EPROM PROGRAMMER

ASSEMBLY MANUAL

For Revision 3 boards

MANUAL REV 1. 1

EMAC, inc.
EQUIPMENT MONITOR AND CONTROL
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PRIMER TRAINER WARRANTY, RETURN POLICY,
AND LIABILITY DISCLAIMER

I. WARRANTY

This limited warranty is given to you by EMAC Inc.

This warranty extends only to the original customer purchase of the product.

What the warranty covers and how long:
If this product was purchased assembled and is defective in material or workmanship, return the product within one (1) year of the original date of purchase, and we will repair or replace it (with the same or an equivalent model), at our option, with no charge to you. If this product was purchased unassembled and contained defective parts, we will replace the defective part(s) for a period of 30 days from the original date of purchase. Return the product or defective parts to EMAC for replacement.

How to exercise your warranty or obtain service:
You may arrange for service or for warranty repair by obtaining a Return Authorization Number and then shipping your Product to EMAC Inc. There will be no charge for warranty service except for your PREPAID shipping cost to our site. We suggest that you retain the original packing material in case you need to ship your product. When returning your Product to our site, please be sure to include:

1. Name
2. Address
3. Phone Number
4. Dated Proof of Purchase (required)
5. A description of the operating problem
6. Serial Number (if available)

We cannot assume responsibility for loss or damage during shipping.

After we repair or replace (at our option) your Product under warranty, you will be shipped the Product at no cost to you.

What this Warranty does not cover:
This warranty does not cover damage resulting from accidents, alternations, failure to follow instructions, incorrect assembly, misuse, unauthorized service, fire, flood, acts of God, or other causes not arising out of defects in material or workmanship.

What we will not do:
WE WILL NOT PAY FOR LOSS OF TIME, INCONVENIENCE, LOSS OF USE OF THE PRODUCT, OR PROPERTY DAMAGE CAUSED BY THIS PRODUCT OR ITS FAILURE TO WORK OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES.
THIS WARRANTY SETS FORTH ALL OUR RESPONSIBILITIES REGARDING THIS PRODUCT. REPAIR OR REPLACEMENT AT AN AUTHORIZED SERVICE LOCATION IS YOUR EXCLUSIVE REMEDY. THIS WARRANTY IS THE ONLY ONE WE GIVE ON THIS PRODUCT. THERE ARE NO OTHER EXPRESS OR IMPLIED WARRANTIES INCLUDING, BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, FROM EMAC INC.

Other Conditions:
If we repair your product, we may use reconditioned replacement parts or materials. If we choose to replace your product, we may replace it with a reconditioned one of the same or equivalent model. Parts used in repairing or replacing the product will be warranted for one (1) year from the date that the product is returned. Product or parts deemed not defective will be replaced or repaired and shipped at your cost.

State Law Rights:
Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitations may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

PRIMER parts have been carefully packed, but should there be a shortage of parts, wrong parts, or defective parts, EMAC will supply replacement parts at no charge.

MISSING PARTS

If parts are found missing, send us your name, address, and phone number, with the description of the components missing to EMAC within seven (7) days after receipt of the kit, to the address shown below.

EMAC, INC.
P.O. BOX 2042
CARBONDALE, IL 62902

A WORD ABOUT SAFETY

In the following pages, you will assemble the kit for the EPROM programmer. In doing so, you will be using tools that may present a danger of injury to those who are careless. The most prevalent danger is eye injury. You will be using diagonal wire cutters to clip the excess component leads as each component is soldered. The cutters will throw wire bits in all directions as leads are clipped. These lead clippings sometimes achieve high velocity, and may strike your eye. Wearing of safety glasses by you and others present in the room will reduce the risk of injury.

Another hazard may be burns. You will be extensively using a soldering iron, so be careful where you set it down. Make sure it will not roll off the table, as it may fall on your leg, etc, or you may instinctively grab for it as it falls, and burn yourself.

Preferably, do the assembly on a fire-resistant, non electrically conductive surface, such as a Formica table top. Metal benches are fire resistant, but pose a shock hazard when working with electrical devices. Never leave the soldering iron plugged in when unattended. Children or pets may accidently knock it off the table, where it may cause burns or start a fire.

Some of the parts have sharp points. The header connectors used may pierce skin if handled carelessly.

Always work in a well ventilated room, especially when using any cleaning solvents. Practicing simple, sane safety measures will allow you to avoid injury while assembling, testing, and using the PRIMER, or any other electronic assembly.

EPROM PROGRAMMER KIT ASSEMBLY PROCEDURE

Introduction

One important phase of microprocessor program development is EPROM PROGRAMMING, where code developed for a specific application is "burned" into an Erasable Programmable Read Only Memory (EPROM). The EPROM retains a permanent copy of the required microprocessor program code, which will not be lost in the absence of power. A Programmed EPROM chip may then be installed into the target microprocessor system, and provide the instructions the target system will execute.

The EMAC EPROM PROGRAMMER board is part of the EMAC's standard SBC (Single Board Computer) line, but is readily adaptable for use with the training systems such as the UNIVERSAL TRAINER and PRIMER TRAINER as well. This board is a bus expansion peripheral, with it the user may extend the capabilities of both the host computer to include the EPROM programming function.

The EPROM programmer board may be plugged onto the host trainer or SBC when EPROMs are to be programmed as required, or it may be installed permanently to a specific host to create a multipurpose EPROM PROGRAMMER UNIT.

General Assembly Tips

Soldering is an essential operation used in almost all electronic assembly. It is a process that bonds metals together both physically and electrically. In the case of PCB (Printed Circuit Board) assembly, solder is used to bond the leads of various electronic components to the PCB, which provides the interconnections between the components. Soldering is a basic skill to be mastered, a good way is to practice with scrap PCBs salvaged from discarded electronic devices before attempting to solder on something new and valuable.

Soldering requires a heat source, usually supplied by a tool called a soldering iron. The common soldering iron is an electric heating element powered by wall current, with a copper tip used to transfer heat to the metals to be soldered. Soldering irons come in many sizes, with power ratings from a few watts to 450 watts or more. For electronic soldering purposes, a small soldering "pencil" with a power rating from 20 to 35 watts will be ideal. This type of soldering iron is readily available at most consumer electronic stores.

Solder is required to make the connection, and there are many types of solder available, each with special alloys to perform various types of soldering jobs. For electronic work, a 60/40 alloy of lead and tin solder, with an activated rosin flux core built in, is the most commonly used type.

Solder flux is a chemical that blocks the penetration of oxygen into the solder joint as it is heated. It has a light cleaning action, but it cannot remove dirt or scale. It is traditional to use rosin core solder when assembling electronic circuitry, because the flux is automatically delivered to the connection by the solder as it is melted in place, thus eliminating the need to "paint" flux onto the solder connection prior to soldering.

Later, when the board assembly is completed, it is recommended for appearance's sake that the board be cleaned up to remove unsightly solder flux residues. Toward that end, a solder with an easy cleaning flux is recommended. ALPHA METALS (tm) "PURE CORE" solder, is the type we use at EMAC to assemble our PCB's. This solder has a water soluble flux core that easily washes away with plain water. That, or an equivalent solder will be the best kind to use, if you can get it.

Solder with a rosin flux built in is readily available at the same consumer electronic stores the soldering iron is purchased from. **Be aware not to use acid core solder or acid fluxes, as they are intended for mechanical, not electrical bonding. Acid fluxes will attack and eventually ruin electronic circuitry.**

Some components such as IC sockets will be "tack" soldered into place initially, and "finish" soldered later. Tack soldering consists of partially soldering one or two leads of a multi-leaded component, so that is may be held temporarily in place. This permits the part to be somewhat moveable by re-heating the tacked solder joints, and then simultaneously pushing the part around with a free hand, to permit the part to be positioned exactly.

Tack soldering also permits several parts to be installed and tacked, so they will not fall out of place as the board is handled. After several parts have been installed, all tacked components may then be finish soldered.

Components with flexible leads such as resistors and capacitors do not require tacking, as the leads may be spread apart after the component is installed, and the leads will hold the part in place.

All completed solder connections should just fill the solder pad feedthrough hole and component lead. The connection should resemble the slope of a volcano, a sloping mound rising from the solder pad up to a point, which will be the remaining component lead. The connection should be shiny bright. A solder joint with a crystalline appearance is a bad connection, probably the component lead moved while the solder cooled. It should be re-heated, and possibly a bit more solder may be fed to it, to clean the connection up.

