February 4, 2001

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Dr. Good,

Here are the Tutorial pages that we discussed on the net. I believe they would help if they could be placed on the WHT site.

The first seven pages are the tutorial by mike Doane taken from the pages of the SW99ERS Newsletter. The eighth page is By Harold Liter also taken from a newsletter, I don't know which one. Page nine is a hand drawn schematic by Matt Matthews used for guidance in his own PEB conversions. Page ten are some cautions gleaned from Micropendium . The last six pages are one of the earlier tutorials by John Willforth from the pages of West Penn 99ers and the PUG Peripheral newsletters.

I have successfully completed four of these conversions and am very pleased that they are cool running and have lasted from three to five years now without problems. Tim Tesch suggests another method of connecting the power from the power supply to the regulators. However they will still heat up using his method. With the regulators removed , they cannot heat up.

Cheers, Ol'Matt

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P.E. Box Power Modification - Part 1

by Mike Doane

I intend to try, in this series of articles, to teach you how to install an "IBM" style "switching" power supply in your P.E. Box (Peripheral Expansion Box).

As is the case of all articles regarding the modification of any electronic component you will be doing this at your own risk. I will assume no responsiblity for any damages done by this modification.

The type of power supply I suggest you buy is the "mini-tower" type of power supply. This power supply is usually small, high powered (200-250 watts), lacks the big, cumbersome on-off toggle and is usually $2 to $5 cheaper. Do NOT buy the XT power supply or the "baby AT" power supply. They will work but sometimes they will require some extensive sheet metal working to install into the T.I. Peripheral Box case. Don't settle for less than 150 watts. There is not much sense in "up-grading" your power supply if you are going to exceed it's output very quickly. The 200 watter will supply all your cards, 4 disk drives, a hard drive or 2, and your console (if you desire this modification)!

I also suggest you modify a box with the "rocker" style power switch. You can modify one with the "push button" switch but be forewarned! These "push button" switches are fragile! Care must be taken when removing and installing the switch connections!

The first thing you need is a good work space with plenty of light. The actual modifications only take about 4 hours but you will not want to work the entire time. Take plenty of breaks, stretch every 20 minutes or so. You don't want to stop in the middle of something to clear the table off for such frivolous items as lunch or supper (Hey, the dogs can eat from bowls on the floor, why not the kids?).

Tool List:

- Screwdriver (Phillips slotted head)
- Screwdriver (Small, flat blade)
- 9/32" nutdriver or socket set
- Wire cutters (Diagonal cutters,"Dykes")
- Pliers (needle nosed)
- Small container (for screws, etc.,)
- Hack saw (or similar cutter)
- Small file
- Drill and 3/16" metal bit
- 1/4" drill bit (optional)

This tool list will expand as this article goes on. I am "modifying" a PEB as I am writing this article. This is not the easiest way to do either the mod. or the article, but I believe it will make it easier for you.

Place the PEB facing away from you. Disconnect the power cord and all external cables (PIO printer cable, modem serial cables, etc.,) from the box. Press the two release latches and remove the lid. Remove all the cards you have in the PEB. The flex cable interface (the card with the long black "fire-hose" cable which attaches to the console) usually has one screw holding it into the PEB. This screw is on the right side of the card by the vent grill of the PEB. Remove the cable from the disk controller card. You might need to use the flat screwdriver to loosen the connector. Slide the screwdriver into the crack between the ribbon cable connector and the card socket. TWIST the screwdriver!! Do NOT use the screwdriver as a pry bar. I guarantee you will bend the pins on the card if you pry it off. Do not try to get the connector off at one end and then the other. Try to remove the connector evenly.

