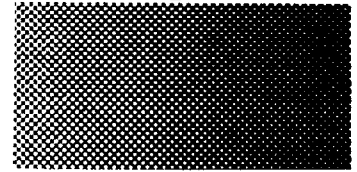


88.TYA



CALL / CONTROL
UNIT

THEORY AND ASSEMBLY MANUAL

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SECTION I
INTRODUCTION

1-1. SCOPE

This 88-TYR Call/Control Unit Theory and Assembly Manual provides a general description of the Call/Control Unit and its detailed circuit theory and assembly instructions. This Call/Control Unit is only used with the teletype printer, keyboard, and paper tape reader (ASR-3320/3JT), although other units are available for the teletype printer (receive only 3300/IAP) and KSR-33 (3310/3ES) teletype.

1-2. ARRANGEMENT

This manual contains three sections as follows:

1. Section I contains a general description of the Call/Control Unit.

2. Section II contains a detailed theory explanation of the Call/Control Unit.

3. Section III contains the detailed assembly and cabling instructions of the Call/Control Unit.

1-3. DESCRIPTION

The Call/Control Unit[®] provides a means of communication between a serial input/output (I/O) circuit and the teletype printer keyboard and paper tape reader. It receives serial data from the I/O circuit and conditions the teletype printer to print the proper character or characters. Also, it allows keyboard and paper tape reader information to be transferred to the serial I/O circuit.

SECTION II

THEORY OF OPERATION

2-1. GENERAL

This section contains a detailed circuit description of the MITS Call/Control Unit operation for the teletype printer, keyboard, and paper tape reader (ASR-3320/3JT).

2-2. THEORY OF OPERATION (Figure 2-1)

The Call/Control Unit is used in either the LOCAL or LINE modes of operation. It consists of an AC power distribution circuit, two full-wave rectifier circuits, a reader control circuit, a receive circuit, and a transmit circuit. Each of these circuits will be discussed in relation to the Call/Control Unit's LOCAL or LINE mode of operation. However, the AC power distribution, fullwave rectifiers and reader control circuits are discussed first because they directly affect both modes.

2-3. AC Power Distribution Circuit

The AC power distribution circuit consists of an AC Power Cord, fuses F3, F2, and F1, and switch S1. When switch S1 is positioned to LOCAL or LINE, the teletype motor (M) is enabled (turned on) and voltage is applied to the distributor trip magnet (DIST TRIP MAG). The other contact in switch S1 will either energize (LINE) or deenergize (LOCAL) RELAY 1. Also an AC voltage is applied through fuses F3, F2, and F1 to the fullwave rectifiers.

2-4. Fullwave Rectifier Circuits

The fullwave rectifier circuits consist of diodes D1 through D4, (first rectifier), diodes D5 through D8, (second rectifier), and filter capacitors C1 and C2. The first rectifier supplies a DC voltage to the receive circuit (transistors Q1, Q2, and Q3) and RELAY 2 in the reader control circuit. It also supplies a loop current source to the transmit circuit (LOCAL mode only). The second rectifier supplies a DC voltage to the reader feed magnet (READ FEED MAG).

2-5. Reader Control Circuit

The reader control circuit allows for software control in turning the teletype paper tape reader on and off. It is influenced by the READER CONTROL input from the serial Input/Output (I/O) circuit. When the input is high, transistor Q4 is enabled (turned on), energizing RELAY 2. This action enables the distributor trip magnet (DIST TRIP MAG), which allows the distributor to scan the data present at the paper tape reader. At the end of a distributor scan cycle a switch contact is made and the READ FEED MAG is energized advancing the paper tape in the reader to the next character. Likewise, if the input is low, transistor Q4 is disabled (turned off) deenergizing RELAY 2, which deenergized the DIST TRIP MAG.

2-6. Local Mode Of Operation

In the local mode of operation the teletype is not in communication with a serial input/output (I/O) circuit (off line). This is accomplished by positioning switch S1 to LOCAL which deenergizes RELAY 1. However, the operator can still use the teletype keyboard or the paper tape reader because of the following Call/Control Unit operation. A loop current source is established from the output of the fullwave rectifier circuit through resistor R3, normally closed contacts BE of RELAY 1, the distributor, and normally closed contacts CK and JA of RELAY 1 to the base of transistor Q1 in the receive circuit. The current source enables transistor Q1 and transistor Q3 to keep the selector magnet (SEL MAG) energized. This prohibits any characters from being printed. If the operator punches a character on the keyboard or enables the paper tape reader, the loop current source is opened at the distributor, which disables transistors Q1 and Q3. As a result, the SEL MAG is deenergized and sets up the code bars in the printer to determine what character to print.

2-7. Line Mode of Operation

In the line mode of operation the teletype is in communication with a serial I/O circuit (on line). This is accomplished by positioning switch S1 to LINE which energizes RELAY 1. With RELAY 1 energized, the receive and transmit circuits are in communication with the serial I/O circuit.

2-8. Receive Operation

The receive circuit is affected by the receive in (REC IN) input from the serial I/O circuit. The signal present on the input is coupled to the base of transistor Q1 by normally open contacts DA of RELAY 1. If no information is present at the input, a constant current source is applied to transistor Q1. This enables Q1 and Q3 which keeps the SEL MAG energized. Any data present at the input appears as a series of "opens" which deenergize the SEL MAG by disabling transistors Q1 and Q3. As a result, the SEL MAG sets up the code bars in the printer that determine what character to print.

Diodes D9, Resistor R6, and Capacitor C5 prevent any voltage transients, and resistor R12 limits the current through the SEL MAG coil.

2-9. Transmit Operation

The transmit operation enables either the teletype keyboard or paper tape reader data to be transferred to the serial I/O circuit. When a character is depressed on the keyboard or read from the paper tape reader, a parallel ASCII code is produced (through: opened or closed switches). The parallel data is present at plug 7 (P7) or plug 6 (P6), and mechanically scanned by the distributor which converts the parallel data to serial data for transfer to the serial I/O circuit. The serial data is transferred through normally open contacts CF and EG of RELAY 1 and out the transmit out (XMTR OUT) to the serial I/O circuit.

2-10. Reader Control Option

If the operator does not wish to use the software control of the ASR-33 paper tape reader, connect pin 4 of the I/O connector to +5 volts. This enables manual control of the paper tape reader by using the START/STOP/FREE switch on the teletype. The voltage requirements for the READER CONTROL input (pin 4) are the following:

READER OFF - Less than .5 volts or disconnected.

READER ON - 1 to 5 volts at a minimum of .5 milliamps of current.

2-11. Paper Tape Reader Control With 88-2SIO

The paper tape reader is controlled by the Request To Send (RTS) output from the 88-2SIO. If BIT 6 from the CPU to the 88-2SIO control channel is high, the paper tape reader is enabled. Likewise, if BIT 6 is low, the paper tape reader is off. The remaining bits of the 2SIO control channel initialization word should not be changed. However, when the paper tape reader is controlled by the 88-2SIO, the START/STOP/FREE switch on the teletype is positioned to START.

When the initialization word is 21_8 (octal), the paper tape reader is off. However, if the initialization word is 121_8 (octal), the paper tape reader is on and 8 data bits, 2 stop bits, and divide 16 mode is still maintained. Also the transmit interrupt cannot be used when the RTS output is controlling the paper tape reader.

If the operator desires to turn the paper tape reader off after each character is received by the CPU, the following software timing loop can be used. It will turn the paper tape reader on for approximately 30 milliseconds then turn it off.

LOCATION	CODE
0	001
1	304
2	011
3	013
4	110
5	260
6	302
7	003
8	000

After 30 milliseconds, the program will continue at location 9. The software timing loop sequence is: 1) turn reader on, 2) wait 30 milliseconds, 3) turn reader off, and 4) jump to normal I/O routine that waits for valid status, then inputs character.

SECTION III

ASSEMBLY

3-1. GENERAL

This section contains all the pertinent information needed for the circuit construction of the Call/Control Unit. It consists of helpful assembly hints and detailed instructions of component installation on the Call/Control Unit.

3-2. ASSEMBLY HINTS

Before beginning the construction of your unit, it is important that you read the "MITS Kits Assembly Hints" booklet included with your kit. Pay particular attention to the section on soldering, because most problems occur as the result of poor soldering. It is essential that you use the correct type of soldering iron. A 25-30 watt iron with a chisel tip (such as an Ungar 776 with a 7155 tip) is recommended in the assembly hints booklet.

NOTE

Some important warnings are also included in the hints booklet. Read them carefully before you begin work on your unit -- failure to heed these warnings could cause you to void your warranty.

Check the contents of your kit against the appendix in this manual (Parts List) to make sure you have all the required components, hardware, and parts. The components are in plastic envelopes; do not open them until you need the components for an assembly step. You will need the tools called for in the "Kits Assembly Hints" booklet.

As you construct your kit, follow the instructions in the order they are presented in the assembly manual. Always complete each section before going on to the next. Two organizational aids are provided throughout the manual to assist you: 1) Boxed off parts identification lists, with spaces provided to check off the components as they are installed; 2) reproductions of the silk screens showing previously installed components, components being installed, and components yet to be installed (Figure 3-1).

