SMT SOLDERING

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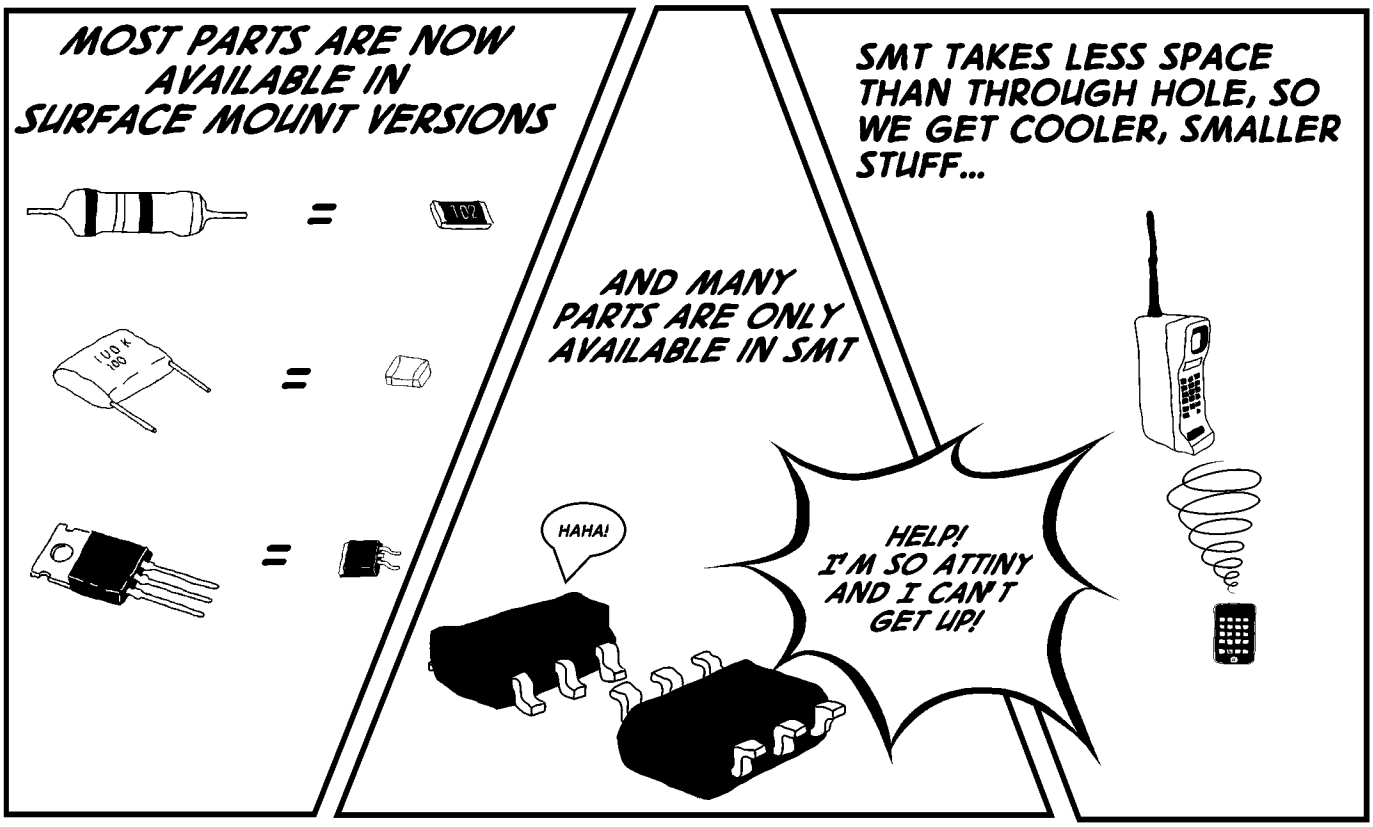
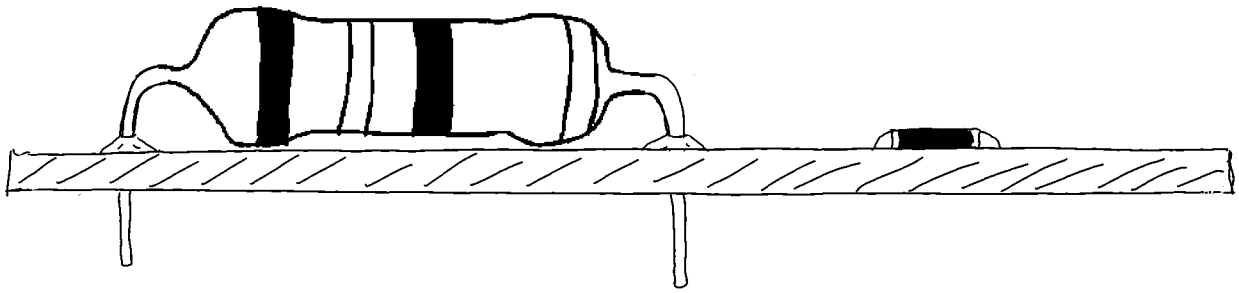
ELECTRONIC TECHNOLOGY IS CHANGING ... (AND FAST!)

S.M.T. Abbreviations & Acronyms

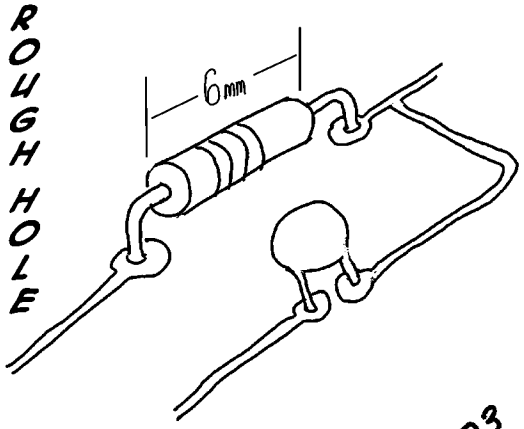
SMT is the three letter acronym for surface mount technology.