Set all the cards well away from you. I would suggest putting them in a small box and covering them with a towel to protect them from dirt and metal filings. Turn the PEB so it is facing away from you with the disk drive(s) at the top. Take out the retaining screws for the drives. There should be 2 per drive on top and the same on the bottom. You might not have this many but you should. Grasp the drive by the door or lever and pull it out. You may need to feed the controller cable through it's slot in the PEB to pull the drives out. Disconnect the power cable to the drives (this cable has 4 separate wires and is connected to the back of the drive) and pull the drives completely out of the PEB. Feed the connector cable out with the drives. Put the mounting screws BACK into the drives (it makes it easier to keep track of them) and set the drive(s) and cable aside with the cards.

Turn the PEB upside down and facing away from you. Remove the seven screws from the base of the PEB (six around the outer rim and one just to the right of center). There are 2 screws, one on each end of the PEB. If you use your PEB standing up, you may need to clean out the slots to make sure the screwdriver will fit into them. Use a toothpick, hairpin, straight pin, etc., to clean the slots out.

Set the PEB rightside up facing away from you. Remove the 6 screws on the back panel. You do not need to remove the 2 screws holding on the retaining clips. Slide the front cover away from you. The sheet metal might stick if you have never had it apart but just wiggle it and off it comes. Make sure the drive power cable does not get entangled in the sheet metal. Set the front panel aside.

Turn the PEB chassis so the power supply is nearest you with the power switch to your right. You will see a circuit board (apx. 5"X6") directly in front of you. Look between this board and the transformer (the Dr. Frankenstein looking device with 5 blue and yellow wires coming from the top of it). You'll see 2 screws holding the board on. Remove and discard these two screws. The circuit board has 3 connectors snapped into it. Push out on the white prongs and the plugs will snap loose. Discard the board.

There are 4 nuts holding down the transformer. Remove them with the appropriate tool. Discard the nuts. Lift the transformer off the studs. Disconnect the red and the white wires leading to the PEB power switch. Be gentle removing these leads because the switch is a delicate device. Snip the wires leading from the transformer to the power plug outlet and the fan on the chassis. You should have 2 white, 4 red, 1 black, 1 brown and 1 orange wire. Discard the transformer.

Remove the power plug outlet. You will notice 4 plastic "prongs" sticking out from the main body of the outlet. There are 2 on the top of it and 2 on the bottom. Press down on the nearest prong with the screwdriver until it is below the surface of the metal. Press out the front top of the outlet until it is past the surface of the metal. Do the same for the other 3 prongs. You may have to disconnect 2 of the slide on connectors to clear the metal cutout in the chassis. Push the outlet away from the box. There is a ground strap connected to the box. Remove it's nut. Discard the outlet and the ground nut.

There are 4 small nuts holding on the fan. Remove and discard them. Lift off fan and discard it.

There are 8 screws holding down the card slot strip. These screws are tight! Make sure the screw driver you are using is the right size! Check to make sure it's tip is in good condition! Now might be the time buy a new one. DON'T BE CHEAP!!! A $2 screwdriver can end up costing a lot more than a $5 one. Snip the wire tie (you may not have one) holding the remaining cluster of wires together. Clip the green,

black, yellow, and brown wires close to the white plastic circuit board connector NOT by the card slot strip!! Lift off the metal frame and card slot strip. Set them aside and cover with a towel, etc.

Directly below the old fan vent, you will find a plastic cable guide with 4 wires running through it. Open it up and remove the wires. Remove THIS guide. Leave the one by the drive mounts alone. Fold the wire cluster back over the drive mount area.

Remove the 4 studs sticking up from the base of the chassis. You can either saw all the way through them or saw partially through them and bend them back and forth with pliers. File down any part which is sticking out (now do you know why the drives and cards were separated and covered?) until the surface is level. Do the same with the 5 studs on the back upright chassis by the fan. (4 fan mounting studs and the 1 ground) Do not cut off the screw holding on the retaining clip. Ignore the stud by the drive mounting.

Place your "IBM" power supply in the PEB chassis with it's fan vent towards the fan vent mesh in the chassis. Look at the base of the chassis for the marks left by the shield you removed. Make sure your new power supply does not overlap these marks. Try to "line up" one of the mounting holes of the power supply with one of the original vent holes. If you can it will be a lot easier. If you can place the fan of the new power supply against the mesh and have most of the fan showing you are even luckier!