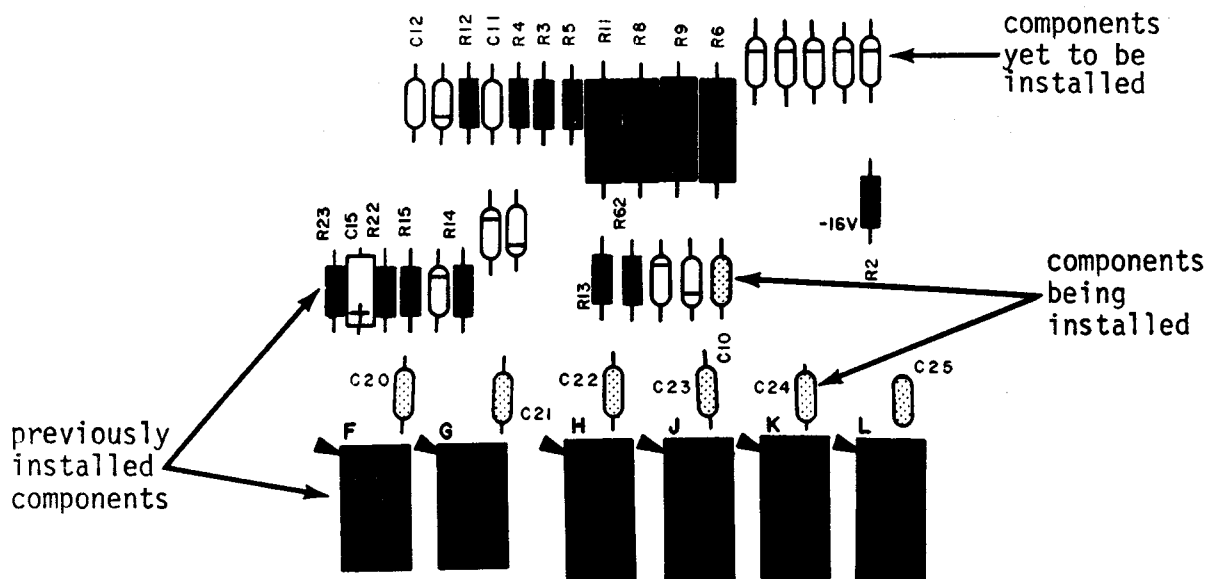


Figure 3-1. Typical Silk Screen

3-3. COMPONENT INSTALLATION INSTRUCTIONS

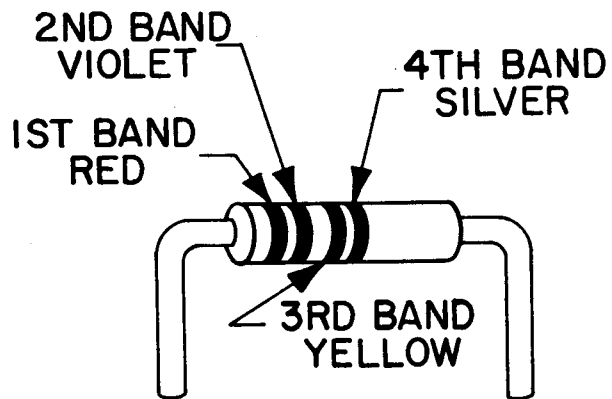
The following component installation instructions describe the proper procedures for installing various types of components in your kit. Read these instructions over very carefully and refer back to them when-ever necessary. Failure to properly install components may cause permanent damage to the component or the rest of the unit; it will definitely void your warranty. More specific instructions, or procedures of a less general nature, will be included within the assembly text itself.

Under no circumstances should you proceed with an assembly step without fully understanding the procedures involved. A little patience at this stage will save a great deal of time and potential "head-aches" later.

3-4. Resistor Installation Instructions.

Resistors have four (or possibly five) color-coded bands as represented in the chart below. The fourth band is gold or silver and indicates the tolerance. NOTE: In assembling a MITS kit, you need only be concerned with the three bands of color to the one side of the gold or silver (tolerance) band. These three bands denote the resistor's value in ohms. The first two bands correspond to the first two digits of the resistor's value and the third band represents a multiplier.

For example: a resistor with red, violet, yellow and silver bands has a value of 270,000 ohms and a tolerance of 10%. By looking at the chart below, you see that red is 2 and violet 7. By multiplying 27 by the yellow multiplier band (10,000), you find you have a 270,000 ohm (270K) resistor. The silver band denotes the 10% tolerance. Use this process to choose the correct resistor called for in the manual.



RESISTOR COLOR CODES		
COLOR	BANDS 1&2	3rd BAND (Multiplier)
Black	0	1
Brown	1	10 ²
Red	2	10 ³
Orange	3	10 ⁴
Yellow	4	10 ⁵
Green	5	10 ⁶
Blue	6	10 ⁷
Violet	7	10 ⁸
Gray	8	10 ⁹
White	9	10 ⁹

Use the following procedure to install the resistors onto the boards. Make sure the colored bands on each resistor match the colors called for in the list of Resistor Values and Color Codes given in the assembly instructions.

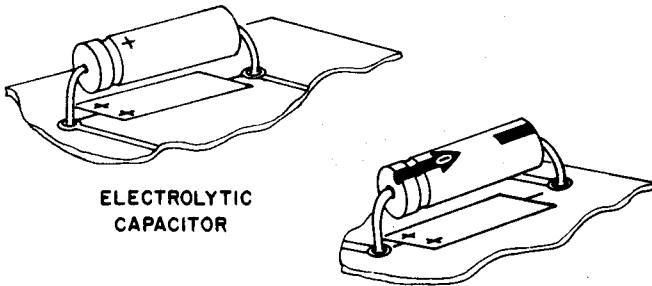
1. Using needle-nose pliers, bend the leads of the resistor at right angles to match their respective holes on the PC board.
2. Install the resistor into the correct holes on the silk-screened side of the PC board.
3. Holding the resistor in place with one hand, turn the board over and bend the two leads slightly outward.
4. Solder the leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.

3-5. Capacitor Installation Instructions.

A. Electrolytic and Tantalum Capacitors

Polarity requirements must be noted on electrolytic capacitors and tantalum capacitors before they are installed.

The electrolytic capacitors contained in your kit may have one or possibly two of three types of polarity markings. To determine the correct orientation, look for the following.



One type will have plus (+) signs on the positive end; another will have a band or a groove around the positive side in addition to the plus signs. The third type will have an arrow on it; in the tip of the arrow there is a negative (-) sign and the capacitor must be oriented so the arrow points to the negative polarity side.

The tantalum capacitor is metallic in appearance and smaller than the electrolytic capacitors. Its positive end has a plus sign on it or a red dot.

Install the electrolytic capacitors and tantalum capacitors using the following procedure. Make sure you have the correct capacitor value each time.

1. Bend the two leads of the capacitor at right angles to match their respective holes on the board. Insert the capacitor into the holes on the silk-screened side of the board. Be sure to align the positive polarity side with the "+" signs printed on the board.

2. Holding the capacitor in place, turn the board over and bend the two leads slightly outward. Solder the leads to the foil pattern and clip off any excess lead lengths.

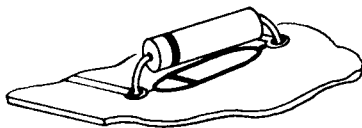
B. Ceramic Disk Capacitors

Install the ceramic disk capacitors using the following procedure. Make sure you have the correct capacitor value each time.

1. Straighten the two capacitor leads as necessary to fit their respective holes on the PC board.
2. Insert the capacitor into the correct holes from the silk-screened side of the board. Push the capacitor down until the ceramic insulation almost touches the foil pattern.
3. Holding the capacitor in place, turn the board over and bend the two leads slightly outward.
4. Solder the two leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.

3-6. Diode Installation Instructions.

NOTE: Diodes are marked with a band on one end indicating the cathode end. Each diode must be installed so that the end with the band is oriented towards the band printed on the PC board. Failure to orient the diodes correctly may result in permanent damage to your unit.



DIODE

Use the following procedure to install diodes onto the board. Refer to the list of Diode Part Numbers included for each board to make sure you install the correct diode each time.

1. Bend the leads of the diode at right angles to match their respective holes on the board.
2. Insert the diode into the correct holes on the silk screen, making sure the cathode end is properly oriented. Turn the board over and bend the leads slightly outward.
3. Solder the two leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.

3-7. Transistor Installation Instructions.