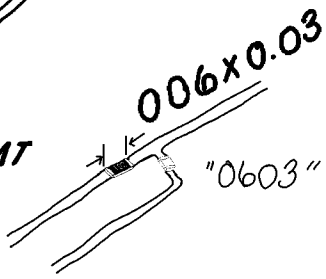
SURFACE MOUNT USES PADS, NOT HOLES, TO MOUNT PARTS TO THE BOARD



THROUGH HOLE

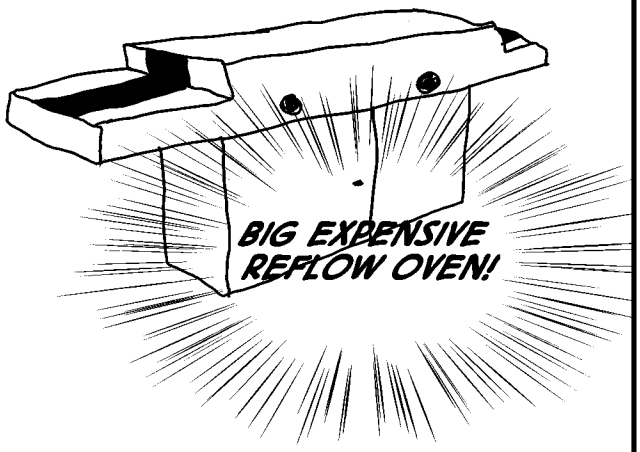


SMT



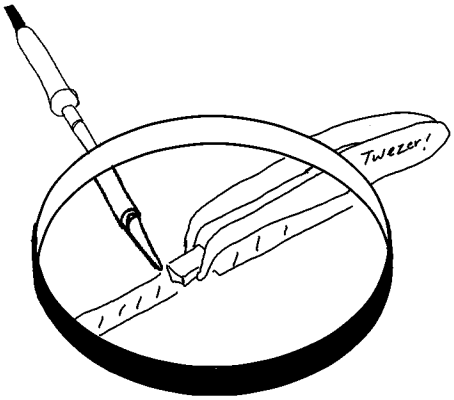
YES, SMT PARTS ARE SMALL!
SOME TIMES REALY REALY SMALL!!

YOU MIGHT THINK SMT CAN ONLY BE DONE BY PROFESSIONALS WITH EXPENSIVE EQUIPMENT IN A BIG FACTORY...



BUT WE ARE GOING TO SHOW YOU HOW TO DO IT INEXPENSIVELY AT HOME

THE PARTS ARE SMALL, BUT WITH THE RIGHT TOOLS SMT IS EASY TO SOLDER...



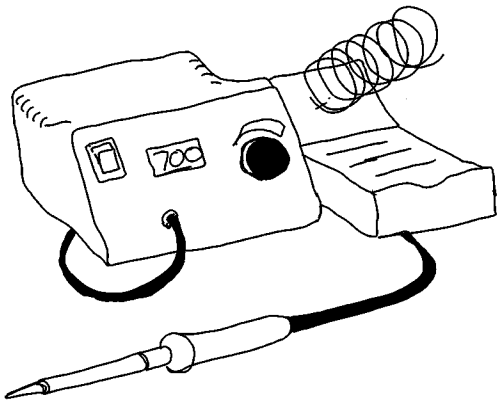
WITH PRACTICE, YOU MAY EVEN FIND IT EASIER THAN THROUGH HOLE

SOLDERING IRON

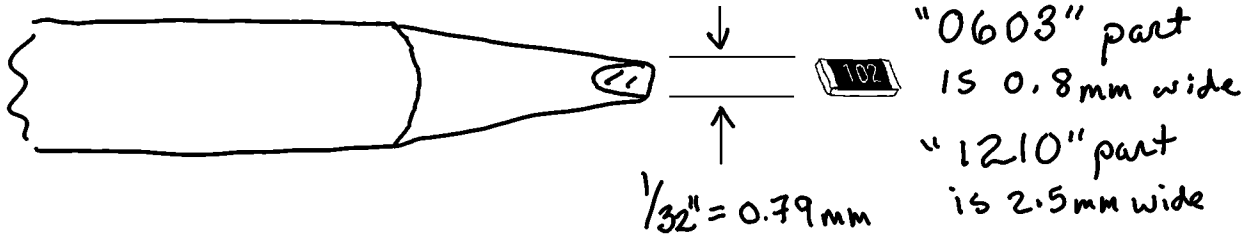
AN INEXPENSIVE "PENCIL" IRON CAN BE EASILY USED TO SOLDER SMT

BUT A TEMPERATURE CONTROLLED IRON MAKES IT MUCH EASIER.

AN ANALOG TEMPERATURE CONTROL WORKS JUST AS WELL AS A DIGTAL FOR LESS COST



A GOOD SOLDERING TIP IS MORE IMPORTANT THAN AN EXPENSIVE IRON AND FAR CHEAPER!

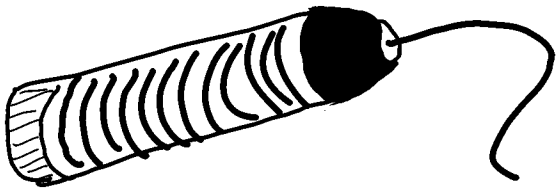


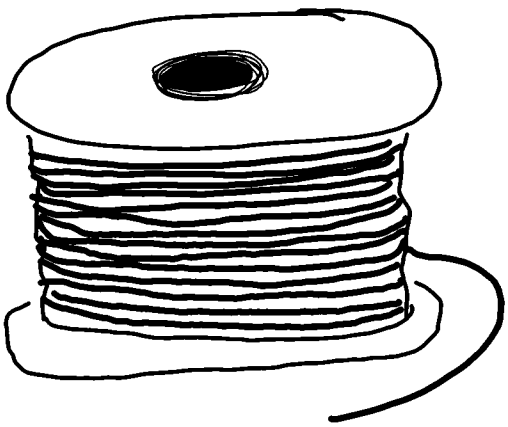
THE ROUND POINTED TIP THAT COMES WITH MOST IRONS ISN'T THE BEST FOR SMT
A FLAT TIP ABOUT AS WIDE AS THE PINS OR PARTS YOU ARE SOLDERING IS BEST

- WE RECOMEND A 1 TO 2 MM "SCREWDRIVER" OR "CHISEL" TIP

SOLDER CHOICES ARE SIMILAR FOR SMT AND THROUGH HOLE.

