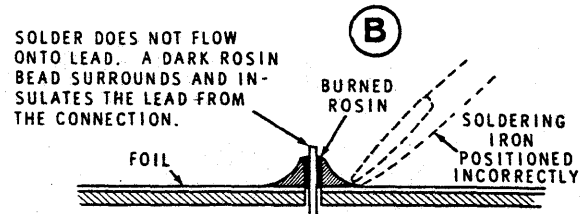
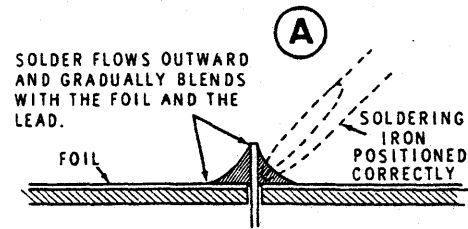
4. Hold the lead with one hand while you cut off the excess lead length close to the connection. This will keep you from being hit in the eye by the flying lead.

To Check a Connection:

Be sure the solder made a good electrical connection. When both the lead and the circuit board foil are heated at the same time, the solder will flow onto the lead and the foil evenly. See Illustration A. The solder will then make a good electrical connection between the lead and the foil.

When the lead is not heated sufficiently, the solder will not flow onto the lead as shown at B. Reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection as shown at A.

When the foil is not heated sufficiently, the solder will blob on the circuit board as shown at C. Reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection as shown at A.



A solder bridge between two adjacent foils How the connection should appear.

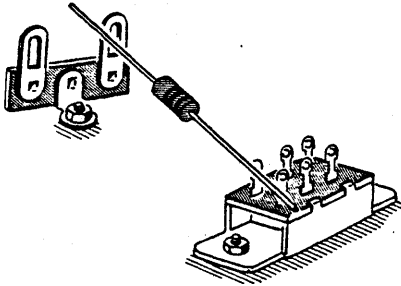


Be sure you did not make any solder bridges. Due to the small foil area around the circuit board holes and the small areas between foils, you must use the utmost care to prevent solder bridges between adjacent foil areas.

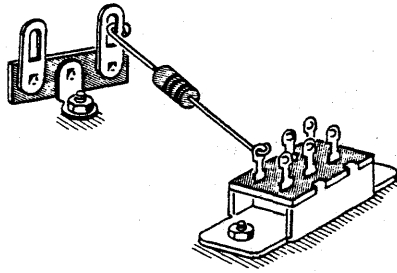
A solder bridge may occur if you accidentally touch an adjacent connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. Always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together.

CHASSIS WIRING

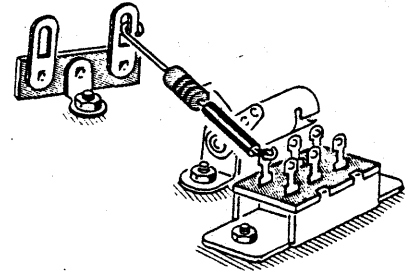
To Install a Part:



1. Cut the leads to the proper length.



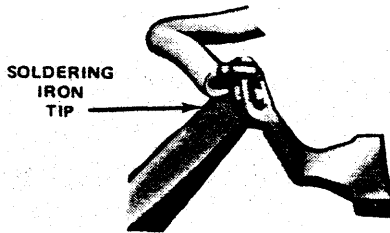
2. Fasten the lead ends.



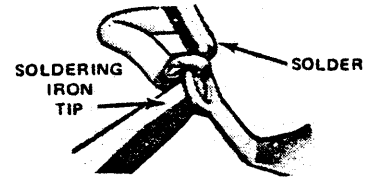
NOTE: Use sleeving when it is called for to provide insulation.

To Solder a Connection:

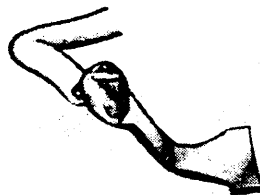
1. Heat both the wire and the connection point; do not burn the insulation on the wire.



2. Apply only enough solder to thoroughly wet both the tip and the connection.



3. Let the connection harden before moving the wire. The connection should be smooth and bright.



4. Check the connection. Poor connections look crystalline and grainy, or the solder tends to blob. Reheat the connection if it does not look smooth and bright.



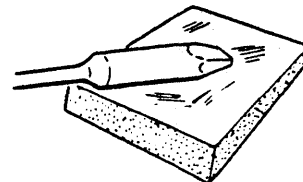
Remember:

Soldering abbreviations are given in the steps. (NS) means not to solder because other wires will be added later. "S-" with a number, such as (S-3), means to solder the connection. The number following the "S" tells how many wires are at the connection. (Where a wire passes through a connection and goes on to another point, it counts as two wires...S-2).

When there are several wires at a connection, be sure all of them are soldered.

Good solder connections are MOST IMPORTANT: 90 percent of all service problems are caused by poor soldering.

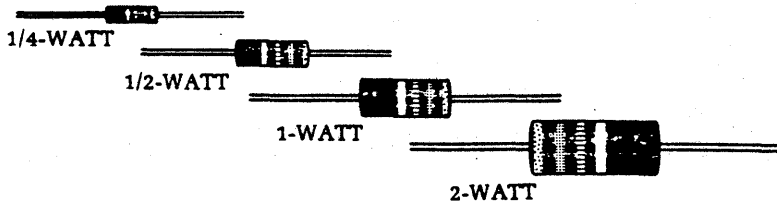
Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to it to give the entire tip a wet look. This "tinning" process will protect the tip and enable you to make good connections. When the solder tends to "ball" or not stick to the tip, the tip needs to be cleaned and retinned.