Almost all of the power supplies I have seen have a protruding fan guard on the rear of them. They are usually just sheet metal extended out from the original sheet. They usually have only 4 places where the "shield" is still connected to the power supply case. You can cut through these four small places and have a flat mounting surface. This will ease your mounting immeasurably. You will still have the original PEB mesh to prevent anything from touching the fan.

Hold the power supply against the chassis and estimate and draw the size of cutout you will need for your new power plug. Set the power supply aside and cut the hole. You don't have to be too precise. The back of your PEB is hidden. Clean all the metal filings away with a paint brush, soft cloth, etc.. Slide the power supply into the chassis, align the screw hole (if you were lucky enough to have one match up!) and mark any adjustments to the hole required. Remove the power supply, cut out any extra, and file the edges smooth. Clean the mess again. Slide the power supply back into place. Measure and mark the mounting screw holes (usually a total of 4). Remove the power supply and drill the screw holes. Align the power supply with the screw holes. Start all 4 screws but do not tighten them.

If your new fan does not exactly line up with the vent holes, you may want to drill a few extra holes. Remove the power supply and do so at this time. Use the 1/4" drill bit for this. If you have 50% or more of the fan exposed through the original holes I would not fool with it. We are not drawing very much power compared to the 16 megabytes of memory found on an IBM 386 machine. It's YOUR box, you do as you wish. File these drill holes smooth. Clean all the metal filings and shavings, again and put the power supply into place. Put the screws into place and tighten. Be gentle! You are screwing into sheet metal!

Your power supply is mounted and ready for wiring!

P.E. Box Power Modification - Part 2

Let's get WIRED!!

by Mike Doane

"IBM" power in a T.I.!

Now for the next step. The tools you'll need for this part of the project are:

Tools:
- White electrical tape
- Drill with 1/4" bit
- Phillips screwdriver
- Voltmeter
- Wire cutters
- Disk drive
- Paper and pen
- Soldering iron (15-30 watt)
- Solder (electrical)
- Razor knife

Plug the disk drive into one of the power supply's existing power cables. Connect the power leads from the new power supply (usually a four wire bundle of two white and two black wires with slip-on connectors) to your PEB switch. If you have not purchased a "mini-tower" power supply you will have to remove the switch from the power supply and run the leads and add the connectors. Do NOT attempt to solder to the switch. It is a light-duty switch and will not take the heat. Slip the wires on the PEB switch with the colors on the same side. The white above the white, the black above the black. NOT side by side.

Put power cable on PEB and connect power cord into wall socket. Turn PEB switch on. Plug the voltmeter negative lead into the ground lead of one of the disk drive power plugs. The center leads in the drive plug are ground (black). Take the two bundles of wires with long plastic connectors, place the plugs side by side with the black wires in the middle and the red wires on the left. The "standard" pinout voltages should be, from left to right:

```
 :  :  :  :  :  :  :  :  :  :  :  :
+5 +5 +5 -5 gnd gnd gnd gnd -12 +12 +5 +5(or 0)
<---volts--->                <----volts---->
```

Check these voltages, write down the colors of the wires and their voltages. Do not use the last wire on the right if it reads +5 volts. This pin is used in the "IBM" to detect a "computer ready" state!! It will handle no load. Turn the power off and unplug the power cord. Clip and tape this wire out of the way.

Plug in your soldering iron and let it get hot. Get the card slot strip and remove the four wires connected to it. Use some caution here, don't create a "bridge" of solder between the wire connections and the card ground. Snip, strip, and tin a +5 lead from the connector mentioned earlier. Do not cut your wire too short. Snip it just below the connector!! Slip it through the wire tie if there is one. Use a good quality 60/40, .032 size solder (Radio Shack part #64-005). Connect the wire to the hole marked "GRN". The "GRN" stands for green and not "GROUND"!!

