A S S E M B L Y I N S T R U C T I O N S

1. Please read and follow all instructions carefully. They are arranged into individual steps of one or more substeps. The steps are ordered to make assembly easier and more reliable. Most steps contain quality assurance guidance which is valid only when the steps are performed in the prescribed order. A good practice is to perform a step, double check it (including all substeps), and then note its completion on the assembly instructions before going on to the next step. This is especially important if the assembly process is interrupted. Each step is important and most problems can be traced to a missed step or one which was not adequately double checked.

2. The components have been purchased in quantity from reliable sources. Occasionally substitutions are made of comparable quality but of different appearance. Errata will be included where a difference impacts the construction process or makes component recognition difficult. Refer to the parts identification list often to avoid mistakes.

3. The assembly procedure involves 15% mechanical assembly, 80% wire-wrapping, and 5% soldering. Required tools include a small Phillips screwdriver, a small straight screwdriver, a small adjustable wrench, a small sharp knife, a wire-wrap tool, a small soldering iron, and less than 6" of 60/40 rosin core solder. If you are not proficient at either soldering or wire-wrapping, refer to the quality assurance examples in their respective manuals. NOTE: The wire-wrap sockets have their pins trimmed to allow for up to three careful wraps. In most cases only two wraps are required. A given wrap should not include more than two turns of insulation to allow for other wraps on the same pin. If you have trouble controlling the number of insulation turns, it is suggested that you try an un-modified wire-wrap tool. You may wish to experiment with some extra wire until you can wrap in a proper and consistent manner. Also, consult the instructions included with your wire-wrap tool for wrap quality guidance.

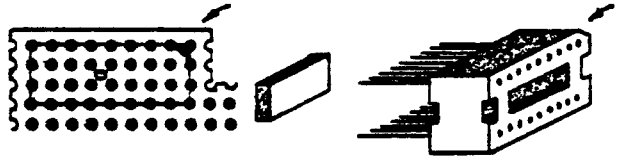
4. Remember to double check each step. It is easy to mis-count pin numbers when wire-wrapping. Although this kit can be assembled in three to four hours by an average experienced kit builder, the monotony of repetitive similar wraps may lead to premature fatigue and wiring errors. Don't rush yourself. Stop and get a sandwich if you feel yourself getting tired or careless. If you have any questions not answered by these instructions, please feel free to call (not collect) Perkins Engineering at (616) 582-9832.

A S S E M B L Y P R O C E D U R E

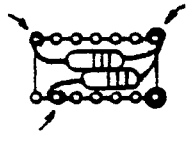
1. Inventory all parts against the parts list to ensure that your kit is complete. Use this opportunity also to familiarize yourself with the parts' appearance so that you can readily recognize and select them as they are called for in the remainder of the procedure.

2. Using a sharp knife or scissors, cut the adhesive foam into 13 ¼"x½" pieces leaving the remainder as one large piece.

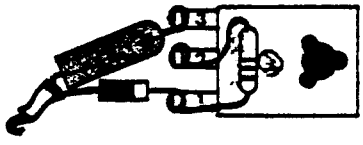
3. Remove the backing material from the ¼"x½" pieces and, using a small screwdriver as a spatula, stick one side of each piece to the center area between the pins of each of the 14, 16, and 18 pin wire-wrap sockets. Insert the sockets into the perforated board from the top in the positions marked on the board. Press the sockets firmly against the board to provide a secure adhesion. The sockets may rock in their places slightly but otherwise should be "stuck" in place. IMPORTANT: ensure that the angle-cut corner of each socket aligns with the angle-marked corner in each position on the board.



4. Locate the two 4700 ohm resistors. Using a small screwdriver as a wire bending guide, bend the leads of one resistor into a "C" shape and the other into an "S" shape. Bend a small loop about ¼" from the body of the resistor in each of the leads. Loop the "C" shaped resistor over pins 14 and 8 of socket B and the "S" shaped resistor over pins 14 and 6 of the same socket B. Solder the resistor leads close to the board at pins 6, 8, and 14.

