

SECTION 4 HARDWARE ASSEMBLY

4.1 HOW TO USE THIS MANUAL

THE HARDWARE ASSEMBLY INSTRUCTIONS ARE DIVIDED INTO SUBSECTIONS. EACH SUBSECTION CONTAINS AN INTRODUCTION DESCRIBING THE GENERAL PROCEDURES TO BE FOLLOWED, AND THEN A DETAILED STEP-BY-STEP SET OF INSTRUCTIONS FOR EACH COMPONENT TO BE INSTALLED. THE STEP-BY-STEP INSTRUCTIONS PROVIDE A PLACE () FOR A CHECKMARK AFTER EACH STEP IS COMPLETED.

IF MULTIPLE COMPONENTS ARE TO BE INSTALLED REPEATING THE SAME INSTRUCTION, A PLACE IS PROVIDED FOR A CHECKMARK FOR EACH COMPONENT INSTALLATION STEP.

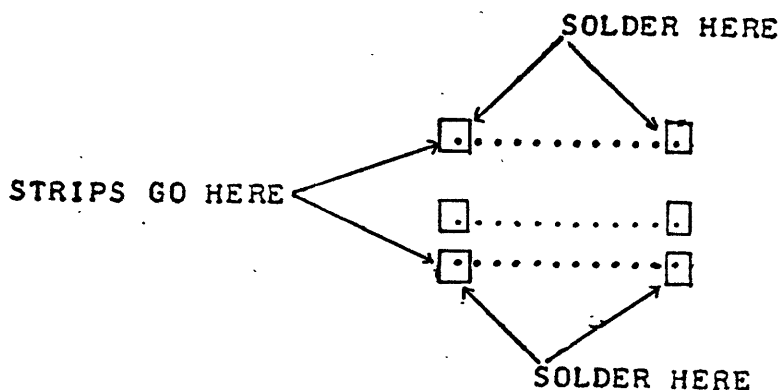
4.2 24- OR 40-PIN SOCKETS

EACH 24- OR 40-PIN SOCKET CONSISTS OF TWO SEPARATE 12- OR 20-PIN STRIPS. THE 24-PIN SOCKETS ARE ALWAYS INSTALLED HORIZONTALLY AT THE EXTREME RIGHT OR LEFT END OF A ROW. THAT IS, THESE SOCKETS ALWAYS OCCUPY COLUMN 1, 2, AND 3 OR 6, 7, AND 8 OF A ROW. A 40-PIN SOCKET IS ALWAYS INSTALLED AT THE EXTREME RIGHT END OF A ROW. THAT IS, THESE SOCKETS ALWAYS OCCUPY COLUMNS 4, 5, 6, 7, AND 8 OF A ROW. A WHITE DOT ON THE COMPONENT SIDE OF THE BOARD DENOTES PIN 1 OF A SOCKET. THE DIMPLE NEAR THE END OF THE SOCKET SHOULD ALWAYS BE POINTED TOWARD THE LEFT SIDE OF THE BOARD. WHEN THE TERMINALS ARE CORRECTLY ALIGNED WITH THE HOLES IN THE PRINTED CIRCUIT BOARD, GENTLY PUSH THE TERMINALS THROUGH THE HOLES UNTIL THE STRIP IS FLUSH AGAINST THE TOP OF THE BOARD.

HOLDING THE STRIPS, TURN THE BOARD OVER AND LAY IT DOWN ON THE WORK TABLE.

REFER TO SECTION 4.11 TO DETERMINE IF A GROUND CLIP IS TO BE INSTALLED ON A LEAD TO BE SOLDERED TO THE BOARD. IF SO, REFER TO THE INSTRUCTIONS IN 4.11 AND INSTALL THE GROUND CLIP TO THE PIN. THEN SOLDER THE GROUND CLIP TO THE GROUND PLANE AND THE PIN TO THE SOLDER PAD.

SOLDER THE PINS AT THE ENDS OF EACH STRIP TO THE SOLDER PAD AS SHOWN. DO NOT CUT THESE LEADS.



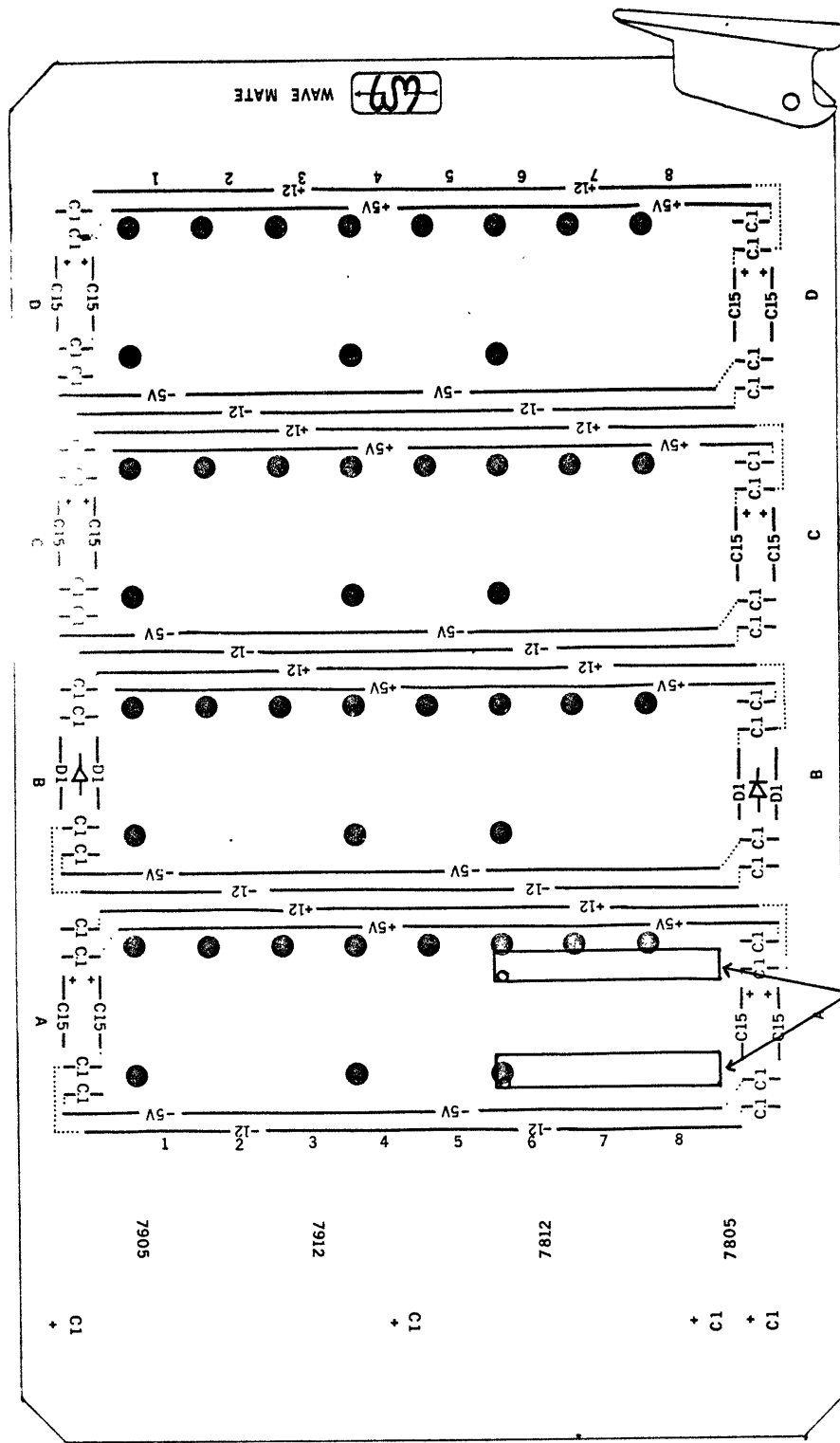
AFTER SOLDERING, CHECK FOR SOLDER BRIDGES AND FOR SOLDER ON THE TERMINALS OF THE STRIPS. SCRAPE OFF ANY SOLDER ON THESE STRIPS WITH A SCREWDRIVER OR AN EXACTO KNIFE.

24-PIN SOCKETS

- () INSTALL AND SOLDER TWO 12-PIN STRIPS AT (A6, 7, 8)

CHECK ALL SOCKETS TO MAKE SURE THAT ALL STRIPS ARE DOWN FLUSH ON THE BOARD. IF ANY ARE NOT, REHEAT THE SOLDER PAD ON ONE, AND PRESS THE BOARD DOWN OVER THE SOCKET STRIP. DO THIS FOR ALL SOCKET STRIPS THAT ARE NOT FLAT ON THE BOARD.

- () CHECK FOR SOLDER BRIDGES.
- () CHECK FOR SOLDER ON TERMINALS.



(2) 12-PIN STRIP SOCKET

ACI

4.3 INPUT VOLTAGE FILTER CAPACITORS

INSTALL 1UF 35V TANTALUM CAPACITORS (COLOR CODE BROWN, BLACK, GREEN) IN THE LOCATIONS MARKED "C1" NEAR THE BOTTOM OF THE BOARD. REFER TO THE ASSEMBLY DRAWING TO DETERMINE WHICH OF THE 4 C1 LOCATIONS ARE TO BE FILLED.

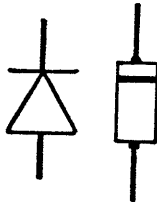
THE BLUE STRIPE ON THE CAPACITOR MUST LINE UP WITH THE + MARKED ON THE BOARD.

AFTER INSTALLING EACH CAPACITOR BEND THE LEADS TO RETAIN THE CAPACITORS.

- () () INSTALL 1UF CAPACITOR
- () CHECK POLARITY
- () SOLDER ALL CAPACITORS
- () CLIP LEADS
- () CHECK FOR SOLDER BRIDGES AND COLD SOLDER JOINTS

4.4 REVERSE VOLTAGE PROTECTION

INSTALL 1N4001 1 AMP DIODES IN LOCATIONS MARKED D1. THE BANDED END OF THE DIODE MUST LINE UP WITH THE BAR ON THE DIODE SYMBOL ON THE BOARD:



BEND BOTH LEADS DOWNWARD CLOSE TO THE DIODE BODY, TO MATCH THE SPACING IN THE BOARD. INSERT THE DIODE LEADS THROUGH THE HOLES MARKED "D1" AND BEND THE LEADS OUT TO RETAIN THE DIODES.

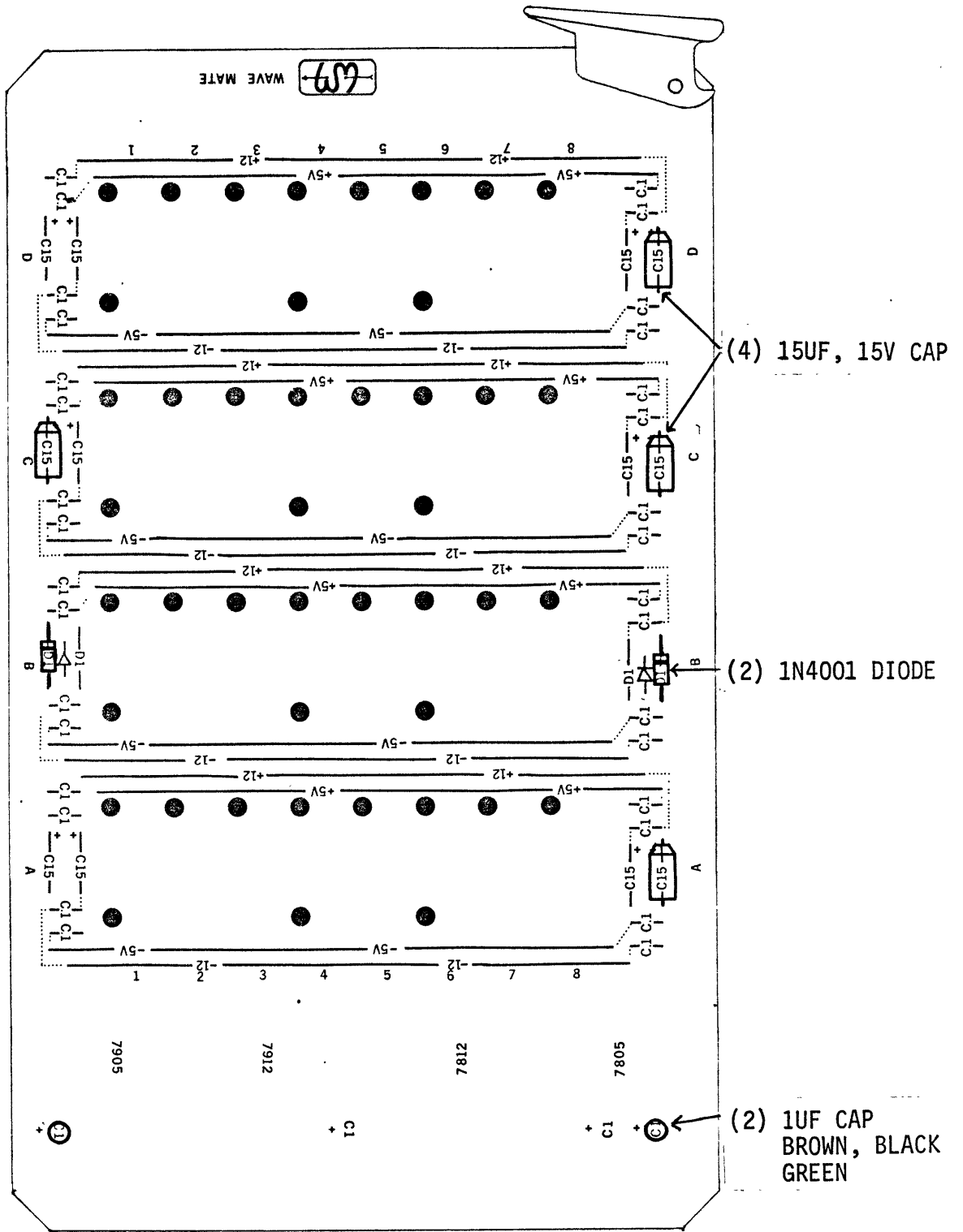
- () () INSTALL DIODE, ROW B
- () SOLDER ALL DIODE LEADS
- () CLIP LEADS
- () CHECK FOR SOLDER BRIDGES AND COLD SOLDER JOINTS

4.5 LOW FREQUENCY BYPASS CAPACITORS

INSTALL 15UF 15V TANTALUM LOW FREQUENCY BYPASS CAPACITOR IN LOCATIONS MARKED C15. THE POSITIVE END OF THE CAPACITOR IS INDICATED BY THE SLOPING EDGES AS WELL AS A WHITE + MARK. THE POSITIVE END OF THE CAPACITOR MUST LINE UP WITH THE WHITE + PRINTED ON THE BOARD.