Sometimes, if a component lead is severely oxidized, the solder will form a doughnut shape around the lead, but will not bond with it. This soldering failure must be corrected, as the lead may not be electrically connected. Cutting the lead flush to the soldering pad surface will expose new and clean component lead. By feeding solder to the new joint as it is heated, it should bond correctly.

Excess component lead should be clipped off after soldering. IC socket leads are usually fairly short, so they usually do not require trimming, but resistor and capacitor leads are quite long, and must be clipped. Using diagonal cutters, clip the lead so it ends at the top of each solder "volcano". Diagonal cutters are also a common electronic assembly tool, and will also be available at the same consumer electronic stores that carry solder and soldering irons.

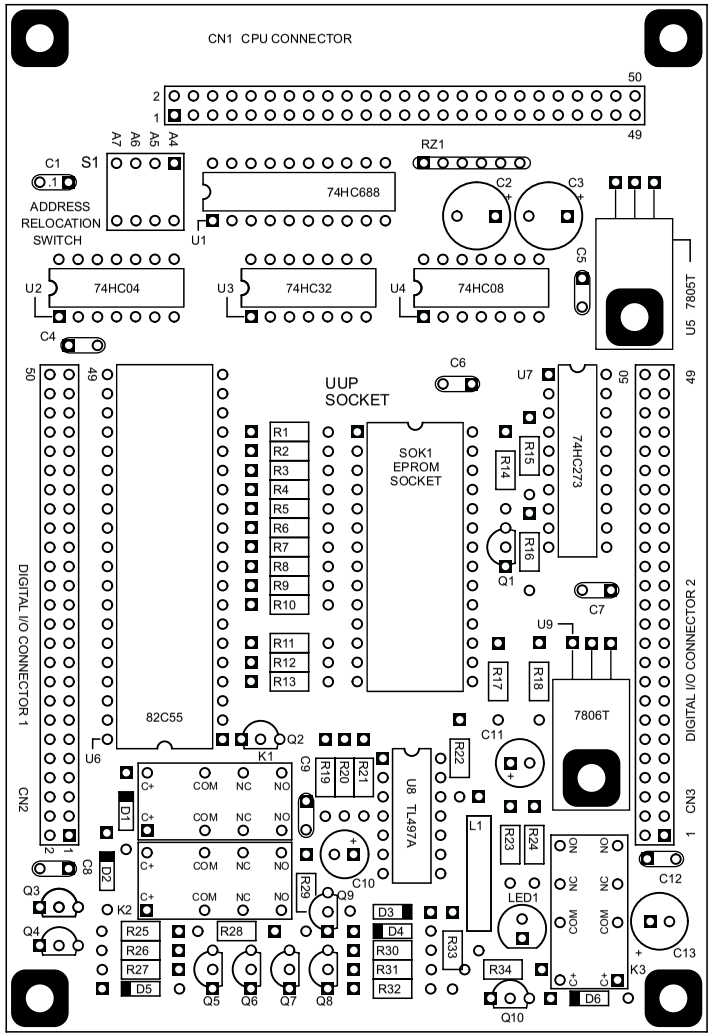
Occasionally, solder will bridge between two or more solder pads during assembly. These are called solder shorts, and must be removed. Simply touching the solder iron tip to the short, and pulling it away will usually remove the short. Wipe excess solder from the soldering iron tip and repeat as necessary to eliminate the short.

When a part has been installed in the wrong location, or is installed backwards, etc., and has also been fully soldered, desoldering techniques must be employed to remove the solder blob(s) so the part may be removed and the problem corrected.

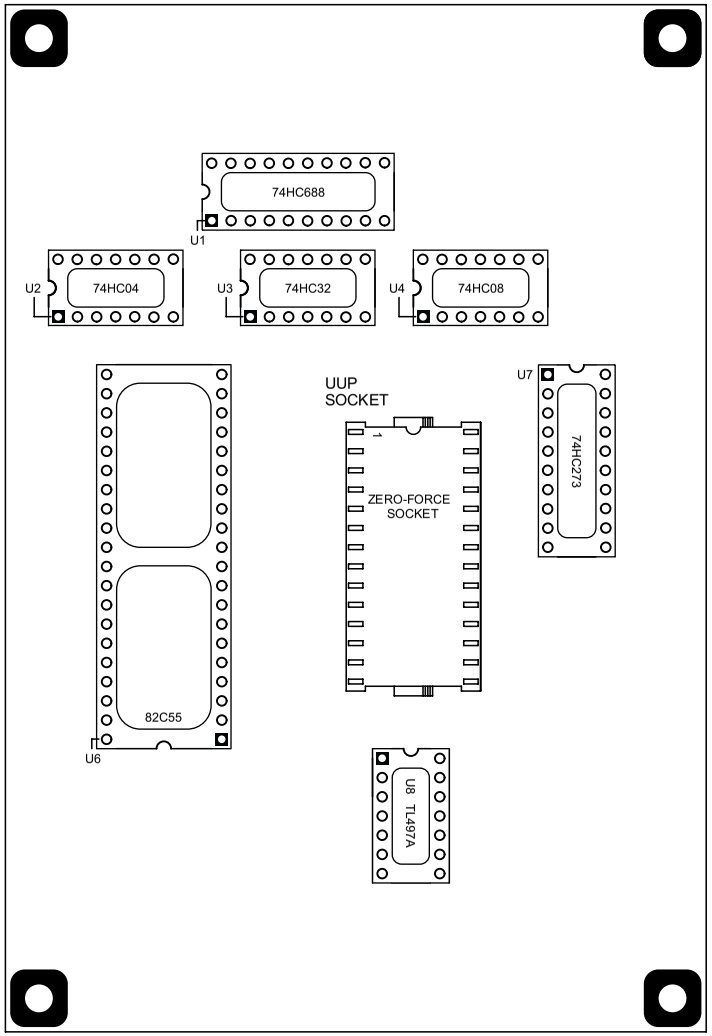
This may be accomplished with the aid of solder wick(tm), which may be applied to the solder blob to be removed, and heated. The solder wick will suck up the hot solder like a sponge. Alternatively, a bulb type solder sucker may also be used to suck hot solder as well.

Solder wick and solder sucker tools are also commonly available at most consumer electronic stores.

EPROM PROGRAMMER ASSEMBLY PHASE 1 -- I.C. SOCKET INSTALLATTION



APPEARANCE BEFORE STEPS 1A THROUGH 1H
PCB SILKSCREEN AND PADS



COMPONENTS INSTALLED THIS PHASE

Assembly Phase 1. IC Socket installation.

The kit form EPROM PROGRAMMER employs sockets for all ICs, so the chips may be removed and re-installed easily if required for trouble shooting purposes.

Referring to the illustration on the facing page, you will see drawings of the board's appearance before the assembly steps are executed. The adjacent drawing depicts which components will be installed during this phase. The left drawing is that of a blank EPROM PROGRAMMER board, showing the silkscreen layout and PCB pad holes. The copper tracks are removed for clarity. All components are to be installed on the component side of the board.

Assembly start.

( ) 1A. Install a 40 pin socket, (02-0010) at location U6. Observe the notch on the PCB silkscreen, and install the socket so it faces the same direction. Tack solder the socket into place, as described previously in the general assembly tips section.

( ) 1B. Install a 20 pin socket (02-0014) at location U1. Orient properly, then tack solder into place.

( ) 1C. Install a 20 pin socket (02-0014) at location U7. Orient properly, then tack solder into place.

( ) 1D. Install a 14 pin socket (02-0017) at location U2. Orient properly, then tack solder into place.

( ) 1E. Install a 14 pin socket (02-0017) at location U3. Orient properly, then tack solder into place.