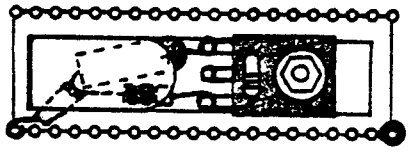


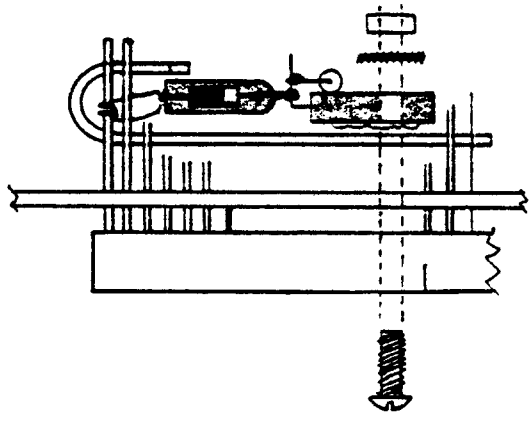
5. Locate the power transistor, the 5.6v Zener diode, the 16 ohm resistor, and the 22uf capacitor. Attach the banded end of the Zener diode to pin 1 of the transistor about 1/8" from the end of the diode. Attach the resistor between pins 1 and 2 of the transistor, laying the resistor across the body of the transistor near the pins. With the diode extending straight away from the transistor's pin end, solder the diode and resistor to pin 1. NOTE: the transistor and diode have short leads and may be damaged by prolonged soldering. Apply just enough solder and heat to cause the solder to flow, then remove the heat quickly. Attach the positive end (rounded end marked with a +) of the capacitor to pin 3 of the transistor, parallel to the diode. The end of the capacitor should be snug against the pin with little or no space between the end of the capacitor and the pin. Bring the non-banded end lead of the diode toward the non-rounded end of the capacitor and bend the capacitor lead close to the capacitor body such that it runs parallel to the diode lead. Slip the ¼" piece of tubing over both leads and slide it on all the way to the base of the capacitor where the lead comes out. Bend a small loop in the two leads at the point where they extend from the tubing and cut off the excess leads.



6. This is the most difficult and critical step in the procedure. Make sure you double check each sub-step carefully. WARNING: carelessness in this step can damage your BLUE RAM and cause overheating of some components. Double check that the diode and resistor have been attached to the pins at the proper end (diode banded end; capacitor + end) as shown above. Install the 40 pin socket through the top side of the perforated board such that the angle-cut corner matches the angle-marked corner on the board layout and the large hole in the socket aligns with the the large hole in the board. Insert the 6-32x½" machine screw through the hole in the socket, through the hole in the board, through the "J" shaped heat sink. Turn the transistor assembly (from previous step) upside down, exposing the metallic area on the back. Cut the corner of the heat-conductive grease and spread it libreally over the metallic area of the transistor, using all of the grease provided. Carefully maneuver the transistor assembly into the heat sink such that the hole in the transistor body aligns with the hole in the heat sink (and the screw) with the transistor in its upright position. When this step is completed the looped wire-tails from the capacitor and diode should be wrapped around the corner pin (pin 20) of the 40 pin connector, the capacitor and diode should be mostly concealed by the "hook" in the heat sink, and the transistor (with pins toward you) should lie along the heat sink with their holes aligned.

7. Slide the screw up through the socket, board, and heatsink, through the transistor, and finally through the lock-washer and 6-32 machine nut. Tighten the nut on the screw only finger tight. Align the heatsink such that it is exactly parallel to the holes in the board and centered with respect to the socket pins. Align the transistor such that it lies directly between the socket pins also. IMPORTANT: ensure that the tubing on the capacitor and diode wire-tails protects the wire-tails from touching the heat sink. Ensure also that the wire-tails wrap around and touch only the corner pin on the socket (pin 20). When all of these assurances have been made, tighten the screw with a screwdriver, being careful that the alignment of the heat sink and transistor with the socket does not change during the tightening process. Again check pin 20 clearance, the wire-tail - heat sink clearance protected by the tubing, and the alignment of the heat sink, transistor, and socket pins. Do not proceed to the next step until this step has been adequately validated after the screw has been tightened.





8. Select four 4½" and one 5" piece of wire and twist one end of each of them together. Make one wrap of the twisted-end bundle around pin 3 of the transistor and cut off the excess wire ends beyond the wrap. Solder the capacitor and the wire bundle to pin 3 of the transistor. Again, do not use too much heat; just enough to make the solder flow over the wires and pin. Select one each of the following wire lengths: 3" 4" 4½" 7½" 7½". Using the wire-wrap tool, make two turns around pin 20 of the 40 pin socket with one end of each wire, cutting off the excess (not wrapped) beyond the wrap. Solder the capacitor and the wires to pin 20, ensuring that ample room is left between pin 20 and pin 19. Pin 20 may be bent away from pin 19 slightly to properly ensure separation. You may unplug your soldering iron now as the following steps consist purely of wire-wrapping. Before you start, make one last inspection of the steps so far. It is extremely difficult to make mechanical changes once a significant amount of wire-wrapping has been done.