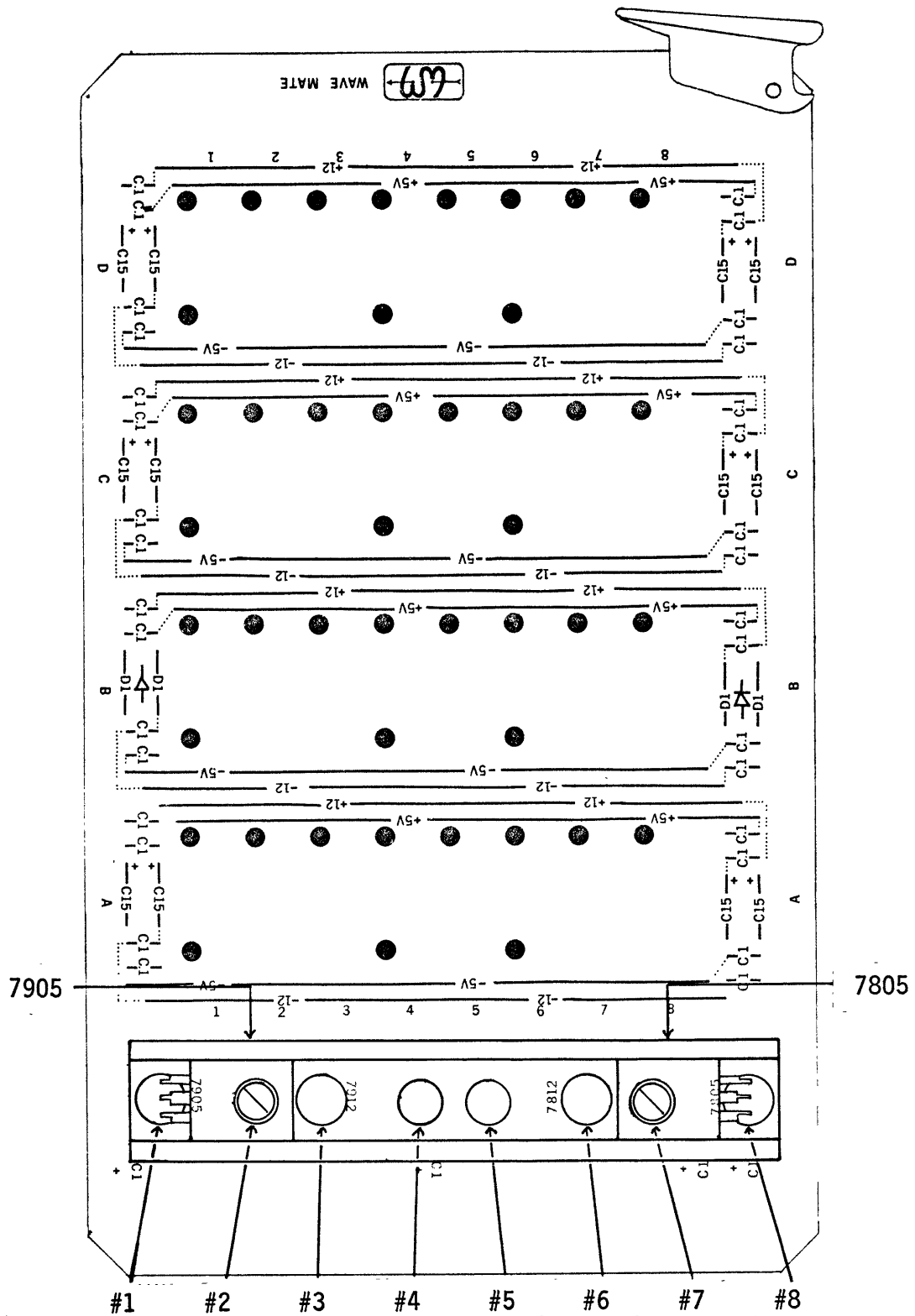
BEND BOTH LEADS DOWNWARD CLOSE TO THE CAPACITOR BODY, INSERT THE LEADS THROUGH HOLES MARKED "C15" AND BEND THE LEADS TO RETAIN THE CAPACITORS.

- () () INSTALL 15UF CAPACITOR, ROW A
- () () INSTALL 15UF CAPACITOR, ROW C
- () () INSTALL 15UF CAPACITOR, ROW D
- () CHECK POLARITY
- () SOLDER ALL CAPACITORS
- () CLIP LEADS
- () CHECK FOR SOLDER BRIDGES AND COLD SOLDER JOINTS



4.6 VOLTAGE REGULATORS

- () PLACE THE HEAT SINK ON THE BOARD ABOVE THE BUSS-CONNECTOR SO THAT THE NUMBERS 7805, 7812, 7912, 7905 ARE COVERED UP, AND THE SMALL HOLES IN THE HEAT SINK LINE UP WITH THE LARGE HOLES ON THE BOARD.
- () PLACE A 1/8" NYLON SPACER IN HOLE #7
- () PLACE A 1/8" NYLON SPACER IN HOLE #2
- () () PLACE ONE PLASTIC INSULATOR ON EACH REGULATOR SUPPLIED. THESE INSULATORS ARE COATED ON BOTH SIDES WITH A SPECIAL HEAT TRANSFER COMPOUND. LINE UP THE HOLE ON THE PLASTIC WITH THE HOLE IN THE REGULATOR.
- () PLACE THE 7805 REGULATOR LEADS THROUGH HOLE #8 AND THE THREE HOLES IN THE CIRCUIT BOARD. THE HOLE IN THE REGULATOR SHOULD LINE UP WITH HOLE #7.
- () PLACE THE 7905 REGULATOR LEADS THROUGH HOLE #1 AND THE THREE HOLES IN THE CIRCUIT BOARD. THE HOLE IN THE REGULATOR SHOULD LINE UP WITH HOLE #2.
- () () PLACE A #6 LOCKWASHER ON A #6-32 X 1/2 ROUND HEAD SCREW AND PUSH THROUGH EACH REGULATOR FROM HEAT SINK SIDE OF BOARD.
- () () PICK BOARD UP ON EDGE AND PLACE A #6 LOCK WASHER AND A #6-32 HEX NUT ON EACH SCREW.
- () () TIGHTEN ALL HARDWARE FROM THE NUT SIDE WITH A SOCKET WRENCH. DO NOT OVER TIGHTEN.
- () () SOLDER THE TWO OUTSIDE LEADS OF EACH REGULATOR.
- () () CLIP ALL THREE LEADS OF EACH REGULATOR.
- () CHECK FOR SOLDER BRIDGES.
- () CHECK FOR COLD SOLDER JOINTS.



4.7 BUS CONNECTOR

- () ORIENT THE BUS CONNECTOR AT THE BOTTOM OF THE BOARD SO THAT THE LONG LEADS POINT TO THE BOARD AND THE SHORT LEADS ARE FACING TOWARDS THE BOTTOM OF THE BOARD.
- () WORK THE LONG LEADS THROUGH THE CORRESPONDING HOLES IN THE BOARD BEING CAREFUL NOT TO CRUNCH THE FILTER CAPACITORS IN THE BOARD. PUSH THE CONNECTOR DOWN UNTIL IT IS FLAT AGAINST THE BOARD.
- () INSTALL A 2-56 X 1/2 SCREW AND NUT AT EACH END OF THE CONNECTOR. THE SCREW HEAD IS ON BOTTOM OF BOARD AND THE NUT IS ON TOP OF CONNECTOR.
- () IN THE SAME MANNER INSTALL A 10-PIN IO CONNECTOR IN THE TOP LEFT HAND CORNER OF THE BOARD. THE HOLES IN THE CONNECTOR SHOULD LINE UP WITH THE HOLES IN THE BOARD.
- () INSTALL A 2-56 X 1/2 SCREW AND NUT AT EACH END OF THE CONNECTOR.

THE 4 CONNECTOR LEADS ON THE RIGHT-HAND SIDE AND THE 10 ON THE LEFT-HAND SIDE ARE TO BE SOLDERED.

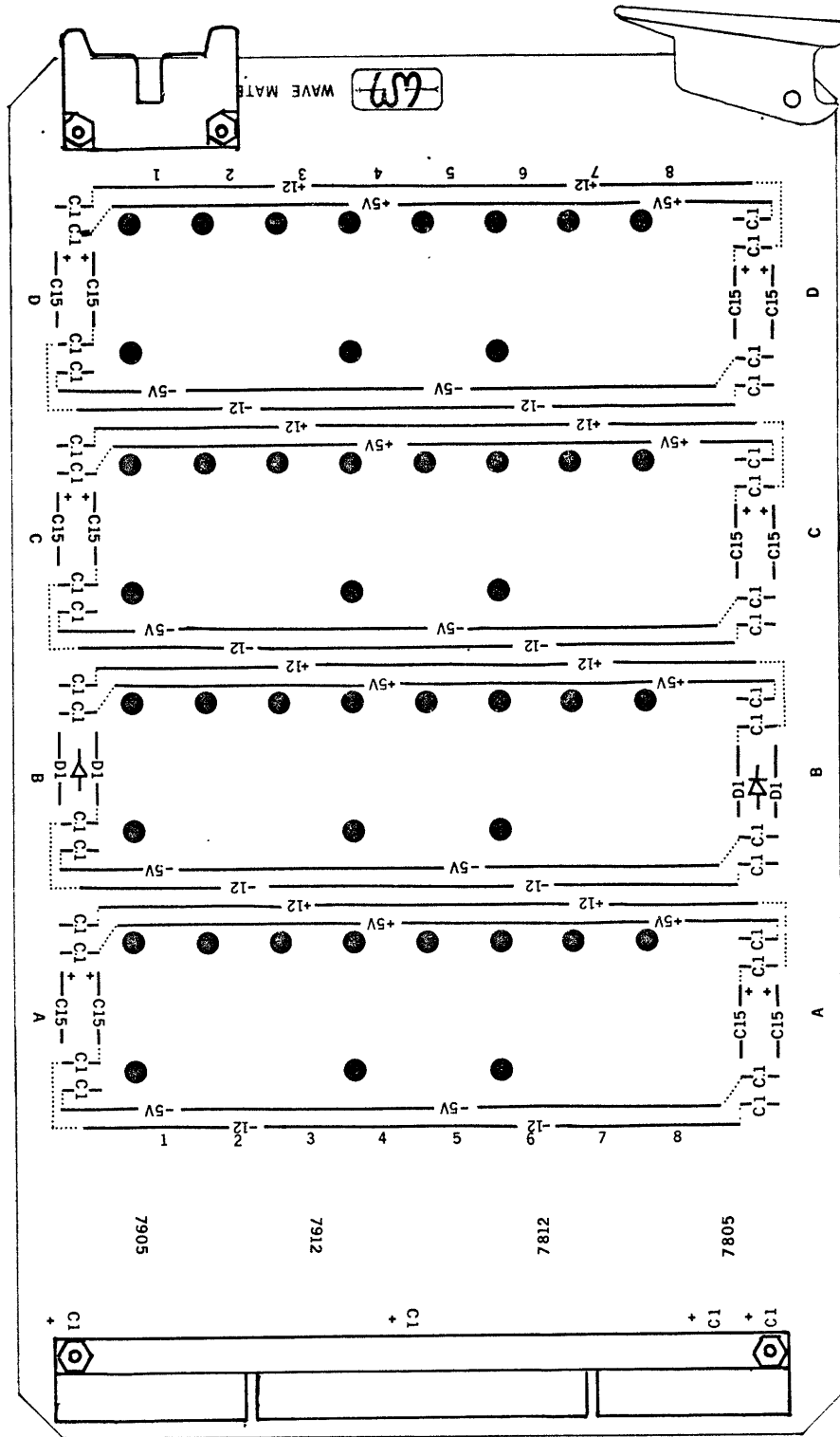
- () USING WIRE CUTTERS, CLIP ONLY THOSE LEADS SHOWN IN FIGURE 4.7.1 AS CLOSE TO THE BOARD AS POSSIBLE.



FIGURE 4.7.1

- () SOLDER THE 4 LEADS ON THE RIGHT-HAND SIDE COMMON PAD FORMING A SMOOTH SOLDER LAKE.
- () SOLDER THE PINS ON THE LEFT-HAND SIDE TO THE PADS BEING CAREFUL NOT TO FORM BRIDGES. IT IS IMPORTANT THAT GOOD SOLDER CONNECTIONS ARE MADE, AS THESE PINS SUPPLY POWER TO THE CARD. A POOR SOLDER CONNECTION WILL CAUSE INTERMITTANT OPERATION.
- () CHECK THE ADJACENT (UNCLIPPED) CONNECTOR LEADS FOR SOLDER. SCRAPE ANY SOLDER OFF THESE LEADS.
- () CHECK LEFT-HAND SIDE FOR SOLDER BRIDGES
- () CHECK FOR COLD SOLDER JOINTS

10-PIN CONNECTOR



BUS CONNECTOR

4.8 BUSS BARS

EACH BUSS BAR CONTAINS 10 TERMINALS. THE TWO END TERMINALS ARE SOLDERED TO THE PRINTED CIRCUIT CARD. THE REMAINING 8 TERMINALS ARE USED TO SUPPLY POWER TO EACH OF THE SOCKETS THAT MAY BE INSTALLED IN THE ROW.

EACH BUSS BAR LOCATION IS INDICATED BY A WHITE LINE ON THE BOARD WITH THE VOLTAGE INDICATED (+12, +5, -5, -12). WHEN INSTALLED, THE BUSS BAR SHOULD COMPLETELY COVER THE APPROPRIATE WHITE LINE.

THE +5 AND +12 VOLT BUSS BARS ARE LOCATED ABOVE EACH ROW, WHILE THE -5 AND -12 VOLT BUSS BARS ARE LOCATED BELOW EACH ROW.