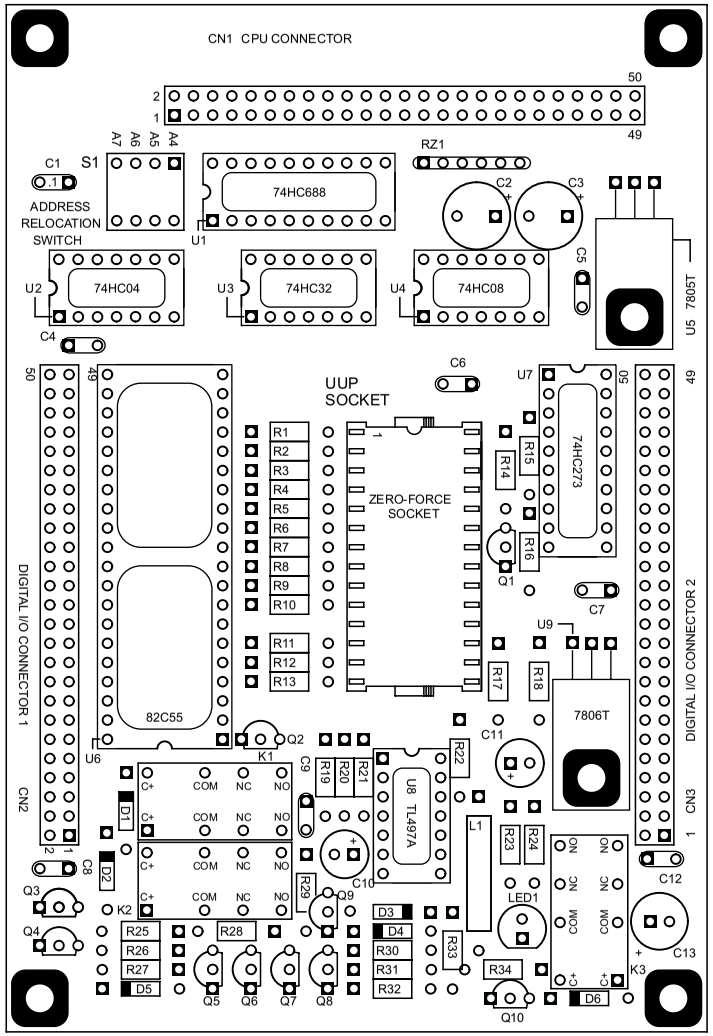
( ) 1F. Install a 14 pin socket (02-0017) at location U4. Orient properly, then tack solder into place.

( ) 1G. Install a 14 pin socket (02-0017) at location U8. Orient properly, then tack solder into place.

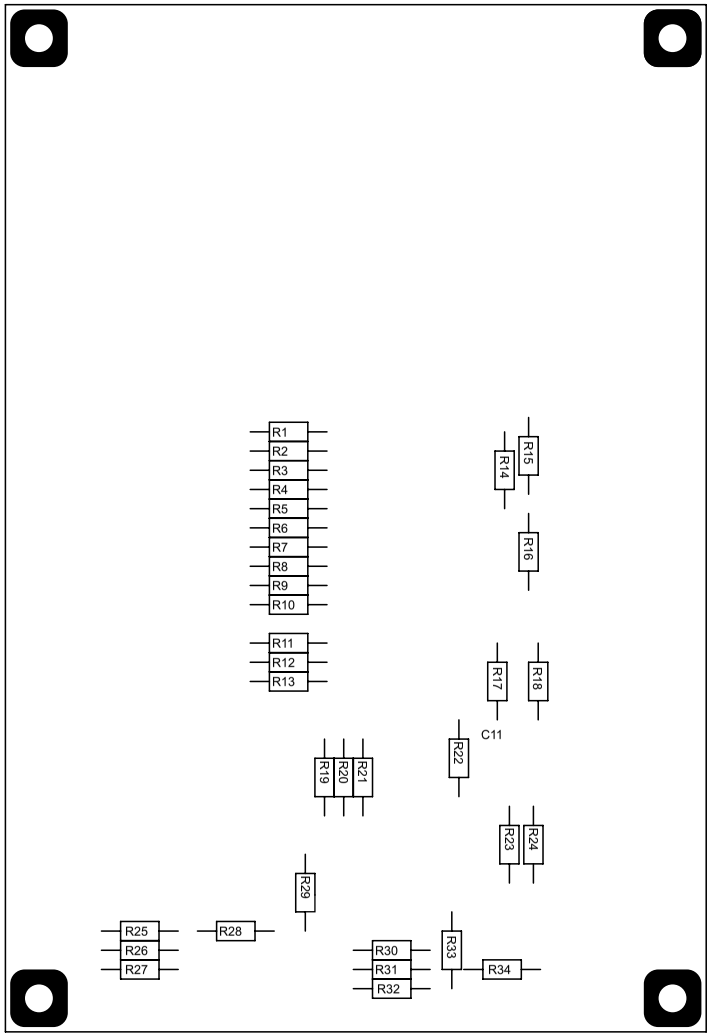
( ) 1H. Finally, install the 28 pin socket zero-force socket, (02-0035) at the "UUP SOCKET" location. This socket has a handle on it that permits the part to be locked or unlocked, and it's appearance may vary from the illustration. As before, be careful to install it with the proper orientation, and tack solder into place.

With the sockets installed, please carefully check that they are correctly aligned with their silkscreen outlines. If a socket is installed backwards, or is not seated flat against the PCB, correct it now. Once satisfied all the sockets are properly installed, you may now finish soldering all of the IC socket leads at this time.

EPROM PROGRAMMER ASSEMBLY PHASE 2 -- RESISTOR INSTALLATION



APPEARANCE BEFORE STEPS 2A THROUGH 2K
PCB SILKSCREEN, PADS, AND PHASE 1 PARTS



COMPONENTS INSTALLED THIS PHASE

Assembly Phase 2. Resistor installation.

To install a resistor, bend the leads at right angles to the part, with both leads pointing in the same direction. Then insert the leads into the appropriate component pad holes as indicated, from the component side of the PCB. Snug the resistor down flat to the PCB by pushing down with a finger. When the part is satisfactorily installed, spread the leads apart from one another, to secure it in place temporarily. The leads may now be soldered, or you may prefer to install more resistors and then solder a group of them. After soldering, clip the excess leads with a pair of diagonal cutters. Resistors are not polarized, so they may be installed without regard to polarity.

Install the following resistors:

( ) 2A. Install a 1 ohm 1/4 W resistor (10-0001) at location R22.

( ) 2B. Install a 470 ohm 1/4 W resistor (10-0065) at nine locations, ( )R1, ( )R2, ( )R3, ( )R4, ( )R5, ( )R6,( )R7, ( )R8, and ( )R23.

( ) 2C. Install a 680 ohm 1/4 W resistor (10-0069) at location R24.

( ) 2D. Install a 1 Kohm 1/4 W resistor (10-0073) at four locations, ( ) R17, ( ) R18, ( ) R27, and ( ) R34.

( ) 2E. Install a 3 Kohm 1/4 W resistor (10-0084) at two locations, ( )R11 and ( )R14.

( ) 2F. Install a 4.7 Kohm 1/4 W resistor (10-0089) at four locations, ( )R12, ( )R16, ( )R26, and ( )R32.

( ) 2G. Install a 10 Kohm 1/4 W resistor (10-0097) at seven locations, ( )R9, ( )R10, ( )R13, ( )R15, ( )R28,( )R31, and ( )R33.

( ) 2H. Install a 15 Kohm 1/4 W resistor (10-0101) at location R30.

( ) 2I. Install a 100 Kohm 1/4 W resistor (10-0121) at two locations ( )R25, and ( )R29.