9. This and several following steps consist only of wire-wrapping. The steps are broken into several substeps, each of which contain several wire-wraps. The wire-wraps are tabularized into the following format: S(n)-D(n) L" where S=starting socket and pin#; (n)=number of wires on that pin after this one is wrapped; D=destination socket and pin#; L"=overall wire length. EXAMPLE: M15(1)-A32(1) 6" means wrap one end of a 6" wire to socket M pin 15 (where this is the only wire currently there), and the other end to socket A pin 32 (where again only one wire ends up on that pin so far). NOTE: wraps whose starting socket/pin# is either T3 or A20 should use the wires already on those pins from step 8.

T3(5)-A40(1) 4½"	A20(5)-B7(1) 3"
T3(5)-A34(1) 4½"	A20(5)-K9(1) 4"
T3(5)-B14(1) 4½"	A20(5)-N8(1) 4½"
T3(5)-K18(1) 4½"	A20(5)- NOTE: twist the full
T3(5)-L16(1) 5"	A20(5)- length of the 2 7½" wires together except for about 1½" at the end. These will be connected later.

10. Route the 2 remaining 7½" wires along the outside A19 through A1 and on past the double rows of pins on socket D. Other wires should be routed over these wires. In general, wire routing is not critical except that they should stay on the board and not bind too tightly around other pins. Tight binding can cause the insulation to displace and a short circuit to develop. Proceed with the wire-wrapping as follows:

K18(2)-J18(1) 3"	K9(2)-J9(1) 3"
J18(2)-I18(1) 3"	J9(2)-I9(1) 3"
I18(2)-H18(1) 3"	I9(2)-H9(1) 3"
H18(2)-G18(1) 3"	H9(2)-G9(1) 3"
G18(2)-F18(1) 3"	G9(2)-F9(1) 3"
F18(2)-E18(1) 3"	F9(2)-E9(1) 3"
E18(2)-D18(1) 3"	E9(2)-D9(1) 3"
B14(2)-C14(1) 3½"	B7(2)-C7(1) 3½"
L16(2)-M16(1) 3"	N8(2)-M8(1) 3"
M16(2)-N16(1) 4"	M8(2)-L8(1) 3"

This completes the power wiring to all sockets on the board.

11. Proceed with the wire-wrapping as follows: (REMEMBER to count pin numbers carefully)

D1(1)-E1(1) 3"	D2(1)-E2(1) 3"
E1(2)-F1(1) 3"	E2(2)-F2(1) 3"
F1(2)-G1(1) 3"	F2(2)-G2(1) 3"
G1(2)-H1(1) 3"	G2(2)-H2(1) 3"
H1(2)-I1(1) 3"	H2(2)-I2(1) 3"
I1(2)-J1(1) 3"	I2(2)-J2(1) 3"
J1(2)-K1(1) 3"	J2(2)-K2(1) 3"
D3(1)-E3(1) 3"	D4(1)-E4(1) 3"
E3(2)-F3(1) 3"	E4(2)-F4(1) 3"
F3(2)-G3(1) 3"	F4(2)-G4(1) 3"
G3(2)-H3(1) 3"	G4(2)-H4(1) 3"
H3(2)-I3(1) 3"	H4(2)-I4(1) 3"
I3(2)-J3(1) 3"	I4(2)-J4(1) 3"
J3(2)-K3(1) 3"	J4(2)-K4(1) 3"
D5(1)-E5(1) 3"	D6(1)-E6(1) 3"
E5(2)-F5(1) 3"	E6(2)-F6(1) 3"
F5(2)-G5(1) 3"	F6(2)-G6(1) 3"
G5(2)-H5(1) 3"	G6(2)-H6(1) 3"
H5(2)-I5(1) 3"	H6(2(-I6(1) 3"
I5(2)-J5(1) 3"	I6(2)-J6(1) 3"
J5(2)-K5(1) 3"	J6(2)-K6(1) 3"
D7(1)-E7(1) 3"	D8(1)-E8(1) 3"
E7(2)-F7(1) 3"	F8(1)-G8(1) 3"
F7(2)-G7(1) 3"	H8(1)-I8(1) 3"
G7(2)-H7(1) 3"	J8(1)-K8(1) 3"
H7(2)-I7(1) 3"	D10(1)-E10(1) 3"
I7(2)-J7(1) 3"	E10(2)-F10(1) 3"
J7(2)-K7(1) 3"	F10(2)-G10(1) 3"
G10(2)-H10(1) 3"	I10(2)-J10(1) 3"
H10(2)-I10(1) 3"	J10(2)-K10(1) 3"