Next prepare and connect a ground lead from the same connector (usually a black wire) to the hole marked "BLK". Refer to the notes you took earlier. Snip the -12 wire, prepare it and connect it to the hole marked "YEL". Clip and prepare the +12 line. Solder it to the hole marked "BRN". Unplug your soldering iron and put it out of the way (unless you are into scarring and self-mutilation, of course!!).

Clip the protruding ends of the wires as close to the board as possible. Isolate the slot strip from the chassis (use a towel or small piece of cloth). Cross your fingers, plug in the power cord, and turn the power.

No smoke? Use your voltmeter to check the voltages on the card slot. The terminal marked "GRN" should show +5 volts (or reasonably close), the "BLK" should show 0, the "YEL" should show -12 volts, and the "BRN" should show +12 volts. These voltages will vary from "true" voltages. Part of this will be from the variance in your voltmeter and also from the fact the "switching" power supply puts out on demand and is not a constant supplier as is a "linear" power supply. You are using the +5 line (remember the disk drive you are "supposed" to have connected, hmmm!) but not the others.

Turn off and disconnect the power. Place the slot strip onto its mounting area in the chassis. Place the card holder bracket into place. START ALL 8 screws and THEN tighten them. Reconnect and turn on the power, re-test your connections. Disconnect power.

Heat your soldering iron. Snip the two plastic connectors from the original drive cable, NOT at the drive end!!! Strip and tin all four leads (red, blue, lavender, and orange). Clip the 4-wire drive connector from the power supply. Clip it approximately 1-2 inches away from the connector. Most power supplies have two or three of these type drive connectors. Strip and tin these four wires. Solder the +12 lead to the lavender wire and tape. Solder the +5 lead to the blue wire and tape. Solder the red and orange wires to the remaining ground wires. You can solder both of them to one ground wire if you wish. Tape the connections together. Unplug soldering iron.

Disconnect your drive from the power supply and connect it to the "original" drive power cable. Plug in and turn on power, test all your leads again. Disconnect power. If your power supply has another drive cable, and most do, you can easily add power for an external drive. Hold the connector and look into the slide-on end. You will notice four male prongs. Look closely and you will see a small tab sticking out from each prong much like the prongs which were on the original power cord outlet. Depress this prong with a toothpick, probe or small screwdriver. The wire will slide out. Do this for all four wires. If you have planned well and are lucky, the hole below the retaining latch in the chassis is uncovered. If so, remove the latch and fed the wires through. Tape the four wires together where they will contact with the metal. Don't use too much tape! Replace the latch and screw.

Hold the connector you removed, facing you with the tapered corners up. Looking at it, from left to right, the voltages should be, +12, ground, ground, +5. Slide the wires back into place. You may have to bend the tabs back out to make them stay, if you were over-zealous removing them. Don't bend them too much as they will break! If the hole is covered drill a 1/4" hole and pass the wires through it.

Let's take care of another modification while we are here. Heat the soldering iron. Snip the -5 line close to its connector. You should also have a +5 and a ground at the same connector. Snip them also. Strip and tin a small section of the +12 line inside the PEB. Connect a 12" wire to the stripped section and tape. Unplug soldering iron. Drill a hole beside the power supply in the chassis. Feed the +5, -5, ground, and the wire you connected to the +12 through this hole. Tape the section in contact with the metal. label each wire, fold over and tape. These wires will be used to replace the "coffee heater" inside your console if desired.

Disconnect the drive and power supply plug. Slide the sheet metal case back onto the chassis. Be careful of your power wires and drive cable. START the six screws on the back panel and the two on the sides. Turn the PEB, power supply down, with the back facing you. START the seven screws on the bottom. Tighten these seven screws. Tighten the six screws on the back. Turn the PEB right side up and the tighten the two end screws.

Connect the power cord and drive power cable to the drive. Turn the unit on. The low hum you hear is all the noise this puppy will make!! Stay tuned for next month's installment of the continuing saga of "The Starship Powerprize", better known as "P.E. Box Power Modification". For now, DO NOT put your cards in the PEB. They MUST be modified BEFORE you install them.