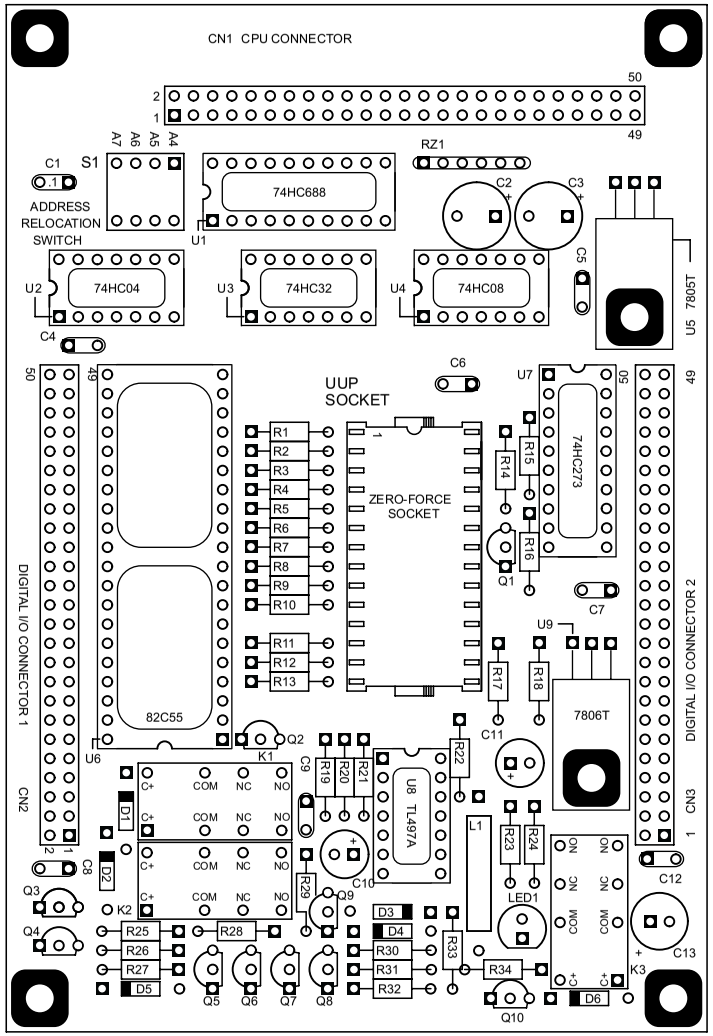
( ) 2J. Install a 1.21 Kohm 1/4 W resistor (10-0401) at location R21.

( ) 2K. Install a 20.0 Kohm 1/4 W resistor (10-0518) at location R20.

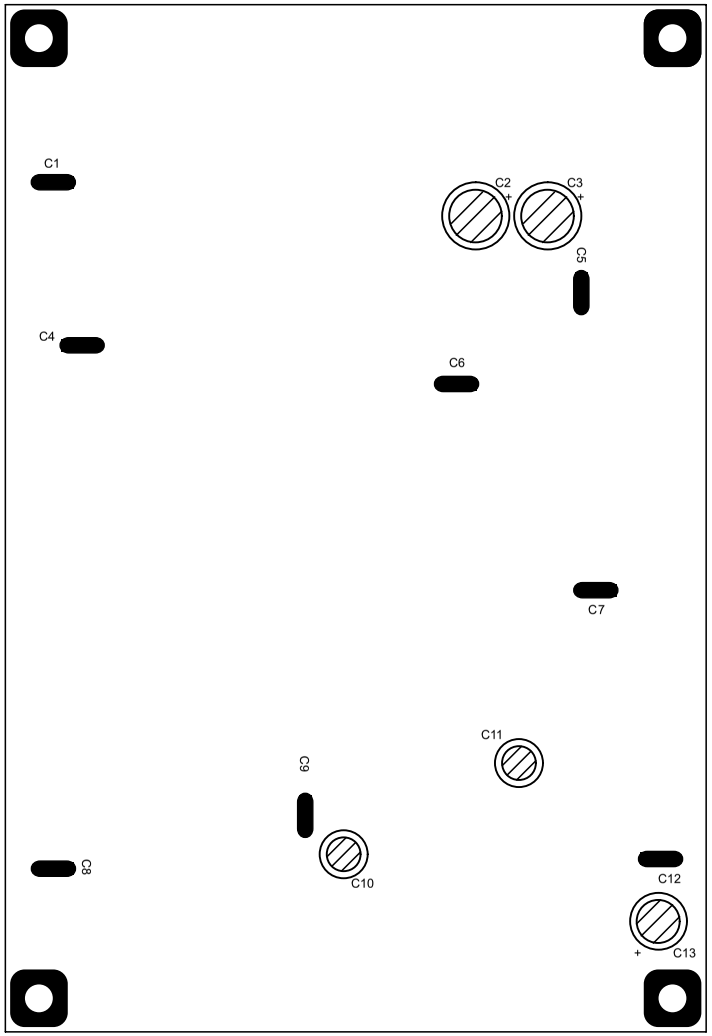
( ) 2L. Install a 24.9 Kohm 1/4 W resistor (10-0527) at location R19.

At this time, carefully check over the resistor installation, to be sure the resistors are installed into the correct locations. Solder and clip excess leads on all resistors.

EPROM PROGRAMMER ASSEMBLY PHASE 3 -- CAPACITOR INSTALLATION



APPEARANCE BEFORE STEPS 3A THROUGH 3G
PCB SILKSCREEN, PADS, AND PREVIOUS PARTS



COMPONENTS INSTALLED THIS PHASE

Assembly Phase 3. Capacitor installation.

The capacitors used in this assembly radial leaded parts. There are some polarized, and some non-polarized capacitors employed. Ceramic disc and monolithic capacitors are non-polarized, and may be installed without regard to polarity, as the resistors were. Electrolytic capacitors, however, must be connected to circuit points with matching DC potentials, or the part will fail, and may in some cases damage the circuit as well.

The electrolytic capacitors have polarity markings which denote which lead is positive, and which one is negative. The PCB silkscreen has a "+" marking to denote which PCB pad the capacitor's positive lead should go into. After installation of the part, snug it down close to the PCB as before, however these parts will stand vertically instead of laying down flat. Once the capacitor is installed and snugged down, spread the leads apart to hold the part in place until you solder it.

( ) 3A. Install a 470 pF ceramic disc capacitor (09-0042) at location C9.

( ) 3B. Install a .1 uF monolithic capacitor (09-0550) at seven locations, ( )C1, ( )C4, ( )C5, ( )C6, ( )C7, ( )C8, and ( )C12.

Note: Save some wire scraps from the .1 uF capacitors, they will be used later.

( ) 3C. Install a 47 uF, 16 Volt electrolytic capacitor (09-0803) at location C11. This is a polarized part, be sure to install correctly.

( ) 3D. Install a 220 uF, 16 Volt electrolytic capacitor (09-0805) at location C3. This is also a polarized part, be sure to install it correctly.

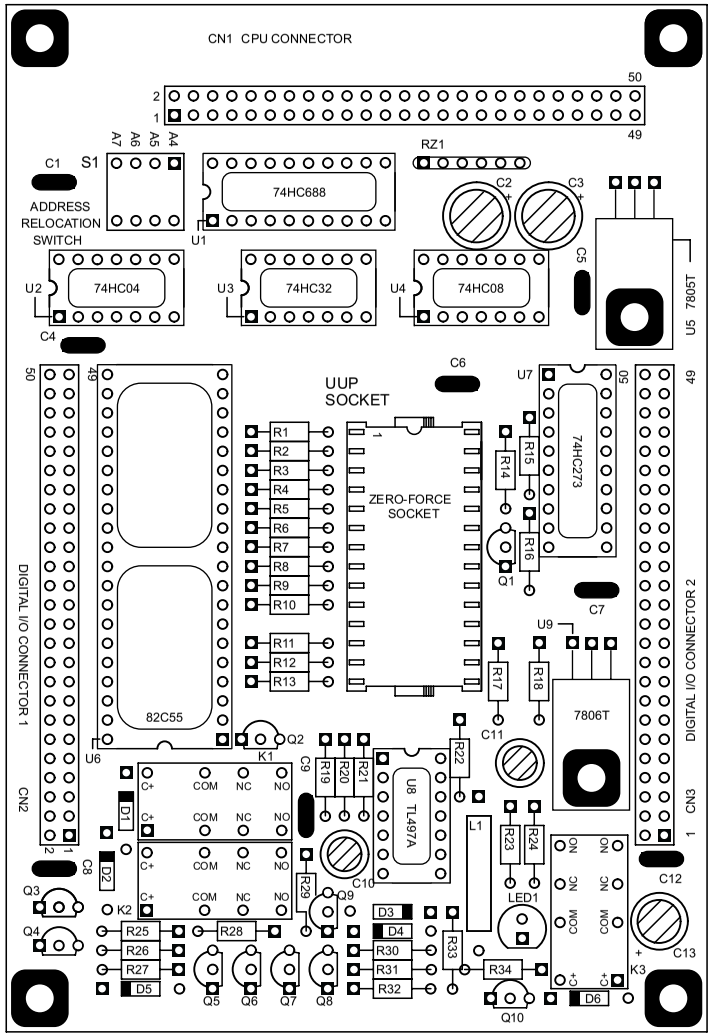
( ) 3E. Install a 470 uF, 6.3 Volt electrolytic capacitor (09-0807) at location C2. This is also a polarized part, be sure to install it correctly.

( ) 3F. Install a 100 uF, 16 Volt electrolytic capacitor (09-0850) at location C13. This is also a polarized part, be sure to install it correctly.