Use rosin core, radio-type solder (60:40 or 50:50 tin-lead content) for all soldering in the kit. The Warranty will be void and we will not service any kit in which acid core solder or paste fluxes have been used.

RESISTORS

Resistors come in several sizes and shapes, each one with its color code or value printed on it. The Manual calls out the value, and color code when used, of each resistor at the time it is installed.



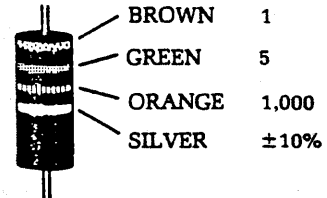
RESISTOR COLOR CODE



TOLERANCE
Gold 5%
Silver 10%
No Band 20%

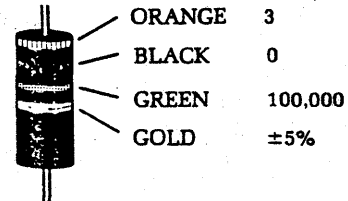
COLOR	1st DIGIT	2nd DIGIT	MULTIPLY BY
BLACK	0	0	1
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
VIOLET	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	1,000,000,000
GOLD			.1
SILVER			.01

EXAMPLES:



BROWN 1
GREEN 5
ORANGE 1,000
SILVER ±10%

$15 \times 1,000 = 15,000 \Omega$ (15,000 OHMS),
or "15 k"



ORANGE 3
BLACK 0
GREEN 100,000
GOLD ±5%

$30 \times 100,000 = 3,000,000 \Omega$ (OR 3 MΩ)
3 MΩ = 3 MEGOHMS

CAPACITORS

Capacitors come in many sizes and types. The Manual will tell the type and value of each one, and show what it looks like. This page shows how you can read the code printed on some capacitors.

EXAMPLES:

151K = $15 \times 10 = 150 \text{ pF}$
759 = $75 \times 0.1 = 7.5 \text{ pF}$

NOTE: The letter "R" may be used at times to signify a decimal point; as in: 2R2 = 2.2 (pF or μF).

First digit of

capacitor's value: 1

Second digit of

capacitor's value: 5

Multiplier: Multiply the first & second digits by the proper value from the Multiplier Chart.

To find the tolerance of the capacitor, look up this letter in the Tolerance columns.



pF = picofarads
μF = microfarads

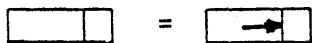
MULTIPLIER		TOLERANCE OF CAPACITOR		
FOR THE NUMBER:	MULTIPLY BY:	10pF OR LESS	LETTER	OVER 10pF
0	1	±0.1pF	B	
1	10	±0.25pF	C	
2	100	±0.5pF	D	
3	1000	±1.0pF	F	±1%
4	10,000	±2.0pF	G	±2%
5	100,000		H	±3%
			J	±5%
8	0.01		K	±10%
9	0.1		M	±20%

ELECTROLYTIC CAPACITORS

Many capacitors must be connected in the proper direction. These capacitors are marked by "+" or "-" signs to indicate one of the wires. This polarity must correspond to the marking on the circuit board where they are installed. For example, if one lead is marked "-" and one hole in the board is marked "+", do not solder the "-" lead in the "+" hole.

DIODES

Diodes must be installed in the proper direction. Diodes are marked with an arrow touching a line, $\rightarrow|$. On small diodes only the line is marked. The end of the diode closest to the line is the end toward which the arrow would point:



The direction of the arrow must match the arrow on the circuit board or must point toward the hole marked "-".

CABLE CONNECTORS

It is convenient for trouble-shooting to mark pin 1 on all connectors, plugs and receptacles and on both sides. This can be done by painting a dot near the pin using typewriter "whiting out" paint.

SOLDERING TRANSISTORS AND DIODES

When soldering transistors and diodes avoid heating the leads longer than necessary. If you don't get a good looking joint after about a second of heating, let the joint cool before touching it up. After soldering one lead move to another component to allow the first to cool before going back to it.

INTEGRATED CIRCUITS

The pin numbering of integrated circuits starts with pin 1 at one corner and proceeds counterclockwise. Pin 1 is usually marked with a dot. Sometimes the end that has pin 1 is marked with a notch or a dot. Pin 2 is always on the same side as pin 1. Pin 1 of the circuit must correspond to the location marked on the circuit board by a dot or otherwise.

REMOVING SOLDER

If you put too much solder on a joint or if you need to remove a component already soldered to the board, the solder can be removed by use of the solder wick braid. Place the braid against the solder and place the iron against the braid. When the braid heats up, it will soak up the solder. Cut off the end of the braid after it is filled with solder.

CUTTING TRACES

In some cases, the instructions call for cutting traces on the circuit board. This is best done by cutting the traces with a sharp knife. Remove a piece of the trace about 1/16 inch long to be sure the trace is open. If the ends of the open trace have lifted off the board, cut them back to a point where they are firmly attached. Remove the cut pieces of the trace; don't leave them on the board where they might cause a short.