P.E. BOX Power Modification - Part 3

A New Deck of Cards

by Mike Doane

"IBM" power in a T.I.!

Now, let's go to the most controversial steps in the power supply conversion procedure. The REMOVAL of the regulators from the "cards".

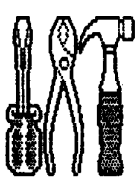
Texas Instruments' original design, with it's "linear" power supply, was to ensure the steady supply of power to the peripheral devices. In order to ensure there would be sufficient power they heavily "over-supplied" the card strip bus and then each card would regulate the voltage it required. When I say HEAVILY, I MEAN heavily ! T.I.'s specs. originally called for +16 volts on the +12 volt line and +8 volts on the +5 volt line. This was on an "ideal" power supply. I have found +25 volts on the +12 line and +13 volts on the +5 line. This is akin to using a 16lb. sledgehammer to drive a thumbtack. Sure, it can be done BUT you have to regulate the force.

There has been some talk of running the +12 volt line of the new power supply to the +5 volt line and leaving the regulators on the card. This will work but I compare it to having a horse pull a working automobile. What's the point? What we are trying to achieve is the supply of "clean" power and the removal of heat sources (the regulators).

The removal of the regulators means if you place your "modified" cards into a standard T.I. PEB, you will have a new coaster to sit your coffee cup on!! It WILL be toast!! NEVER swap cards from system to system UNLESS they have the same type of power supply!

Tool List

- Low wattage soldering iron
- Small "Phillips" screwdriver
- Small "Flat" screwdriver
- Solder (small gauge, electrical)
- 24 gauge insulated wire
- Small "diagonal-cut" wire cutters
- Towel (to set your cards on)
- Small can (for screws, etc.)
- Ohmmeter



The T.I. Disk Controller Card

There are two handle clips on the "clam shell" covering. Remove them by lightly spreading the bottom of the loop apart. Set the clips in the can. There are 4 screws located in the corners of the case. Remove these screws. Some of the T.I. "clamshells" do not have the screws. Seperate these style cases by depressing the locking "fingers" with your flat screwdriver. Spread the towel on your work space. Turn the disk controller screws side down and the screws should drop out. Place the screws in the can and lay the disk controller (henceforth to be called the "DC") with the drive connector to the right and facing up. The bus connector will be towards you. Insert the flat screwdriver into the crack on the side where the shell halves meet. "Twist" the screwdriver, do not pry. The halves should separate. You might have to do this on both sides of the case. Do NOT put the screwdriver into either the opening for the bus slot or the one for the drive connector. The label on top of the card might be stuck to both halves, just fold it over.

In the lower right hand corner of the card is a flat, 3 legged component. It will have the number TL780-05C, 78M05C, or some combination of 78 and 05 on it. It is easy to spot. On the lower left, below the LED (that little yellow or green "light" which comes on when the card is activated) is one which looks like it except it says 78M12C. The one with the 05 is the +5 volt regulator and the one with the 12 is the +12 volt regulator (Nope, don't take no rocket scientists 'round HERE!). Remove the card from the shell. Set the shell aside. Plug in the soldering iron. Lay the card, component side up, so the LED is to your left and the drive connector is to your right. Insert your flat screwdriver (you know, if you use Orange Crush instead of Orange juice those screwdrivers wouldn't be flat!) beneath the outer/lowest leg of the +5 reg. Heat the leg with the soldering iron and gently twist the screwdriver. The leg will lift free. Bend this leg up out of your way and do the same to the other two legs. Do the same to the +12 regulator. Cut a 1 inch long piece of the 24 ga. wire. Strip and tin the two ends of the wire. Insert and solder one end of this wire into the closest/lowest hole where the +5 reg. was. Insert and solder the other end into the farthest/highest hole of the +5 regulator. Ignore the center hole (this is the "ground" for the old regulator). Do the same for the +12 regulator. Turn the card over, component side down, and clip off any protruding wire from your "jumper" wires.