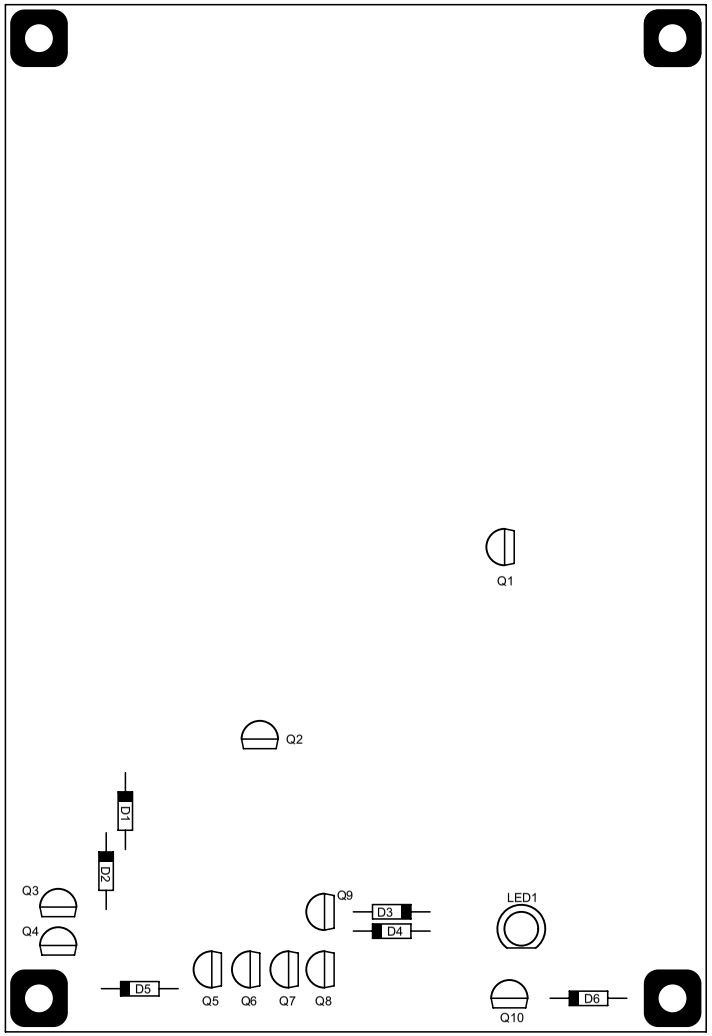
( ) 3G. Install a 4.7 uF, 35 Volt electrolytic capacitor (09-0900) at location C10. This is also a polarized part, be sure to install it correctly.

At this time, check that all capacitors are installed at the correct locations, then solder them into place, and clip excess leads.

EPROM PROGRAMMER ASSEMBLY PHASE 4 -- DIODES AND TRANSISTORS



APPEARANCE BEFORE STEPS 4A THROUGH 4C
PCB SILKSCREEN, PADS, AND PREVIOUS PARTS



COMPONENTS INSTALLED THIS PHASE

Assembly Phase 4. Diodes and Transistor installation.

The diodes used in the EPROM PROGRAMMER are axial leaded parts. They are installed flat against the PCB using the same procedure as resistors, but these parts are polarized. The Cathode lead of the diode is denoted by a color band painted on the diode. The PCB silkscreen layout also has a thick band painted on the diode location to denote which pad accepts the cathode of the part.

The transistors are radial leaded parts, their installation technique is similar to that of the capacitors, except they have three leads. The PCB silkscreen layout has the outline of a transistor painted onto it, simply align the part with the outline prior to insertion of the transistor into the board.

Install the following parts:

( ) 4A. Install a 1N4148 diode (04-0001) at six locations, ( )D1, ( )D2, ( )D3, ( )D4, ( )D5, and ( )D6.

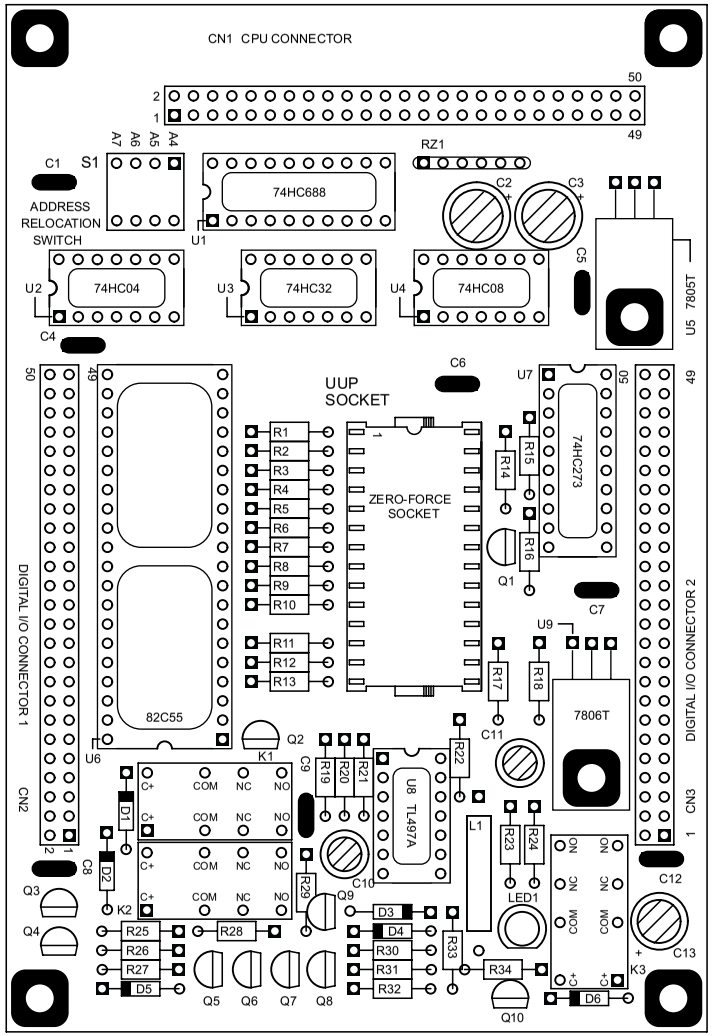
( ) 4B. Install a 2N3906 transistor (05-0002) at location Q9.

( ) 4C. Install a 2N3904 transistor (05-0001) at the following nine locations, ( )Q1, ( )Q2, ( )Q3, ( )Q4, ( )Q5, ( )Q6, ( )Q7, ( )Q8, and ( )Q10.

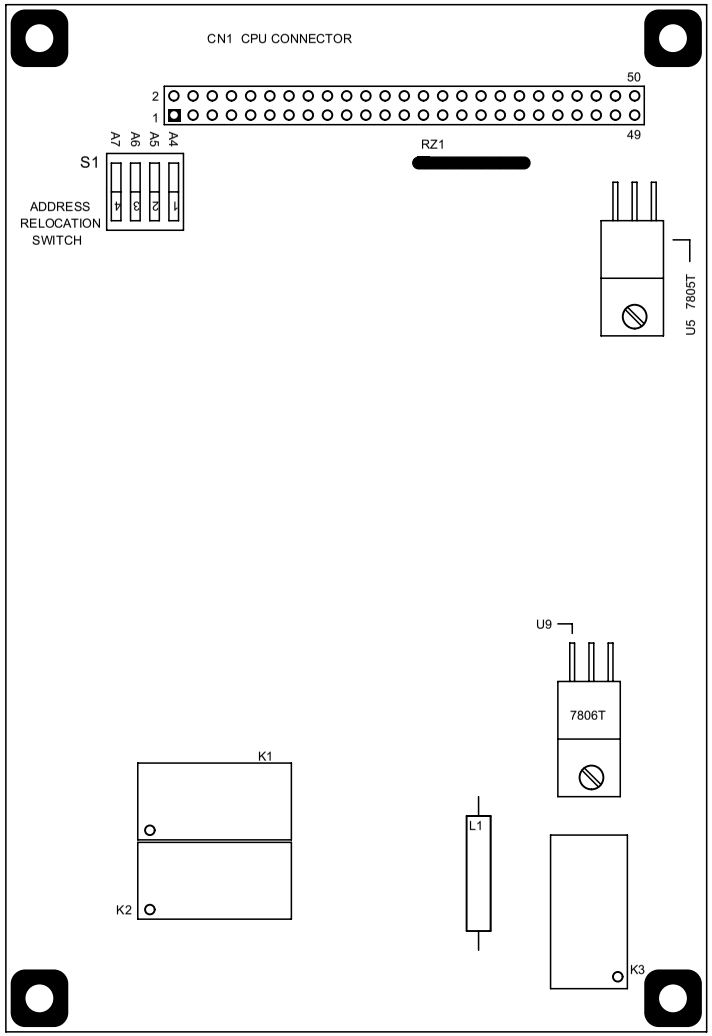
( ) 4D. Install a red LED (07-0001) at location LED1. LEDs have many variations denoting which lead is which, but usually the longer lead of the part is the anode, put it into the round component pad (anode), and the other lead (catode) into the square pad. Some LEDs have a flat side carved into their base, this denotes the cathode lead.