12. Proceed with the wire-wrapping as follows: NOTE that the wire length changes on this step.

D11(1)-F11(1) 3½"	D12(1)-F12(1) 3½"
F11(2)-H11(1) 3½"	F12(2)-H12(1) 3½"
H11(2)-J11(1) 3½"	H12(2)-J12(1) 3½"
E11(1)-G11(1) 3½"	E12(1)-G12(1) 3½"
G11(2)-I11(1) 3½"	G12(2)-I12(1) 3½"
I11(2)-K11(1) 3½"	I12(2)-K12(1) 3½"
D13(1)-F13(1) 3½"	D14(1)-F14(1) 3½"
F13(2)-H13(1) 3½"	F14(2)-H14(1) 3½"
H13(2)-J13(1) 3½"	H14(2)-J14(1) 3½"
E13(1)-G13(1) 3½"	E14(1)-G14(1) 3½"
G13(2)-I13(1) 3½"	G14(2)-I14(1) 3½"
I13(2)-K13(1) 3½"	I14(2)-K14(1) 3½"
D15(1)-E15(1) 3"	D16(1)-E16(1) 3"
E15(2)-F15(1) 3"	E16(2)-F16(1) 3"
F15(2)-G15(1) 3"	F16(2)-G16(1) 3"
G15(2)-H15(1) 3"	G16(2)-H16(1) 3"
H15(2)-I15(1) 3"	H16(2)-I16(1) 3"
I15(2)-J15(1) 3"	I16(2)-J16(1) 3"
J15(2)-K15(1) 3"	J16(2)-K16(1) 3"
D17(1)-E17(1) 3"	A26(1)-K5(2) 4½"
E17(2)-F17(1) 3"	A27(1)-K6(2) 4½"
F17(2)-G17(1) 3"	A28(1)-K7(2) 5"
G17(2)-H17(1) 3"	A29(1)-K4(2) 4½"
H17(2)-I17(1) 3"	A30(1)-K3(2) 4½"
I17(2)-J17(1) 3"	A31(1)-K2(2) 4½"
J17(2)-K17(1) 3"	A32(1)-K1(2) 4½"
A8(1)-D11(2) 4"	A12(1)-E11(2) 4"
A9(1)-D12(2) 4"	A13(1)-E12(2) 4"
A10(1)-D13(2) 4"	A14(1)-E13(2) 4"
A11(1)-D14(2) 4"	A15(1)-E14(2) 4"

This concludes the wiring of the address and data lines.