SAFETY

Always wear glasses when cutting wires or soldering. Small pieces of wire can easily get in the eye.

ASSEMBLY INSTRUCTIONS - Circuit Board

1. Assemble circuit board as follows. See Figure 1.
 - 1.1 Space socket 3/16 inch from bottom side of board using gage between socket and board as shown in Figure 1B.
 - 1.2 Solder socket pins on top side of board.
 - 1.3 Cut pins above solder using diagonal cutting pliers.
 - 1.4 Bend leads of 4 power diodes as shown at the upper left of Figure 1 (lead center distance, 0.8 in.).
 - 1.5 Insert power diodes (as shown in Figure 1).
 - 1.6 Solder 4 power diodes to board on both sides of board.
 - 1.7 Bend leads of ten output diodes to fit board (0.5 in. centers).
 - 1.8 Insert output diodes - note direction of bars marked on diodes. NOTE: Diodes and resistors (Step 1.9) occupy alternate positions.
 - 1.9 Bend leads of ten 1/4-watt, 100 ohm resistors (0.5 in. centers).

ASSEMBLY INSTRUCTIONS - Circuit Board (Con't)

- 1.11 Insert resistors.
- 1.12 Solder diodes and resistors.
- 1.13 Bend leads of 2-watt resistor (1.35 inch centers).
- 1.14 Insert resistor.
- 1.15 Solder resistor on both sides of board.
- 1.16 Insert the powertransistors one at a time with the bottom of the transistor 1/4-inch above the board. Note the location of the bevels as shown in Figure 1A. Solder the center lead of each transistor to the top of the board after it is inserted.
- 1.17 When all the transistors are inserted and the center lead soldered to the top side of the board, solder the outer leads on both sides of the board and the center leads to the bottom of the board. To avoid overheating the transistors, do not solder two leads of the same transistor in succession.
- 1.18 Examine all the solder joints and touch them up if necessary.
- 1.19 Check that all the diodes and transistors are inserted in the proper direction as shown in Figure 1.

ASSEMBLY INSTRUCTIONS - Wiring

2. Wire components before assembly in the box as follows:
 - 2.1 Cut wires to lengths listed in Table 1.
 - 2.2 Strip insulation 1/4" from each end of each wire.
 - 2.3 Solder ten 3½-inch wires in the holes numbered 1 through 10 on the circuit board as shown in Figure 2. Solder to both sides of the board.
 - 2.4 Solder five 5½-inch wires in the holes numbered 21, 22, 23, 25, and 26. Solder a 7-inch wire in the hole numbered 24.
 - 2.5 With the circuit board and receptacle positioned as shown in Figure 2, solder the ten wires between the circuit board and receptacle, connecting matching numbers.
 - 2.6 Solder two 7-inch wires to receptacle pins 11 and 15 and a 5½-inch wire to pin 14.
 - 2.7 Cut off projecting wires or component leads on the bottom side of the board.
 - 2.8 Attach the two lugs to the capacitor and tighten the screws firmly—Figure 3A.

ASSEMBLY INSTRUCTIONS - Wiring (Con't)

- 2.9 Solder two $5\frac{1}{2}$ -inch wires to the lugs on the capacitor.
- 2.10 Solder a 1-1/2 inch wire and a 2-inch wire to one swinger tab of the relay—see Figure 3B. Solder the other end of the $1\frac{1}{2}$ -inch wire and a $2\frac{1}{2}$ -inch wire to the other swinger tab.
- 2.11 Solder the other end of the 2-inch wire to the nearest coil tab.
- 2.12 Solder a 3-inch wire to each of the two contact tabs and the other coil tab as shown in Figure 3B.
- 2.13 Strip the insulation 1/4 inch from the end of the four transformer wires. If there is a fifth wire of an odd color, do not strip it but insulate the bare end with shrink tubing. See that the tubing extends at least 1/4 inch beyond the end of the wire and that it is shrunk tightly on the wire.
- 2.14 Solder one $5\frac{1}{2}$ -inch wire and one 2-inch wire to the AC receptacle.

ASSEMBLY INSTRUCTIONS - Components

3. Assemble the components in the box as follows:
 - 3.1 Attach the capacitor clamp ring.* Note the position shown in Figure 3A.
 - 3.2 Insert the capacitor in the clamp ring. Note that one terminal is marked +. Rotate the capacitor to the position shown in Figure 3A.
 - 3.3 Attach the transformer with the secondary wires at the top and with its insulating washers and spacer as shown in Figure 4. Be sure that the shoulder on the washers enters the holes in the transformer feet.*
 - 3.4 Attach the relay.
 - 3.5 Attach the fuse holder.
 - 3.6 Attach the terminal strip.
 - 3.7 Attach the AC receptacle.
 - 3.8 Install the circuit board. The screws are inserted from outside the box, the spacers go between the board and the box and the nuts go on top of the board. Be sure that the socket on the bottom of the board enters the hole in the box before tightening the screws.
 - 3.9 Attach the 18-pin typewriter receptacle.

*Nuts that are hard to reach should be taped to the parts before the parts are put in the box.