At this time, check that the parts installed in this phase have been installed at the correct locations, and oriented properly. Then solder and clip excess leads.

EPROM PROGRAMMER ASSEMBLY PHASE 5 -- MISCELLANEOUS PARTS



APPEARANCE BEFORE STEPS 5A THROUGH 5G
PCB SILKSCREEN, PADS, AND PREVIOUS PARTS



COMPONENTS INSTALLED THIS PHASE

Assembly Phase 5. Miscellaneous parts.

Assembly procedure for the following parts are varied in nature, so they will be described as they occur.

( ) 5A. Install a 1000 uhy inductor (08-0100) at location L1.

( ) 5B. Install a 10 Kohm x 6 lead Resistor network (10-2103) at location RZ1. This component has a pin #1 identifier printed on it, which must go into the pin #1 pad on the PCB. The square shaped pad (closest to the designator, RZ1) is the correct location of RZ1's pin #1.

( ) 5C. Install a 5 volt DPDT DIP Relay (13-0100) at three locations, K1, K2, and K3. The leads are offset so the relay will go in only one way. Hold it in place while soldering. ( )K1 ( )K2 ( )K3

( ) 5D. Install a five volt regulator (06-0408) at location U5, using the following procedure.

5D1. Hold the part against the PCB, with the PCB mounting hole aligned with the mounting hole on the regulator. Observe where the leads will enter the connection pads, and bend them at a right angle with needle nose pliers, so the leads will enter the holes.

5D2. Install the regulator onto the board, and pass a #6-32 by 1/4" screw (03-0031) through the regulator and the PCB mounting hole. Then secure the screw and the regulator in place with a #6 hex nut (03-0050), and tighten the nut.

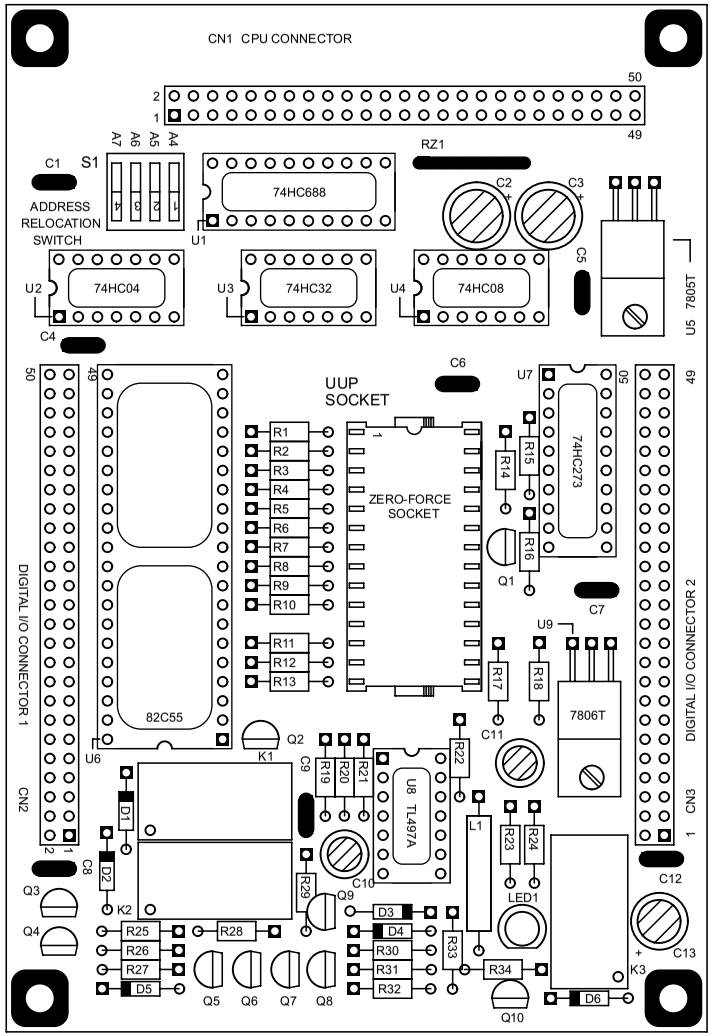
( ) 5E. Install a 6 volt regulator (06-0409) at location U9, using the same procedure as above.

( ) 5F. Install a 2x25 pin dual row male header connector (02-0300) at location CN1. Hold it in place, snug against the PCB, as you solder it.

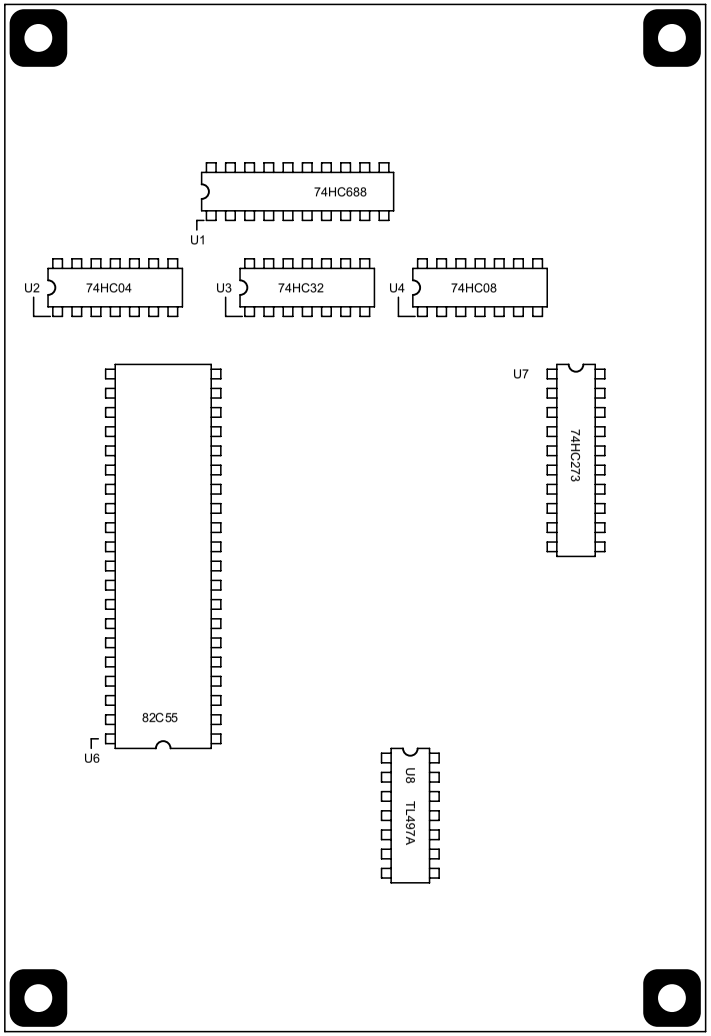
( ) 5G. Using wire scraps saved from capacitor installation, install a wire jumper at three locations in S1, at stations A5, A6, and A7. These jumpers bridge across the switch positions as illustrated.

At this time, all soldered in parts have been installed. Please thoroughly inspect the board one more time to insure that all parts have been installed at the proper locations, and that their polarities are correct when it applies. Be sure to solder and lead clip any and all remaining unsoldered leads that may have been missed.

EPROM PROGRAMMER ASSEMBLY PHASE 6 -- I.C. INSTALLATION



APPEARANCE BEFORE STEPS 6A THROUGH 6G
PCB SILKSCREEN, PADS, AND PREVIOUS PARTS



COMPONENTS INSTALLED THIS PHASE

Phase 6. IC installation.

