PARASITIC ENGINEERING

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HOW A CLOCK FIX KIT WORKS

A 94618 is a high precision non-retriggerable dual one-shot with temperature compensated schmidt trigger inputs, enable inputs, and complementary outputs. The chip also has a pin-out similiar to a 74123.

2MHz clock pulses from the crystal clock generator are applied to pin 1, the trigger input for the first one-shot. This one-shot fires on the negative going edge of the input. The outputs of this one-shot are $\phi 1$ and $\overline{\phi 1}$. $\overline{\phi 1}$ is connected through a diode to the trigger input, pin 10, of the second one-shot. This input also has a 47pf. capacitor to ground and a 1K resistor to +5v. During $\phi 1$, $\overline{\phi 1}$ is low, this holds pin 10 low through the diode. The diode is a low forward drop type, but it does degrade the noise margin somewhat. Therefore to insure that $\phi 2$ cannot occur during $\phi 1$, $\phi 1$ is connected to the enable input of the second one-shot. This is a complemented input, so, during $\phi 1$ the second one-shot is positively prevented from triggering. At the end of $\phi 1$ the second one-shot is enabled by $\phi 1$ going low. $\overline{\phi 1}$ goes high at this time also, but pin 10 is now isolated from $\overline{\phi 1}$ by the diode. The capacitor holds pin 10, the trigger input, low, until the capacitor can change. This delays the trigger input to the second one-shot.

When the capacitor charges to the threshold of the trigger input, the second one-shot fires and produces $\phi 2$ and $\overline{\phi 2}$. This trigger input has a temperature compensated threshold with hysteresis for stable reliable triggering.

$\overline{\phi 2}$ is connected to pin 2, the enable input of the first one-shot, this prevents $\phi 1$ from occuring until the end of $\phi 2$. This allows the circuit to generate $\phi 1$ and $\phi 2$ even when fed with 6MHz from the crystal oscillator (see Notes On Using The Clock Fix Kit for further details).

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NOTES ON USING THE CLOCK FIX KIT

The Clock Fix Kit replaces the two phase clock generator of an Altair 8800 or 8800a with a reliable stable circuit. The Clock Fix Kit does not change the 2MHz crystal oscillator circuit, which drives the two phase clock generator. This crystal oscillator circuit is fairly reliable, however, if the crystal is weak there is a tendency for this circuit to oscillate at 6MHz (the 3rd overtone). MITS has published (Computer Notes V2:3 p.10) a circuit modification which helps, but does not eliminate the problem. The best solution is a new crystal, but as the crystal ages the problem may reoccur.

The improved Clock Fix Kit will generate correctly timed 2MHz Ø1 and Ø2 with either 2MHz or 6MHz input. The C.P.U. and front panel do not use the 2MHz crystal oscillator, but it is buffered and put on the bus as $\overline{\text{CLOCK}}$. Thus if any of the boards in your system use $\overline{\text{CLOCK}}$, a weak crystal may still cause problems. Boards that use Ø1 or Ø2 for timing will run correctly. Most boards that use $\overline{\text{CLOCK}}$ can probably be modified to use Ø1 or Ø2 instead of $\overline{\text{CLOCK}}$; write to their manufacterers for information on this.

PARASITIC ENGINEERING CLOCK FIX KIT INSTRUCTIONS

Parts list:

1 - 94618 Integrated Circuit

1 - 1K, 1/4 watt resistor (brown-black-red)

1 - 2.7K, 1/4 watt resistor (red-violet-red)

1 - 8.2K, 1/4 watt resistor (gray-red-red)

3 - 47pf ceramic capacitor

1 - 1N270 diode

14" solder wick

Tools needed:

1 pair long nose pliers (4" or larger)

1 pair Diagonal cutters (4" These must be small and sharp)

1 Soldering Iron (35 watt - very important as excessive heat can damage the printed circuit board)

Rubbing alcohol

Short stiff brush (an old tooth brush will work)

Cellophane tape

Sharp knife (4" to 6" blade)

Limited Warranty

All Parasitic Engineering products are warranted against defects in materials for a period of ninety (90) days from date of delivery. During the warranty period, Parasitic Engineering will replace at no charge any components that prove to be defective.

This warranty does not apply to any components damaged by accident, misuse or improper assembly.

No other warranty is expressed or implied. Parasitic Engineering is not liable for any damages to equipment used in conjunction with its products, nor for consequential damages.

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IMPORTANT: Read this first!