ASSEMBLY INSTRUCTIONS - Final Wiring

4. Complete the wiring as follows:

- 4.1 Solder one transformer secondary wire and the wire from hole 21 on the circuit board to terminal 21 on the terminal strip. See Figure 3C for the terminal numbers.
- 4.2 Solder the other transformer secondary wire and the wire from hole 22 on the circuit board to terminal 22.
- 4.3 Solder the wire from hole 24 on the circuit board, the wire from the negative terminal of the capacitor and the wire from the relay swingers to terminal 24.
- 4.4 Solder wire from hole 23 on the circuit board and the wire from the nearest relay fixed contact to terminal 23.
- 4.5 Solder wire from hole 25 on the circuit board, the wire from the relay coil and the wire from the positive terminal of the capacitor to terminal 25.
- 4.6 Solder wire from hole 26 on the circuit board, the wire from the relay fixed contact and the wire from pin 15 of the typewriter receptacle to terminal 26.

ASSEMBLY INSTRUCTIONS - Final Wiring (Con't)

- 4.7 Solder one transformer primary wire to one contact on the fuse holder.
- 4.8 Solder the other primary wire, the long wire from the AC receptacle, and the wire from pin 11 of the typewriter receptacle to terminal 27.
- 4.9 Solder the short wire from the AC receptacle and the wire from pin 14 of the typewriter receptacle to the other contact of the fuse holder.

ASSEMBLY INSTRUCTIONS - Checking

5. Check the circuit.

- 5.1 Using an ohmmeter to check continuity, verify that you have wired the power supply in accordance with Figure 5.
- 5.2 Insert the typewriter plug and turn on the typewriter.
- 5.3 Check the voltage between terminals 24 and 25. It should be 32-38 volts DC.
- 5.4 The relay should pull in from 2 to 5 seconds after turning on the typewriter.

ESCON POWER SUPPLY

Model E-B

PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY PER KIT</u>
	Transformer, 120-24V, 5 amp	1
	Capacitor, 11,000 mf, 40 volts	1
	Relay, 2 pole, 2 amp, 24V coil	1
	Receptacle, 18 pin, male	1
	Fuse holder, for 1/4 x 1 fuse	1
	Circuit board, Part No. 31D193	1
	Power diodes, 1N4720	4
	Power transistors, D41D10	10
	Input resistors, 100 ohms, 1/4 watt	10
	Delay resistor, 68 ohms, 2 watts	1
	Output diodes, 1N4003	10
	Fuse, 1/4 x 1, 2 amp	1
	Terminal lugs	2
	Wire, No. 22, stranded	10 ft.
	Dip socket, 16-pin wire wrap	1
	Terminal strip, 7 terminals	1
	Box, 5 x 7 x 3"	1
	Cover, 5 x 7"	1

PARTS LIST - Continued

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY PER KIT</u>
	Sheet metal screws 6/32 x 3/8" long	4
	Machine screws, 6/32 x 5/16" long	12
	Machine screws, 6/32 x 3/4" long	2
	Machine screws, 4/40 (sm. dia.) x 5/8" long	2
	Nuts, 6/32 with lock washers attached	10
	Nuts, 6/32 without lock washers	2
	Nuts, 4/40 with lock washers attached	2
	Spacers, 1/4 x 1/2	2
	Capacitor clamp ring - with screw and nut	1
	Insulating spacer	1
	Insulating washer, small	2
	Dip socket gage	1
	AC socket	1
	Ribbon cable	6 ft
	1/16" shrink tubing	3 in
	Solder	6 ft
	#7 flat washer, light	2

Rev. 6/15/78

TABLE 1

<u>OVERALL WIRE LENGTH</u>	<u>NUMBER REQUIRED</u>
1½"	1
2"	2
2½"	1
3"	3
3½"	10
5½"	9
7"	3

Rev. 1/26/78

OPERATION

The power supply is designed to operate solenoid magnets on the ESCON typewriter conversion. The basic conversion has ten magnets. However, positions for 14 drivers are provided to allow for additional functions.

The magnet drive channels are all independent in the power supply. Logic requirements of the input signal, pulse timing, etc. must be as specified in the Installation Instructions for the Typewriter Magnet Assemblies.

The power supply obtains its AC power from the typewriter. A time delay circuit using the relay and the filter condenser as a delay element ensures that the typewriter motor is up to speed before the magnets are energized. This delay is necessary to prevent damage to the typewriter mechanism.

The transistors in the driver circuits can be turned on by a current of 100 ma minimum drawn through the ribbon cable. Amplifiers such as the TI SN 75453B are recommended to draw this current. In the off condition, the current drawn through the cable should be less than $\frac{1}{2}$ ma. These conditions are met by the ESCON interface board.