The Integrated circuits may now be installed into their sockets. Be careful to note their orientation, as it is very important to install them correctly. Most I.C.s have a notch, a dimple, or sometimes a guide channel to denote which pin of the IC is pin #1. Similar markings are present on the IC socket as well.

NOTE:
When snapping the ICs into the sockets, be careful to not bend the leads.

( ) 6A. Install a 74HC04 IC (06-0003) into the socket at location U2.

( ) 6B. Install a 74HC08 IC (06-0004) into the socket at location U4.

( ) 6C. Install a 74HC32 IC (06-0011) into the socket at location U3.

( ) 6D. Install a 74HC273 IC (06-0024) into the socket at location U7.

( ) 6E. Install a 74HC688 IC (06-0028) into the socket at location U1.

( ) 6F. Install a TL497A IC (06-0403) into the socket at location U8.

( ) 6G. Install an 82C55 IC (06-1219) into the socket at location U6.

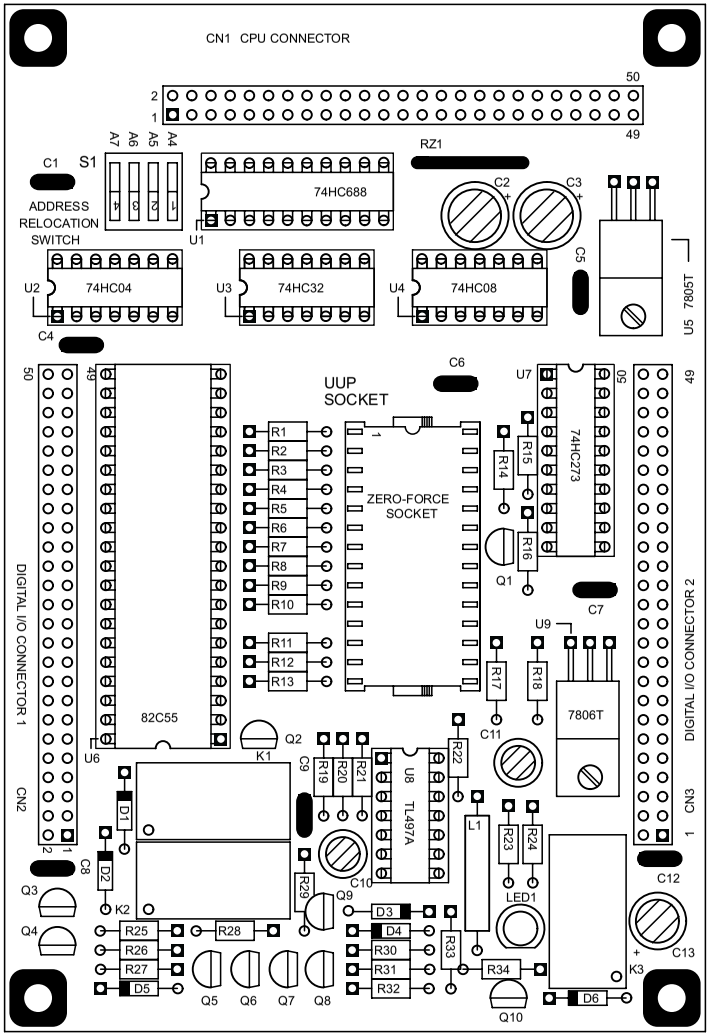
At this time, re-check socketed IC installation.

Phase 7. Final assembly.

Note that no parts were installed at locations CN2 and CN3. The EPROM Programmer circuit does not employ these connector parts.

Install the four rubber feet (03-0300) at the corner mounting pads, on the solder side of the PCB, if you do not wish to mount the EPROM Programmer onto a baseplate. The rubber feet will space the board above a table top to avoid shorting on a conductive surface.

EPROM PROGRAMMER ASSEMBLY -- COMPLETED BOARD



FINAL APPEARANCE OF PCB ASSEMBLY

Phase 8. Cleanup.

To improve the appearance of the finished unit, the solder flux should be removed. If a water soluble flux core solder was used to assemble the board, simply scrub the solder side of the PCB with a scrub brush while holding it in the flow from the tap. Warm or hot water may be used. Lightly scrub the component side as well. Water will not harm the board or it's components, as long as the board is THOROUGHLY DRIED immediately.

This may be accomplished by blow drying the board for at least ten minutes with a hair blow dryer. Alternatively, the board may be placed in front of a fan for an hour or so. Be sure the board receives a strong air flow, to insure trapped water will completely evaporate.

If a standard rosin flux core solder was used, a stronger solvent will be required to remove the flux scale. Try light duty solvents such as isopropyl rubbing alcohol first. Wet a toothbrush with the alcohol and scrub the board, then rinse the board by drenching the alcohol over it.

Should alcohol fail to dissolve the flux, try a stronger solvent, such as denatured alcohol, or tri-chlor solvent, (sometimes called carbo-chlor) using the same procedure described above.

Safety Notes:
Be very careful when using the stronger solvents! Perform the cleanup operation outside, or in a very well ventilated area, as the fumes are dangerous and will make you sick. Never smoke when using them, as some of them are explosive. Further, chlorinated fluorocarbon solvents such as tri-chlor are damaging to the ozone layer, and may be banned in your area.

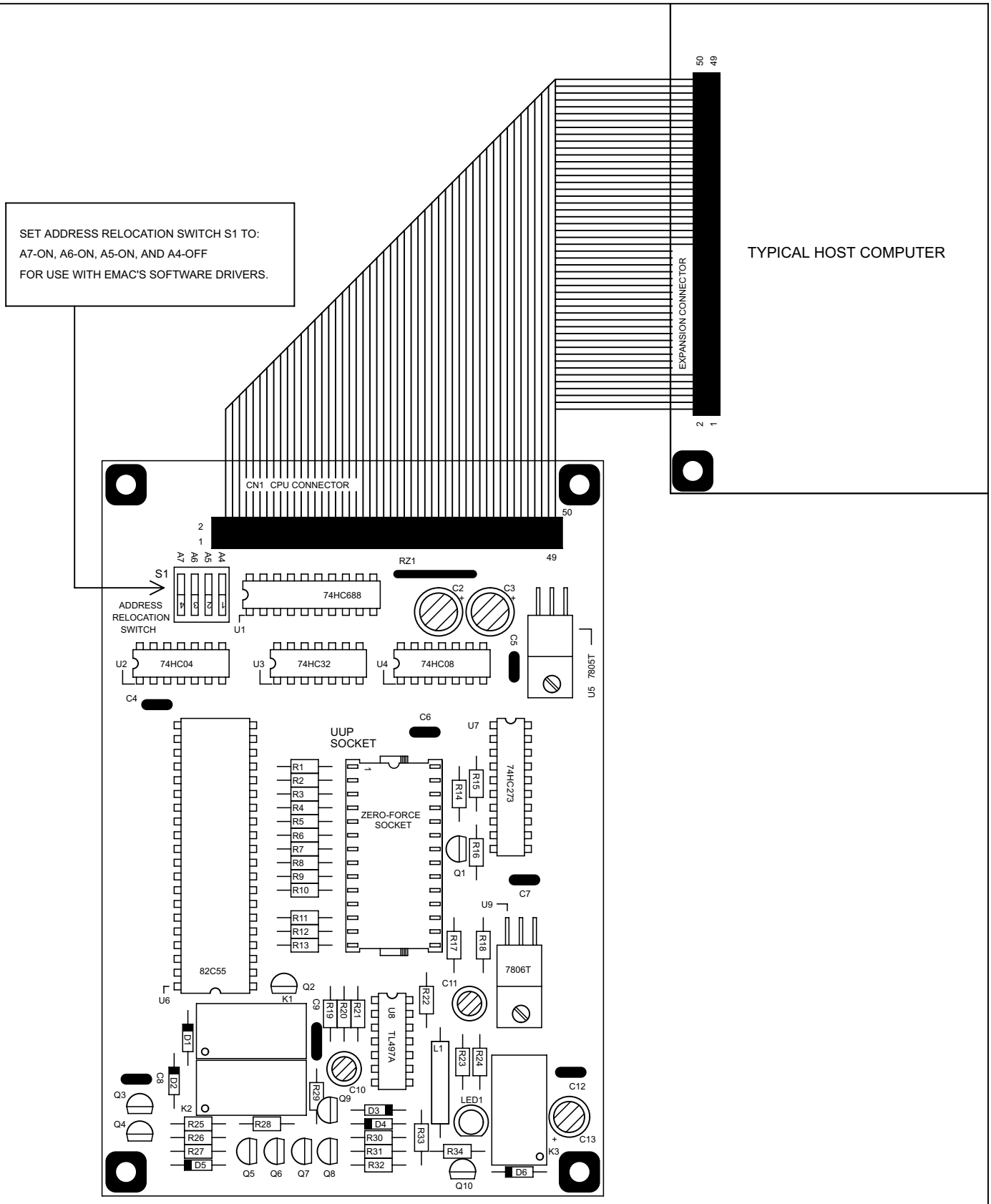
Also be advised to test a drop of the solvent onto the plastic parts before scrubbing, as some solvents will dissolve them! Tri-chlor will not attack any of the plastics used on the EPROM PROGRAMMER, but some solvents, such as turpentine or acetone will attack plastics.