The most difficult and delicate step in installing this kit is the removal of parts, particularly IC-Q, from the printed circuit board. If this is not done carefully and gently, the board may be damaged. While our procedure will destroy the parts that are removed, it is the gentlest method available to remove parts from a double sided PC board.

REMEMBER: A damaged PC board is difficult to repair, and quite expensive to replace.

Check off each instruction as you complete it.

( ) Locate IC-Q as shown in figure #1.

( ) Cut the leads of IC-Q as close to the body of the IC as possible. Refer to figure #2. This makes it easier to remove the leads of the IC and clean the holes.

( ) With your long nose pliers, gently grab ahold of an IC lead, then heat the lead with your soldering iron. The lead should pull out as soon as the solder melts. If the leads were bent over on the bottom of the board when the IC was initially installed, it may be necessary to cut the leads off flush with the top of the board, and remove them from the bottom. DO NOT PULL ON THE LEAD BEFORE THE SOLDER HAS FULLY MELTED. THIS COULD BREAK THE PLATING IN THE HOLE.

( ) One at a time, do this to all of IC-Q's leads that are left in the PC board.

( ) Now take the piece of solder-wick provided, and place one end of it on the bottom of the PC board over one of the IC holes you cleared. Apply the soldering iron on top of the solder-wick directly over the hole. See figure #3. After a few seconds the solder should begin to melt, and be sucked up into the solder-wick. After about 10 seconds, remove the soldering iron and solder wick. The hole should now be clear of solder. If a lot of solder is left, then try again using a fresh area of the solder wick. If a small amount of solder is left, but the hole is still plugged, it may be easier to fill the hole with fresh solder and try again.

( ) Repeat this procedure for all 16 of IC-Q's holes, using a fresh area of the solder wick for each hole.

( ) Locate R41, R42 and R43 in figure #1.

( ) Now remove these resistors. Once again, cut their leads as close to the resistor as possible.

( ) Locate C4, C5 and C6 in figure #1.

( ) Remove these capacitors in the same manner.

( ) Remove the 12 leads from the board. Clear the holes as you did with IC-Q.

( ) Clean off the flux, which was deposited on the board, by the solder wick. Use the alcohol and a brush to do this.

IC-Q Installation

(✓) Insert the 94618 IC into the printed circuit where you removed IC-Q. The pins of the 94618 are numbered the same as IC-Q. Be sure to get the IC inserted properly. See figure #1.

(✓) Solder only pins 10 and 11 of the 94618. See figure #4. (Note: figure #4 is a bottom view.) Use the solder sparingly at this time. You will go back and resolder them later.

(✓) Between pins 10 and 11 of the 94618 there is a printed circuit trace. This trace is no longer needed. Again see figure #4. With a knife, carefully cut out a section of this trace between pins 10 and 11 of the 94618. Be sure to cut only this one trace.

(✓) Solder the rest of the pins of the 94618.

(✓) Install one of the 47pf capacitors where you removed C-4. Solder leads and clip off excess.

(✓) Install another of the 47pf capacitors where C-5 was removed. Solder and trim the excess leads.

(✓) Install the 8.2k (grey-red-red) resistor where R-42 was removed.

(✓) Install the 2.7k (red-violet-red) resistor where R-41 was removed.

(✓) Solder these resistors and trim off excess leads. Save one of the leads you cut off for use in the next step.

(✓) Take one of the leads you trimmed off the resistors and install where you removed R-43. Solder and trim off excess leads.

( ) Locate the 3 remaining parts, a 1k (brown, black, red) resistor, a 47pf capacitor and a diode. Refer to figure #5. Cut and form the leads of each part as shown.
Note: The pictures in figure #5 are actual size, and may be used as a cutting guide by laying the parts on top of the outlines.

(✓) Now using a short piece of cellophane tape, tape the resistor to figure #6 so that it is positioned over its outline. Position the tape as shown, away from the end of the resistor with the loop in it.

(✓) Next, insert the non-banded lead of the diode into the loop in the end of the resistor and then tape the diode in place. Again position the tape away from the loop.

(✓) Finally, insert the longer lead of the capacitor through the resistor loop, and tape the capacitor in place.

(✓) Now, carefully solder the three parts together, as shown in figure #6. Then remove the complete assembly from the paper.

(✓) Position the assembly on the bottom of the board under IC-Q, as shown in figure #7.

(✓) Solder the free end of the resistor to the foil that is connected between pin 14 of IC-M and pin 14 of IC-N.

(✓) Solder the free lead of the diode to pin 4 of IC-Q.

(✓) Solder the free lead of the capacitor to pin 8 of IC-Q.