THERE ARE SEVERAL TYPES, EACH WITH TRADE OFFS!

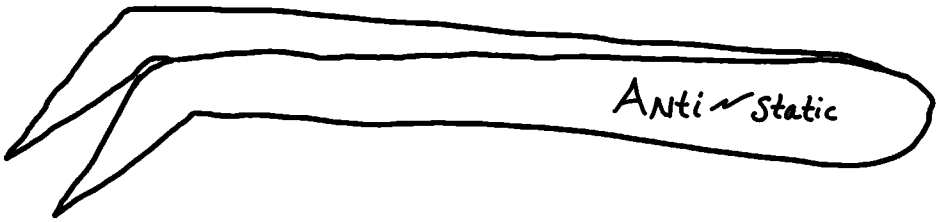




WE RECOMMEND FOR SMT
- LEADED 63/37 OR 60/40 EITHER IS FINE
- RMA FLUX
- THINNER IS BETTER (IE. 0.032" = 0.8MM)

TWEEZERS ARE A MUST-HAVE TOOL FOR SMT

LIKE DIAGONAL CUTTERS FOR THROUGH HOLE, A GOOD PAIR OF TWEEZERS WILL REALLY MAKE THE JOB EASIER



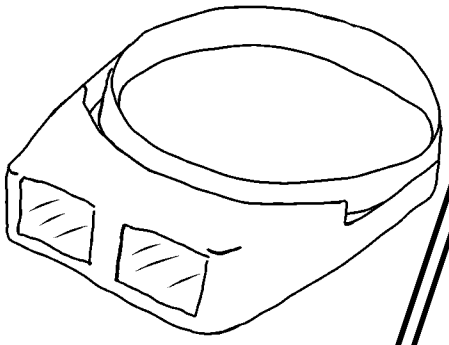
SMT PARTS ARE SO SMALL THAT A VERY SMALL MAGNETIC OR STATIC CHARGE CAN MAKE PARTS CLING TO THE TWEEZERS.

REMEMBER TO FOLLOW THESE TIPS:

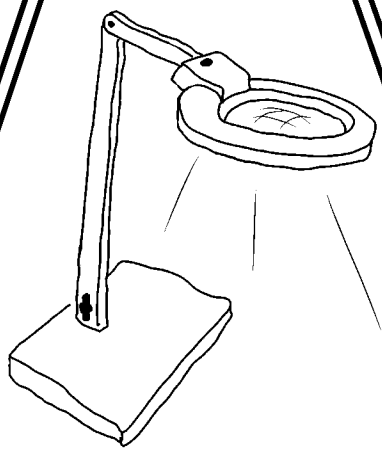
- ELECTRIC SUPPLIERS SELL ANTI-MAGNETIC, ANTI-STATIC TWEEZERS FOR UNDER $5
- IT'S EASY TO BEND THE FINE TIPS MAKING THEM USELESS. SO DON'T USE THEM TO PRY OR FORCE ANYTHING
- FLUX RESIDUE COLLECTS ON THE TIPS SO CLEAN THEM WITH ALCOHOL OCCASIONALLY
- AND AVOID MAGNETS!!!

TO WORK WITH THE SMALL PARTS YOU WILL NEED MAGNIFICATION AND GOOD MAGNIFICAITON MAKES "EVERYTHING" EASIER!

POSSIBLE MAGNIFICATION CHOICES INCLUDE:

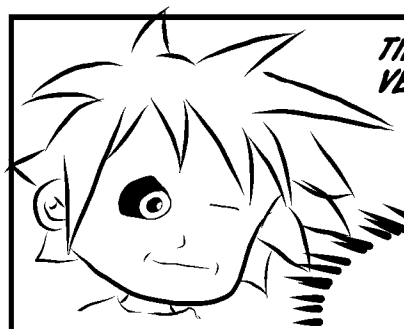


HEAD MOUNTED MAGNIFIER
CHEAP, BUT TAKES SOME
GETTING USED TO IT!



MAGNIFYING RING LAMP
IT'S BETTER AND COSTS
MORE BUT WORTH THE EXTRA COST

STEREO ZOOM
MICROSOPE
THE VERY BEST, BUT
ALSO VERY EXPENSIVE!

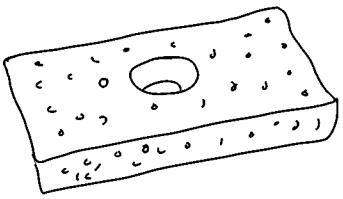


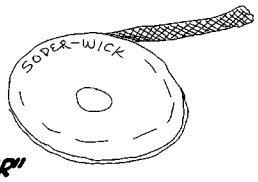
TIP: A 10X JEWELERS LOUPE IS CHEAP AND VERY HANDY FOR INSPECTING THE SOLDER JOINT CLOSE UP

MYSTERIOUS EFFECT! THE GREATER THE MAGNIFICATION THE STEADIER YOUR HAND BECOMES

SOME OTHER BITS YOU WILL NEED !

BRASS TIP CLEANER OR SPONGE:



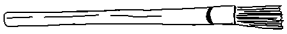


SOLDER BRAID:

FOR REMOVING SOLDER. YOUR OLD "SOLDER SUCKER" WON'T WORK FOR SMT

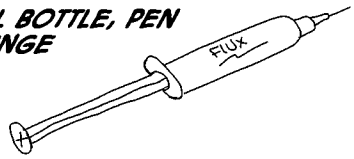
ISOPROPYL ALCOHOL & BRISTLE BRUSH:

FOR CLEANING EXCESS FLUX



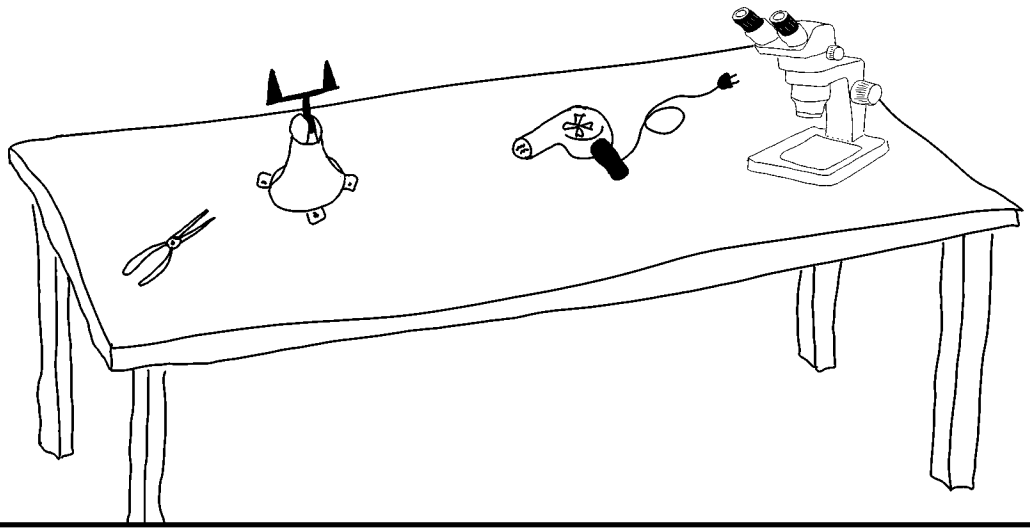
SOLDER FLUX:

A SMALL BOTTLE, PEN OR SYRINGE



WHAT YOU DON'T NEED!

- HOT AIR GUN
- GLUE
- PART HOLDING GIZMOS
  - LIKE A VISE OR HELPING HANDS
- MICROSCOPE
- THE STEADY HANDS OF A SURGEON :)




ENOUGH TALK!
LET'S GET TO WORK

REMEMBER:

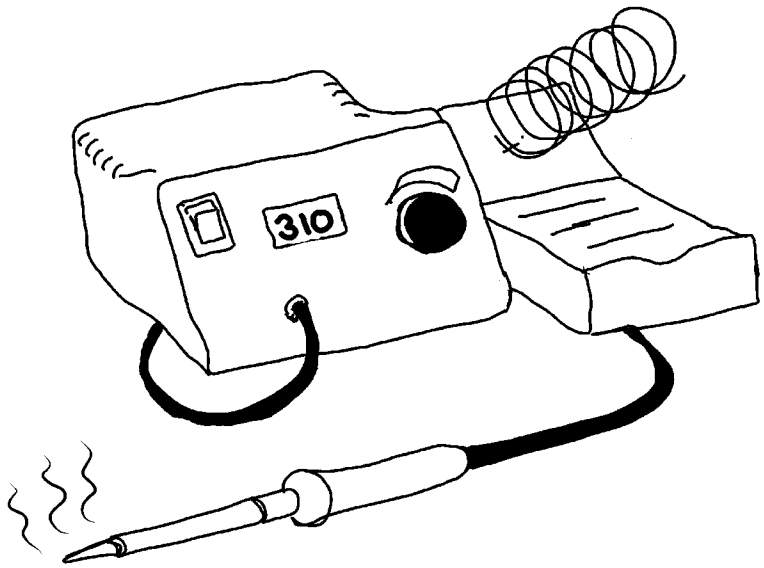
A CLEAN, TINNED TIP IS EVEN MORE IMPORTANT FOR SMT...

THAN THROUGH HOLE SOLDERING!

HEAT UP YOUR SOLDERING IRON.

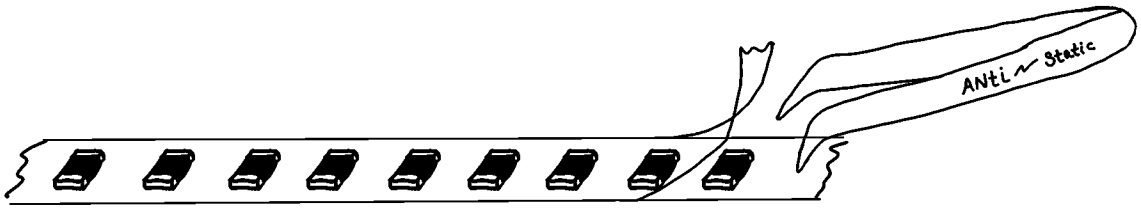
ABOUT 310°C / 590°F IF YOU USE LEAD SOLDER SUCH AS 63/37.

LEAD FREE SOLDER TAKES A HIGHER TEMPERATURE AROUND 350°C / 662°F.



LET'S START WITH A SIMPLE 2 PIN PART LIKE A RESISTOR OR A CAPACITOR.

THESE PARTS USUALLY COME ON TAPE CUT FROM A LARGER REEL OF PARTS.

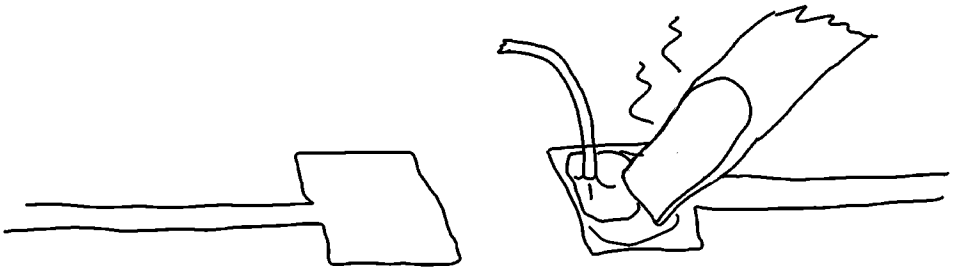


USE YOUR SMT TWEEZERS TO CAREFULLY PULL BACK ENOUGH CLEAR TAPE TO RELEASE ONE PART

AND DROP THE PART ON WHITE PAPER SO YOU CAN SEE IT...

STEP 1: TIN

POSITION THE PCB UNDER YOUR MAGNIFIER & TIN ONE PAD WITH SOLDER...