TABLE I

<u>OVERALL WIRE LENGTH</u>	<u>NUMBER REQUIRED</u>
1½"	1
2"	2
2½"	1
3"	3
3½"	10
5½"	9
7"	3

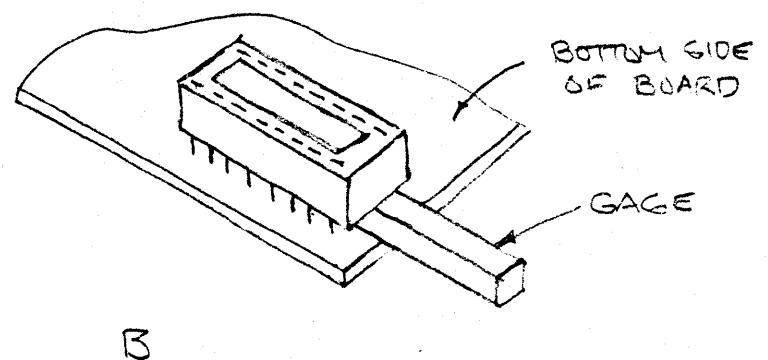
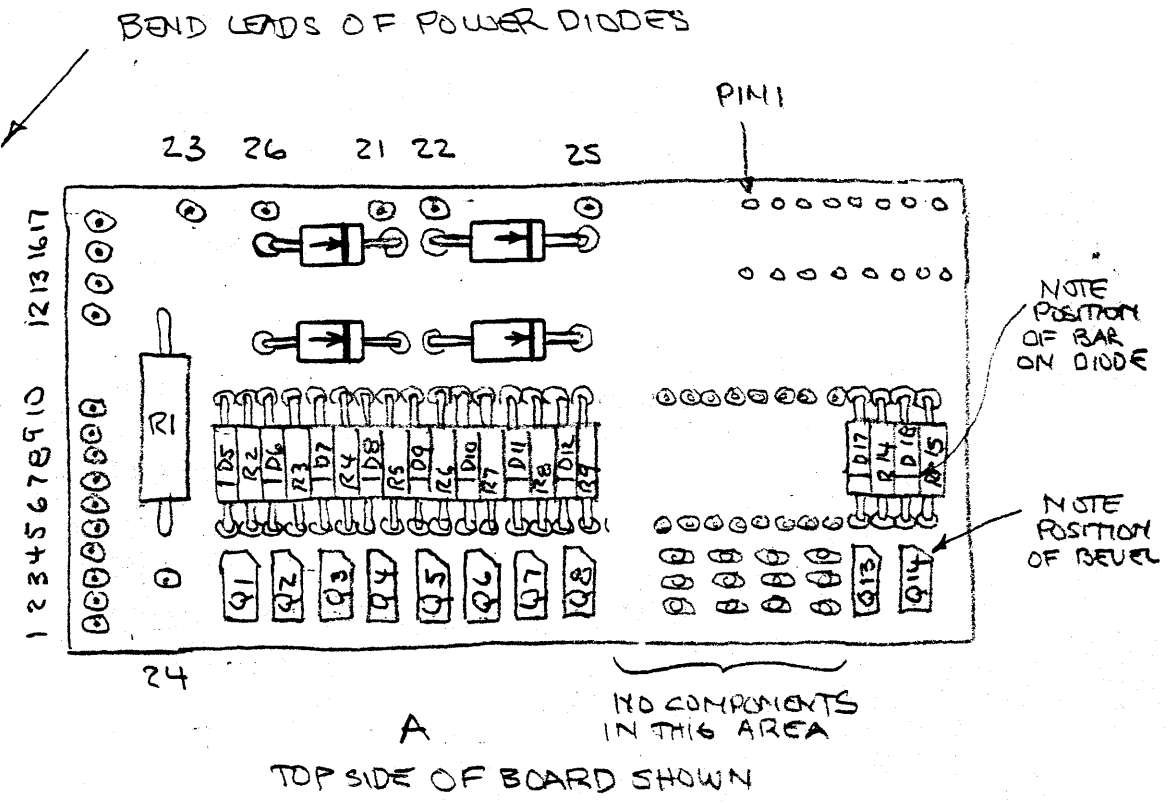
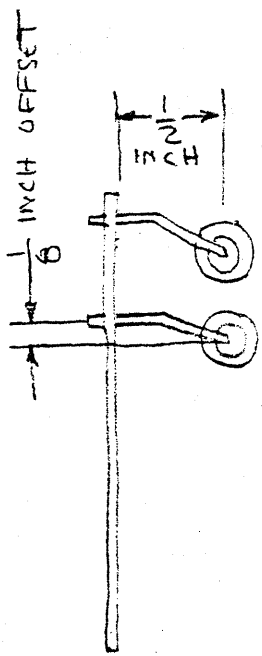