( ) Solder the lead, from the center of the assembly, to pin 10 of IC-Q.

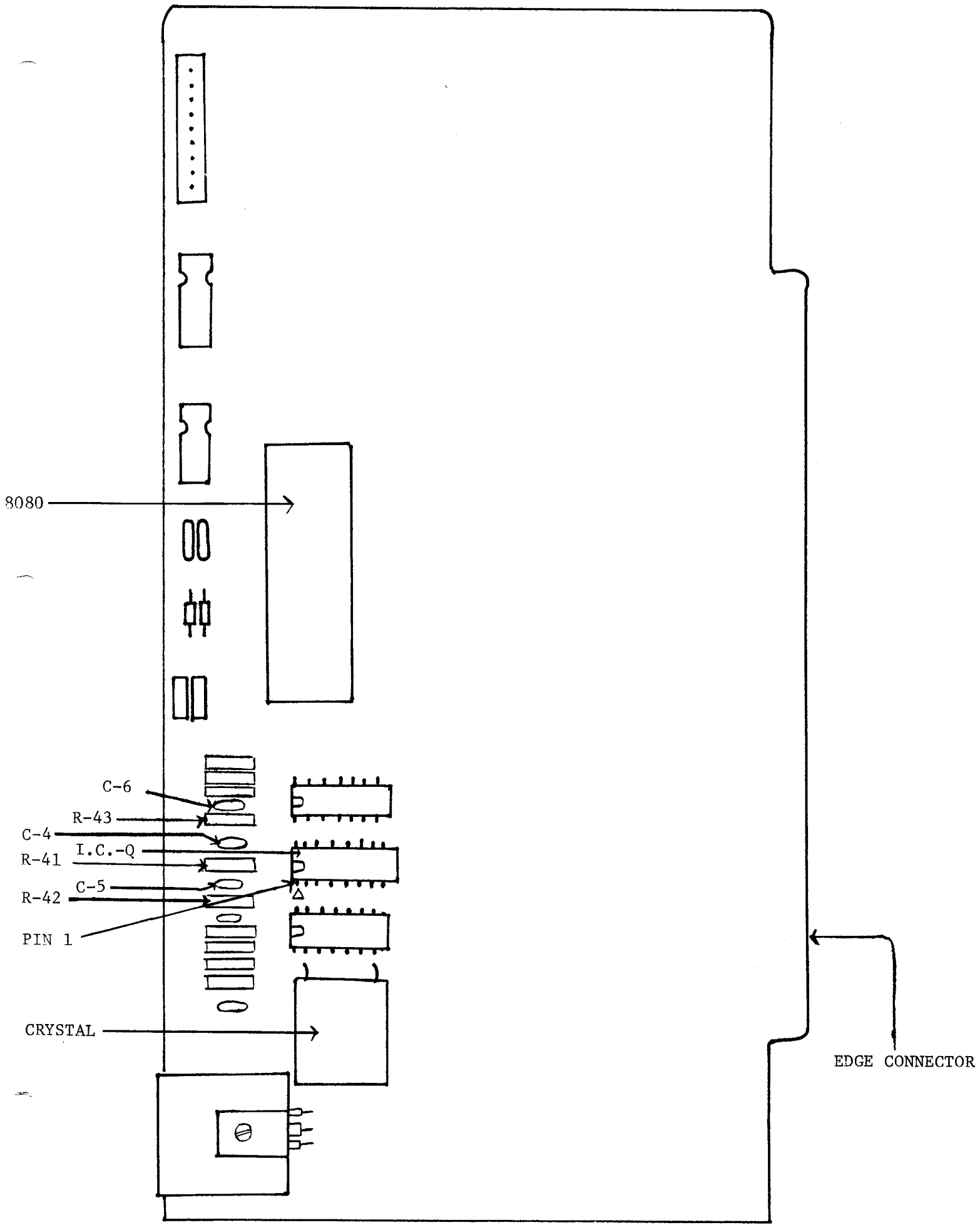
( ) Again use the brush and alcohol to clean off the board.

( ) Insert the new System Clock schematic in your Altair Manual.

This completes the assembly of your clock kit.