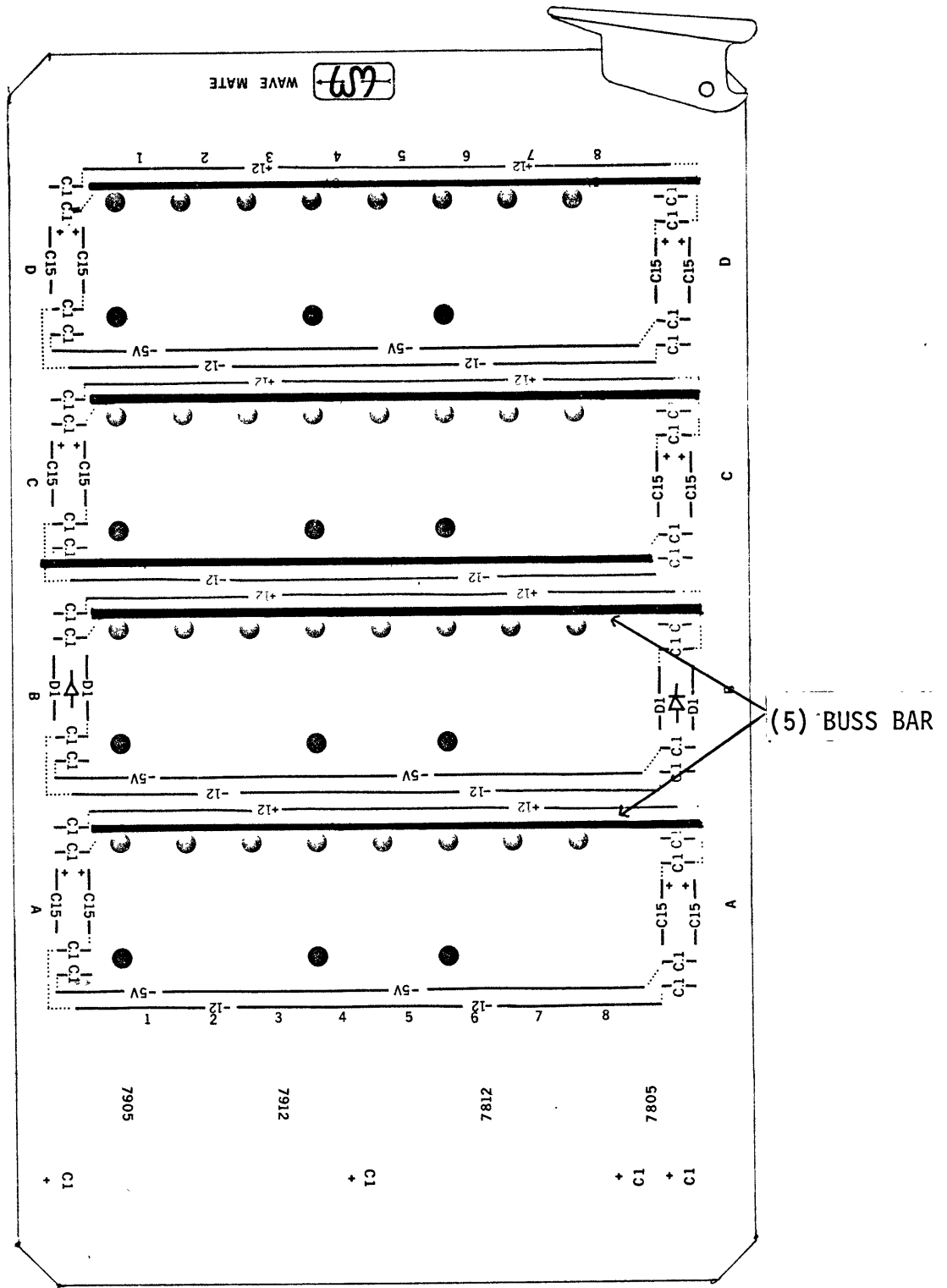
VISUALLY CHECK THE BUSS BAR PINS TO CONFIRM THAT THEY ARE STRAIGHT. CHECK BY SIGHTING FROM THE END AS WELL AS FROM THE FRONT.

LINE UP THE PINS WITH THE HOLES IN THE BOARD AND WIGGLE IN UNTIL THE BOTTOM OF THE BUSS BAR IS FLUSH AGAINST THE BOARD.

BEND THE 2 END PINS OVER SLIGHTLY TO HOLD THE BARS IN THE BOARD.

- () INSTALL BUSS BAR +5V, ROW D
- () INSTALL BUSS BAR +5V, ROW C
- () INSTALL BUSS BAR -5V, ROW C
- () INSTALL BUSS BAR +5V, ROW B
- () INSTALL BUSS BAR +5V, ROW A

- () RECHECK POSITIONS
- () SOLDER ALL BUSS BAR END PINS
- () CLIP ALL BUSS BAR END PINS
- () CHECK FOR SOLDER BRIDGES
- () CHECK ALL PINS FOR STRAIGHTNESS



4.9 HIGH-FREQUENCY BYPASS CAPACITORS

A HIGH-FREQUENCY BYPASS CAPACITOR IS INSTALLED AT BOTH ENDS OF EACH BUSS BAR. A DOTTED WHITE LINE ON THE PRINTED CIRCUIT BOARD POINTS FROM EACH BUSS BAR TO THE LOCATION OF THE CORRESPONDING BYPASS CAPACITOR.

BLUE 0.1 UF 50V CERAMIC CAPACITORS MARKED "104M" ARE USED FOR THE HIGH FREQUENCY BYPASS.

INSERT THE LEADS THROUGH HOLES MARKED "C.1". BEND THE LEADS TO HOLD THE CAPACITORS IN THE BOARD.

R L

() () INSTALL 0.1UF CAPACITOR +5V, ROW D

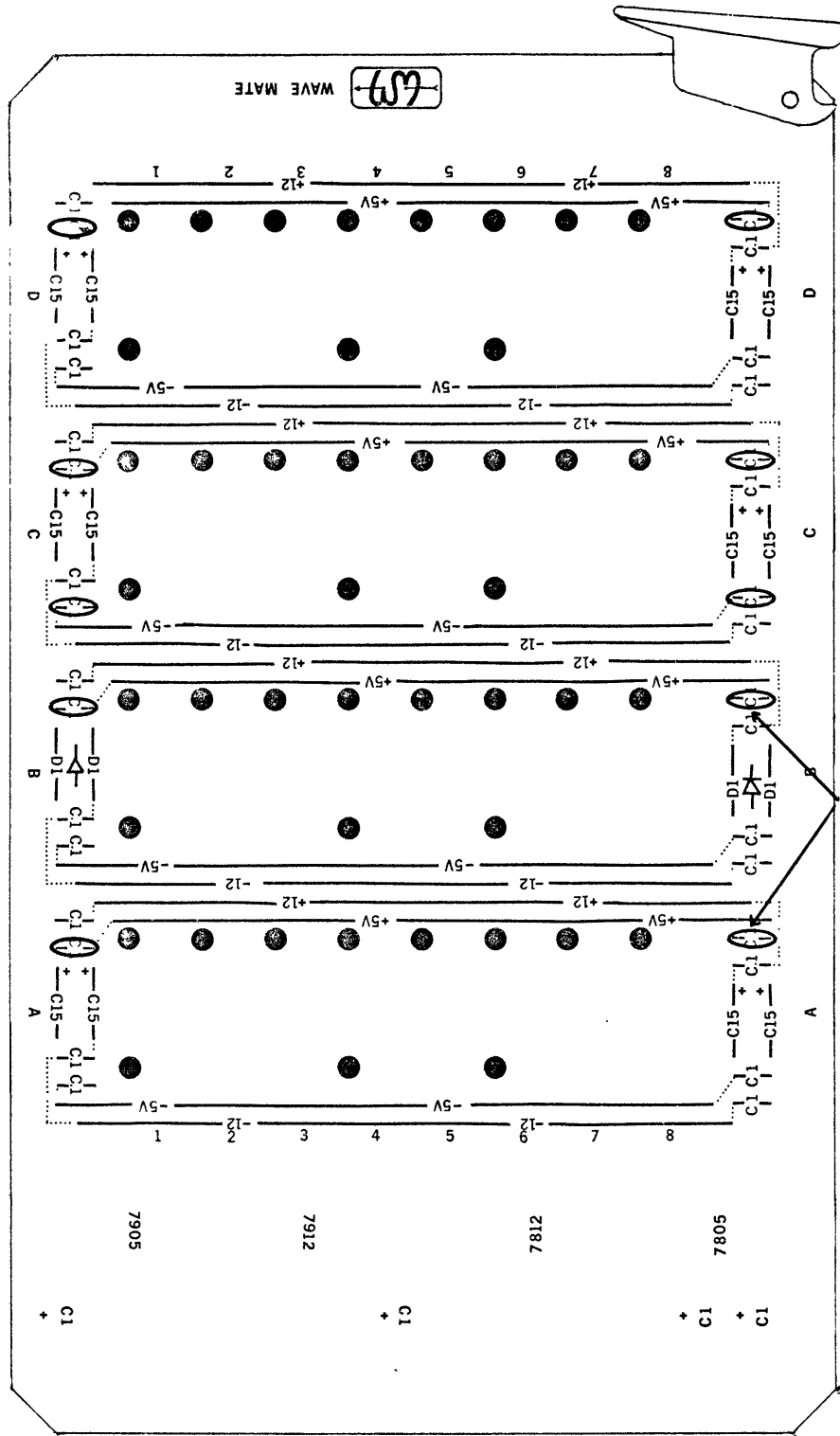
() () INSTALL 0.1UF CAPACITOR +5V, ROW C

() () INSTALL 0.1UF CAPACITOR -5V, ROW C

() () INSTALL 0.1UF CAPACITOR +5V, ROW B

() () INSTALL 0.1UF CAPACITOR +5V, ROW A

() CHECK LOCATIONS
() SOLDER ALL CAPACITORS
() CLIP ALL CAPACITOR LEADS
() CHECK FOR SOLDER BRIDGES
() CHECK FOR COLD SOLDER JOINTS



(10) 0.1 UF CAP

ACT

4.10 18-PIN IC SOCKETS

SOCKETS FOR 18-PIN IC'S ARE INSTALLED IN THE LOCATIONS SPECIFIED BELOW.

PLACE THE CIRCUIT BOARD ON A TABLE, TOP UP, WITH THE BUS CONNECTOR TOWARD YOU.

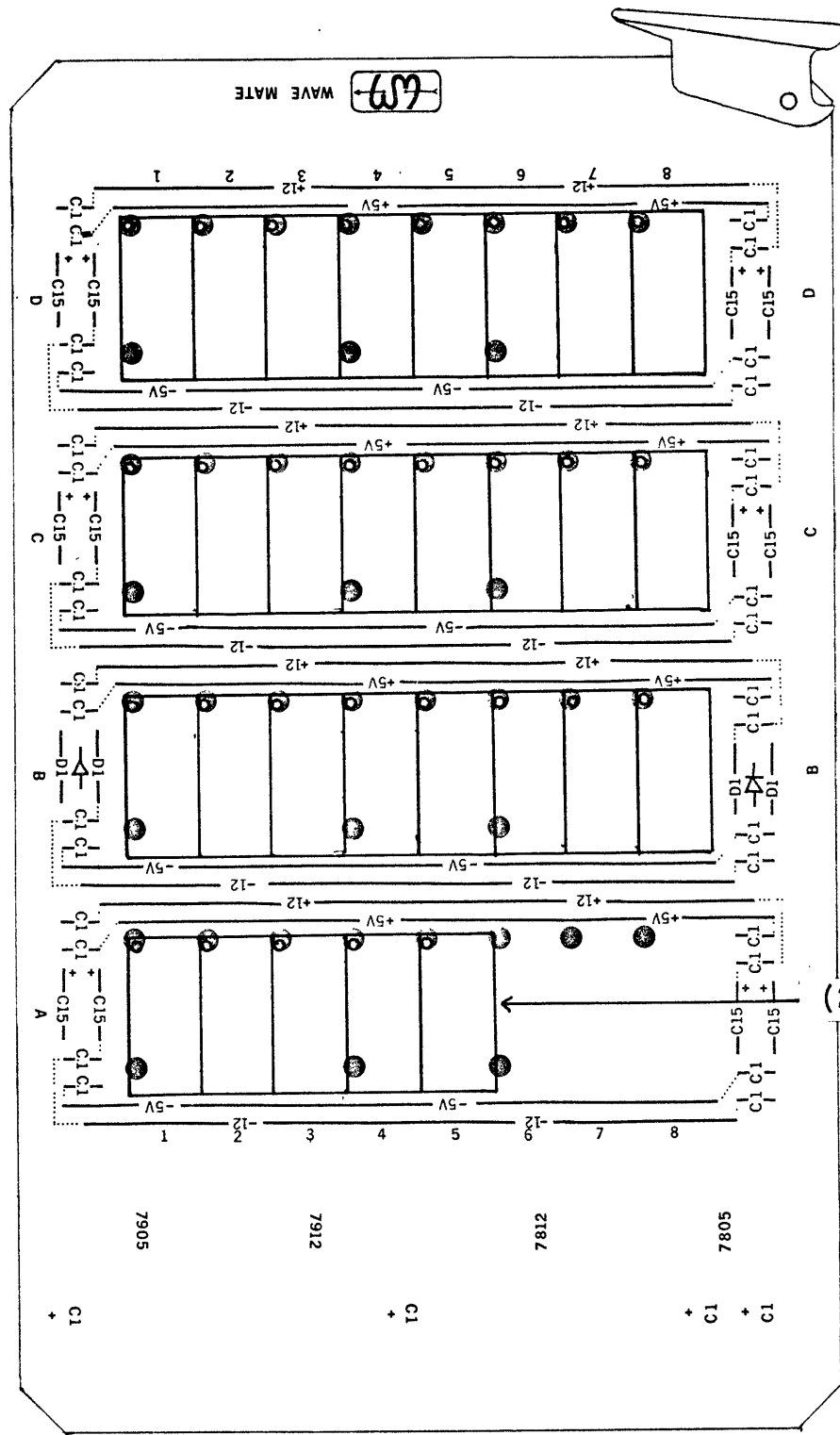
EACH ROW CONTAINS 8 POSITIONS FOR 18-PIN SOCKETS. WHEN INSTALLING THE SOCKET, ORIENT IT SUCH THAT THE SAE MARKING (OR DIMPLE) IS POINTED TOWARD THE TOP OF THE BOARD. BE SURE THAT THE CENTER OF THE SOCKET IS LINED UP WITH THE IDENTIFICATION NUMBER OF THE COLUMN (1-8). PIN 1 OF THE SOCKET (UPPER LEFT-HAND CORNER) SHOULD BE LINED UP WITH THE WHITE DOT ON THE BOARD.

LINE UP THE SOCKET TERMINALS WITH THE CORRESPONDING HOLES IN THE PRINTED CIRCUIT BOARD AND GENTLY PUSH THE TERMINALS THROUGH THE HOLES. THEN SNAP THE SOCKET INTO THE CIRCUIT BOARD.

USING THE CLOSED TIP OF THE NEEDLENOSED PLIERS, PUSH THE PIN IN THE CENTER OF THE SOCKET DOWN UNTIL IT IS FLUSH WITH THE PLASTIC. THE SOCKET WILL BE LOCKED INTO PLACE.