FIGURE 1
LOCATION OF PARTS ON CIRCUIT BOARD

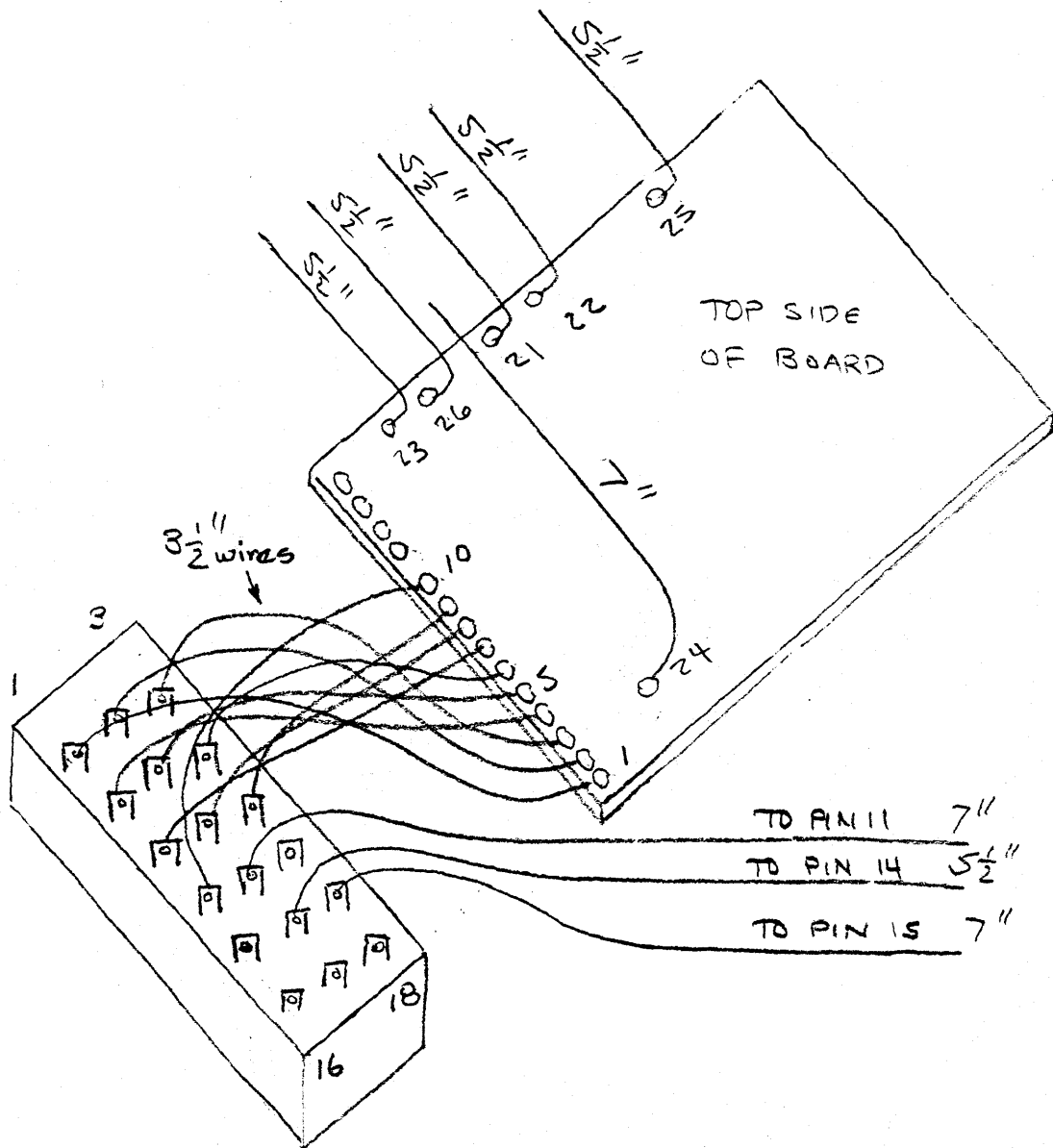
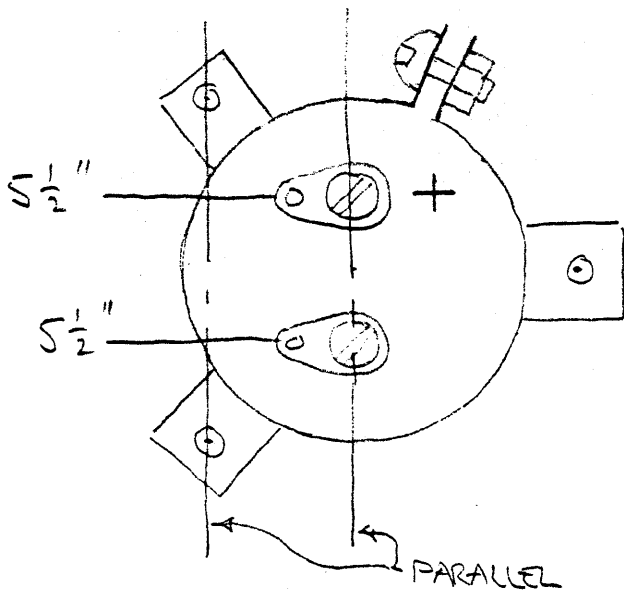
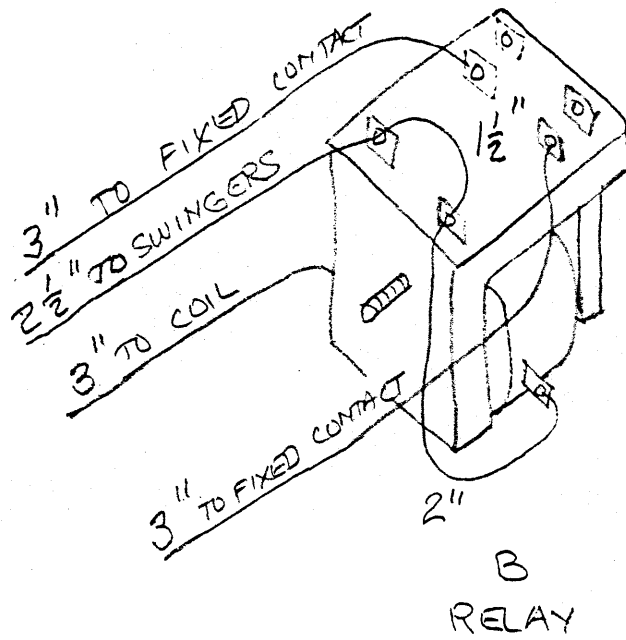