TOP VIEW OF THE C.P.U. BOARD

FIGURE # 1



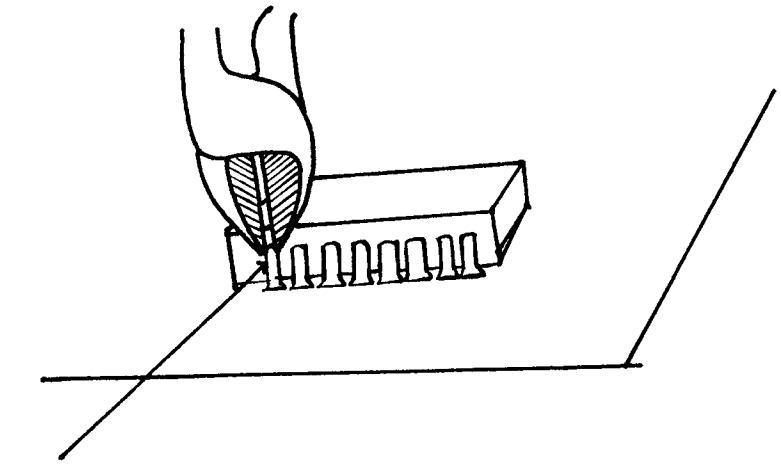


FIGURE # 2

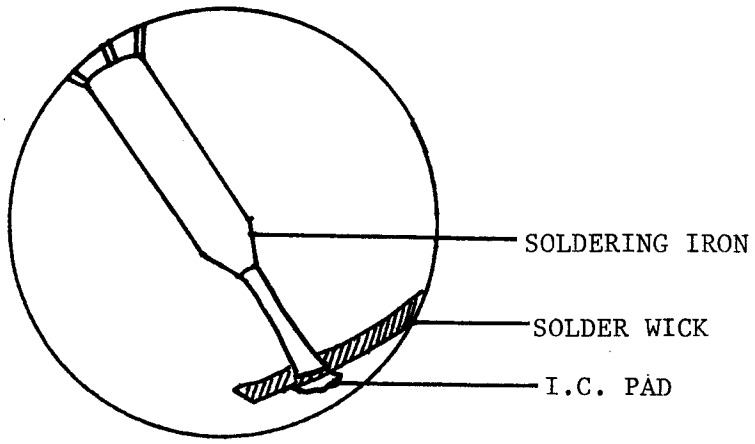
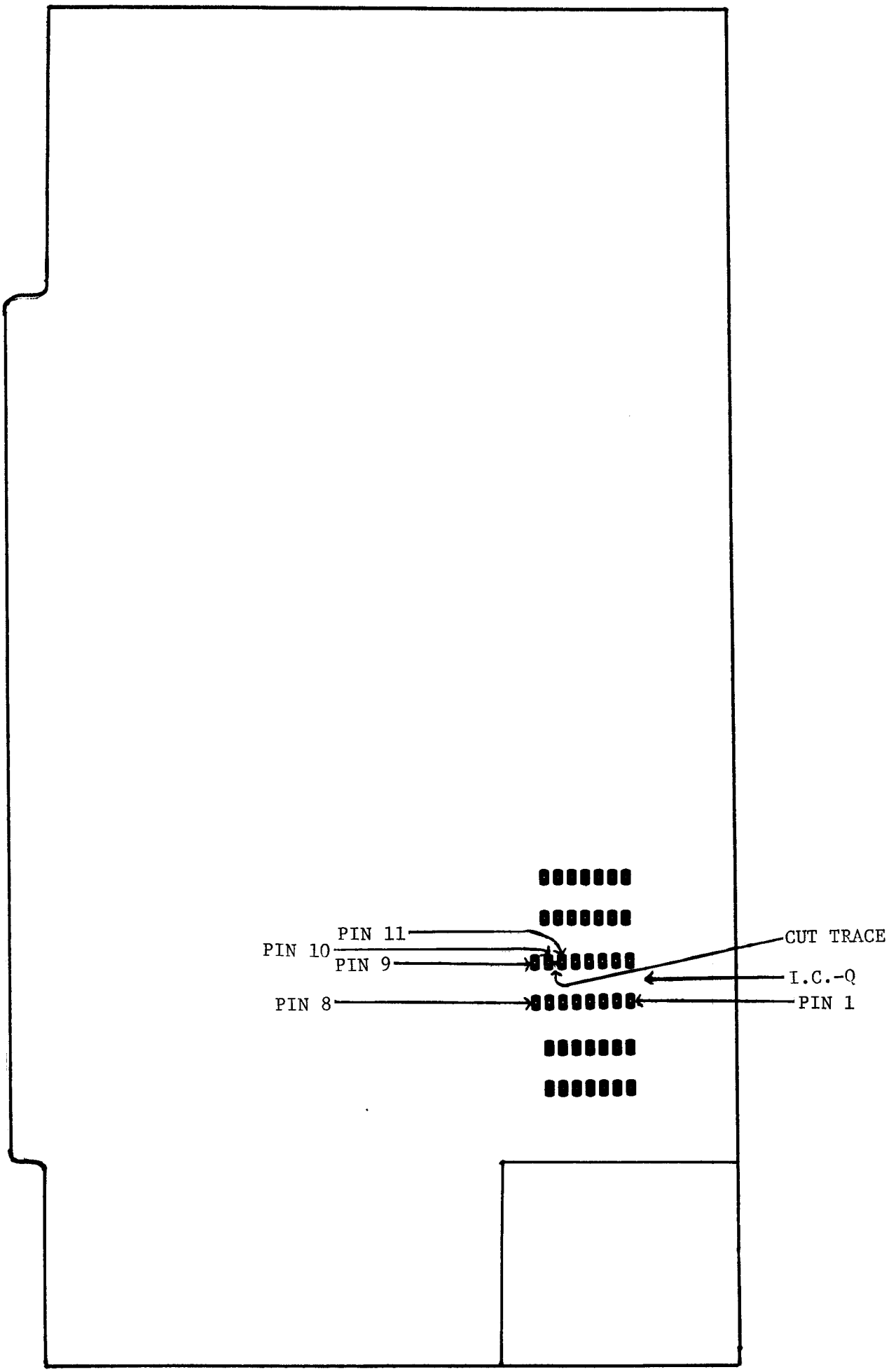
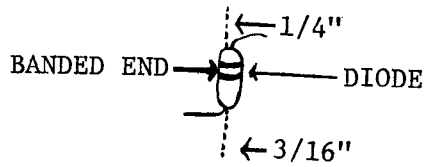