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| ()D1 | ()D2 | ()D3 | ()D4 | ()D5 | ()D6 | ()D7 | ()D8 |
| ()C1 | ()C2 | ()C3 | ()C4 | ()C5 | ()C6 | ()C7 | ()C8 |
| ()B1 | ()B2 | ()B3 | ()B4 | ()B5 | ()B6 | ()B7 | ()B8 |
| ()A1 | ()A2 | ()A3 | ()A4 | ()A5 | | | |

IF IT IS NECESSARY TO REMOVE THE SOCKET, USE A SMALL SCREWDRIVER BLADE TO PUSH THE PIN BACK UP FROM THE BOTTOM. INSERT THE BLADE BETWEEN THE PLASTIC AND PUSH THE PIN UP. USE NEEDLENOSED PLIERS FROM THE TOP TO PULL THE PIN UP. THEN CAREFULLY PUSH THE SOCKET FROM THE BOTTOM OF THE BOARD UNTIL THE SOCKET SNAPS OUT OF THE BOARD.



(29) 18-PIN SOCKET

ACI

4.11 GROUND PINS

INSTALL GROUND PINS ON THE DESIGNATED TERMINALS USING THE TOOL PROVIDED. PLACE THE GROUND PIN IN THE INSERTION TOOL. PLACE THE INSERTION TOOL OVER THE TERMINAL WITH THE LEG OF THE GROUND PIN POINTED TOWARD THE INSIDE OF THE SOCKET. PUSH THE INSERTION TOOL DOWN ON THE TERMINAL UNTIL THE LEG OF THE GROUND PIN IS FLUSH AGAINST THE SOLDER PLANE. BE CAREFUL NOT TO BEND THE ELBOW OF THE GROUND PIN.

SOLDER THE GROUND PIN TO THE GROUND PLANE BUT AVOID GETTING SOLDER ON ANY WIRE WRAP PINS. USE AN ADEQUATE AMOUNT OF SOLDER AND MOVE THE TIP OF THE SOLDERING IRON AROUND ON THE GROUND PLANE TO INSURE A SMOOTH SOLDER JOINT.

INSTALL GROUND PINS IN THE FOLLOWING LOCATIONS:

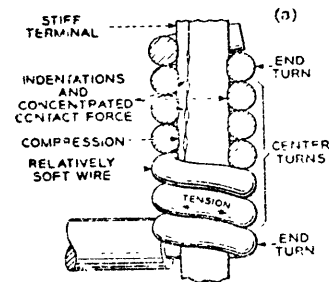
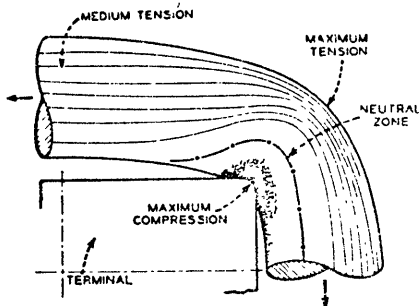
- | | | | |
|--------------------------------|--------------------------------|---------------------------------|---------------------------------|
| <input type="checkbox"/> D5-9 | <input type="checkbox"/> D6-8 | <input type="checkbox"/> D7-8 | <input type="checkbox"/> D4-8 |
| <input type="checkbox"/> C1-8 | <input type="checkbox"/> C2-8 | <input type="checkbox"/> C3-8 | <input type="checkbox"/> D8-7 |
| <input type="checkbox"/> C5-8 | | <input type="checkbox"/> C7-8 | <input type="checkbox"/> C8-8 |
| <input type="checkbox"/> B1-8 | <input type="checkbox"/> B2-7 | <input type="checkbox"/> B3-7 | <input type="checkbox"/> B4-7 |
| <input type="checkbox"/> B5-7 | <input type="checkbox"/> B6-8 | <input type="checkbox"/> B7-1,8 | <input type="checkbox"/> B8-1,8 |
| <input type="checkbox"/> A1-8 | <input type="checkbox"/> A2-8 | <input type="checkbox"/> A3-7 | |
| | <input type="checkbox"/> A6-1 | | |
| <input type="checkbox"/> CON-4 | <input type="checkbox"/> CON-8 | | |

- SOLDER ALL GROUND PINS
- CHECK FOR COLD SOLDER JOINTS

SECTION 5 WIRE WRAPPING

WIRE WRAPPING IS A SOLDERLESS TECHNIQUE FOR CONNECTING TERMINALS TOGETHER. THIS APPROACH TO WIRING HAS BEEN WIDELY ADOPTED WITHIN THE COMPUTER INDUSTRY BECAUSE IT PROVIDES ADVANTAGES OF INCREASED DENSITY AND FLEXIBILITY AS COMPARED TO PRINTED CIRCUIT OR SOLDER TERMINAL TECHNIQUES.

WHEN THE WIRE IS WRAPPED CORRECTLY, THE WIRE IS UNDER TENSION PRODUCING AN INDENTATION IN BOTH THE WIRE AND THE EDGES OF THE TERMINAL. TESTS HAVE SHOWN THAT OVER A PERIOD OF TIME THE WIRE MATERIAL ACTUALLY DIFFUSES INTO THE TERMINAL PRODUCING AN EXTREMELY RELIABLE CONNECTION.



■ By bending the wire around the sharp corner of the terminal the oxide layer on both wire and terminal is crushed or sheared, and a clean, oxide-free metal-to-metal contact is obtained.

WIRE WRAPPING IS ACCOMPLISHED THROUGH THE USE OF A WIRE WRAP TOOL. THE WIRE WRAP TOOL CONTAINS A BIT WHICH FITS OVER THE TERMINAL TO BE WRAPPED. THE TOOL THEN FORCES THE WIRE, UNDER TENSION, AROUND THE TERMINAL. IT IS IMPORTANT THAT THE BIT BE THE CORRECT SIZE FOR BOTH THE TERMINAL AND THE WIRE. THE TERMINALS USED ON YOUR WAVE MATE KIT ARE .025" X .025". THE WIRE SUPPLIED WITH YOUR KIT IS 30 GAGE WITH KYNAR INSULATION.

A WIRE USED FOR WRAPPING MUST HAVE THE INSULATION STRIPPED ONE INCH FROM EACH END. THE WIRE SUPPLIED WITH YOUR WAVE MATE KIT IS PRECUT, PRESTRIPPED, AND COLOR CODED.

BEFORE BEGINNING TO WIRE WRAP A BOARD, CLEAN THE BOARD AND TERMINALS THOROUGHLY WITH ALCOHOL AND A STIFF BRUSH. BE SURE TO CLEAN ALL EXCESS FLUX FROM THE BOARD AND TO BRUSH ALL PINS WELL.

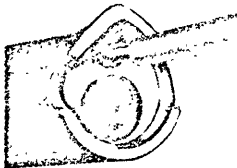
5.1 PROPER TECHNIQUE

TO WRAP A TERMINAL, HOLD THE WIRE WRAP TOOL WITH THE BIT FACING YOU. INSERT THE STRIPPED WIRE INTO THE HOLE IN THE BIT WHICH IS CLOSER TO THE EDGE.

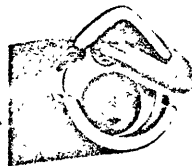
INSERT THE WIRE UNTIL THE INSULATION IS APPROXIMATELY 0.1 INCH INSIDE THE BIT. AT THIS POINT THE BIT CONSTRUCTION WILL PREVENT THE WIRE FROM BEING INSERTED FURTHER INTO THE WIRE HOLE.

BEND THE WIRE TO THE SIDE.

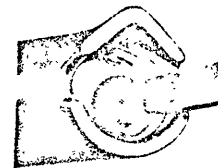
PLACE THE WIRE WRAP TOOL OVER THE TERMINAL SO THAT THE LARGE HOLE IN THE CENTER OF THE BIT FITS OVER THE TERMINAL. IF A LEVEL-1 CONNECTION IS BEING INSTALLED SLIDE THE TOOL AS FAR DOWN ON THE TERMINAL AS IT WILL GO. DO NOT FORCE! IF A LEVEL-2 CONNECTION IS BEING INSTALLED, SLIDE THE TOOL PARTIALLY DOWN THE TERMINAL. DO NOT MAKE CONTACT WITH THE ALREADY INSTALLED WIRE WRAP.



WIRE INSERTION



WIRE ANCHORING



TERMINAL INSERTION

FIGURE 5.1.1 WIRE WRAP TOOL INSERTED OVER TERMINAL

PUSH DOWN ON THE TOOL WITH MODERATE, EVEN PRESSURE AND TWIST THE TOOL IN A CLOCKWISE DIRECTION UNTIL THE BARE PORTION OF THE WIRE IS COMPLETELY WRAPPED AROUND THE TERMINAL (ABOUT 10 OR 11 REVOLUTIONS). LIFT THE TOOL OFF THE TERMINAL.

THE WIRE WRAP SHOULD LOOK LIKE THIS:

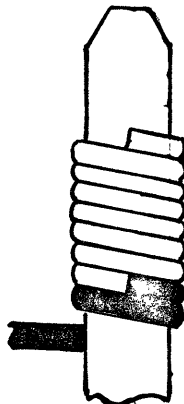


FIGURE 5.1.2 CORRECT WIRE WRAP

IF TOO LITTLE DOWNWARD PRESSURE IS USED THE WIRE WRAP WILL LOOK LIKE:



FIG. 5.1.3 OPEN WRAP

IF THE DOWNWARD PRESSURE IS NOT STEADY:



FIGURE 5.1.4 SPIRAL WRAP

IF THE DOWNWARD PRESSURE WAS EXCESSIVE:

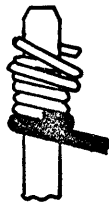


FIGURE 5.1.5 OVERWRAP

IF THE INSULATION WAS NOT PUSHED DOWN FAR ENOUGH INTO THE BIT:

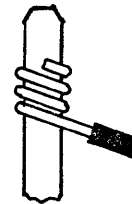


FIGURE 5.1.6 INSUFFICIENT INSULATION

WHEN WIRE WRAPPING, ROUTE THE WIRES AS NEATLY AS POSSIBLE. ALWAYS TRY TO ROUTE THE WIRES THROUGH LARGE OPENINGS, CENTERS OF SOCKETS, ETC. WHENEVER POSSIBLE, DO NOT ROUTE WIRES OVER THE SOLDERED CONNECTIONS ON THE SIDES OF THE BOARD.

WHEN WIRE WRAPPING IS COMPLETED, GENTLY PUSH THE WIRES DOWN SO THAT THEY DO NOT PROTRUDE ABOVE THE TERMINALS.

AFTER THE WIRING OF AN ASSEMBLY IS COMPLETED, MANY TERMINALS WILL HAVE TWO WIRES WRAPPED TO THEM. EACH WIRE WRAP IS CALLED A LEVEL. THE FIRST WIRE CONNECTED TO A TERMINAL IS LEVEL-1 (BOTTOM LEVEL). THE SECOND WIRE WRAP IS LEVEL-2 (TOP LEVEL). IF THE WIRE LIST CALLS OUT LEVEL-1 AND THERE ALREADY IS A WIRE CONNECTED TO THAT TERMINAL YOU HAVE DISCOVERED A WIRING ERROR. BY THE SAME TOKEN IF THE WIRE LIST CALLS OUT LEVEL-2 AND THERE IS NO WIRE CONNECTED TO EITHER OF THE TERMINALS ANOTHER WIRING ERROR HAS BEEN FOUND. NO MORE THAN TWO WIRES WILL EVER BE CONNECTED TO ONE TERMINAL.

A WIRE WRAP CAN BE REMOVED USING AN UNWRAP TOOL. PLACE THE UNWRAP TOOL OVER THE TERMINAL AND TURN IN A COUNTER-CLOCKWISE DIRECTION UNTIL THE WIRE IS REMOVED (10 OR 11 TURNS). BE GENTLE, AND DO NOT HURRY. THE TOOL WILL BREAK IF YOU ARE IN TOO MUCH OF A RUSH.

ALSO, BE CAREFUL NOT TO DROP THE UNWRAP TOOL. THE BIT MIGHT BE DULLED, MAKING THE UNWRAP TOOL UNUSABLE.

5.2 WIRELIST

THE WIRELIST PROVIDES ALL INFORMATION REQUIRED TO WIRE WRAP AN ASSEMBLY. THE WIRE LIST IS DIVIDED INTO SEVERAL SECTIONS CORRESPONDING TO WIRING LEVEL AND LENGTH OF WIRE REQUIRED. FIRST ALL LEVEL-1 CONNECTIONS ARE LISTED, THEN LEVEL-2 CONNECTIONS. WITHIN EACH LEVEL THE WIRES ARE GROUPED BY LENGTH WITH THE LONGEST FIRST.

THE WIRELIST IDENTIFIES PINS BY XY COORDINATES. THE ROWS ARE LABELED BY LETTERS A THROUGH D. WITHIN EACH ROW THE SOCKETS ARE IDENTIFIED BY COLUMNS 1 THROUGH 8. AN ENTRY IN THE WIRELIST A4-2:B5-7 MEANS CONNECT A WIRE FROM PIN 2 OF THE SOCKET IN ROW A, COLUMN 4 TO PIN 7 OF THE SOCKET IN ROW B, COLUMN 5.

A PAPER OVERLAY HAS BEEN PROVIDED TO AID IN THE IDENTIFICATION OF SOCKETS AND PIN NUMBERS. THE USE OF THIS OVERLAY IS OPTIONAL. TO USE THIS OVERLAY, CUT IT OUT, PLACE THE CARD ON ITS BACK (WIRE WRAP PINS FACING UP) WITH THE BUSS CONNECTOR AT THE BOTTOM. USE A PIN TO PUNCH HOLES IN THE CORNER PINS OF THE OVERLAY. PLACE THE OVERLAY ON TOP OF THE WIRE WRAP PINS WITH THE PRINTED NUMBERS FACING UP. ALIGN THE CORNER PINS OF THE OVERLAY WITH THE CORNER TERMINALS ON THE BOARD. GENTLY AND EVENLY PUSH THE OVERLAY THROUGH THE WIRE WRAP PINS UNTIL THE ENTIRE OVERLAY IS FLUSH AGAINST THE BOARD. THE OVERLAY WILL PERMANENTLY REMAIN IN THIS POSITION AND CANNOT BE REMOVED WHEN WIRE WRAPPING IS COMPLETED.