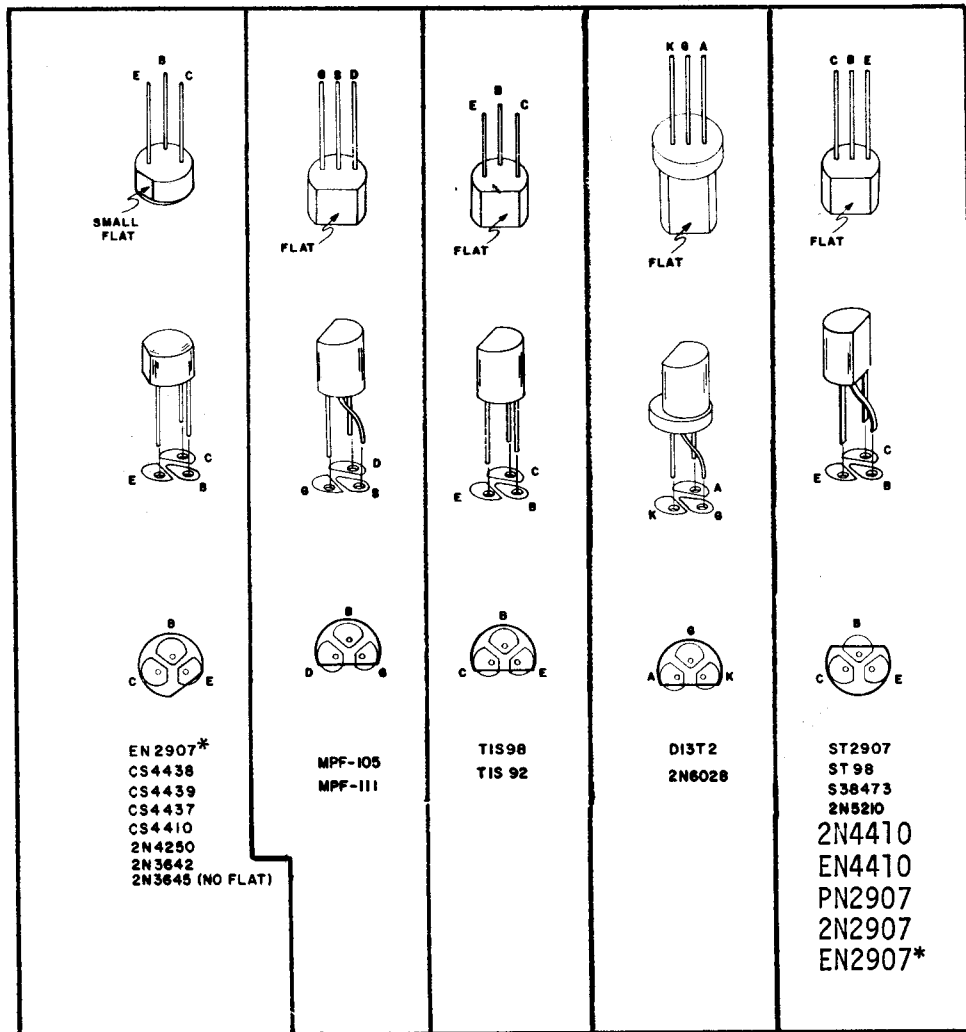
To install transistors, use the following instructions.

NOTE: Always check the part number of each transistor before you install it. (See listing of Transistor Part Numbers for each board.) Some transistors look identical but differ in electrical characteristics, according to part number. If you have received substitute part numbers for the transistors in your kit, check the Transistor Identification Chart which follows these instructions to be sure you make the correct substitutions.

NOTE: Always make sure the transistor is oriented so that the emitter lead is installed in the hole on the PC board labeled with an "E". To determine which lead is the emitter lead, refer to the Transistor Identification Chart.

1. After the correct transistor has been selected and the leads have been properly oriented, insert the transistor into the holes on the silk-screened side of the board.
2. Holding the transistor in place, turn the board over and bend the three leads slightly outward.
3. Solder the leads to the foil pattern on the back side of the board; then clip off any excess lead lengths.

TRANSISTOR IDENTIFICATION CHART



IN THE ILLUSTRATION ABOVE THE OUTLINE OF EACH TYPE OF TRANSISTOR IS SHOWN OVER THE PADS ON THE CIRCUIT BOARD WITH THE CORRECT DESIGNATION FOR EACH OF THE THREE LEADS. USE THIS INFORMATION TOGETHER WITH THE INFORMATION IN THE ASSEMBLY MANUAL FOR THE CORRECT ORIENTATION OF THE TRANSISTORS AS YOU INSTALL THEM.

THE FOLLOWING IS A LIST OF POSSIBLE SUBSTITUTIONS: IF ANY OTHERS ARE USED YOU WILL RISK DAMAGING YOUR UNIT:

2N4410 = EN4410 = CS4410 = CS4437, CS4438, TIS98, ST98, S38473 (NPN)

EN2907 = 2N2907 = PN2907 = ST2907, CS4439 (PNP)

WHEN MAKING SUBSTITUTIONS, REFER TO THE ILLUSTRATION TO DETERMINE THE CORRECT ORIENTATION FOR THE THREE LEADS.

*Configuration of the leads on EN2907 may vary.

3-8. CALL/CONTROL UNIT ASSEMBLY

3-9. Diode Installation (Figure 3-2)

There are 10 diodes (Bags 5 and 10) to be installed on the Call/Control Unit. Install these diodes according to diode installation instructions on page 3-6.

Diodes & Part Numbers

() D1 through D10 are IN4004 diodes.

3-10. Transistor Installation (Figure 3-2)

Install the following three transistors (Bags 5 and 10) according to the transistor installation instructions on page 3-6.

Transistors	Part Number
() Q1, Q2, Q4	2N or CS4410

There is one transistor, Q3, left to install. Its installation requires it to be secured by a screw, lockwasher, and nut.

- () Obtain the TIP 140 or 141 transistor from Bag 5 and one each 6-32 x 3/8 inch screw, #6 lockwasher, and 6-32 nut.
- () The transistor is to be installed with the metal side against the board, but before installation shape the transistor leads to conform to its associated holes on the PC Board.
- () Insert the transistor leads through the top of the PC Board, clip off any excess leads and solder them to the foil (bottom) side of the PC Board.
- () Insert the 6-32 x 3/8 inch screw through the top of the PC Board and transistor mounting hole.
- () Holding the screw in place, insert a #6 lockwasher and #6-32 nut (Bag 3) on the back side of the board and tighten securely.

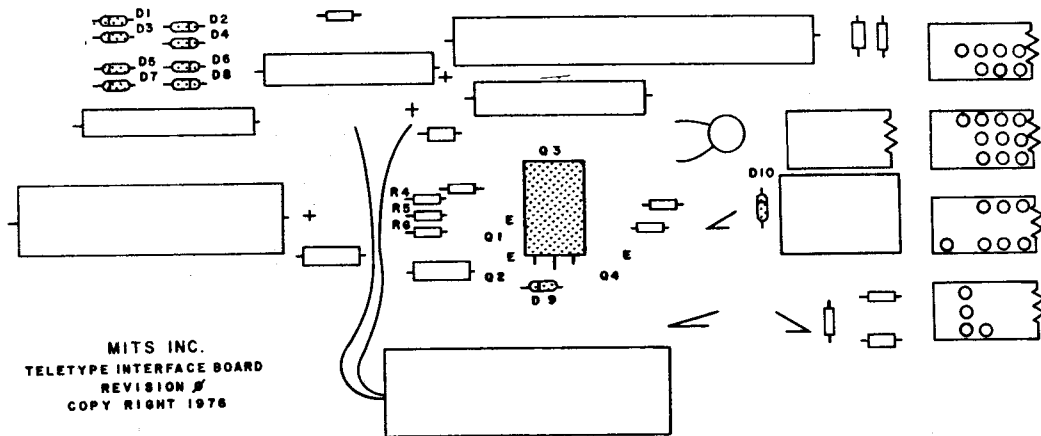


Figure 3-2. Diode and Transistor Installation

3-11. Capacitor Installation (Figure 3-3)

There are three electrolytic capacitors and 3 mylar capacitors (Bags 2, 7, and 8) to be installed on the Call/Control Unit. Install these capacitors according to capacitor installation instructions on page 3-5.

Capacitor Values

- () C1 is a 2200 uf, 50V electrolytic
- () C2 is a 10 uf, 200V electrolytic
- () C4 is a .22uf, 200V

NOTE

Capacitor C5 is an electrolytic capacitor. The + end of C5 is installed facing R3 on the silk-screen of the PC Board.

- () C5 is a 1 uf, 60V electrolytic
- () C6 is a .1 uf, 100V
- () C7 is a .1 uf, 200V

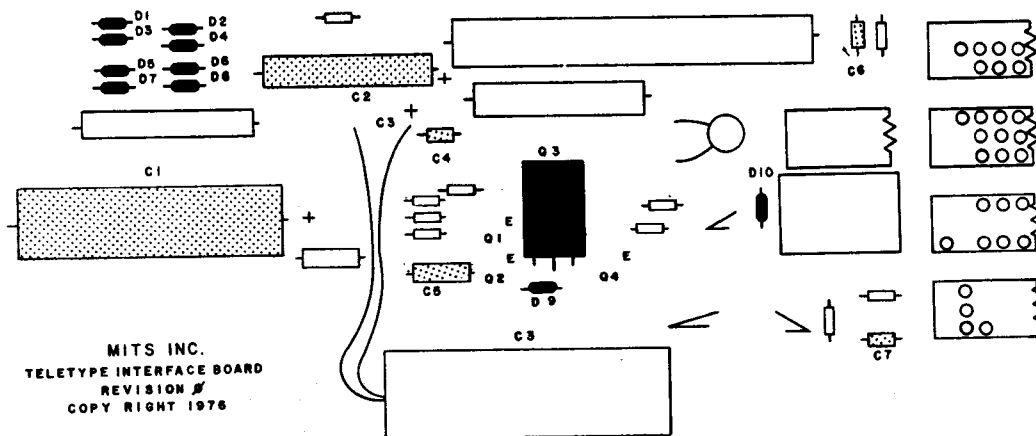


Figure 3-3. Capacitor Installation

One other electrolytic capacitor (C3) is to be installed on the PC Board.