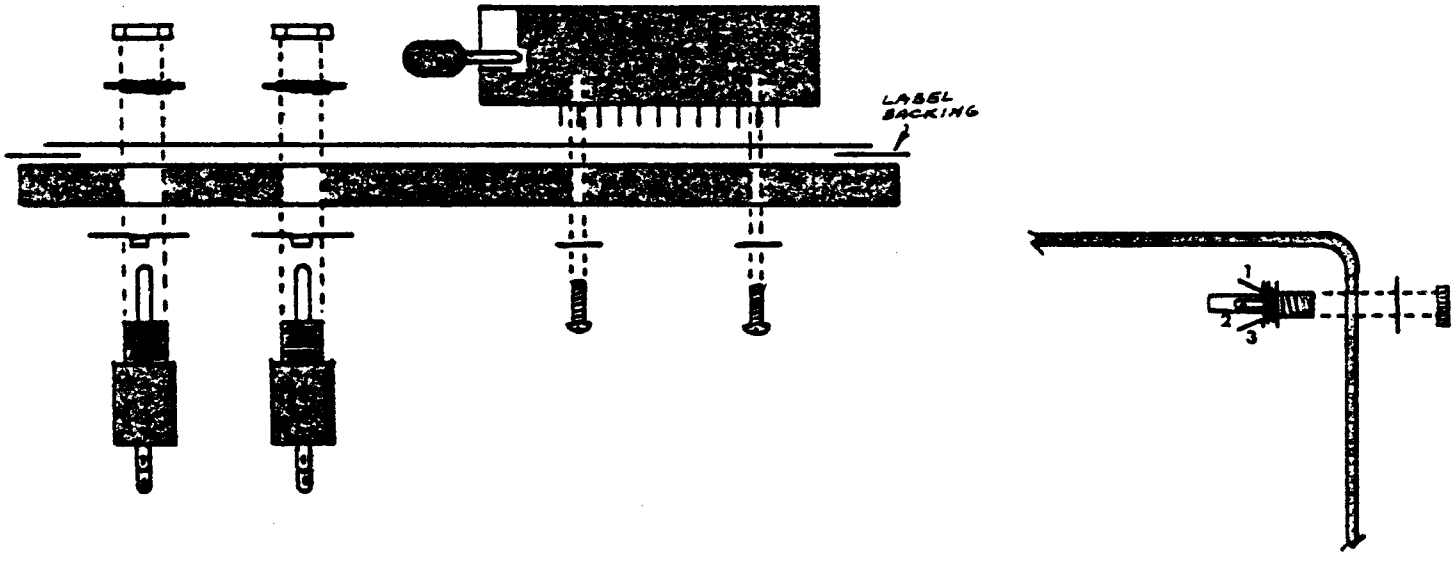
13. Proceed with the wire-wrapping as follows: This step completes the wiring of the logic circuits.

N1(1)-E8(2) 6"	B4(1)-B1(1) 3"
N2(1)-G8(2) 5"	B8(2R)-B2(1) 3"
N3(1)-I8(2) 4"	B4(2)-M7(1) 4½"
N4(1)-K8(2) 3½"	B9(1)-L4(1) 3½"
N5(1)-B5(1) 4½"	B10(1)-L6(1) 4"
B6(1R)-A35(1) 4½"	B12(1)-B13(1) 3"
N12(1)-B8(1R) 4"	M14(1)-K17(2) 3½"
C8(1)-C13(1) 3"	C9(1)-M6(1) 3½"
C10(1)-C11(1) 3"	C3(1)-K10(2) 4"
C2(1)-C6(1) 3"	C4(2)-A38(1) 5"
C4(1)-C5(1) 3"	M12(1)-A33(1) 6"
C12(1)-M9(1) 4"	M15(1)-A32(2) 6"

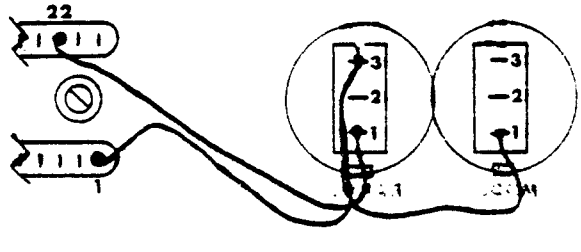
This completes the wiring of the board itself.

14. Warm up your soldering iron again for the final soldering procedure. While it's warming, this step will assemble the remaining components to the box. Remove the backing from the label. Cut the backing material just removed into 3/4" on a side triangles and restick them to the four corners of the label such that about 3/8" of each corner is covered. Hold the label in front of the top of the box and, holding both up to the light, align the label cutouts with the box cutouts and stick the label to the top. Using a small sharp knife, remove the cutouts from the label. Also, cut out the label for the two small holes between the two slots, using light from the back as a guide. Place the ZIF socket on the top of the box such that the pins in the socket extend into the two slots and the handle on the socket is nearest the label box marked "RANGE". Using two 4-40 screws and washers, fasten the ZIF socket to the top by passing the screws through the washers, through the top from the back (non-labeled) side, and into the holes in the socket. Align the socket such that the pins are centered in the slots and tighten the screws. Remove all nuts and washers from both switches. Replace the large flat tanged washer back on each switch with the tang side away from the handle. Insert the switches through the holes in the top of the box from the back with the 2-position switch in the hole marked "RANGE" and the 3-position switch in the hole marked "MODE". Place the lock washer and a nut on each switch from the top side and tighten with your fingers until barely snug, then loosen ½ turn. From the back, align

the tanged washer on each switch such that the tang is toward the nearest edge. Turn the body of the switch, holding the nut on the other side with your fingers, until the switch is both snug and vertically aligned with the tang. Repeat this substep for the other switch. NOTE: it may require several tries to make the switch both snugly installed and vertically aligned. Do not try to tighten the nut or tearing of the label may occur. Install the power jack in the bottom of the box in the rear side hole from the inside. On the outside, install the washer and nut loosely. Align the jack such that the center contact wiper arm is closest to the bottom and tighten the nut. This completes the final component mounting.