LEVEL ONE WIRES:

BROWN 6.5 INCH WIRES:

() 1 B3-15 [6.5] BUS-60

WHITE 6.0 INCH WIRES:

() 2 A6-3 [6.0] C6-17
() 3 A6-6 [6.0] C7-1
() 4 BUS-26 [6.0] A6-13

BLUE 5.5 INCH WIRES:

() 5 A2-11 [5.5] C4-11
() 6 A6-4 [5.5] C6-11
() 7 B6-6 [5.5] D8-13
() 8 D1-12 [5.5] C7-15
() 9 C8-5 [5.5] D1-10

GREEN 5.0 INCH WIRES:

() 10 A1-15 [5.0] B5-3
() 11 A3-16 [5.0] BUS-24
() 12 A4-4 [5.0] BUS-36
() 13 A4-7 [5.0] BUS-11
() 14 A4-12 [5.0] BUS-13
() 15 A4-15 [5.0] BUS-38
() 16 A4-16 [5.0] BUS-29
() 17 A4-18 [5.0] BUS-37
() 18 A5-1 [5.0] BUS-39
() 19 A5-3 [5.0] BUS-31
() 20 A5-4 [5.0] BUS-40
() 21 A5-7 [5.0] BUS-15
() 22 A5-12 [5.0] BUS-17
() 23 A5-15 [5.0] BUS-42
() 24 A5-16 [5.0] BUS-33
() 25 A5-18 [5.0] BUS-41
() 26 BUS-35 [5.0] A6-11
() 27 BUS-59 [5.0] A6-14
() 28 BUS-58 [5.0] A6-15
() 29 A6-16 [5.0] BUS-57
() 30 A6-17 [5.0] BUS-56
() 31 A6-18 [5.0] BUS-55
() 32 A6-19 [5.0] BUS-54
() 33 A6-20 [5.0] BUS-53
() 34 A6-21 [5.0] BUS-52
() 35 A6-22 [5.0] BUS-51
() 36 B1-1 [5.0] B5-15
() 37 B1-10 [5.0] C2-16
() 38 C7-11 [5.0] D8-1
() 39 D3-6 [5.0] D8-15

YELLOW 4.5 INCH WIRES:

() 40 B6-4 [4.5] C4-5
() 41 A1-17 [4.5] A6-2
() 42 A2-1 [4.5] B4-14
() 43 B4-16 [4.5] A3-12

() 44 A4-6 [4.5] BUS-28
() 45 A4-9 [4.5] BUS-12
() 46 A4-10 [4.5] BUS-14
() 47 A4-13 [4.5] BUS-30
() 48 A5-9 [4.5] BUS-16
() 49 A5-13 [4.5] BUS-34
() 50 A6-5 [4.5] B6-13
() 51 A6-24 [4.5] B8-3
() 52 B1-6 [4.5] C2-17
() 53 B1-9 [4.5] C2-14
() 54 B1-17 [4.5] B6-5
() 55 B2-2 [4.5] B5-13
() 56 B2-13 [4.5] B6-1
() 57 C4-2 [4.5] B2-15
() 58 B2-16 [4.5] B6-14
() 59 D1-8 [4.5] C4-3
() 60 C3-15 [4.5] B3-14
() 61 B5-5 [4.5] C5-1
() 62 C1-18 [4.5] CON-3
() 63 C4-1 [4.5] D7-13
() 64 C7-7 [4.5] D8-5
() 65 C7-14 [4.5] D8-4

RED 4.0 INCH WIRES:

() 66 A2-4 [4.0] B2-5
() 67 A3-4 [4.0] A5-2
() 68 A3-5 [4.0] A5-5
() 69 A3-6 [4.0] A5-17
() 70 A3-15 [4.0] A5-14
() 71 A6-25 [4.0] A6-8
() 72 B6-17 [4.0] B3-16
() 73 A6-23 [4.0] B4-12
() 74 B4-13 [4.0] B7-3
() 75 D7-2 [4.0] D8-12
() 76 C1-15 [4.0] C3-13
() 77 C4-4 [4.0] B3-3
() 78 B3-13 [4.0] B1-18
() 79 B2-3 [4.0] B4-1
() 80 B3-2 [4.0] C2-13
() 81 B4-15 [4.0] B6-16
() 82 B6-2 [4.0] B7-13
() 83 B6-12 [4.0] B8-13
() 84 C3-16 [4.0] D1-11
() 85 C6-7 [4.0] C8-17
() 86 C6-9 [4.0] C8-16
() 87 C7-4 [4.0] D6-15
() 88 D1-5 [4.0] CON-2
() 89 D1-14 [4.0] CON-6
() 90 D2-2 [4.0] D3-12

BLACK 3.5 INCH WIRES:

() 91 A1-8 [3.5] A1-16
() 92 A1-11 [3.5] A2-5
() 93 A1-12 [3.5] A2-7
() 94 A1-13 [3.5] A2-12
() 95 A1-14 [3.5] A2-17
() 96 A1-19 [3.5] A1-18
() 97 C6-5 [3.5] C6-14

() 98 A2-19 [3.5] A2-18
() 99 A3-1 [3.5] A4-5
() 100 A3-2 [3.5] A4-17
() 101 A3-3 [3.5] A4-14
() 102 A3-19 [3.5] A3-18
() 103 A4-8 [3.5] A4-11
() 104 A5-8 [3.5] A5-11
() 105 A6-10 [3.5] A6-12
() 106 C1-4 [3.5] C1-10
() 107 B1-7 [3.5] B1-15
() 108 B1-11 [3.5] B1-12
() 109 B1-19 [3.5] B1-13
() 110 B2-19 [3.5] B2-18
() 111 B2-17 [3.5] B2-14
() 112 B2-4 [3.5] B2-1
() 113 B3-4 [3.5] B4-4
() 114 B3-5 [3.5] B3-17
() 115 B3-12 [3.5] B4-3
() 116 B4-2 [3.5] B5-4
() 117 C4-8 [3.5] C5-2
() 118 B3-19 [3.5] B3-18
() 119 B4-19 [3.5] B4-18
() 120 B5-19 [3.5] B5-18
() 121 B5-17 [3.5] B5-1
() 122 B5-7 [3.5] B5-2
() 123 B6-8 [3.5] B6-7
() 124 B6-19 [3.5] B6-18
() 125 B7-2 [3.5] B7-16
() 126 B7-6 [3.5] B7-7
() 127 B7-19 [3.5] B7-18
() 128 B8-2 [3.5] B8-16
() 129 B8-6 [3.5] B8-7
() 130 B8-19 [3.5] B8-18
() 131 B8-4 [3.5] B8-12
() 132 C1-1 [3.5] C1-5
() 133 C1-2 [3.5] C1-16
() 134 C1-14 [3.5] C2-6
() 135 C1-21 [3.5] C1-3
() 136 C1-8 [3.5] C1-9
() 137 C2-11 [3.5] C1-7
() 138 C1-12 [3.5] C1-13
() 139 C1-19 [3.5] C1-17
() 140 C2-1 [3.5] D1-9
() 141 C2-19 [3.5] C2-18
() 142 C2-15 [3.5] C2-2
() 143 C2-8 [3.5] C2-3
() 144 C3-8 [3.5] C3-5
() 145 C3-4 [3.5] C3-1
() 146 C3-17 [3.5] C3-11
() 147 C3-19 [3.5] C3-18
() 148 C4-19 [3.5] C4-18
() 149 C5-19 [3.5] C5-18
() 150 C5-12 [3.5] C5-11
() 151 C5-13 [3.5] C6-1
() 152 C5-14 [3.5] C6-3
() 153 C5-15 [3.5] C6-4
() 154 C6-6 [3.5] C5-16
() 155 C6-12 [3.5] C7-2
() 156 C6-13 [3.5] C8-6
() 157 C7-3 [3.5] C7-5

() 158 C7-6 [3.5] C7-13
() 159 C7-8 [3.5] C7-17
() 160 C7-12 [3.5] C7-16
() 161 C7-19 [3.5] C7-18
() 162 C8-8 [3.5] C8-13
() 163 C8-19 [3.5] C8-18
() 164 D1-1 [3.5] D1-6
() 165 D2-7 [3.5] D3-10
() 166 D1-2 [3.5] CON-1
() 167 D1-3 [3.5] D1-4
() 168 D2-5 [3.5] D3-9
() 169 D1-18 [3.5] D2-1
() 170 D1-13 [3.5] D2-10
() 171 D1-16 [3.5] D2-3
() 172 D1-15 [3.5] D2-9
() 173 D1-17 [3.5] CON-5
() 174 D2-6 [3.5] D3-16
() 175 D2-16 [3.5] D4-7
() 176 D4-9 [3.5] D4-13
() 177 D2-17 [3.5] D4-3
() 178 D2-19 [3.5] D2-18
() 179 D3-1 [3.5] D4-1
() 180 D3-5 [3.5] D4-2
() 181 D4-4 [3.5] D5-1
() 182 D5-17 [3.5] D5-16
() 183 D5-15 [3.5] D5-14
() 184 D5-13 [3.5] D5-12
() 185 D5-11 [3.5] D5-10
() 186 D4-8 [3.5] D4-6
() 187 D4-10 [3.5] D4-14
() 188 D4-12 [3.5] D4-15
() 189 D4-19 [3.5] D4-18
() 190 D5-2 [3.5] D6-1
() 191 D5-3 [3.5] D6-2
() 192 D5-4 [3.5] D6-3
() 193 D5-5 [3.5] D6-5
() 194 D5-6 [3.5] D6-6
() 195 D5-7 [3.5] D6-7
() 196 D5-8 [3.5] D6-4
() 197 D5-19 [3.5] D5-18
() 198 D6-8 [3.5] D6-14
() 199 D6-16 [3.5] D8-3
() 200 D6-17 [3.5] D8-6
() 201 D6-19 [3.5] D6-18
() 202 D7-19 [3.5] D7-18
() 203 D7-1 [3.5] D7-7
() 204 D7-12 [3.5] D7-11
() 205 D8-7 [3.5] D8-14
() 206 D8-19 [3.5] D8-18
() 207 BUS-9 [3.5] BUS-10
() 208 BUS-19 [3.5] BUS-20
() 208A C2-21 [3.5] C2-4

LEVEL TWO WIRES:

BROWN 6.5 INCH WIRES:

() 209 B1-15 [6.5] D7-2

WHITE 6.0 INCH WIRES:

() 210 B6-13 [6.0] D8-16

BLUE 5.5 INCH WIRES:

() 211 B6-1 [5.5] D3-2

GREEN 5.0 INCH WIRES:

() 212 A6-11 [5.0] B4-6

() 213 A6-13 [5.0] B4-5

YELLOW 4.5 INCH WIRES:

() 214 A6-2 [4.5] B6-3

() 215 A5-5 [4.5] BUS-32

() 216 A3-12 [4.5] A6-9

() 217 A6-14 [4.5] B6-17

() 218 D4-14 [4.5] CON-7

RED 4.0 INCH WIRES:

() 219 B4-14 [4.0] C4-7

() 220 B2-5 [4.0] C4-6

() 221 A6-15 [4.0] B6-15

() 222 C4-3 [4.0] B3-1

() 223 B5-4 [4.0] C4-8

() 224 C1-7 [4.0] D1-7

() 225 D7-13 [4.0] C8-12

BLACK 3.5 INCH WIRES:

() 226 B5-3 [3.5] B6-4

() 227 C4-11 [3.5] C6-5

() 228 A5-11 [3.5] A6-7

() 229 C1-10 [3.5] B1-1

() 230 B1-12 [3.5] B1-17

() 231 B3-3 [3.5] B3-13

() 232 B3-17 [3.5] B4-17

() 233 C5-2 [3.5] C6-15

() 234 B3-14 [3.5] B5-14

() 235 B7-16 [3.5] B7-6

() 236 B7-18 [3.5] B7-12

() 237 B8-16 [3.5] B8-6

() 238 B8-18 [3.5] B8-4

() 239 C1-5 [3.5] C1-11

() 240 C3-18 [3.5] C3-12

() 241 C5-18 [3.5] C5-12

() 242 C6-4 [3.5] C6-18

() 243 C5-16 [3.5] C6-16

() 244 C7-2 [3.5] C8-14

() 245 C7-5 [3.5] C8-15

() 246 D1-6 [3.5] D2-7

() 247 D3-10 [3.5] D3-17

() 248 D1-4 [3.5] D2-5

() 249 D2-1 [3.5] D1-13

() 250 D2-10 [3.5] D3-13

() 251 D4-3 [3.5] D4-11

() 252 A2-5 [3.5] A2-2

() 253 A2-7 [3.5] A2-14

() 254 A2-12 [3.5] A2-15

() 255 A4-11 [3.5] A5-8

() 256 C6-17 [3.5] C6-2

() 257 C6-11 [3.5] C6-8

() 258 A6-8 [3.5] A6-10

() 259 B4-12 [3.5] B4-13

() 260 C3-13 [3.5] C4-4

() 261 B2-18 [3.5] B2-17

() 262 B2-14 [3.5] B2-4

() 263 B2-15 [3.5] B3-6

() 264 B4-3 [3.5] B4-2

() 265 B5-18 [3.5] B5-17

() 266 B5-2 [3.5] B5-16

() 267 B6-7 [3.5] B6-11

() 268 B7-7 [3.5] B7-11

() 269 B8-7 [3.5] B8-11

() 270 C1-16 [3.5] C1-14

() 271 C1-9 [3.5] C1-6

() 272 C1-13 [3.5] C2-5

() 273 C2-18 [3.5] C2-15

() 274 C3-5 [3.5] C3-4

() 275 C3-1 [3.5] C3-17

() 276 C5-11 [3.5] C5-7

() 277 C7-13 [3.5] C8-4

() 278 D8-5 [3.5] D8-2

() 279 C7-16 [3.5] C8-2

() 280 C7-15 [3.5] C8-3

() 281 D2-3 [3.5] D1-15

() 282 D4-7 [3.5] D4-9

() 283 D5-1 [3.5] D5-17

() 284 D5-16 [3.5] D5-15

() 285 D5-14 [3.5] D5-13

() 286 D5-12 [3.5] D5-11

() 287 D4-6 [3.5] D4-5

() 288 D4-15 [3.5] D4-16

() 289 D4-18 [3.5] D4-17

() 290 D7-18 [3.5] D7-1

() 291 D7-7 [3.5] D7-12

() 292 D8-14 [3.5] D8-17

5.3 CHAIN LIST

AFTER YOU HAVE FINISHED WIRING THE BOARD IT IS LIKELY THAT YOU WILL HAVE SOME MISTAKES IN THE WIRING. THESE MUST BE FOUND BEFORE INSERTING IC'S INTO THE SOCKETS. A SIMPLE PROCEDURE CAN BE FOLLOWED TO CHECK THE CORRECTNESS OF THE CONNECTIONS. FOR THIS PURPOSE WE HAVE PROVIDED A CHAIN LIST, WHICH TELLS WHICH POINTS ARE CONNECTED TOGETHER. FOR THIS TEST SOME KIND OF CONTINUITY CHECKER IS REQUIRED: FOR EXAMPLE, AN OHMMETER, A BATTERY WITH A LIGHT BULB, A LOGIC PROBE, OR A TONE GENERATOR. IN ANY CASE, THE TESTER SHOULD USE A LOW DC VOLTAGE (NO MORE THAN 5V) TO CHECK FOR CONTINUITY.