1. Obtain C3 (200 uf, 200V electrolytic) from Bag 8 and one each 4-40 x 3/8 inch screw, #4 lock-washer, and #4-40 nut from Bag 11.
2. Refer to figure 3-4 and mount C3 as shown on the PC Board.
3. After C3 is secure, insert the RED wire from C3 through the C3+ hole on the top of the PC Board, and solder the wire on the foil (bottom) side (Figure 3-5).
4. Insert the BLACK wire from C3 through the remaining hole, and solder to the foil side (Figure 3-5).

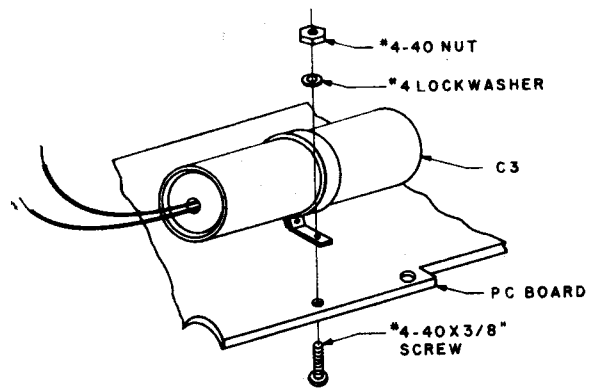


Figure 3-4. C3 Mounting

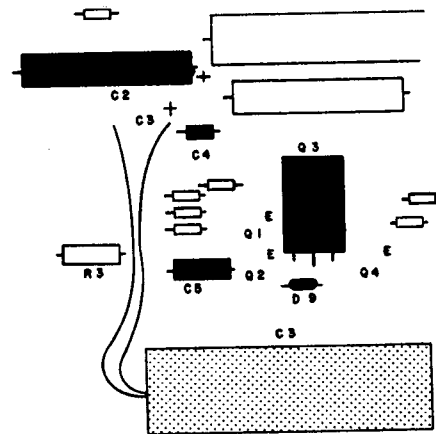


Figure 3-5. C3 Wiring

3-12. Resistor Installation (Figure 3-6)

There are thirteen resistors (Bags 1, 7, and 10) to be installed at present on the Call/Control Unit. Install the resistors according to the resistor installation instructions on page 3-4.

Resistor Values & Color Codes

- () R1, 22 ohm (red, red, black) 4W
- () R2, 56K ohm (green, blue, orange) 1W
- () R3, 1.5K ohm (brown, green, red) 1W
- () R4, 10K ohm (brown, black orange) 1/2W

- () R5, 2.7K ohm (red, violet, red) 1/2W
- () R6, 47 ohm (yellow, violet, black) 1/2W
- () R8, 12K ohm (brown, red, orange) 4W
- () R9, 1K ohm (brown, black, red) 1/2W
- () R10, 1.5K ohm (brown, green, red) 1/2W
- () R11, 1K ohm (brown, black, red) 1/2W
- () R13, 470 ohm (yellow, violet, brown) 1/2W
- () R14, 470 ohm (yellow, violet, brown) 1/2W
- () R15, 220 ohm (red, red, brown) 1/2W

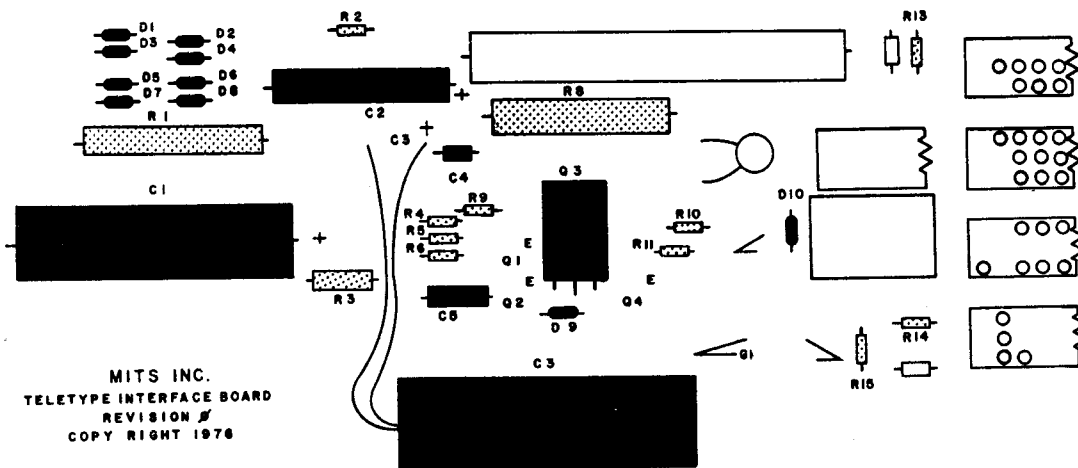


Figure 3-6. Resistor Installation

Resistor R12 is to be installed on the PC Board. R12 is installed in a vertical position, but before its installation, leads have to be made and shaped to conform to the associated holes on the PC Board.

1. Leads

- a. Use a portion of 20 gauge wire (Bag 4) to make your leads for R12.
- b. Align R12 vertically with its associated hole on the PC Board.
- c. With the 20 gauge wire determine how much is needed for the bottom and top connections of R12 and its respective holes on the PC Board. Insure the lead is long enough to be inserted through the hole on the top of the board to the foil (bottom) side of the board.
- d. Solder the leads to R12.

2. R12 Mounting (Figure 3-7)

- a. Align R12 with its respective hole and insert a #6-32 x 2 1/4 inch screw with a #6 washer (Bag 3) through the top of R12.
- b. Holding the screw in place, insert a #6 lockwasher and #6-32 nut (Bag 3) on the back side of the board and tighten securely.
- c. Solder the R12 leads on the foil (bottom) side of the board.

Resistor R7 is to be installed on the PC Board. R7 also needs to have leads made to conform to its associated holes on the PC Board.

1. Leads

- a. Use a portion of the excess R2 resistor (56K ohm) lead clippings to manufacture your leads for R7.
- b. With the excess lead clippings determine how much is required for the installation of R7 to its respective holes on the PC Board. Insure the leads are long enough to be installed through the top of the board to the foil (bottom) side of the PC Board.
- c. Solder the leads to R7

2. R7 Mounting (Figure 3-8)

Insert the leads from R7 through the top of the board to the bottom side and solder.

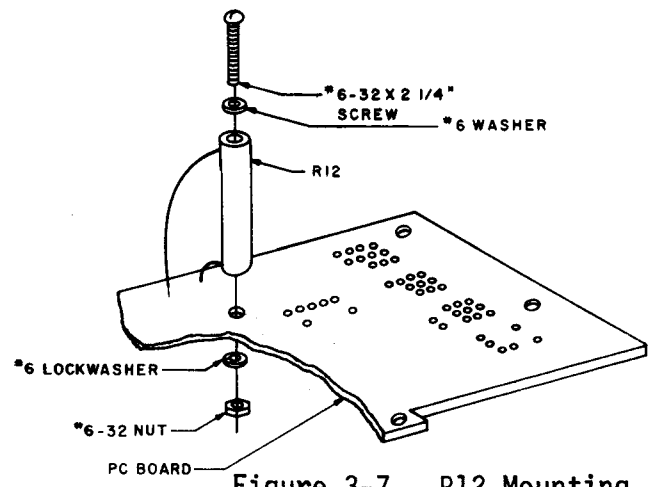


Figure 3-7. R12 Mounting

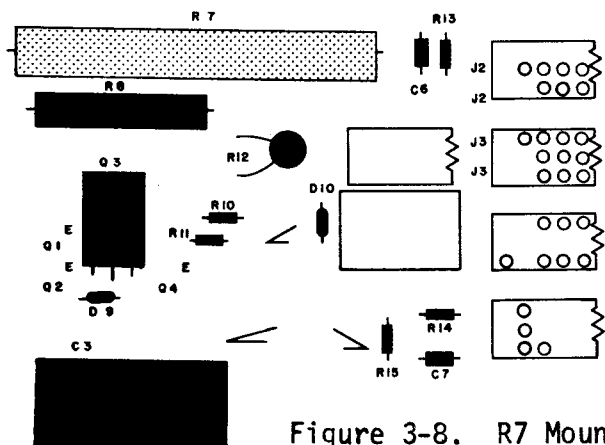


Figure 3-8. R7 Mounting

3-13. Jumper Connections (Figure 3-9)

There are several jumper wires that must be installed on the PC Board. Obtain the 26 gauge wire from Bag 4 and cut 5 pieces of wire approximately 1/2 inch long. Strip both ends and jumper between the following areas on the PC Board.