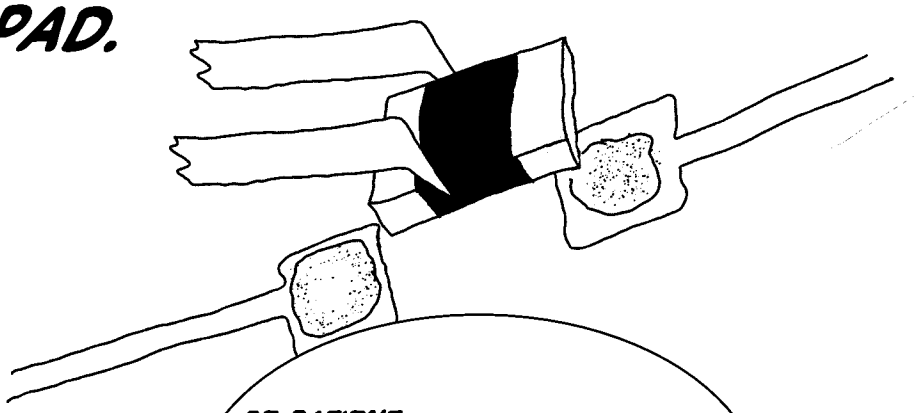
THE PAD SHOULD BE COMPLETELY TINNED, BUT AVOID APPLYING EXCESS SOLDER. REMEMBER SMT DOES NOT NEED MUCH SOLDER.

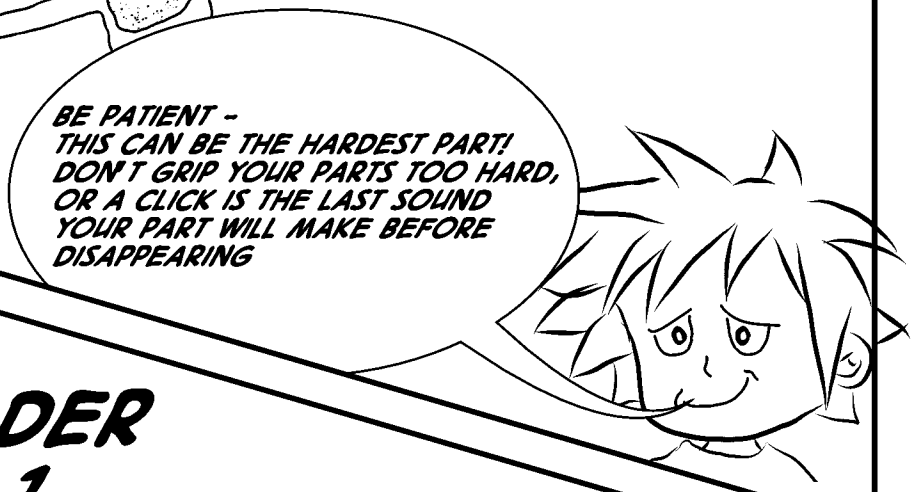
TIP:

IF ONE PAD IS EASIER TO SOLDER, START WITH THE EASY PAD. WITH THE PART SOLDERED DOWN ON ONE PAD, THE SECOND PAD WILL BE EASIER TO DO...

STEP 2: POSITION

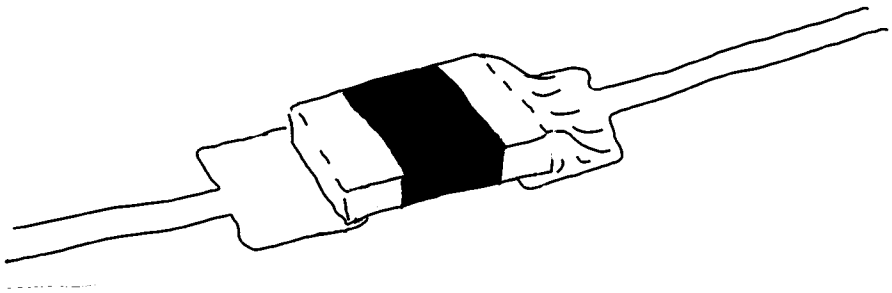
PICKUP THE PART ON BOTH SIDES WITH YOUR TWEEZERS & PLACE THE PART NEAR THE TINNED PAD.





STEP 3: SOLDER PIN 1

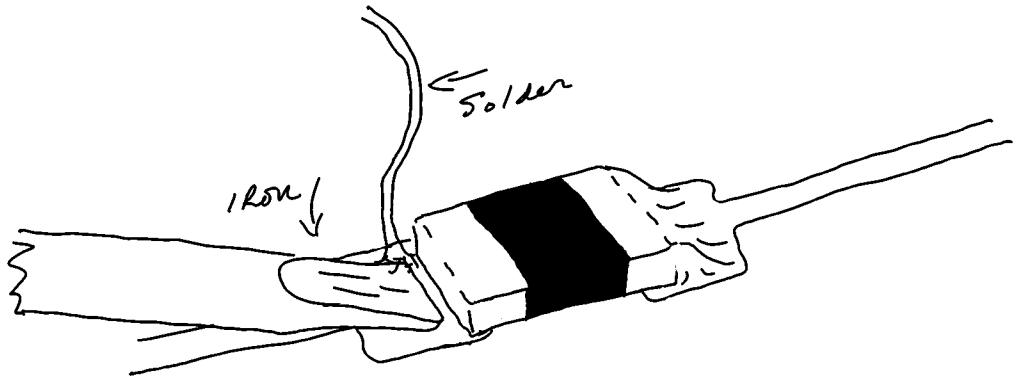
REHEAT THE TINNED PAD.
WHEN THE SOLDER MELTS, SLIDE THE PART INTO POSITION WITH ONE END IN THE MOLTEN SOLDER.



PULL THE SOLDERING IRON AWAY, HOLD THE PART FOR A SECOND WHILE THE SOLDER COOLS AND BECOMES SOLID

STEP 4: SOLDER PIN 2

GRAB YOUR SOLDER AGAIN. NOW TOUCH THE TIP OF THE YOUR IRON TO THE SECOND PAD & TO THE END OF THE RESISTOR. NOW APPLY SOLDER TO MAKE THE JOINT...