15. Initial top component wiring is accomplished in this step. Cut all but 1/8" of the bare wire from each end of a 4" wire and make a small loop in each end. Loop one end through the eyelet of terminal 1 (nearest the tang) of the MODE switch and solder it there. Loop the other end through terminal 3 (farthest from the tang) of the RANGE switch. Wrap one end of a 4½" wire around pin 1 of the ZIF socket. Pin 1 is closest to the lever handle. Cut all but 1/8" of bare wire from the other end and solder it and the existing wire to terminal 3 of the RANGE switch. Wrap one end of 4½" wire around pin 22 of the ZIF socket and, trimming the other end to 1/8", solder it to terminal 1 of the RANGE switch. Route all wires as shown. Cut off the wire ends which would not wrap around the ZIF socket pins (1 & 22).



16. This step wires the components of the top to the board. The connections are shown in tabular form as were the other wire-wrap connections. Where connections are made to the ZIF socket (Z), wires should be first wrapped (3 or 4 turns are sufficient) and then soldered. Where wires are already wrapped, as with pins 1 and 22, use a small screwdriver to make a couple of turns before soldering. Be sure to cut off any loose wire ends to prevent shorting. Connections to the switches should use a similar procedure as described in the previous step. Use only 1/8" of bare wire to form the loop. Route all switch wires over the end nearest the tang. Route all ZIF socket wires toward the end away from the switches. Lay the board upside down (pins up) on top of the bottom of the box top, with the transistor close to the ZIF socket. IMPORTANT: the ZIF socket handle should be in the open position for soldering.

Z24(1)-B1(2) 7½"	Z1(2)-A20(*)
Z23(1)-B13(2) 7½"	Z2(1)-A16(1) 7½"
Z22(2)-A40(2) 5"	Z3(1)-A17(1) 7½"
Z21(1)-A7(1) 6"	Z4(1)-A18(1) 7½"
Z20(1)-A6(1) 6"	Z5(1)-A19(1) 7½"
Z19(1)-A5(1) 6"	Z6(1)-A21(1) 7½"
Z18(1)-A4(1) 5"	Z7(1)-A22(1) 7½"
Z17(1)-A3(1) 5"	Z8(1)-A23(1) 7½"
Z16(1)-A2(1) 5"	Z9(1)-A24(1) 6"
Z15(1)-A1(1) 4½"	Z10(1)-A34(2) 5"
Z14(1)-A39(1) 4½"	Z11(1)-** 7½"
Z13(1)-A20(*)	Z12(1)-** 7½"

*Use wires connected to A20 in step 9.

**These wires will connect later.

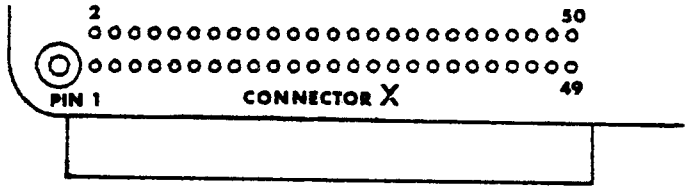
RANGE switch terminal 2(1)-L13(1) 6"

MODE switch terminal 2(1)-C1(1) 4½"

MODE switch terminal 3(1)-C11(2) 4"

Stick the remaining piece of adhesive foam to the center of the under side of the box top. Do not remove the backing material from the exposed side of the foam. This completes the wiring of the components of the top. Place the board directly over the under side of the box top and route all wire slack against the box top. The wires to the ZIF socket and switches should route around the ends of the board in the cutouts provided. Do not bend the wires at their connections too sharply or too much as they are stiff and prone to break off. Double check each connection to ensure that this has not happened.

17. This step completes the wiring of the board to the bottom of the box. Place the box bottom such that the 50-pin connector lies against the long horizontal cutout in the board. Using a similar procedure as with the switch connections, attach and solder a 7½" wire to terminal 2 of the power jack. Wrap the other end around pin 2 (center pin) of the transistor and solder both the wire and the resistor to the pin. Attach and solder a 6" wire to terminal 1 of the power jack. Wrap the other end to L8(2). This completes the soldering; you may unplug your iron again. The remaining connections wire the 50-pin expansion connector (X) to the board to complete all wiring. Again these connections are presented in tabular form with the same format. Note the pin numbering arrangement of the 50-pin expansion connector and verify the correct pin with each wrap. It easy to count incorrectly so be sure to count carefully.