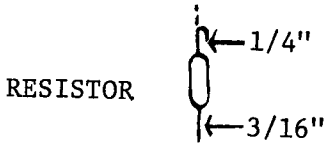
FIGURE # 3

C.P.U. BOARD BOTTOM VIEW

FIGURE # 4







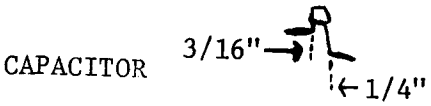


FIGURE # 5

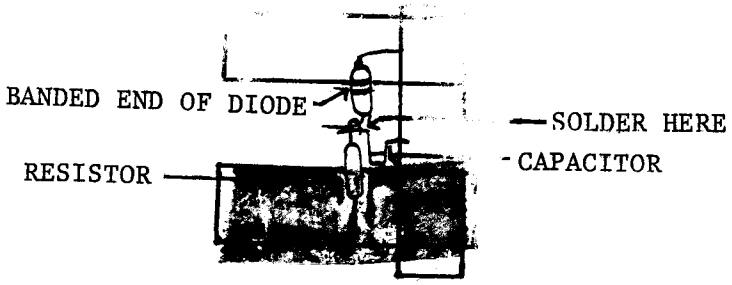
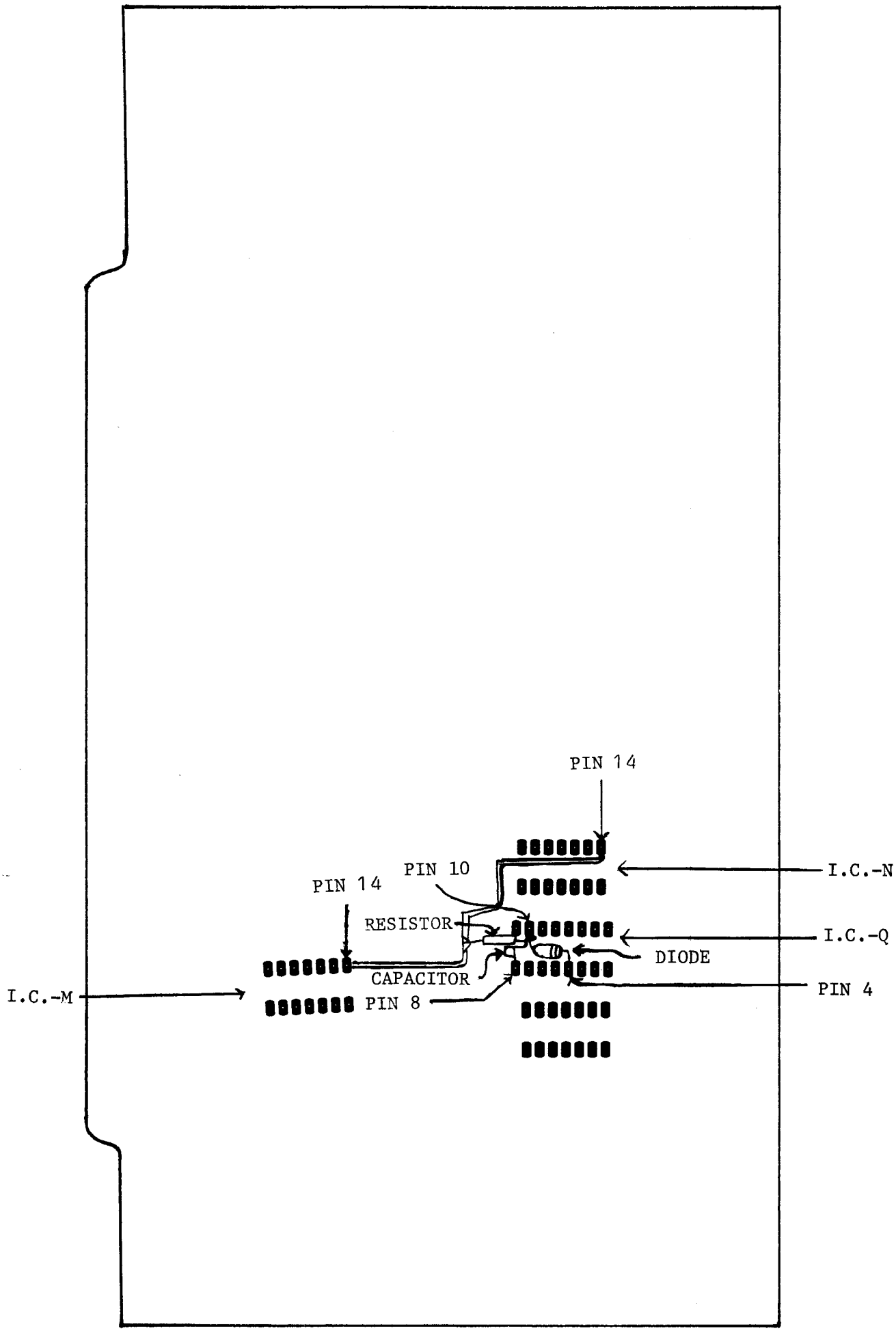
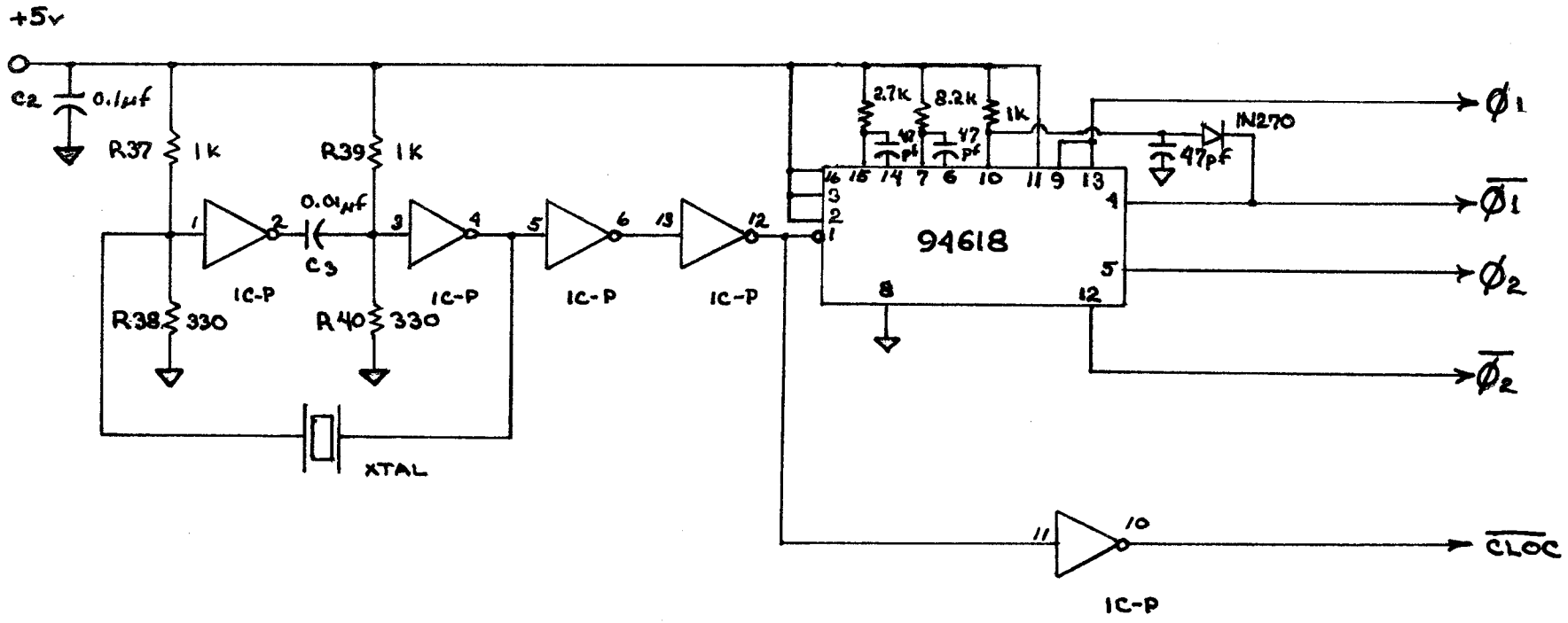