- | Jumper | |
|--------|-------|
| J1 | to J1 |
| J2 | to J2 |
| J3 | to J3 |
| J4 | to J4 |
| J5 | to J5 |

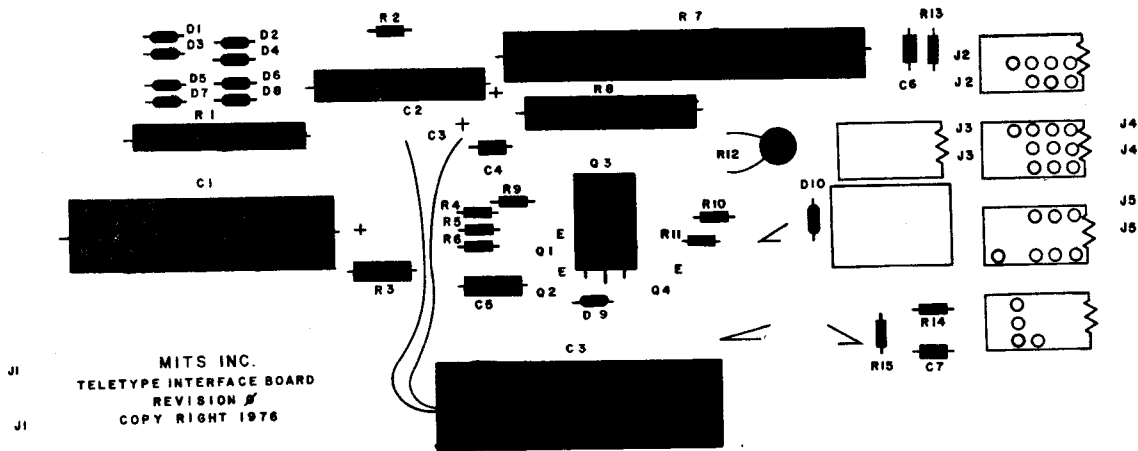


Figure 3-9. Jumper Connections

2. RELAY-1 Installation

- a. After the wires are soldered to RELAY-1, obtain the 6-32 x 3/8 inch screw and #6 lockwasher from Bag 7.
- b. Install RELAY-1 to the PC Board and secure as shown in Figure 3-11.
- c. After RELAY 1 is secured, solder eight of the relay wires to the following PC Board call outs (Figure 3-12).

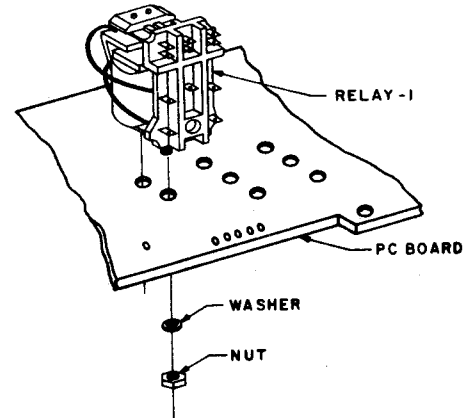


Figure 3-11: Relay-1 Mounting

B wire on RELAY-1 to B on PC Board

G wire on RELAY-1 to G on PC Board

F wire on RELAY-1 to F on PC Board

E wire on RELAY-1 to E on PC Board

H wire on RELAY-1 to H on PC Board

A wire on RELAY-1 to A on PC Board

D wire on RELAY-1 to D on PC Board

The remaining wire on RELAY 1 that is not connected will be soldered to the switch after it is installed.

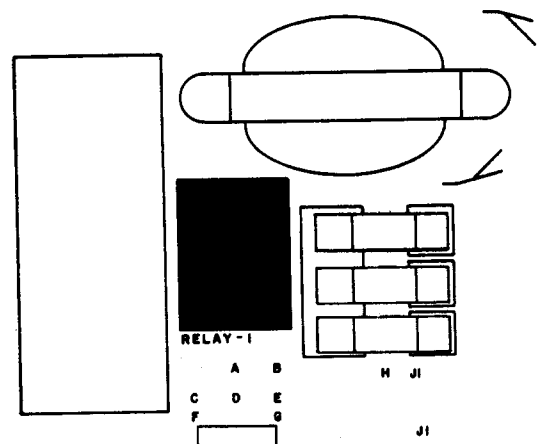
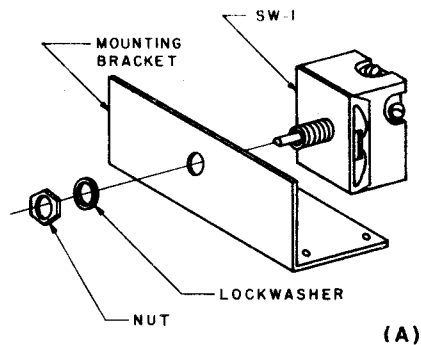


Figure 3-12. Relay-1 Wiring Installation

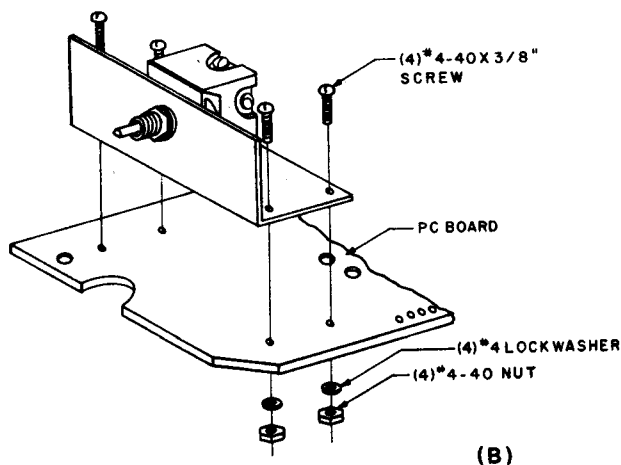
2. Switch Mounting

- a. After the wires are soldered to SW-1, obtain the TTY Switch Bracket from Bag 4.
- b. Remove the nut and lockwasher from SW-1, and insert the shaft of SW-1 through the Mounting Bracket hole and secure as shown in Figure 3-14A.



- c. Obtain four 4-40 x 3/8 inch screws, four #4 lockwashers, and four 4-40 nuts from Bag 3.

- d. Install the Mounting Bracket to the Call/Control Unit Board and secure as shown in Figure 3-14B.



- e. After the TTY Switch Bracket is secured, solder the two wires from the switch to the following PC Board Call outs (Figure 3-15).

L1 on SW-1 to S1-2 on PC Board.

2 on SW-1 to S1-1 on PC Board.

- f. Solder the 1 wire on RELAY-1 to 1 on SW-1.

Figure 3-14. Switch Mounting

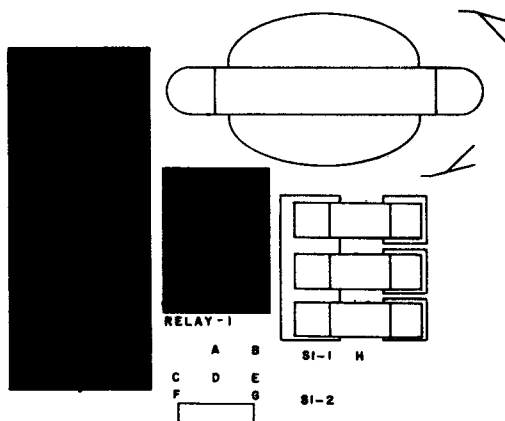


Figure 3-15. Switch Wiring

3-17. Fuse and Fuse Clip Installation (Figure 3-16)

There are six fuse clips and three fuses (F1, F2, and F3) to be installed on the Call/Control Unit board.

- () Spread one of the fuse clips apart slightly and insert a #4 40 x 3/8 inch screw.
- () Align the clip and screw over the correct hole on the silk-screened side of the board and insert the screw into the hole.
- () Holding the clip and screw in place with a screwdriver, place a #4-40 lockwasher and nut onto the screw on the foil side of the board and tighten them securely.
- () Install the remaining five clips in the same manner; then push the clips back together so they will hold the fuse.
- () Carefully insert fuses F1 (1A), F2 (1/2A) and F3 (3A) into the clips. Be sure that the clips hold the fuse securely in place (Figure 3-17).

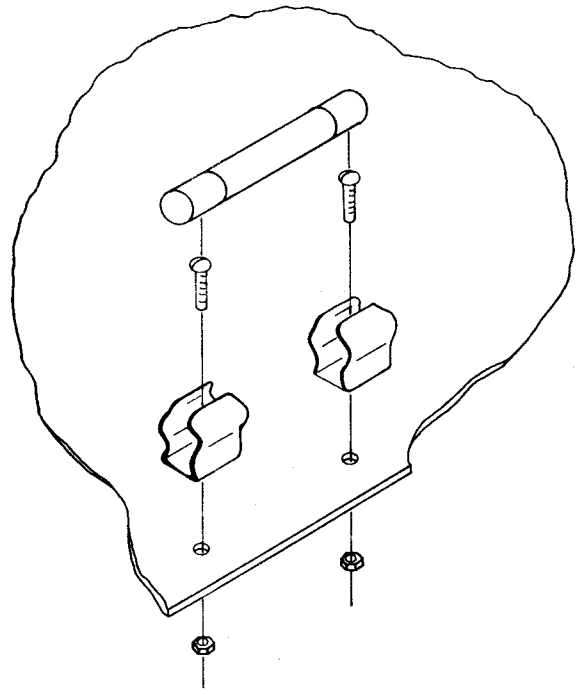


Figure 3-16. Fuse Clip Installation

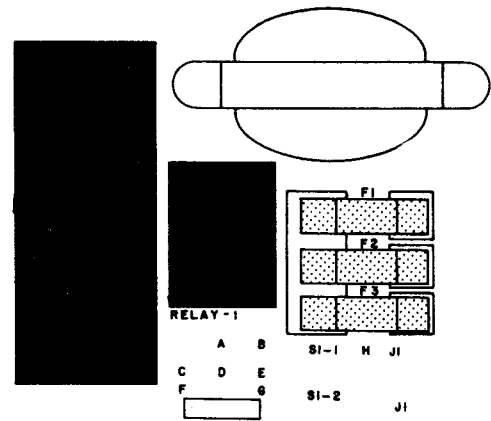


Figure 3-17. Fuse Installation

3-18. I/O Male Molex Connector Installation (Figure 3-18)

There is a 5-pin Male Molex I/O connector (Bag 6) to be installed on the PC Board. To install this connector, insert the 5 pins through the PC Board.