X1(1)-X4(1) 3"
X1(2)-D9(2) 4"
X6(1)-Z11(1) *
X8(1)-Z12(1) *
X9(1)-M13(1) 7½"
X11(1)-A36(1) 6"
X13(1)-M12(2) 7½"
X14(1)-A37(1) 6"
X15(1)-D17(2) 5"
X16(1)-L12(1) 6"
X17(1)-D2(2) 5"
X18(1)-D1(2) 6"
X19(1)-D7(2) 4½"
X20(1)-D3(2) 5"
X21(1)-N13(1) 5"
X22(1)-D4(2) 5"
X23(1)-N14(1) 5"
X25(1)-N15(1) 5"
X26(1)-L15(1) 6"
X27(1)-D15(2) 5"
X28(1)-L14(1) 6"
X30(1)-D16(2) 6"
X31(1)-J14(2) 5"
X33(1)-J13(2) 5"
X34(1)-K11(2) 5"
X35(1)-J12(2) 4½"
X36(1)-D6(2) 6"
X37(1)-K12(2) 5"
X38(1)-D5(2) 6"
X39(1)-K14(2) 5"
X40(1)-J11(2) 4½"
X42(1)-K13(2) 5"
X45(1)-C5(2) 6"
X46(1)-B11(1) 6"
X47(1)-B3(1) 6"
X47(2)-X49(1) 3"

This completes all wiring. Double check the board and other box component connections to ensure that wires are not broken and pins and terminals are not touching each other.

*use the wires connected in step 16.

18. Place the heat vent screen in the bottom of the box. Give the board one more visual inspection for stray wire ends, lead clippings, touching pins, or poorly routed wires which could cause pins to bend together. Route all wires from the 50 pin connector (X) such that they are not tangled in each other and place the board, pin side down, in the box. The pins of the sockets should hold the heat vent screen firmly against the bottom. The top of the box should be open and hanging from its connecting wires. Install the following chips in their sockets:

WARNING WARNING WARNING WARNING WARNING WARNING WARNING

Chips (integrated circuits) of this type are prone to damage from static discharge. When you walk across a new carpet on a cold dry day and touch a doorknob, you often experience an electrical shock from a static charge built up by walking on the carpet. If you were to touch one of these chips instead of the doorknob, the charge you conveyed to the chip would most certainly damage it internally. Even on an average day, a charge may develop from walking on any carpet. Even though this charge is too small to provide a dramatic, visible spark, it can still damage a chip internally. The following precautions will help avoid static discharge from your body into the chips. Install your chips in the kitchen or bathroom. Carry them there in the anti-static packing case in which they arrived. Before touching any of the chips, hold the anti-static packages in one hand and touch your other hand to the water spigot. If you feel that you may have built up a high static charge getting there, wait a few seconds before touching the spigot to avoid the hazard of a shock to you. Re-touch the spigot before handling each chip just to be on the safe side.

Chips are to be installed such that the marked end (usually a notch or deep hole marks this end) is aligned with the same end of its socket as is the angle-cut corner of the socket. NOTE: do not be fooled by the top cap as it is angle-cut at both ends. Check the socket body or the board layout drawing for the actual angle-cut end.

Install a 74LS09 in socket B

Install a 74LS00 in socket C

Install a 74LS42 in each of sockets L, M, and N

If you have access to a volt meter, you may verify the power supply operation at this time. Plug the power pack into the power jack on the side of the box bottom and plug the power pack into the wall. Measure between pins 8 and 16 of chip N (negative lead to 8 and positive lead to 16) for about 5 volts, up to about 5.3 volts. A reading outside this range indicates either an incorrectly wired power section or a component defect. Do not continue until this is resolved!!!