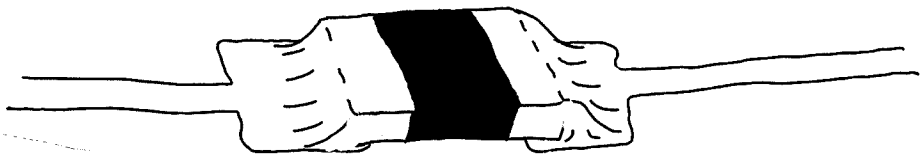


TIP:

IF YOU HAVE TROUBLE TRY PUTTING LIQUID FLUX ON THE PAD AND THEN TRY AGAIN!

STEP 5: INSPECT

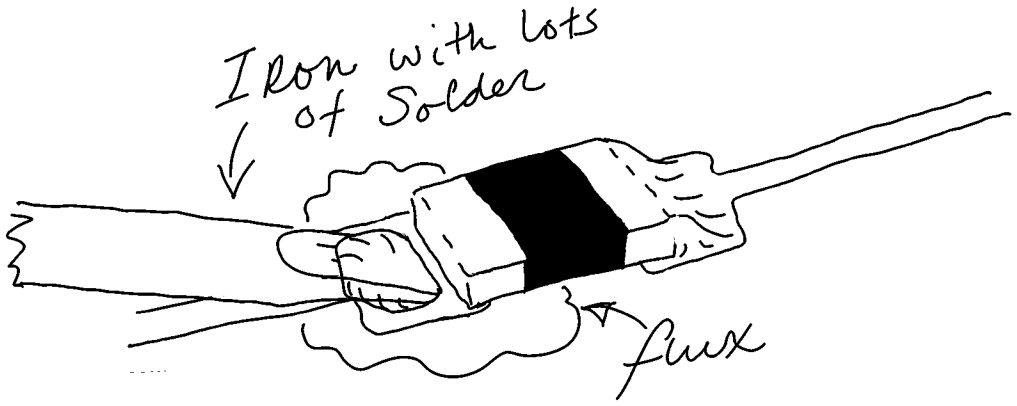
PULL THE SOLDERING IRON AND SOLDER AWAY! (REMEMBER TO ADMIRE YOUR WORK)



THERE SHOULD BE NICE SMOOTH "TENTS" OF SOLDER AT EACH JOINT...

STEP 4: THE ALTERNATE METHOD

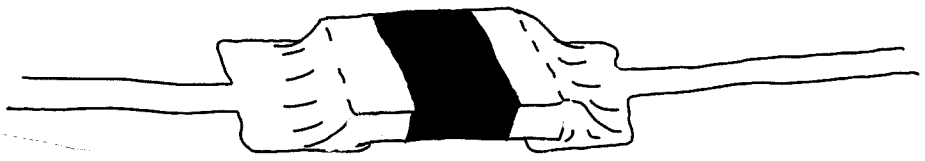
ADD A LITTLE EXTRA SOLDER TO YOUR IRON TIP.
FLUX THE PAD.
NOW TOUCH THE IRON TO THE PAD AND THE SOLDER SHOULD WICK ON THE PART FORMING A NICE JOINT...



THIS TECHNIQUE IS EASIER, FASTER AND WORKS WELL BUT IT DOES LEAVE A LOT OF FLUX ON YOUR BOARD!

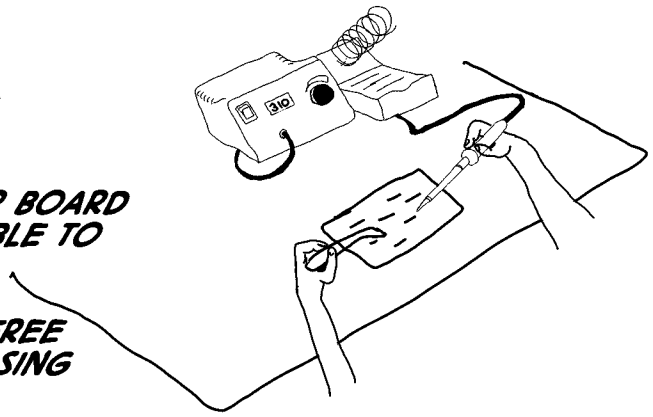
STEP 5: INSPECT

PULL THE SOLDERING IRON AND SOLDER AWAY!
(REMEMBER TO ADMIRE YOUR WORK)



THERE SHOULD BE NICE SMOOTH "TENTS" OF SOLDER AT EACH JOINT...

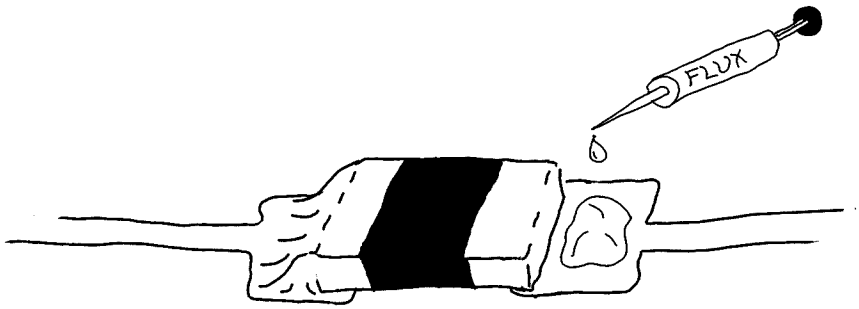
TIP: TO STEADY THE TIP OF YOUR IRON, REST YOUR WRISTS ON THE TABLE WHILE YOU WORK...



DON'T USE A VISE, IT WILL LIFT YOUR BOARD TOO HIGH AND YOU WILL NOT BE ABLE TO STEADY YOUR HANDS...

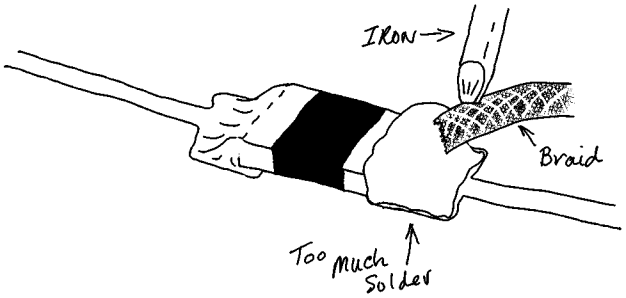
MAKE SURE YOU WORK ON A SKID FREE SURFACE OR YOU WILL JUST BE CHASING YOUR WORK AROUND THE DESK!