NOTE

Insure the LOCK SIDE of the connector is positioned on the inside of the board.

Solder each pin to the foil (bottom) side of the board.

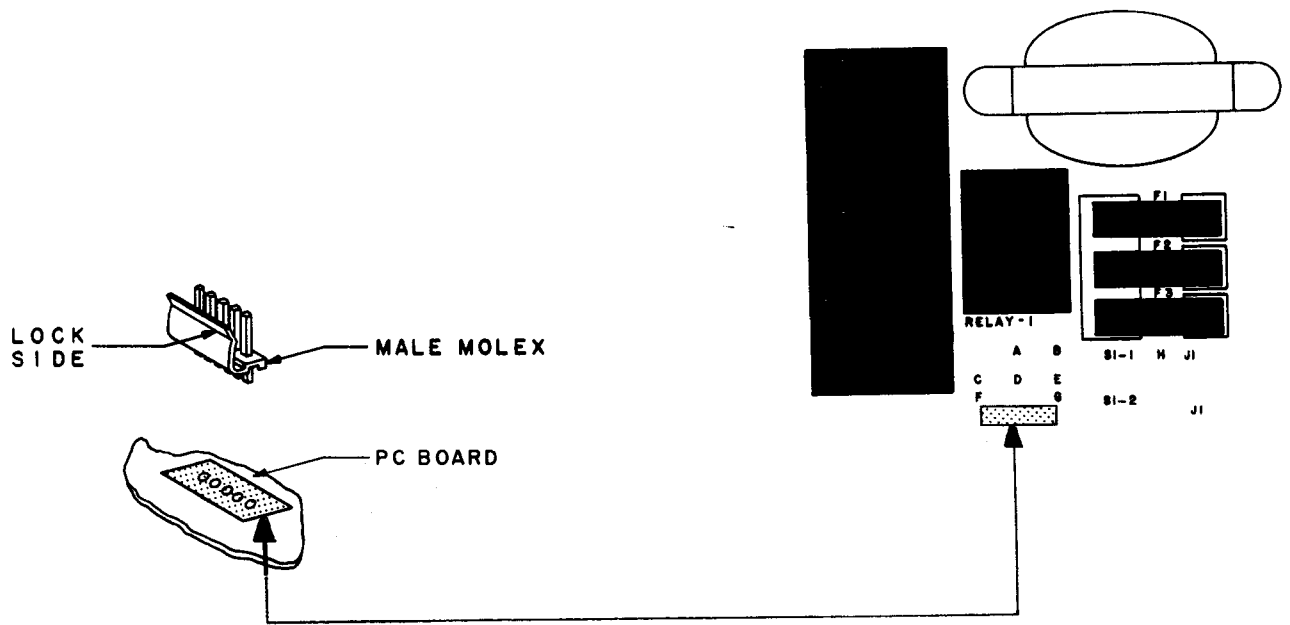


Figure 3-18. I/O Male Molex Installation

3-19. Conductor Cable

There is a 10 foot conductor cable that will be connected to the Call/Control Unit board and the serial I/O board. It must be prepared to be installed to a 5-pin female molex plug and 25-pin connector.

1. Obtain the 10 foot Conductor Cable from Bag 4.
2. Using a small sharp knife, strip one inch of cable sheath from the other end of the I/O conductor cable. Do this by cutting a circle around the sheath, being very careful not to cut into the insulation of the wires inside, and pulling the end off of the wires.
3. There are 12 wires exposed on both ends of the cable; cut all but the RED, YELLOW, GREEN, WHITE, and BLACK wires off to the cable sheath.

NOTE

Do not cut the exposed RED, YELLOW, GREEN, WHITE, and BLACK wires.

4. Strip 1/4 inch of insulation from both ends of the wires, and tin the exposed portion by applying a thin coat of solder.

3-20. 25-Pin Male Connector

The 25-Pin Male Connector will be mated to the 25-pin female connector from your serial I/O board. The two inches of exposed RED, YELLOW, GREEN, WHITE, and BLACK wires from the conductor cable will be soldered to the 25-Pin Male Connector.

1. Obtain the 25 DB-pin male connector from Bag 4 and solder the wires to the following pins.

BLACK wire to pin 2 (ground) on 25 DB-pin male connector

RED wire to pin 3 (receive) on 25 DB-pin male connector

YELLOW wire to pin 4 (transmit) on 25 DB-pin male connector

GREEN wire to pin 5 (transmit) on 25 DB-pin male connector

WHITE wire to pin 6 (Paper Tape) on 25 DB-pin male connector

2. Obtain the Connector Cover from Bag 4 and set the conductor cable and connector inside one half of the cover (Figure 3-19). Insure that the cable runs between the two posts in the center of the cover and that no wires will be pinched along any of the edges.
3. Place the other half of the cover over the first half and hold the two pieces together with one hand.
4. Note that there is a hex-shaped recess on each half of the connector cover. Place a nut in this recess and insert a screw from the opposite side through the round hole. When both of these screws have been installed, tighten them down.
5. Install the two retaining screws and clamps as shown in the drawing. Be sure that the clamps have been installed correctly. A mispositioned plastic cover may crack under stress.

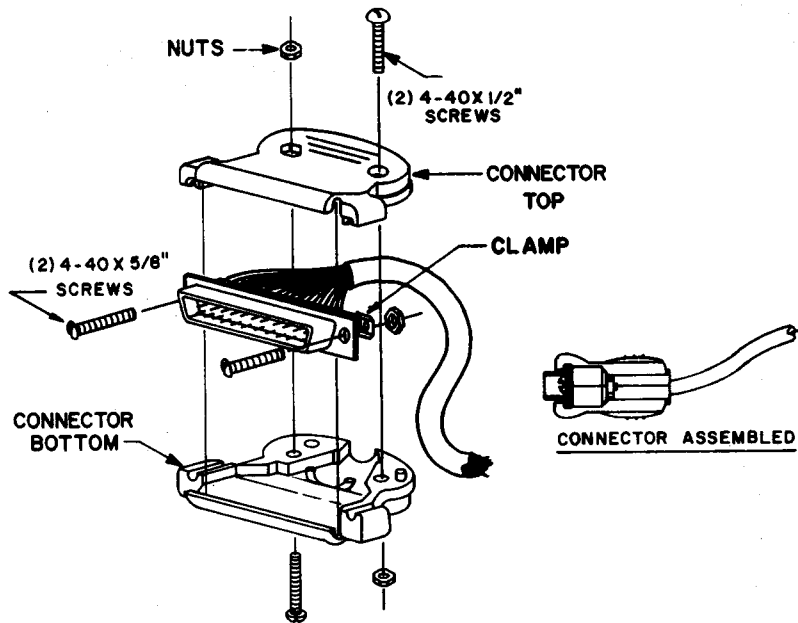


Figure 3-19. Connector Cover Installation

3-21. I/O Female Molex Plug Installation

The I/O Female Molex Plug is connected to the 5-pin Male Molex connector on the PC Board. This plug is installed to the other end of the conductor cable.

1. Refer to figure 3-20 to attach one of the terminal pins (Bag 6) onto the end of the RED, YELLOW, GREEN, WHITE, and BLACK wires of the conductor cable. Do this by crimping the wire into place, then solder the end to the pin itself with a small amount of solder. In-
sure no insulation is melted.
2. Obtain the 5-pin female molex plug from Bag 5 and insert the YELLOW wired terminal pin into the number 1 slot of the female molex plug (Figure 3-21) until it is secure.

NOTE

Disregard the numbers engraved on the female molex plug.

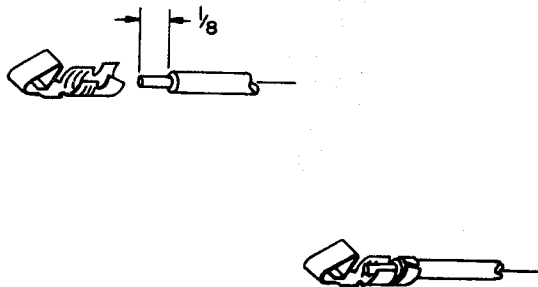


Figure 3-20. Terminal Pins Installation

3. Insert the RED wire terminal pin into the number 2 slot of the female molex plug (Figure 3-21) until it is secure.
4. Insert the GREEN wire terminal pin into the number 3 slot of the female molex plug (Figure 3-21) until it is secured.
5. Insert the WHITE wire terminal pin into the number 4 slot of the female molex plug (Figure 3-21) until it is secured.
6. Insert the BLACK wire terminal pin into the number 5 slot of the female molex plug (Figure 3-21) until it is secure.

NOTE

The female molex plug is not connected to the male molex connector at this time.