19. Install the remainder of the chips as follows being sure to protect them from static discharge and disconnecting all power:

    Install an INS8154N in socket A

    Install a TMS40L45-45NL in each of sockets D through K

    Plug the power pack into the power jack on the side of the box and plut the plug the power pack into the wall. Place the RANGE switch in the 6K-RAM position and the MODE switch in the AUTO position. Slide the 50 pin connector onto the 50 pin edge connector exposed at the back of your BALLY ARCADE between the #2 and #4 hand controller jacks. NOTE: if your edge connector is not exposed, expose it by removing the rectangular knockout in the back of the case bottom. NOTE also that, when properly installed, the BLUE RAM box should cover the jack for controller #4. Turn on the BALLY ARCADE with the BASIC cartridge installed. The familiar BALLY BASIC should appear. Depress RESET a couple of times to see the same response and verify that the BLUE RAM does not interfere with normal operation. If BALLY BASIC does not appear, unplug the BLUE RAM power pack from the wall and try it again. If the BALLY BASIC now appears, the problem could be a wiring error, a defective chip, pins touching together to form a short circuit. If the BALLY BASIC does not appear, the problem is one of wiring or touching pins. Remove the board and reinspect it for errors. When the BALLY BASIC response comes with the BLUE RAM connected and power applied, the first test has passed and the BLUE RAM DIAGNOSTIC should be run (see the next page).

20. When all diagnostic steps have passed, carefully route the wires connected to the top such that they do not interfere with the box edge or the screw posts of the box bottom. Place the box top on the box bottom (it should feel springy) and, carefully bending back the sticker so as not to leave a crease, slip a screw into each hole and tighten it. Now remove the previously reapplied backing paper from the sticker and press it down against the top everywhere except directly over the screw heads. Pressing there will cause dimples in the sticker. Your BLUE RAM add-on is now complete. See BLUE RAM OPERATION for how to use your BLUE RAM and watch the ARCADIAN for future articles on additional applications.

B L U E R A M D I A G N O S T I C

LOADING: Connect the BLUE RAM and place the RANGE switch in the 6K-RAM position and the MODE switch in the AUTO position. Load the tape in the usual way using :INPUT. The program will auto-start showing BLUE RAM DIAGNOSTIC RUNNING... at the top. Stop the tape, the diagnostic is now running. Disregard the pause after ...TV=82;TV=13. This pause is normal when loading a machine code program segment.

OPERATION: The BLUE RAM DIAGNOSTIC tests all memory and I/O ports in the BLUE RAM. A complete test should take about 15 seconds to perform. If all memory and I/O ports test out OK, the program will print ALL TESTS PASSED at the bottom of the screen. Pressing the "1" key or the SPACE key will start the testing process over. Most any other key will acknowledge the current printed message and continue to the next test step. The only step following ALL TESTS PASSED is the last message END OF TESTS.

ERROR MESSAGES: If an error is detected during testing, an appropriate message will be printed in conjunction with supporting graphics. If the error relates to a memory failure, a picture of the internal board will be shown along with a question mark on the suspect chip or the word BAD on a certain chip. You may see this display by placing the MODE switch in the ROM position to cause an error. If the error relates to an I/O failure, a picture of the ZIF socket will be shown along with an arrow pointing to each bit position in error. You may see this display by connecting a 4.7K ohm resistor between pins 10 and 6 of the ZIF socket. The error should be INPUT HUNG HIGH with the arrow pointing to pin 6. Remember that an entry is required to continue testing as explained under OPERATION: (above). A complete list of error messages follows:

MAY NOT BE CONNECTED indicates that the program cannot get any response from the BLUE RAM. Check to ensure that it is properly connected and power applied. If so, either of the "?" chips may be defective.

CAN'T ACCESS MEMORY indicates that memory cannot properly be written into. Either of the "?" chips may be defective.

DEFECTIVE RAM indicates that the BAD memory chip can be accessed, but fails to accurately respond with test data written into it. The chip(s) are assumed to be defective.

CHECK MODE SWITCH is presented when all write protectable memory appears to be defective. Since this number of failures is highly unlikely, a defect is assumed in the MODE switch circuitry as indicated by the message and "?".

INPUT HUNG HIGH indicates that one or more bits will not fall to zero (as they normally should) when they are configured as input bits. Make sure nothing is connected to the socket which would give this symptom. If not, chip A is defective.

OUTPUT HUNG HIGH indicates that one or more bits will not go low when when they are configured as output bits and driven low. If the socket is clear, chip A is defective.

OUTPUT HUNG LOW is similar to OUTPUT HUNG HIGH except that the bit(s) stay low when being driven high. The defect is the same.

NOTE: If depression of the reset button does not give the normal "BALLY BASIC" response, it will not be possible to run this diagnostic. Wiring defects and chips B, L, M, or N are the most likely problems although certain failures in any of the chips can cause this symptom.