REMEMBER FLUX IS YOUR FRIEND!
IT CLEANS OXIDATION THAT YOU CAN'T EVEN SEE AND HELPS WITH HEAT FLOW



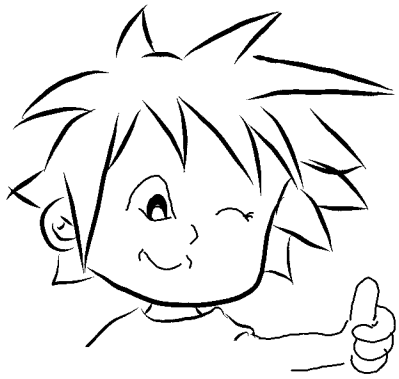
IF YOU GET A COLD SOLDER JOINT, JUST ADD A DROP OF FLUX AND REHEAT!

IF YOU GET TOO MUCH SOLDER ON A JOINT, USE SOLDER BRAID TO REMOVE THE EXCESS...

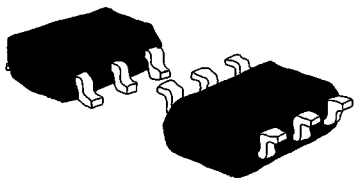


TIP:
TRIM OFF YOUR BRAID AS IT GETS COATED WITH SOLDER... DON'T BE CHEAP - IT ONLY MAKES A MESS.

WASN'T THAT EASY? SO FAR SO GOOD!

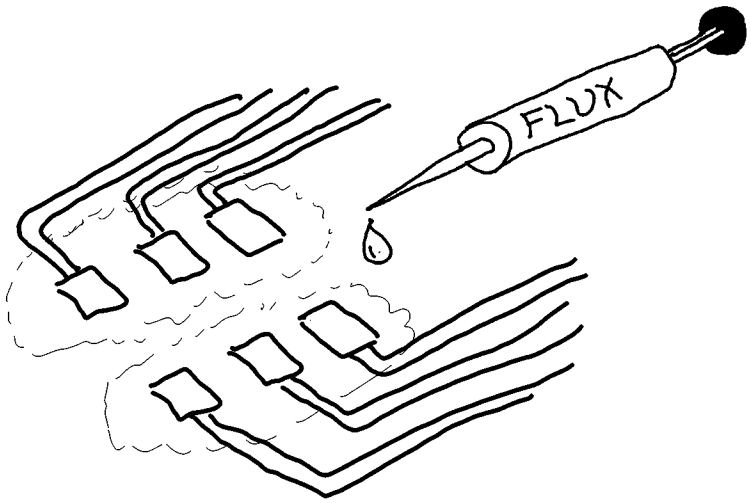


NOW LET'S SOLDER AN IC
(THAT'S SHORT FOR INTEGRATED CIRCUIT)



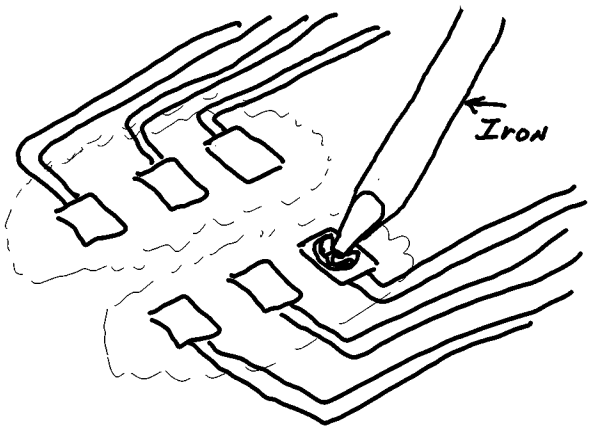
STEP 1: FLUX

PUT FLUX ON ALL OF THE PADS...



STEP 2: TIN

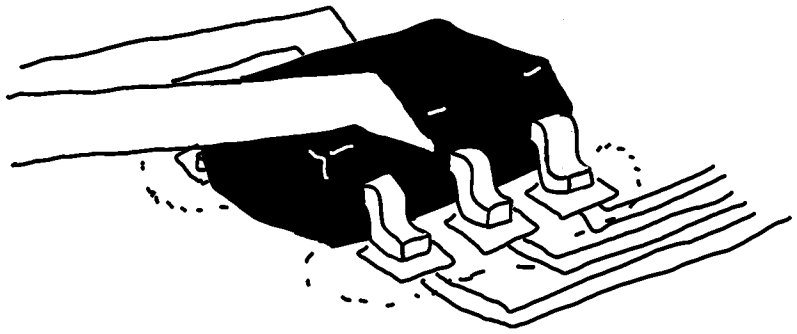
TIN ONE PAD...



THE EASIEST WAY IS TO ADD A LITTLE EXTRA SOLDER TO YOUR IRONS TIP, THEN TOUCH JUST ONE PAD. THE SOLDER WILL THEN FLOW ONTO THAT PAD.

STEP 3: POSITION

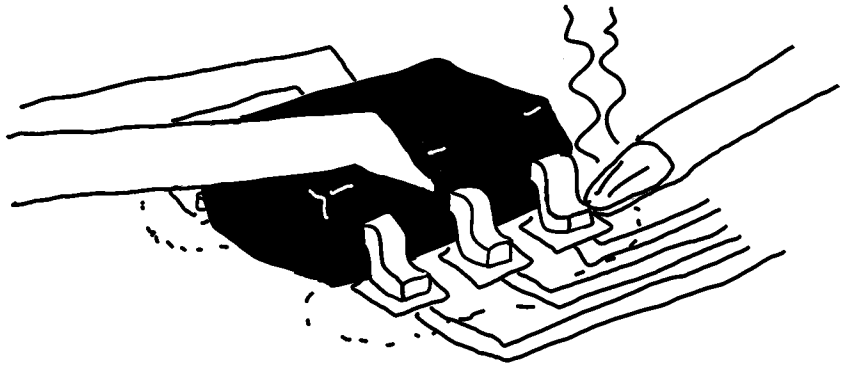
PICK UP THE IC WITH YOUR TWEEZERS, POSITION IT CAREFULLY ALIGNING IT TO ALL OF THE PADS...