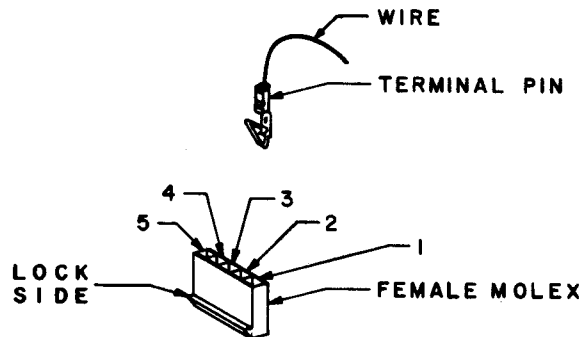


Figure 3-21. Female Molex Wiring

3-22. Molex Connector Installation

There are five 15-pin Molex Connectors to be installed on the Call/Control Unit Board.

1. Obtain the Molex Connectors, Male pins, and Female pins from Bags 6, 7, and 9.
2. Using Figure 3-22, insert the male and female pins into the molex receptacles as shown until secured.
3. After all the pins are inserted, install the Molex Connectors onto the Call/Control Unit Board as shown in Figure 3-23, and solder the connections on the foil (bottom) side of the board.

NOTE

Insure all molex connectors are installed with the ruffled end up on the PC Board.

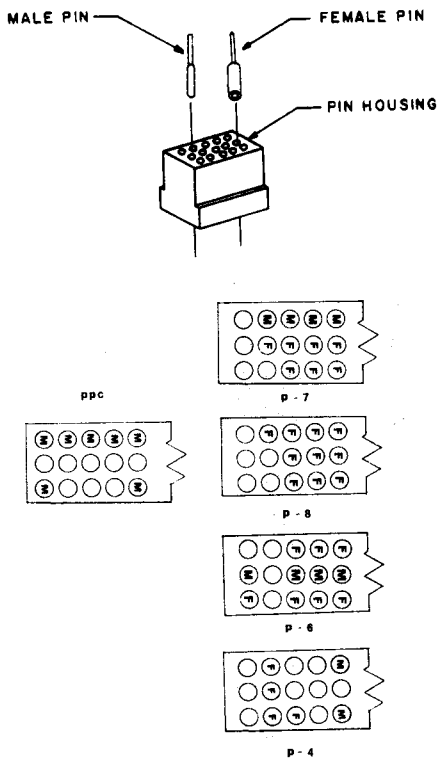


Figure 3-22. Molex Connector Pin Installation

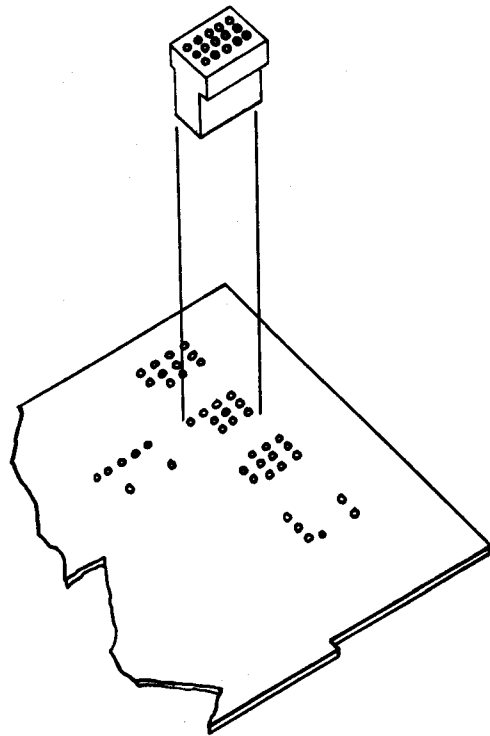


Figure 3-23. Molex Connector Installation

3-23. Transformer Mounting (Figure 3-24)

There is one power supply transformer (T1) to be mounted on the Call/Control Unit Board. T1 is mounted using two 6-32 x 3/8 inch screws, two #6 lockwashers, and two 6-32 nuts (Bag 3).

1. Align T1 to its mounting holes and insure the black wires are on the same side as the fuses (F1, F2, and F3).
2. Insert a #6-32 x 3/8 inch screw through the top side of one of the mounting holes for T1.
3. Hold the screw in place and place a #6 lockwasher over it on the bottom side of the board.
4. Secure with a 6-32 nut and install the second screw in the same manner.
5. Solder the wires from T1 to the following numbers on the Call/Control Unit Board.

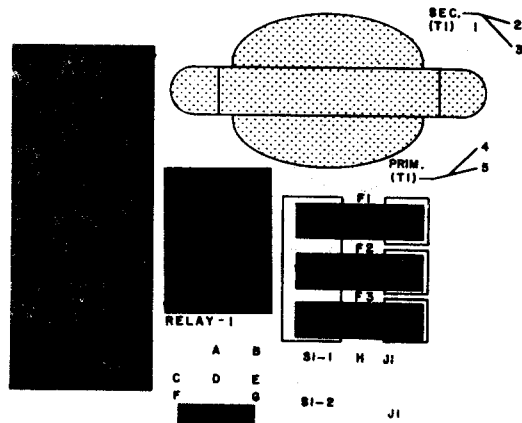


Figure 3-24. Transformer Mounting

Wire Color	Number
Yellow	1
Blacks	4 & 5
Green	2 & 3

3-24. Power Cord Installation (Figure 3-25)

The wires of the Power Cord have been pre-stripped at the factory.

1. Tin the exposed portion of the wires by applying a thin coat of solder.
2. Insert the power cord wires from the silk-screened side of the board, and solder on the bottom side. The location for each wire is listed below.

Color Wire	Location
White	AC GS
Green	GND
Black	AC LS

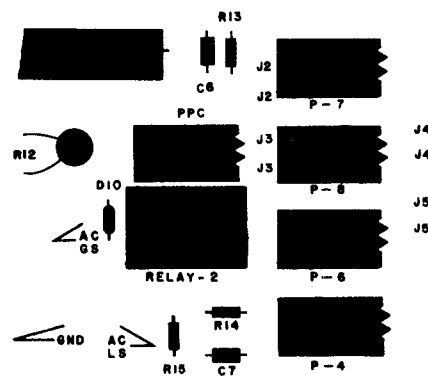


Figure 3-25. Power Cord Installation

3-25. I/O Connection

Put the female molex plug onto the male molex connector located on the Call/Control Board, and push down until it locks (clicks).

3-26. Securing I/O Cable and Power Cord

To secure the I/O Cable and Power Cord to the Call/Control Unit board, perform the following procedure.

1. Obtain the two 1/4 inch cable clamps from Bag 6, and one each 8-32 x 3/4 inch screw and #8 nut from Bag 3.
2. Place the cable clamps around the I/O cable and Power Cord, and use the hole located beside P-6 and J5 (Figure 3-26) on the board for mounting the two cable clamps.
3. Insert the 8-32 x 3/4 inch screw down through the cable clamps, and secure with a #8 lockwasher and a #8 nut on the foil (bottom) side of the board.

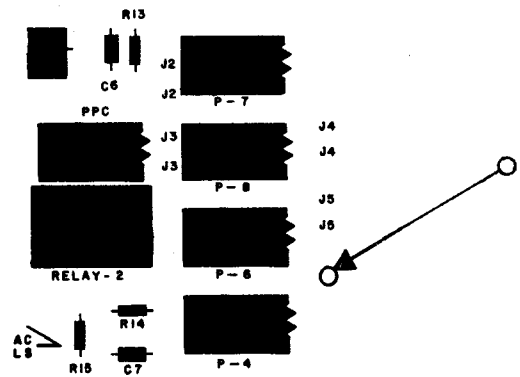


Figure 3-26. Cable Clamp Mounting Hole

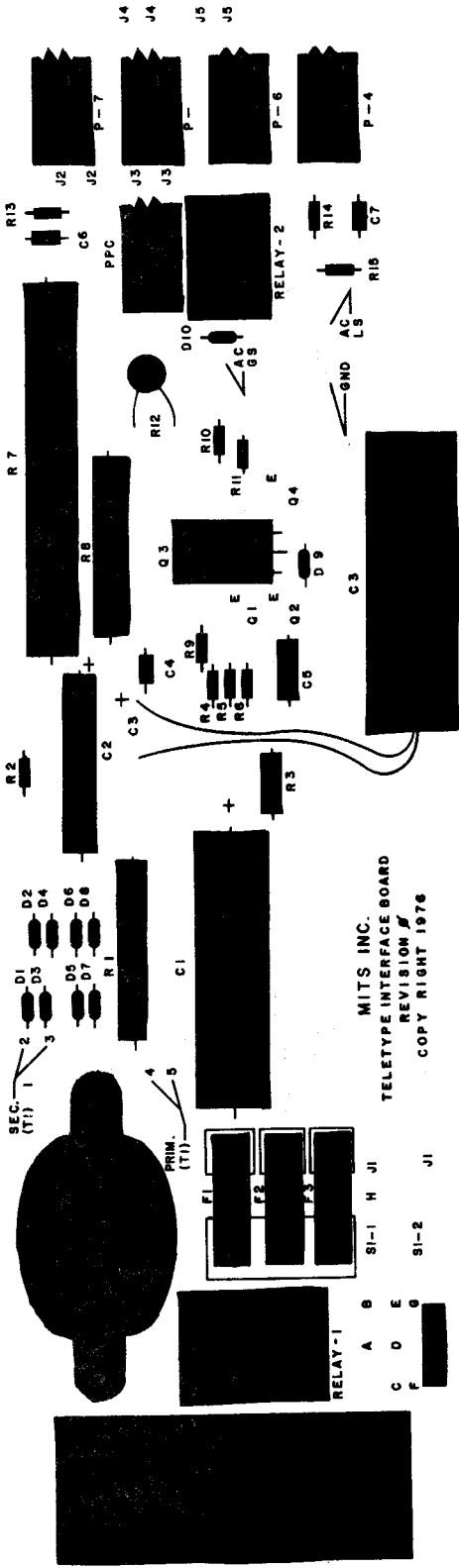
3-27. Call/Control Unit Board Mounting

NOTE

Refer to Figure 3-27 to insure all the components are installed on the Call/Control Unit before mounting it in the Teletype.