PUT THE BOARD ON A TABLE WITH THE SOCKETS FACING UP AND THE BUS CONNECTOR TOWARDS YOU. REMEMBER: PIN 1 IS LOCATED AT THE DIMPLE ON 18-PIN SOCKETS; FOR 24- AND 40-PIN SOCKETS, PIN 1 IS AT THE DIMPLE ON THE LOWER STRIP. WHEN A POWER CONNECTION IS REFERENCED (I.E., A PIN WITH A NUMBER HIGHER THAN IS ON THE SOCKET), THE CONNECTION SHOULD BE TESTED BY TOUCHING THE APPROPRIATE POWER BUSS BAR AT ITS LEFT OR RIGHT END.

PROBES ARE PROVIDED FOR CHECKING CONNECTIONS TO SOCKETS. CONNECT THE PROBES TO YOUR CONTINUITY CHECKER. TOUCH THE TWO PROBES TOGETHER AND CHECK THAT THE CIRCUIT IS COMPLETED.

START AT THE BEGINNING OF THE CHAIN LIST. INSERT ONE PROBE INTO THE FIRST LOCATION SPECIFIED BY THE CHAIN LIST. FOR EXAMPLE, IF THE FIRST LOCATION WERE "A4-2", THEN YOU WOULD INSERT ONE PROBE INTO PIN 2 OF THE SOCKET LOCATED AT A4. RUN THE SECOND PROBE THROUGH EACH LOCATION ON THE CHAIN, AND BE SURE THAT CONTINUITY IS INDICATED AT EACH POINT. IF ANY POINT IS NOT CONNECTED, YOU HAVE FOUND A MISTAKE. MAKE A NOTE OF THIS MISTAKE, TURN THE BOARD OVER AND CORRECT IT. WHEN YOU THINK YOU HAVE FIXED THE ERROR, TURN THE BOARD BACK OVER AND RECHECK THE CHAIN.

WHEN THE FIRST CHAIN CHECKS OUT, GO ON TO THE SECOND. CONTINUE THE ABOVE PROCEDURE UNTIL ALL CHAINS HAVE BEEN VERIFIED.

() AB0 BUS-35 [1] A6-11 [2] B4-6 ;
() AB1 A4-4 [1] BUS-36 ;
() AB10 BUS-45 ;
() AB11 BUS-46 ;
() AB12 BUS-47 ;
() AB13 BUS-48 ;
() AB14 BUS-49 ;
() AB15 BUS-50 ;
() AB2 A4-18 [1] BUS-37 ;
() AB3 A4-15 [1] BUS-38 ;
() AB4 A5-1 [1] BUS-39 ;
() AB5 A5-4 [1] BUS-40 ;
() AB6 A5-18 [1] BUS-41 ;
() AB7 A5-15 [1] BUS-42 ;
() AB8 BUS-43 ;
() AB9 BUS-44 ;
() CLK2 BUS-59 [1] A6-14 [2] B6-17 [1] B3-16 ;
() CP16 C8-5 [1] D1-10 ;
() CP32 C6-13 [1] C8-6 ;
() CP8 D1-12 [1] C7-15 [2] C8-3 ;
() CRC C4-2 [1] B2-15 [2] B3-6 ;
() DB0 A6-22 [1] BUS-51 ;
() DB1 A6-21 [1] BUS-52 ;
() DB2 A6-20 [1] BUS-53 ;
() DB3 A6-19 [1] BUS-54 ;
() DB4 A6-18 [1] BUS-55 ;
() DB5 A6-17 [1] BUS-56 ;
() DB6 A6-16 [1] BUS-57 ;
() DB7 BUS-58 [1] A6-15 [2] B6-15 ;
() IO A3-16 [1] BUS-24 ;

() MEM BUS-23 ;
() V30 BUS-62 ;
() *A008 BUS-27 ;
() *A109 A4-6 [1] BUS-28 ;
() *A210 A4-16 [1] BUS-29 ;
() *A311 A4-13 [1] BUS-30 ;
() *A412 A5-3 [1] BUS-31 ;
() *A513 A3-5 [1] A5-5 [2] BUS-32 ;
() *A614 A5-16 [1] BUS-33 ;
() *A715 A5-13 [1] BUS-34 ;
() *DMA BUS-19 [1] BUS-20 ;
() *DREQ BUS-21 ;
() *ENA BUS-25 ;
() *HALT BUS-22 ;
() *IRQ0 A4-7 [1] BUS-11 ;
() *IRQ1 A4-9 [1] BUS-12 ;
() *IRQ2 A4-12 [1] BUS-13 ;
() *IRQ3 A4-10 [1] BUS-14 ;
() *IRQ4 A5-7 [1] BUS-15 ;
() *IRQ5 A5-9 [1] BUS-16 ;
() *IRQ6 A5-12 [1] BUS-17 ;
() *REFR BUS-61 ;
() *RESET BUS-18 ;
() *RPLY B3-15 [1] BUS-60 ;
() *SVCT BUS-7 ;
() *VCT BUS-9 [1] BUS-10 ;
() *WP BUS-8 ;
() *WRITE BUS-26 [1] A6-13 [2] B4-5 ;
() A1-8 [1] A1-16 ;
() A1-11 [1] A2-5 [2] A2-2 ;

() A1-12 [1] A2-7 [2] A2-14 ;
() A1-13 [1] A2-12 [2] A2-15 ;
() A1-14 [1] A2-17 ;
() A1-15 [1] B5-3 [2] B6-4 [1] C4-5 ;
() A1-17 [1] A6-2 [2] B6-3 ;
() A1-19 [1] A1-18 ;
() A2-1 [1] B4-14 [2] C4-7 ;
() A2-4 [1] B2-5 [2] C4-6 ;
() A2-11 [1] C4-11 [2] C6-5 [1] C6-14 ;
() A2-19 [1] A2-18 ;
() A3-1 [1] A4-5 ;
() A3-2 [1] A4-17 ;
() A3-3 [1] A4-14 ;
() A3-4 [1] A5-2 ;
() A3-6 [1] A5-17 ;
() A3-15 [1] A5-14 ;
() A3-19 [1] A3-18 ;
() A4-8 [1] A4-11 [2] A5-8 [1] A5-11 [2]
A6-7 ;
() A6-3 [1] C6-17 [2] C6-2 ;
() A6-4 [1] C6-11 [2] C6-8 ;
() A6-5 [1] B6-13 [2] D8-16 ;
() A6-6 [1] C7-1 ;
() A6-23 [1] B4-12 [2] B4-13 [1] B7-3 ;
() A6-24 [1] B8-3 ;
() A6-25 [1] A6-8 [2] A6-10 [1] A6-12 ;
() B1-6 [1] C2-17 ;
() B1-7 [1] B1-15 [2] D7-2 [1] D8-12 ;
() B1-9 [1] C2-14 ;
() B1-10 [1] C2-16 ;
() B1-11 [1] B1-12 [2] B1-17 [1] B6-5 ;

- () B1-19 [1] B1-13 ;
- () B2-2 [1] B5-13 ;
- () B2-3 [1] B4-1 ;
- () B2-13 [1] B6-1 [2] D3-2 ;
- () B2-16 [1] B6-14 ;
- () B2-19 [1] B2-18 [2] B2-17 [1] B2-14 [2]
B2-4 [1] B2-1 ;
- () B3-2 [1] C2-13 ;
- () B3-4 [1] B4-4 ;
- () B3-5 [1] B3-17 [2] B4-17 ;
- () B3-12 [1] B4-3 [2] B4-2 [1] B5-4 [2]
C4-8 [1] C5-2 [2] C6-15 ;
- () B3-19 [1] B3-18 ;
- () B4-15 [1] B6-16 ;
- () B4-16 [1] A3-12 [2] A6-9 ;
- () B4-19 [1] B4-18 ;
- () B5-5 [1] C5-1 ;
- () B5-7 [1] B5-2 [2] B5-16 ;
- () B5-19 [1] B5-18 [2] B5-17 [1] B5-1 ;
- () B6-2 [1] B7-13 ;
- () B6-6 [1] D8-13 ;
- () B6-8 [1] B6-7 [2] B6-11 ;
- () B6-12 [1] B8-13 ;
- () B6-19 [1] B6-18 ;
- () B7-2 [1] B7-16 [2] B7-6 [1] B7-7 [2]
B7-11 ;
- () B7-19 [1] B7-18 [2] B7-12 ;
- () B8-2 [1] B8-16 [2] B8-6 [1] B8-7 [2]
B8-11 ;
- () B8-19 [1] B8-18 [2] B8-4 [1] B8-12 ;
- () C1-1 [1] C1-5 [2] C1-11 ;
- () C1-2 [1] C1-16 [2] C1-14 [1] C2-6 ;

() C1-4 [1] C1-10 [2] B1-1 [1] B5-15 ;
() C1-8 [1] C1-9 [2] C1-6 ;
() C1-12 [1] C1-13 [2] C2-5 ;
() C1-15 [1] C3-13 [2] C4-4 [1] B3-3 [2]
B3-13 [1] B1-18 ;
() C1-18 [1] CON-3 ;
() C1-19 [1] C1-17 ;
() C1-21 [1] C1-3 ;
() C2-1 [1] D1-9 ;
() C2-8 [1] C2-3 ;
() C2-11 [1] C1-7 [2] D1-7 ;
() C2-19 [1] C2-18 [2] C2-15 [1] C2-2 ;
() C2-21 [1] C2-4 ;
() C3-8 [1] C3-5 [2] C3-4 [1] C3-1 [2]
C3-17 [1] C3-11 ;
() C3-15 [1] B3-14 [2] B5-14 ;
() C3-16 [1] D1-11 ;
() C3-19 [1] C3-18 [2] C3-12 ;
() C4-1 [1] D7-13 [2] C8-12 ;
() C4-19 [1] C4-18 ;
() C5-13 [1] C6-1 ;
() C5-14 [1] C6-3 ;
() C5-15 [1] C6-4 [2] C6-18 ;
() C5-19 [1] C5-18 [2] C5-12 [1] C5-11 [2]
C5-7 ;
() C6-6 [1] C5-16 [2] C6-16 ;
() C6-7 [1] C8-17 ;
() C6-9 [1] C8-16 ;
() C6-12 [1] C7-2 [2] C8-14 ;
() C7-3 [1] C7-5 [2] C8-15 ;
() C7-4 [1] D6-15 ;
() C7-6 [1] C7-13 [2] C8-4 ;

- () C7-7 [1] D8-5 [2] D8-2 ;
- () C7-8 [1] C7-17 ;
- () C7-11 [1] D8-1 ;
- () C7-12 [1] C7-16 [2] C8-2 ;
- () C7-14 [1] D8-4 ;
- () C7-19 [1] C7-18 ;
- () C8-8 [1] C8-13 ;
- () C8-19 [1] C8-18 ;
- () D1-1 [1] D1-6 [2] D2-7 [1] D3-10 [2]
D3-17 ;
- () D1-2 [1] CON-1 ;
- () D1-3 [1] D1-4 [2] D2-5 [1] D3-9 ;
- () D1-5 [1] CON-2 ;
- () D1-8 [1] C4-3 [2] B3-1 ;
- () D1-14 [1] CON-6 ;
- () D1-16 [1] D2-3 [2] D1-15 [1] D2-9 ;
- () D1-17 [1] CON-5 ;
- () D1-18 [1] D2-1 [2] D1-13 [1] D2-10 [2]
D3-13 ;
- () D2-2 [1] D3-12 ;
- () D2-6 [1] D3-16 ;
- () D2-16 [1] D4-7 [2] D4-9 [1] D4-13 ;
- () D2-17 [1] D4-3 [2] D4-11 ;
- () D2-19 [1] D2-18 ;
- () D3-1 [1] D4-1 ;
- () D3-5 [1] D4-2 ;
- () D3-6 [1] D8-15 ;
- () D4-4 [1] D5-1 [2] D5-17 [1] D5-16 [2]
D5-15 [1] D5-14 [2] D5-13 [1] D5-12 [2]
D5-11 [1] D5-10 ;
- () D4-8 [1] D4-6 [2] D4-5 ;
- () D4-10 [1] D4-14 [2] CON-7 ;

() D4-12 [1] D4-15 [2] D4-16 ;
 () D4-19 [1] D4-18 [2] D4-17 ;
 () D5-2 [1] D6-1 ;
 () D5-3 [1] D6-2 ;
 () D5-4 [1] D6-3 ;
 () D5-5 [1] D6-5 ;
 () D5-6 [1] D6-6 ;
 () D5-7 [1] D6-7 ;
 () D5-8 [1] D6-4 ;
 () D5-19 [1] D5-18 ;
 () D6-8 [1] D6-14 ;
 () D6-16 [1] D8-3 ;
 () D6-17 [1] D8-6 ;
 () D6-19 [1] D6-18 ;
 () D7-19 [1] D7-18 [2] D7-1 [1] D7-7 [2]
 D7-12 [1] D7-11 ;
 () D8-7 [1] D8-14 [2] D8-17 ;
 () D8-19 [1] D8-18 ;

 () GND A1-8 [1] A2-8 [2] A3-7 [1] A6-1 [2]
 B8-1 [1] B8-8 [2] B7-1 [1] B7-8 [2]
 B6-8 [1] B5-7 [2] B4-7 [1] B3-7 [2]
 B2-7 [1] B1-8 [2] C1-8 [1] C2-8 [2]
 C3-8 [1] C5-8 [2] C7-8 [1] C8-8 [2]
 D8-7 [1] D7-8 [2] D6-8 [1] D5-9 [2]
 D4-8 [1] CON-4 [2] CON-8 ;

BEFORE PROCEEDING ANY FARTHER:

- () REMOVE ALL CARDS FROM THE CARD CAGE.
- () PLUG THE CARD INTO THE EXTENDER CARD.
- () PLUG THE EXTENDER CARD INTO THE CARD CAGE, INCLUDING POWER SUPPLY.
- () PLUG IN THE POWER.

TEST THE FOLLOWING VOLTAGES WITH A VOLTAGE METER:

- () () () () +5V ON +5V BUSS BAR.
- () -5V ON -5V BUSS BAR.

IF THESE VOLTAGES ARE NOT CORRECT, CHECK FOR SOLDER BRIDGES OR COLD SOLDER JOINTS ON THE SOLDERED COMPONENTS ON THE EDGE OF THE CARD. IF THERE ARE ANY SOLDER BRIDGES, FIX THEM AND RETEST THE VOLTAGES.