DON'T LET GO YET!

STEP 4: SOLDER ONE PIN

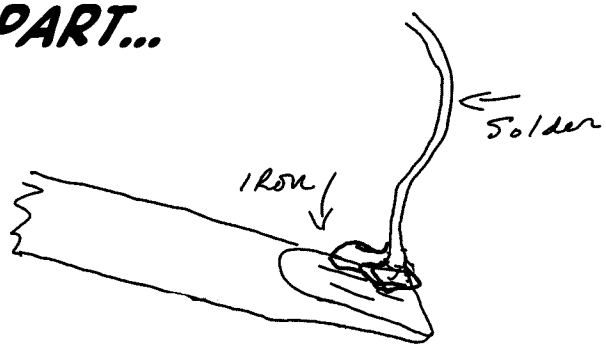
TOUCH THE TINNED PAD WITH THE HOT IRON. THE PART SHOULD SETTLE INTO POSITION WHEN THE SOLDER MELTS...



HOLD THE PART IN PLACE UNTIL YOU REMOVE THE SOLDERING IRON!

STEP 5: ADD SOLDER

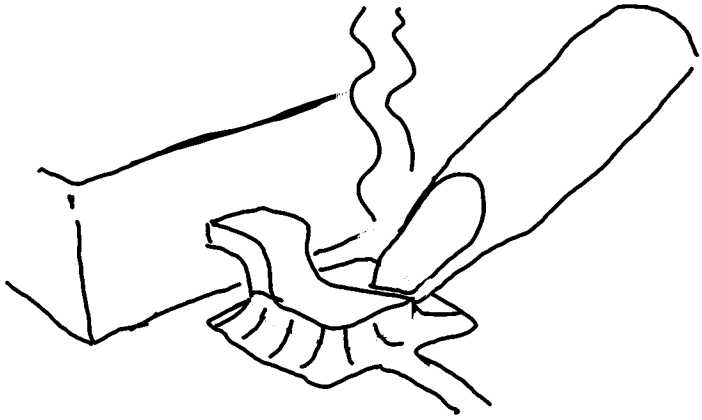
NOW ADD MORE SOLDER TO THE TIP OF YOUR IRON, THEN TOUCH THE TIP TO THE PIN AT THE FAR DIAGONAL CORNER OF YOUR PART...



DOUBLE CHECK THAT ALL OF THE PINS ARE ALIGNED TO THE PADS. AFTER THIS STEP, IT'S VERY HARD TO REALIGN THE PINS.

STEP 6: SOLDER

NOW TOUCH EACH PIN WITH THE SOLDERING IRON TIP...

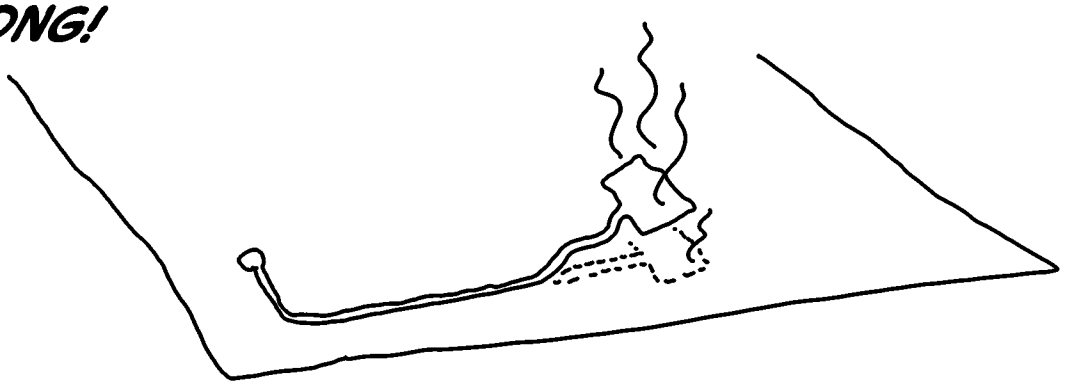


THE SOLDER SHOULD EASILY WICK ONTO THE PAD AND PIN ON THE IC. IF NOT, IT MAY BE TIME TO ADD MORE SOLDER TO THE IRONS TIP...

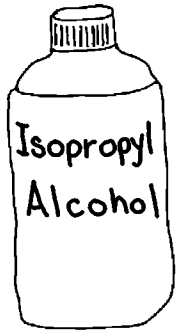
TIPS:

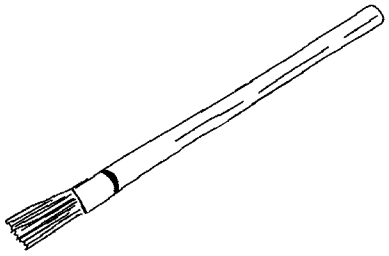
1) REMEMBER: "INSIDE OUT, SMALL TO TALL" ALWAYS START IN THE MIDDLE OF THE BOARD AND WORK TO THE OUTSIDE OF THE BOARD

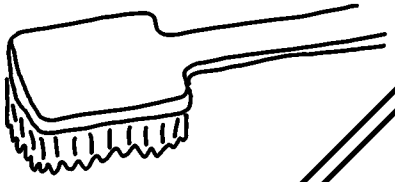
2) ALSO - DON'T HOLD YOUR IRON ON A PAD TOO LONG. THE LITTLE SMT PADS CAN LOSE THEIR GRIP ON THE PC BOARD WHEN HEATED TOO LONG!



3) YOU DON'T HAVE TO REMOVE THE FLUX WHEN YOU ARE FINISHED SOLDERING. BUT IF YOU WANT TO CLEAN UP YOUR BOARD, USE AN OLD TOOTH BRUSH AND RUBBING ALCOHOL







GOOD JOB & CONGRATULATIONS ON FINISHING YOUR FIRST SMT PROJECT

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WE WOULD LIKE TO THANK THESE FOLKS FOR ALL OF THEIR HELP & INSPIRATION:

JEFF KEYZER (MIGHTYOHM.COM)
MARCUS NOWOTNY
ADAM WOLF
MERT EASTMAN

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