To mount the Call/Control Unit Board to the Teletype, perform the following procedure.

1. Remove the teletype case top.
2. Obtain two each 8-32 x 3/4 inch screws, #8 spacers, three 8-32 x 3/8 inch screws, and five each #8 lockwashers from Bag 3.
3. Place the two #8 spacers on the mounting holes as shown in Figure 3-28, and carefully place the Call/Control Unit Board down on them.
4. Insert the 8-32 x 3/4 inch screw with lockwasher down through the board and secure (Figure 3-26).
5. Install the other 8-32 x 3/4 inch screw and the three 8-32 x 3/8 inch screws in the same manner.



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Figure 3-27. Complete Call/Control Unit

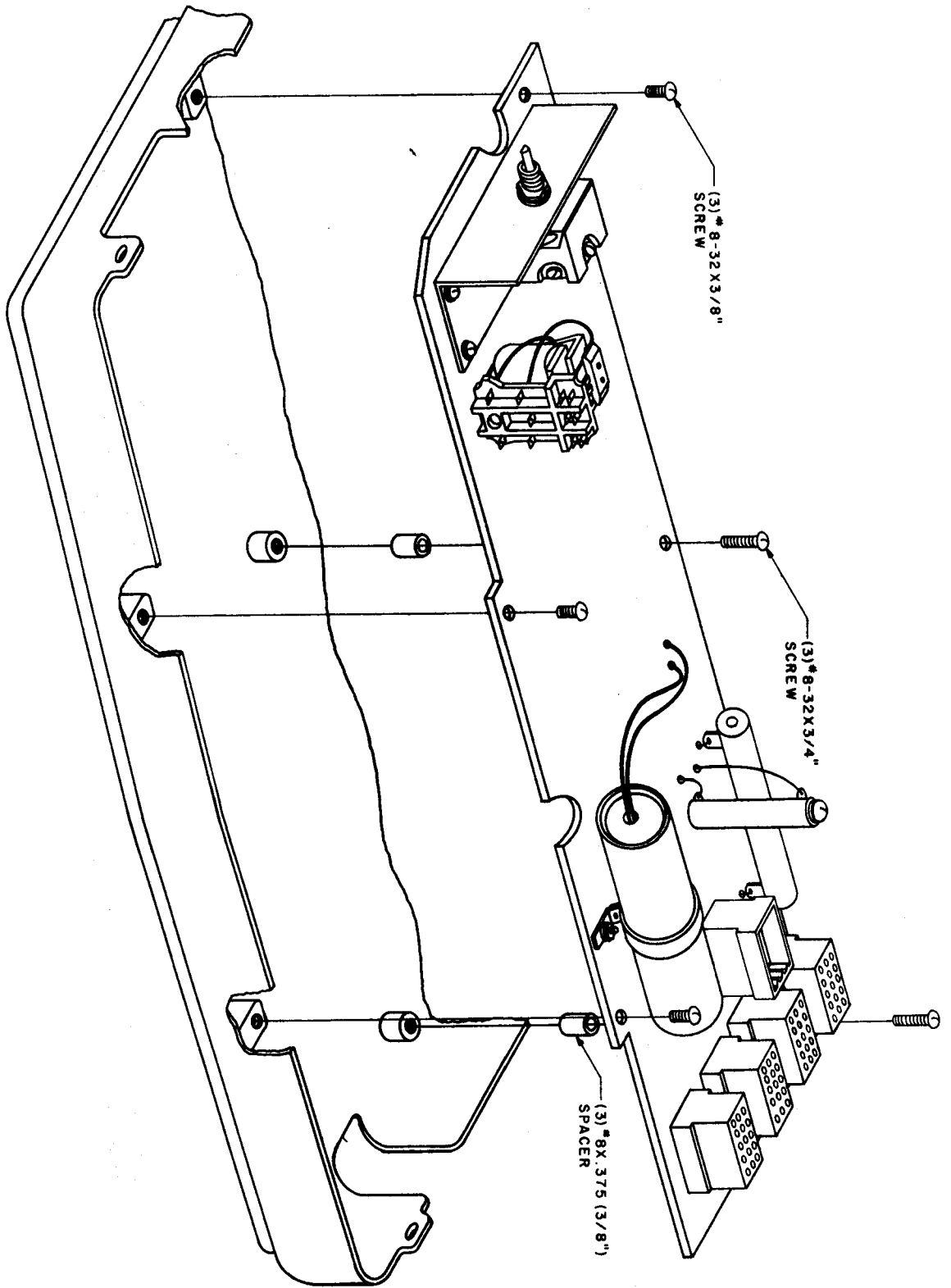


Figure 3-28. Call/Control Unit
Mounting

3-26. Cable Connections

Connect the following plugs from the Teletype to the Molex Connectors on the Call/Control Unit Board.

Teletype Plug	Molex Connectors
P4	P-4
P6	P-6
P7	P-7
P8	P-8
PPC	PPC

The 25-pin male I/O connector will connect directly to the 25-pin female connector on a 88-2SIO (20 ma connection) or a 88-SIOC (Rev. 1).

appendix

parts list

Bag	Quantity	Component	MITS Stock Number
1	1	47 Ohm 1/2W 5% Resistor	101922
	1	1K Ohm 1/2W 5% Resistor	101928
	1	27K Ohm 1/2W Resistor	101929
	1	10K 1/2W 5% Resistor	101932
	1	50 Ohm 20W Resistor	102017
2	1	1 uf 50v Capacitor	100306
	1	2200 uf 50v Capacitor	100376
3	8	4-40 x 3/8" screws	100908
	8	4-40 nuts	100932
	8	#4 lockwashers	100941
	3	6-32 x 3/8" screws	100925
	4	6-32 nuts	100933
	4	#6 lockwasher	100942
	3	8-32 x 3/8" screws	100928
	3	8-32 x 3/4" screws	100953
	6	#8 lockwashers	100945
	2	Spacer #8	101682
	1	6-32 x 2 1/4" screw	100951
	1	#6 flat washer	100943
	1	#8 nut	100929
4	1	Switch Knob	101675
	1	10' 12 Cond. Cable	103058
	1	TTY Switch Bracket	101681
	1	25 DB Connector	102111
	1	Switch	101676

Bag	Quantity	Component	MIT Stock Number
	1	Cover (plaster)	101739
	1	20 AWG x 2'	103063
	3	26 AWG x 14"	103051
5	5	Diode IN4004	100718
	2	Transistor 2N or CS 4410	102806
	1	Transistor TIP 140 or 141	102819
6	1	3A SB fuse	101772
	1	1/2A SB fuse	101771
	4	Fuse Clips	101726
	1	5 pin molex M (straight)	101872
	1	5 pin molex F	101873
	5	Terminal pins	101769
	2	1/4" cable clamp	103021
	2	Molex Receptacles	101680
	2	Male Pins	101677
	14	Female Pins	101678
	3	Solder Lug (#6)	101801
7	1	Molex Receptacle	101680
	4	Molex Male Pins	101677
	7	Molex Female Pins	101678
	1	Line Local Relay	101683
	1	1.5K Ohm 1W Resistor	101972
	1	6-32 x 3/8" screw	100925
	1	#6 Lockwasher	100942
	1	.1 uf 100V Capacitor	100362
	1	470 Ohm 1/2W 5% Resistor	101927

8	1	.1 uf 200V Capacitor	100390
	1	.22 uf 200V Capacitor	100387
	1	10 uf 200V Capacitor	100374
	1	200 uf 200V Capacitor	100388
9	1	Molex Plug	101679
	1	Molex Receptacle	101680
	11	Molex Male Pins	101677
	7	Molex Female Pins	101678
10	1	Transistor 2N or CS4410	102806
	5	Diode IN4004	100718
	1	470 Ohm 1/2W 5% Resistor	101927
	1	1K Ohm 1/2W 5% Resistor	101928
	1	220 Ohm 1/2W 5% Resistor	101925
	1	56K Ohm 1W Resistor	102018
	1	22 Ohm 4W Resistor	102019
	1	12K Ohm 4W Resistor	102015
	1	850 Ohm 40W Resistor	102016
	1	1.5K Ohm 1/2W 5% Resistor	101946
11	1	Reader Control Relay	101674
	1	1A SB Fuse	101777
	2	Fuse Clips	101726
	3	4-40 x 3/8" screw	100908
	3	4-40 nut	100932
	3	#4 Lockwasher	100941
Misc.	1	PC Board	100196
	1	Transformer (P-8661)	102618
	1	Power Cord (3 wire)	101742

mits

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