Use of Turpentine is not recommended, because it will leave behind a slimy residue of it's own.

That is why water soluble flux core solder is recommended, because it is the easiest to clean, is the safest, and most environmentally friendly solder around. But obviously if you could not get it, standard rosin flux core solder will simply have to do.

Boards washed with **solvents** should be air dried outdoors with a spark-free fan, never use a blow dryer, as sparking from the brushes might ignite the solvent's fumes.

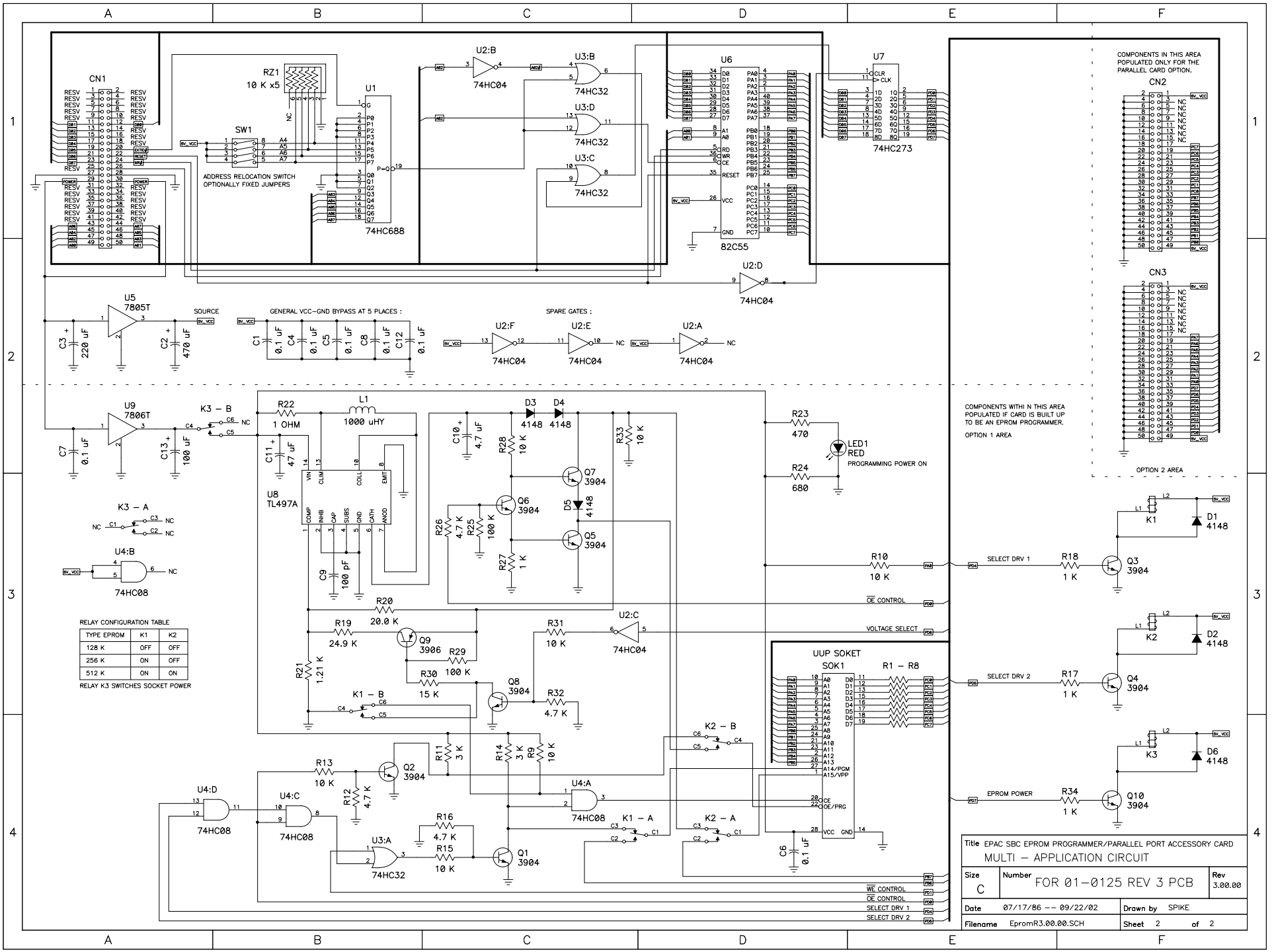
Congratulations !! You have completed assembly of the EMAC EPROM PROGRAMMER kit.



LED1 INDICATES THAT POWER IS APPLIED TO THE EPROM SOCKET.

DO NOT INSERT OR REMOVE EPROMS WHEN LED1 IS LIT.

FILE : EPR3ILL.PCB
ATTR : ROTOFF
SCALE : 1 : 1


CN1
RZ1
10 K x5
SW1
ADDRESS RELOCATION SWITCH
OPTIONALLY FIXED JUMPERS
U1
74HC688
U2:B
74HC04
U3:B
74HC32
U3:D
74HC32
U3:C
74HC32
U6
82C55
U7
74HC273
U2:D
74HC04
U5
7805T
SOURCE
GENERAL VCC-GND BYPASS AT 5 PLACES :
SPARE GATES :
U2:F
74HC04
U2:E
74HC04
U2:A
74HC04
U9
7806T
K3 - B
R22
1 OHM
L1
1000 uHY
D3
4148
D4
4148
U8
TL497A
R23
470
LED1
RED
PROGRAMMING POWER ON
R24
680
Q7
3904
Q6
3904
Q5
3904
D5
4148
R28
10 K
R33
10 K
R26
4.7 K
R25
100 K
R27
1 K
R10
10 K
OE CONTROL
VOLTAGE SELECT
R20
20.0 K
R19
24.9 K
Q9
3906
R29
100 K
R30
15 K
R31
10 K
U2:C
74HC04
R21
1.21 K
Q8
3904
R32
4.7 K
K1 - B
K2 - B
K1 - A
K2 - A
UUP SOKET
SOK1
R1 - R8
R13
10 K
Q2
3904
R11
3 K
R14
3 K
R9
10 K
R12
4.7 K
U4:D
74HC08
U4:C
74HC08
U4:A
74HC08
R16
4.7 K
U3:A
74HC32
R15
10 K
Q1
3904
C6
0.1 uF
WE CONTROL
OE CONTROL
SELECT DRV 1
SELECT DRV 2
COMPONENTS IN THIS AREA POPULATED ONLY FOR THE PARALLEL CARD OPTION.
CN2
CN3
OPTION 2 AREA
COMPONENTS WITHI N THIS AREA POPULATED IF CARD IS BUILT UP TO BE AN EPROM PROGRAMMER.
OPTION 1 AREA
SELECT DRV 1
R18
1 K
Q3
3904
K1
D1
4148
SELECT DRV 2
R17
1 K
Q4
3904
K2
D2
4148
EPROM POWER
R34
1 K
Q10
3904
K3
D6
4148
RELAY CONFIGURATION TABLE
TYPE EPROM | K1 | K2
128 K | OFF | OFF
256 K | ON | OFF
512 K | ON | ON
RELAY K3 SWITCHES SOCKET POWER
Title EPAC SBC EPROM PROGRAMMER/PARALLEL PORT ACCESSORY CARD
MULTI - APPLICATION CIRCUIT
Size C
Number FOR 01-0125 REV 3 PCB
Rev 3.00.00
Date 07/17/86 -- 09/22/02
Drawn by SPIKE
Filename EpromR3.00.00.SCH
Sheet 2 of 2