SECTION 6 COMPONENT INSTALLATION

6.1 INSTALLING 8-, 14-, 16-, AND 18-PIN IC'S

A STATIC ELECTRICITY DISCHARGE CAN DAMAGE THESE CIRCUITS. IT IS VERY IMPORTANT THAT CARE BE TAKEN TO AVOID BUILDUP OF STATIC ELECTRICITY WHEN HANDLING THESE COMPONENTS:

WORK ONLY ON AN UNCARPETED FLOOR. BEFORE HANDLING THESE COMPONENTS TOUCH A WATER FAUCET OR OTHER GROUND POINT TO DISCHARGE STATIC ELECTRICITY.

HOLD THE IC BY THE EDGES, NOT TOUCHING THE PINS, AND USING THE WORK SURFACE, BEND THE PINS ON EACH SIDE OF THE IC TO A 90-DEGREE ANGLE.

ORIENT THE CIRCUIT CARD SO THAT THE SOCKETS ARE FACING UP WITH THE DIMPLE IN THE LEFT CORNER AND THE BUS CONNECTOR TOWARD YOU.

ORIENT THE IC SO THAT THE DOT OR NOTCH ON THE PACKAGE MATCHES THE DOT ON THE SOCKET. THE DOT SHOULD BE IN THE UPPER LEFT HAND CORNER.

USING A SLOW, FIRM, DOWNWARD PRESSURE, WORK THE IC INTO THE SOCKET. IT A LEAD STARTS TO BEND, PULL OUT THE IC, STRAIGHTEN THE LEADS WITH A PAIR OF NEEDLENOSED PLIERS, AND START THE PROCEDURE AGAIN.

INSTALL THE FOLLOWING 6-PIN IC'S IN THE SOCKET. THERE SHOULD BE ONE EMPTY PIN BETWEEN EACH IC (REFER TO DRAWING).

() LOCATION D3, PART FCD820 () LOCATION D3, PART FCD820

INSTALL THE SPECIFIED 8-PIN IC'S TOWARD THE TOP OF THE SOCKET. THE BOTTOM 10 PINS ARE LEFT EMPTY.

() LOCATION B7, PART 555 () LOCATION B8, PART 555

INSTALL THE SPECIFIED 14-PIN IC'S TOWARD THE TOP OF THE SOCKET. THE BOTTOM 4 PINS ARE LEFT EMPTY.

() LOCATION A3, PART 74LS30 () LOCATION B2, PART 74LS74
() LOCATION B3, PART 74LS26 () LOCATION B4, PART 74LS02
() LOCATION B5, PART 74LS74 () LOCATION D2, PART FPQ3724
() LOCATION D8 PART 74LS86

INSTALL THE SPECIFIED 16-PIN IC'S TOWARD THE TOP OF THE SOCKET. THE BOTTOM 2 PINS ARE LEFT EMPTY.

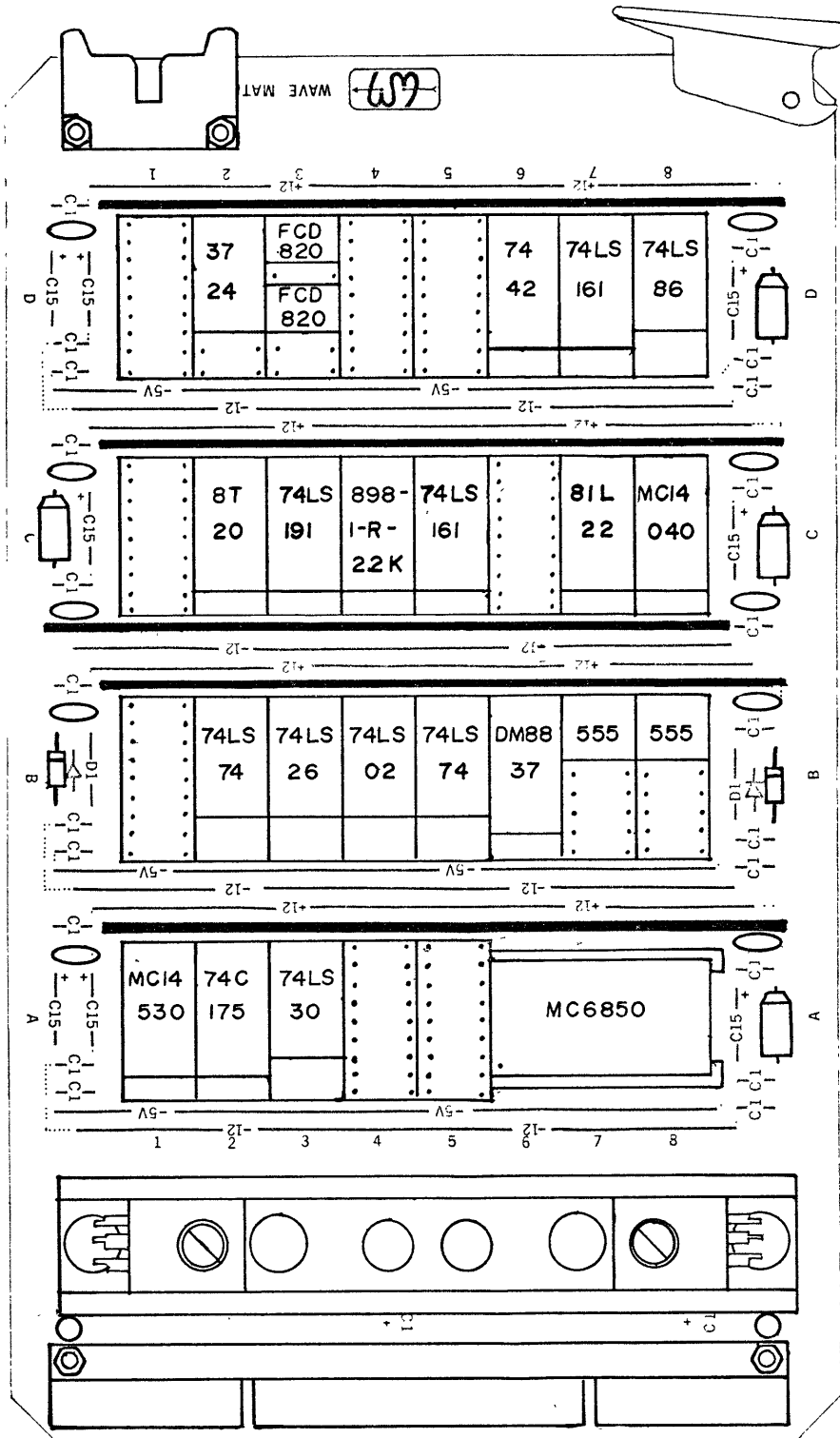
() LOCATION A1, PART MC14530 () LOCATION A2, PART 74C175
() LOCATION B6, PART DM8837 () LOCATION C2, PART 8T20
() LOCATION C3, PART 74LS191 () LOCATION C4, PART 898-1-R-2.2K
() LOCATION C5, PART 74LS161 () LOCATION C7, PART 81L22
() LOCATION C8, PART MC14040 () LOCATION D6, PART 7442
() LOCATION D7, PART 74LS161

6.2 INSTALLING 24- AND 40-PIN IC'S

INSTALL THE SPECIFIED 24-PIN IC'S IN THE FOLLOWING SOCKETS. ORIENT THE DOT ON THE IC TOWARD THE LOWER LEFT HAND CORNER.

() LOCATION A6,7,8 PART MC6850

() CONFIRM DOT IN LOWER LEFT HAND CORNER.



6.3 INSTALLING DISCRETE COMPONENTS

INSTALL THE FOLLOWING COMPONENTS (LISTED BY VALUE AND COLOR CODES) IN THE HOLES CORRESPONDING TO THE NUMBERED PINS OF THE INDICATED SOCKETS. USE THE DRAWINGS ON THE FACING PAGE FOR REFERENCE.

LOCATION B1

() 1N914 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET
1 AND 18

() 9.8304 MHZ CRYSTAL IN HOLES:
15 AND 17

() 15K OHM RESISTOR (BROWN, GREEN, ORANGE) IN HOLES:
6 AND 13

() 680 OHM RESISTOR (BLUE, GRAY, BROWN) IN HOLES:
7 AND 12

() 47 PF CAPACITOR ("470") IN HOLES:
8 AND 11

() 1000 PF CAPACITOR ("102") IN HOLES:
9 AND 10

LOCATION B7

() 1N914 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET
6 AND 13

() 2.7M OHM RESISTOR (RED, PURPLE, GREEN) IN HOLES:
7 AND 12

() 1UF, 35V TANTALUM CAPACITOR (BROWN, BLACK, GREEN- BLUE IS
PLUS) IN HOLES:
8 AND 11 BLUE GOES TO RIGHT SIDE OF SOCKET

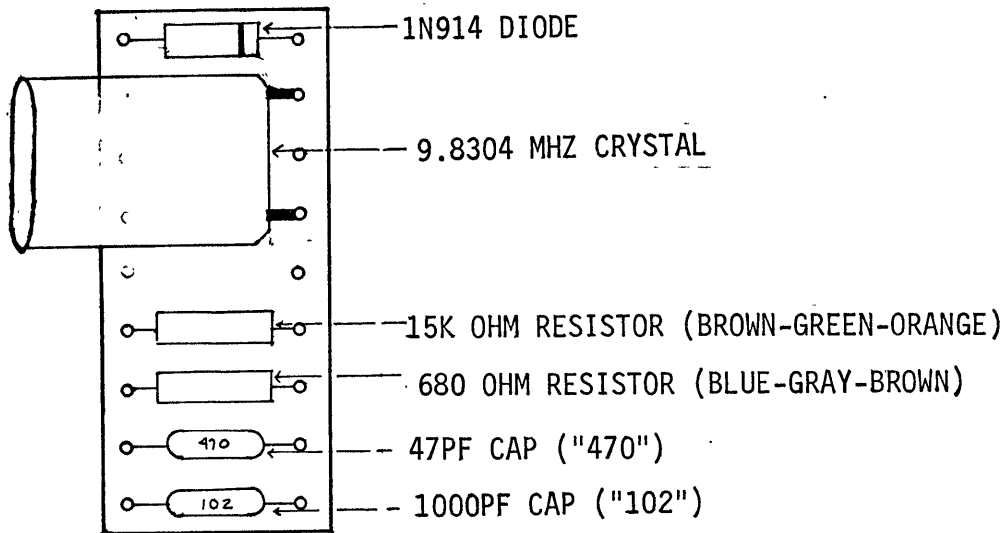
LOCATION B8

() 1N914 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET
6 AND 13 BAND GOES TO RIGHT SIDE OF SOCKET

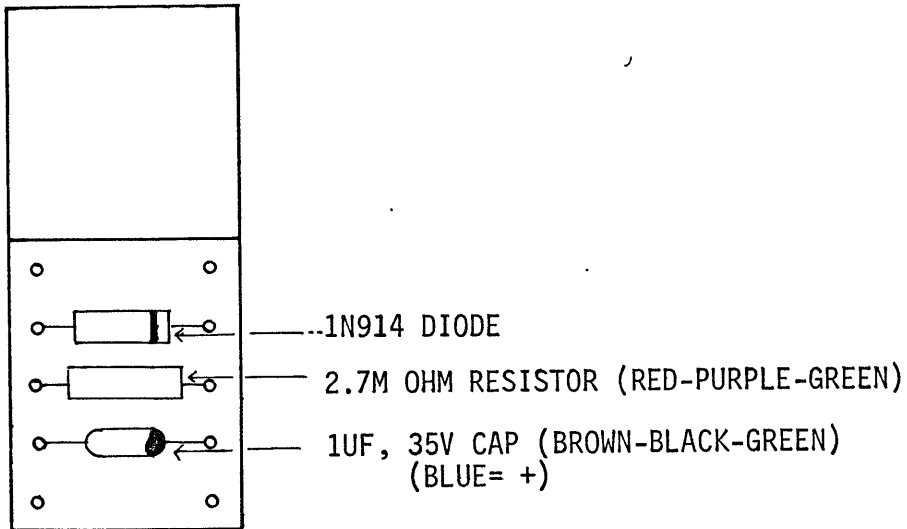
() 5.6M OHM RESISTOR (GREEN, BLUE, GREEN) IN HOLES:
7 AND 12

() 1UF, 35V TANTALUM CAPACITOR (BROWN, BLACK, GREEN- BLUE IS
PLUS) IN HOLES:
8 AND 11 BLUE GOES TO RIGHT SIDE TO SOCKET

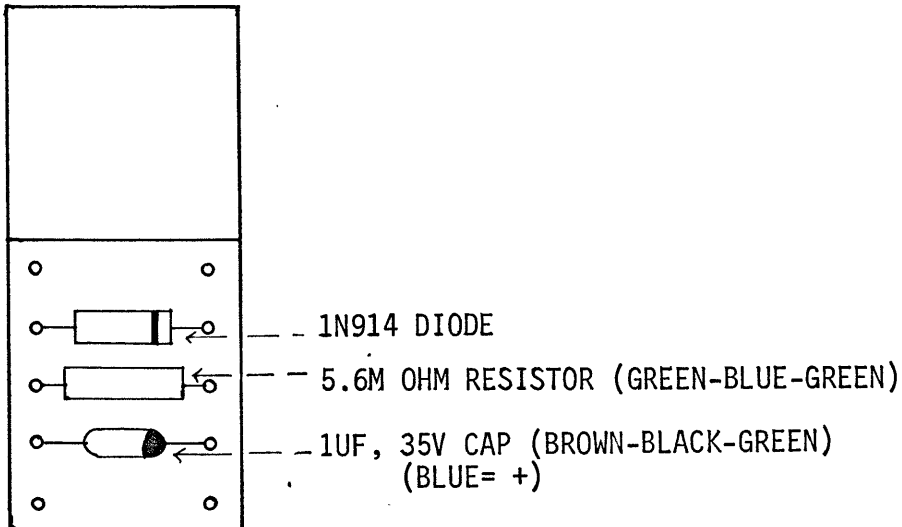
LOCATION B1



LOCATION B7



LOCATION B8



LOCATION C1

1UF, 35V TANTALUM CAPACITOR (BROWN, BLACK, GREEN- BLUE IS PLUS) IN HOLES:

() 1 AND 18 BLUE GOES TO RIGHT SIDE OF SOCKET

1N914 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET

() 2 AND 17

() 3 AND 16

10K OHM RESISTOR (BROWN, BLACK, ORANGE) IN HOLES:

() 4 AND 15

() 8 AND 11

1000 OHM RESISTOR (BROWN, BLACK, RED) IN HOLES:

() 5 AND 14

220 OHM RESISTOR (RED, RED, BROWN) IN HOLES:

() 6 AND 13

.01UF CAPACITOR ("104M") IN HOLES:

() 7 AND 12

1000 PF CAPACITOR ("102") IN HOLES:

() 9 AND 10

LOCATION D2

1N4001 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET

() 9 AND 10

LOCATION D3

1N4001 DIODE IN HOLES: BAND GOES TO RIGHT SIDE OF SOCKET

() 9 AND 10

LOCATION D4

390 OHM RESISTOR (ORANGE, WHITE, BROWN) IN HOLES:

() 1 AND 18

() 2 AND 17

33K OHM RESISTOR (ORANGE, ORANGE, ORANGE) IN HOLES:

() 3 AND 16

() 4 AND 15

10K OHM RESISTOR (BROWN, BLACK, ORANGE) IN HOLES:

() 5 AND 14

2200 OHM RESISTOR (RED, RED, RED) IN HOLES:

() 6 AND 13

1000 PF CAPACITOR ("102") IN HOLES:

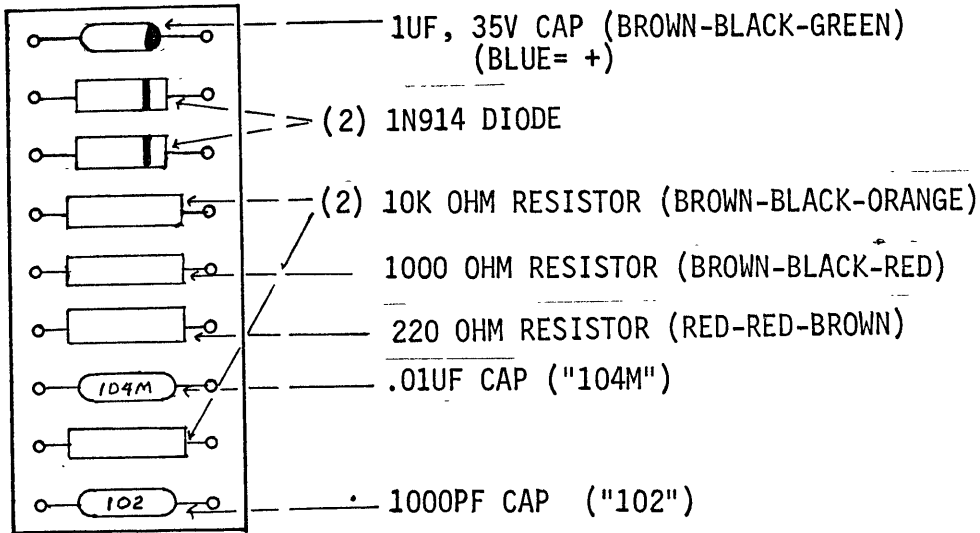
() 7 AND 12

() 8 AND 11

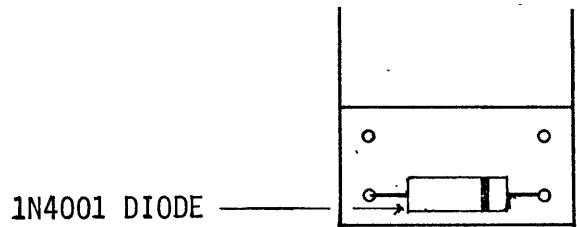
1UF, 35V TANTALUM CAPACITOR (BROWN, BLACK, GREEN- BLUE IS PLUS) IN HOLES:

() 9 AND 10 BLUE GOES TO RIGHT SIDE OF SOCKET

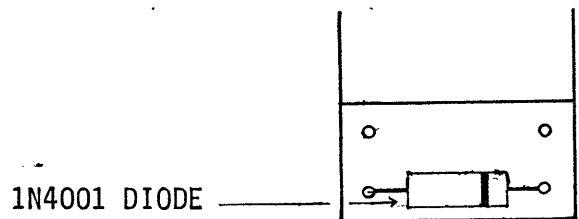
LOCATION C1



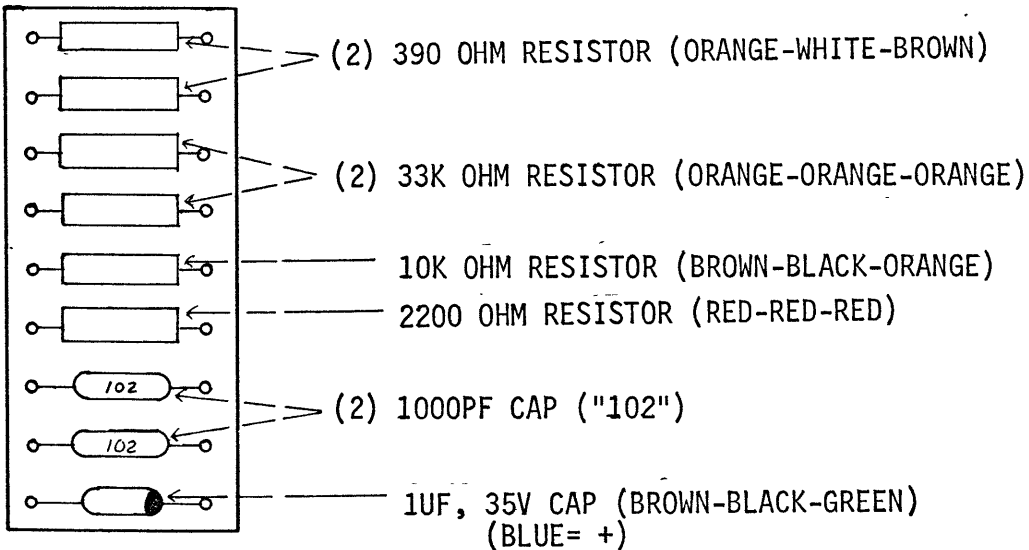
LOCATION D2



LOCATION D3



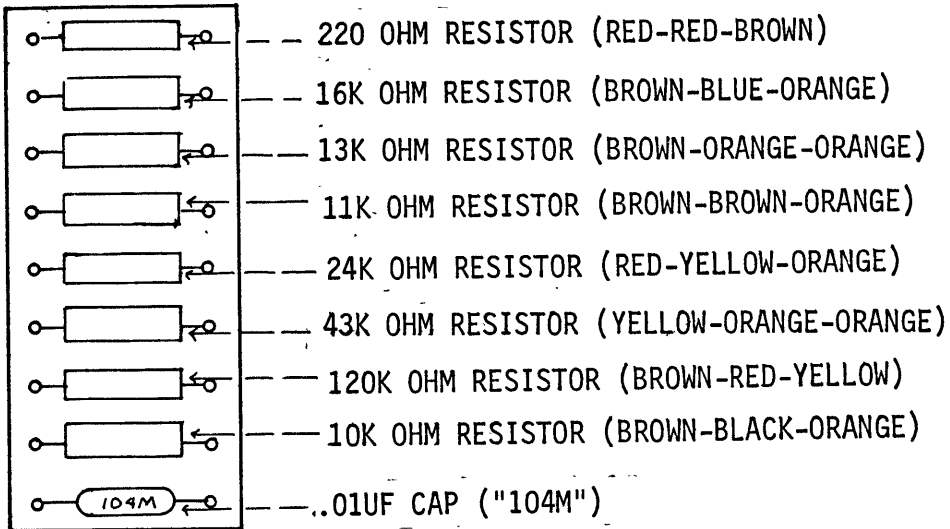
LOCATION D4



LOCATION D5

- () 220 OHM RESISTOR (RED,RED,BROWN) IN HOLES:
1 AND 18
- () 16K OHM RESISTOR (BROWN,BLUE,ORANGE) IN HOLES:
2 AND 17
- () 13K OHM RESISTOR (BROWN,ORANGE,ORANGE) IN HOLES:
3 AND 16
- () 11K OHM RESISTOR (BROWN,BROWN,ORANGE) IN HOLES:
4 AND 15
- () 24K OHM RESISTOR (RED,YELLOW,ORANGE) IN HOLES:
5 AND 14
- () 43K OHM RESISTOR (YELLOW,ORANGE,ORANGE) IN HOLES:
6 AND 13
- () 120K OHM RESISTOR (BROWN,RED,YELLOW) IN HOLES:
7 AND 12
- () 10K OHM RESISTOR (BROWN,BLACK,ORANGE) IN HOLES:
8 AND 11
- () .01UF CAPACITOR ("104M") IN HOLES:
9 AND 10

LOCATION D5



6.4 INSTALLING JUMPER PINS

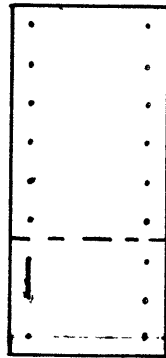
LOCATIONS C6 AND D1 HAVE JUMPER PINS TO VARY READ AND WRITE SPEEDS AND ALLOW FOR THE USE OF VARIOUS CASSETTE PLAYERS.

IF THE CASSETTE MOTORS RUN CONTINUOUSLY AFTER THE MACHINE IS RESET, CHANGE LOCATION D1 TO THE OPPOSITE POLARITY.

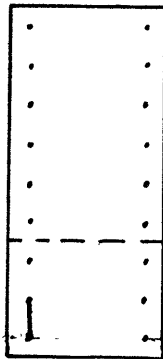
SINGLE EDGE READ IS RECOMMENDED AND HAS THE BEST RELIABILITY.

LOCATION C6

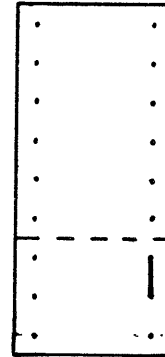
WRITE



300

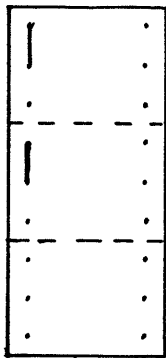


600

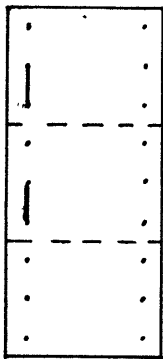


1200

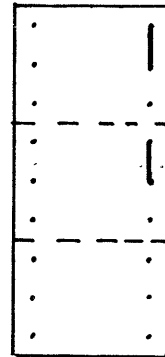
READ - DOUBLE EDGE



300

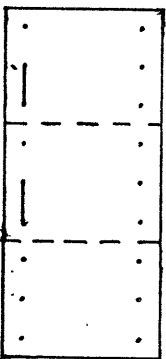


600

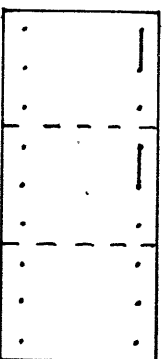


1200

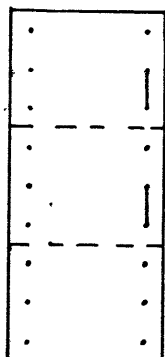
READ - SINGLE EDGE



300



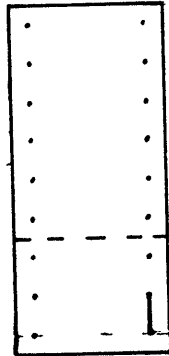
600



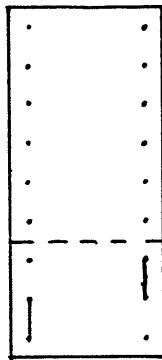
1200

LOCATION DI

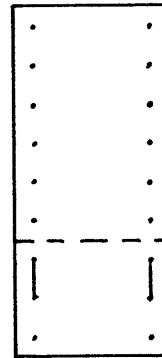
READ-DOUBLE EDGE
EDGE CONTROL



READ-SINGLE EDGE
EDGE CONTROL



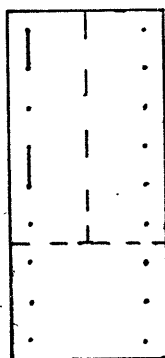
POS



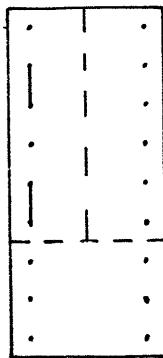
NEG

MOTOR POLARITY

READ CASSETTE

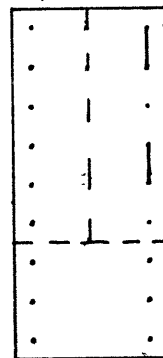


POS

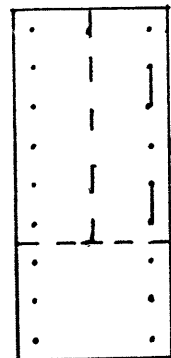


NEG

WRITE CASSETTE



POS



NEG

6.4 INSTALLING JUMPER PINS

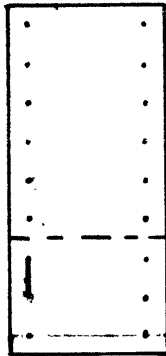
LOCATIONS C6 AND D1 HAVE JUMPER PINS TO VARY READ AND WRITE SPEEDS AND ALLOW FOR THE USE OF VARIOUS CASSETTE PLAYERS.

IF THE CASSETTE MOTORS RUN CONTINUOUSLY AFTER THE MACHINE IS RESET, CHANGE LOCATION D1 TO THE OPPOSITE POLARITY.

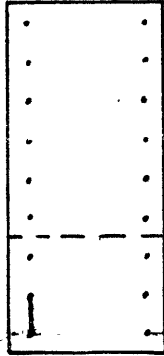
SINGLE EDGE READ IS RECOMMENDED AND HAS THE BEST RELIABILITY.

LOCATION C6

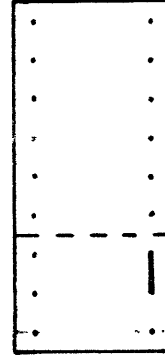
WRITE



300

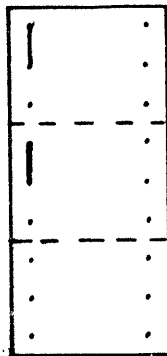


600

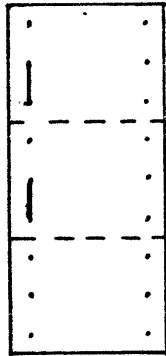


1200

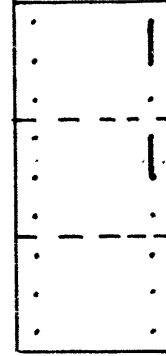
READ - DOUBLE EDGE



300

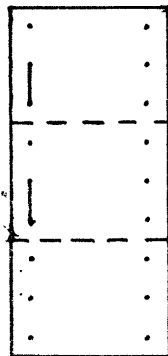


600

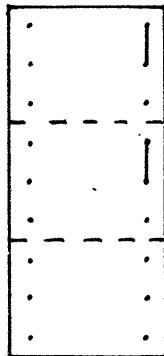


1200

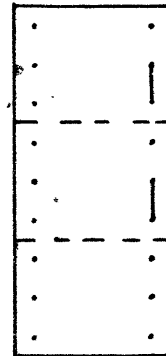
READ - SINGLE EDGE



300



600



1200