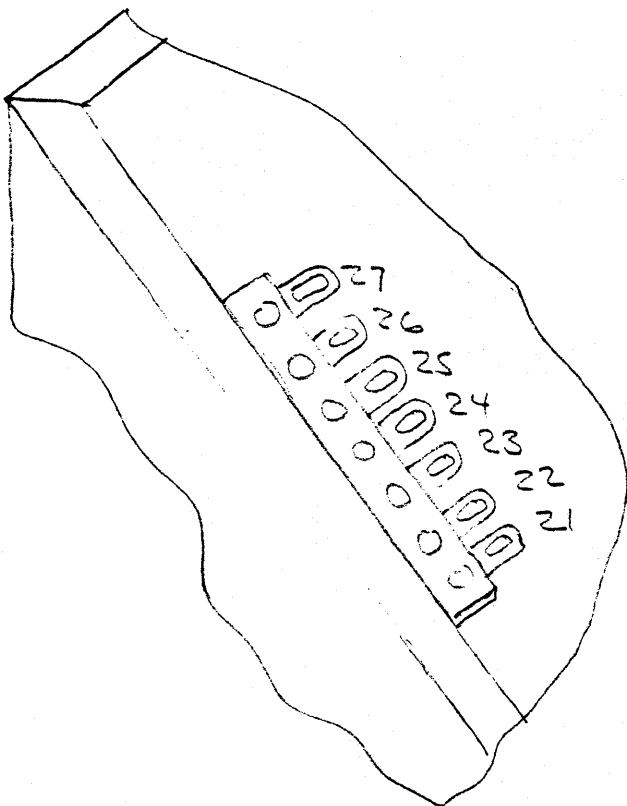
FIGURE 2
 WIRING TO BOARD AND RECEPTACLE



A
CAPACITOR
CLAMP POSITION



B
RELAY



C
TERMINAL STRIP

FIGURE 3

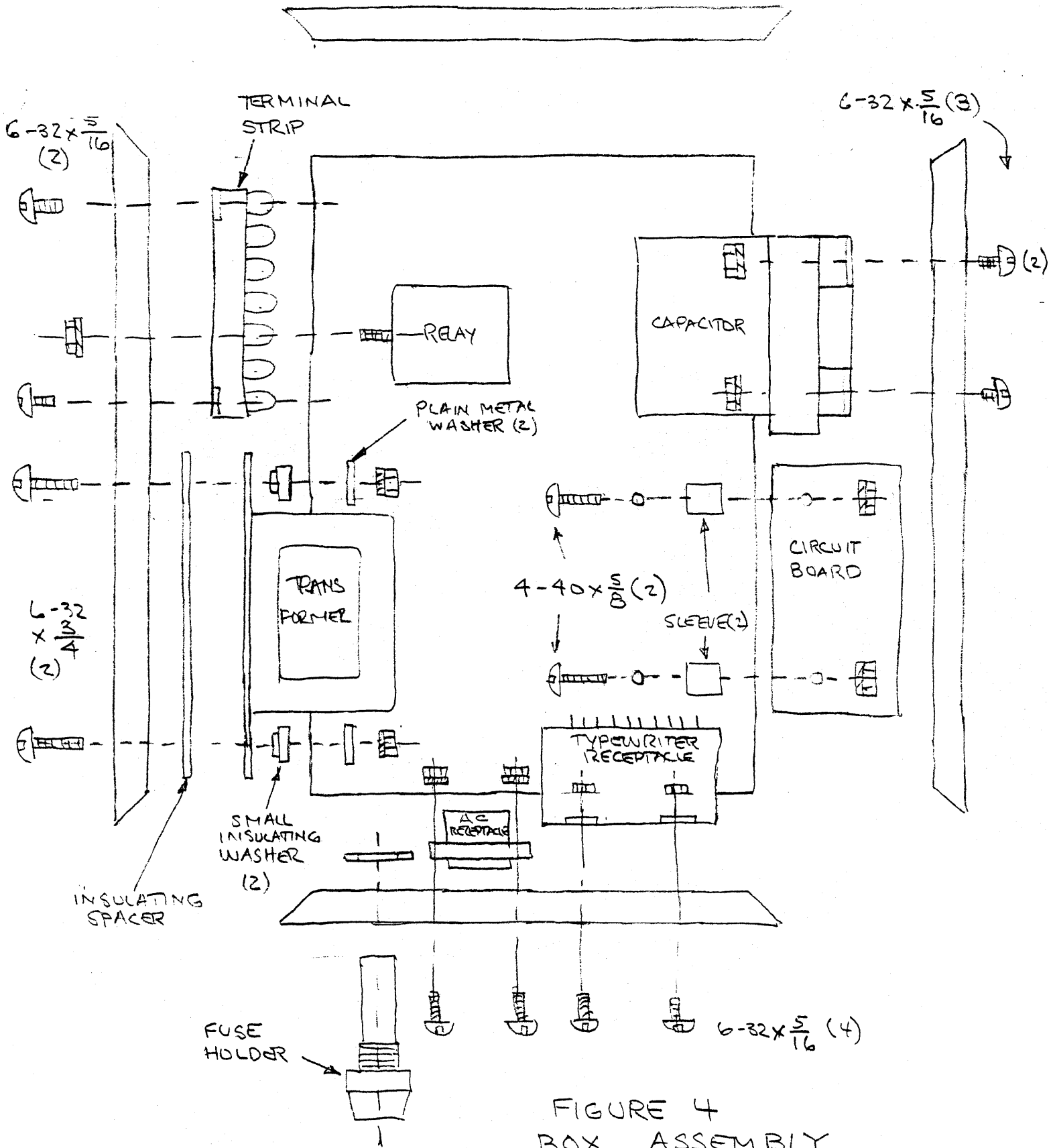
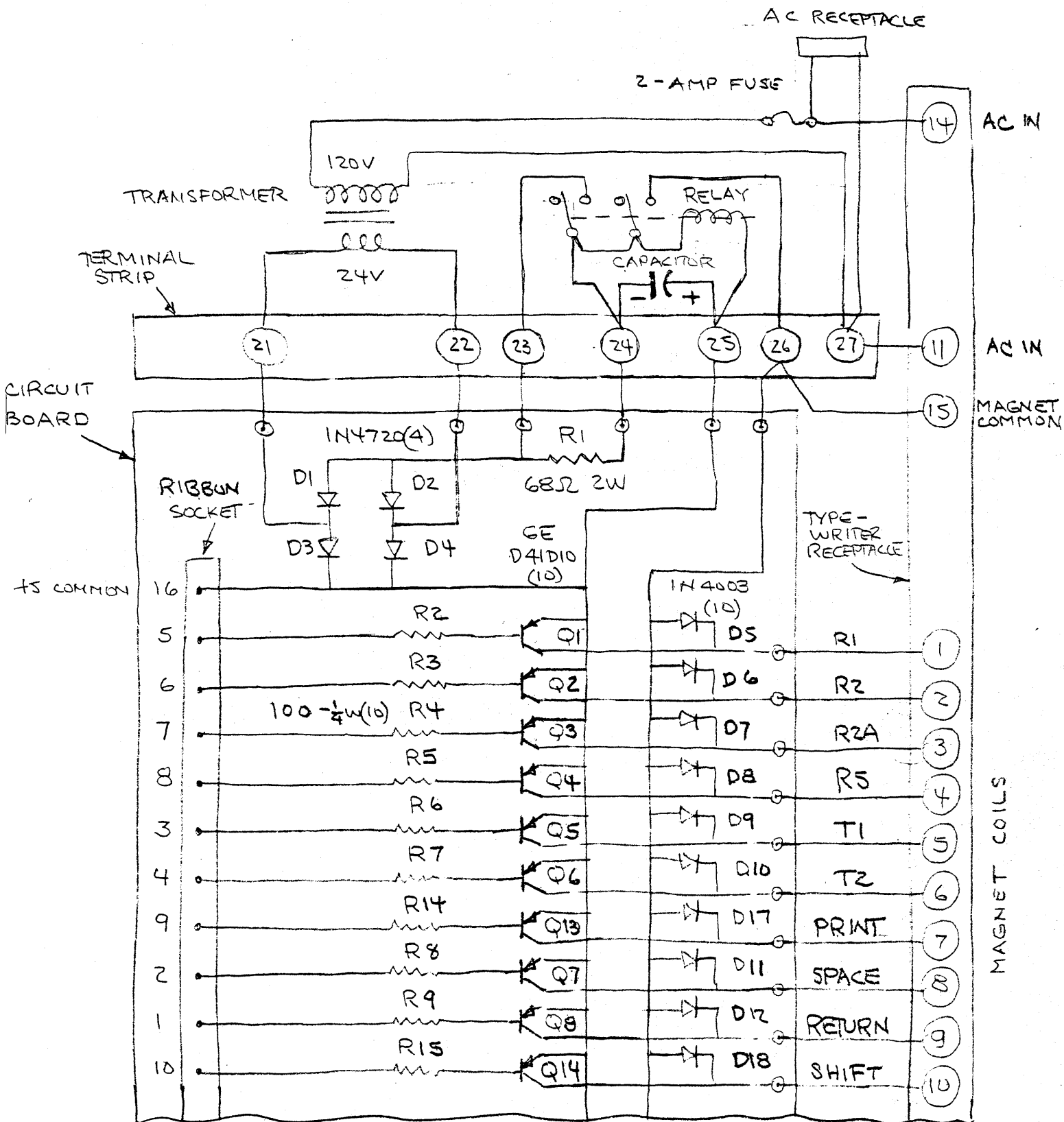
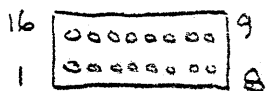


FIGURE 4
BOX ASSEMBLY

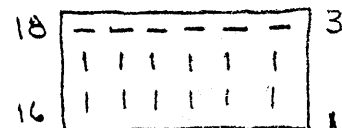


FOUR SPARE CHANNELS NOT USED

FIGURE 5
CIRCUIT DIAGRAM



RIBBON SOCKET
VIEWED FROM PLUG SIDE



TYPEWRITER RECEPTACLE
VIEWED FROM PLUG SIDE