FIGURE # 6

C.P.U. BOARD BOTTOM VIEW

FIGURE # 7





SYSTEM CLOCK

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Addendum to Clock Fix Kit

Dear CFK owner:

We have recently made a slight modification of our clock generator circuit. This change improves circuit performance if the Altair's 2 MHz crystal is weak.

With this improvement we now guarantee that our clock fix kit will produce clock pulses that meet Intel's specifications for the 8080, if the Altair C.P.U. board, on which the clock fix kit is installed, is otherwise functional. If the kit fails to produce correct pulses, we will replace the kit, or refund the purchase price at your option.

Instructions for Clock Fix Kit modification:

( ) Locate pins 2 & 3 of IC-Q on the C.P.U. board. See figure A. Cut the trace between these two pins.

( ) Take the 1" bare wire plus insulation supplied with this addendum. Solder one end of this wire to pin 3 of IC-Q.

( ) Solder the other end of the wire to pin 13 of IC-N.

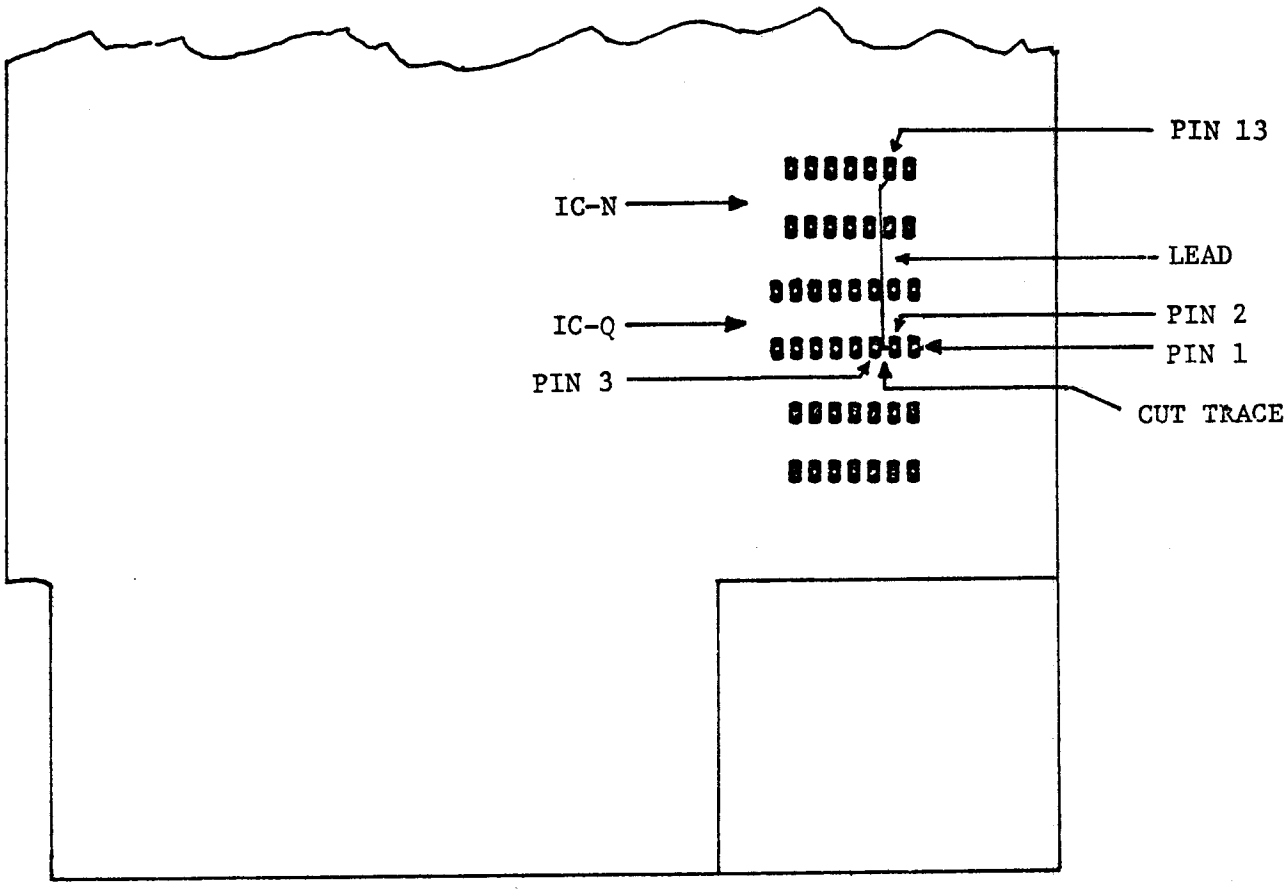
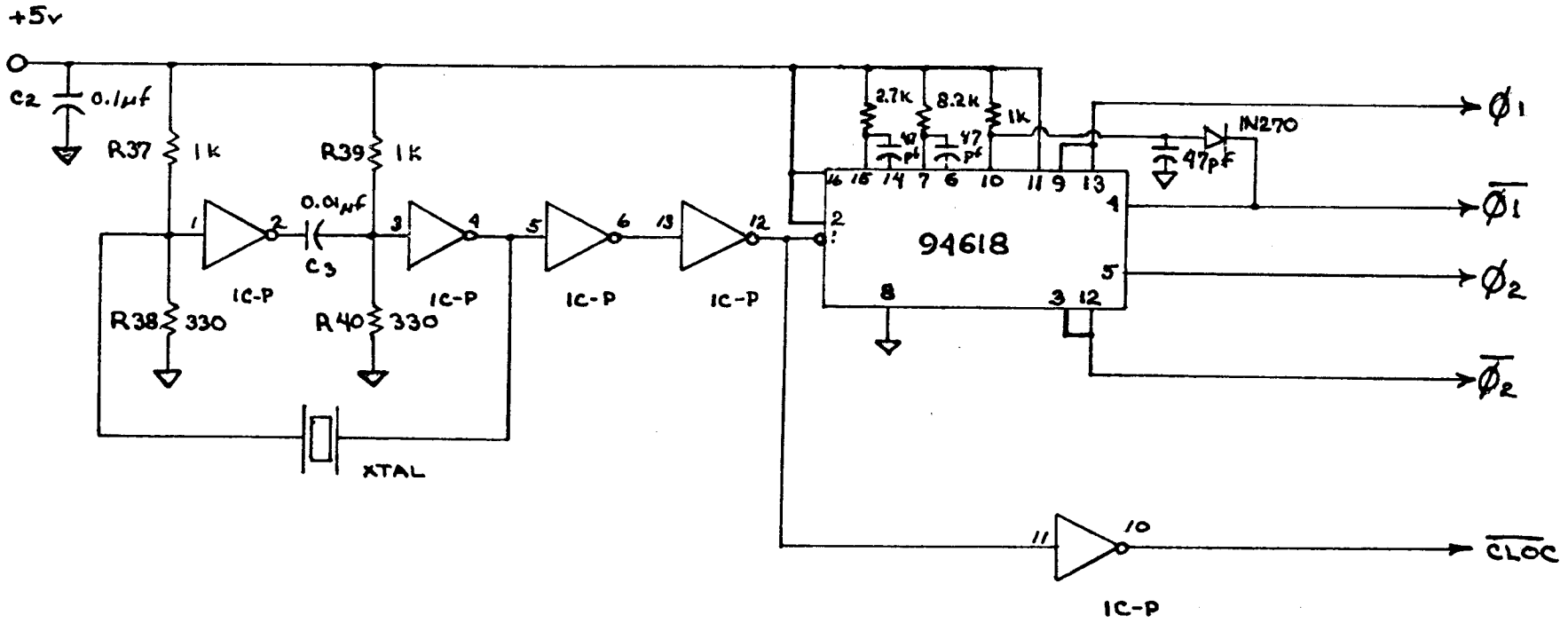


FIGURE A C.P.U. BOARD BOTTOM VIEW



SYSTEM CLOCK