You can ohm test your card if you wish (I highly recommend it!). Look for a DIRECT connection (0 ohms) to ground (the center hole of the old regulator). There will be a 750 ohm (apx.) between the +5 leg holes and ground. THIS IS NORMAL! There should be NO direct (0 ohm) connection! If you do have a connection, check your solder. Make sure the solder did not "pool" and make an overlap with any other traces (the small "lines" on the circuit board). Correct any problems and retest. Unplug your soldering iron.

With power turned OFF (When removing or inserting cards always make sure the PEB power is OFF!), insert the card into your "IBM" powered box (I never replace "clam-shells"!), connect the drive controller cable, and turn on the power. The drive motor should turn on and run for about 10 seconds. If the drive light comes on and stays on, you have the cable reversed. Turn it over and try again.

32 K Memory Card

This is the same as the drive controller with the obvious exception of not having a drive cable. The regulators are in the same places as on the DC. Remove and jumper them using the same procedure. If you "stand" your PEB on "end", you might want to put the "clam-shell" back on this card. It has no protruding end such as the DC, RS-232 and the flex cable interface have to hold them into place. I use a thin piece of plastic to "insulate" it from my DC card.

Flex Cable Interface

Remove the shell the same way. Place the card with the chips up and the "firehose" leading to the right. On the very lower right hand corner you will see the +5 regulator (hey, you're starting to get good at this!). Remove and jumper it. This is the only regulator on this card! Replace the "clam-shell" on this card. You need the "tab" on the rear of it to attach it to your PEB. Do NOT take apart the end which attaches to your computer. There may be no need to replace the regulator mounted on the small board in there. The end can be a real nightmare to put back together correctly. Try the card without removing the regulator first. My luck has been running about 6 to 1 towards removing this regulator. You can always pull the "foot" apart if yours needs to have the regulator removed.

RS-232

This card is a little trickier but it is still easy. Remove the shell. Lay the card component side up and the cable connections to the right. The +5 and +12 regulators are in their usual spots. Remove and jumper them. Approximately 1 inch to the right and 1/2 inch above the +12 regulator (the one on the left by the LED) you will see a small 3 legged component shaped like a transistor (it is shaped like a small black coffee can, flattened on one side, with 3 legs). It is marked "Q3" on the board. This is a -12 volt regulator. Remove it by grasping the plastic body and heating the legs until it comes free from the board. The three holes it was in form a triangle as opposed to the line formed by the other regulators. Insert and solder one end of a jumper wire into the TOP (towards the top of the card AWAY from the bus strip) hole. Insert the other end of the jumper wire into the leftmost (towards the LED) and solder. Test your soldering with the ohmmeter. REMEMBER!! You are looking for a DIRECT ground. Some cards will show a connection with a resistance. This is normal.

Place your cable card back into the PEB. Insert the mounting screw and tighten. Turn on the power. The LED in front should come on. Let it run for 5 minutes. No Smoke? Turn off power. Install your RS-232. Power up again. There should be a light on the cable card and none on the RS-232. Do the 5 minute test again. Do the same for your 32K memory card. The cable card LED should stay LIT when power is on!! The 32K card LED should flicker briefly at power-up and then go out.

Power down. Hook the "firehose" into your console. Turn on the PEB. There should be no LEDs lighted. Turn on your console. The flex cable LED should light. Insert your Extended Basic cartridge. Go to the command prompt of the X-Basic (you know, hit any key and then select "2" for X-basic). The computer should try to access the drive. Make sure you have drive #1 hooked up! The cable card LED should flicker, the DC LED should light, the 32K should flash and the disk tries to engage. Now, put a disk in with a "Load" program and attempt to "load" it. It works? Fine, install the drives and close her up! If it does not work and the connections are correct you will need to dis-assemble the "foot" and remove the regulator inside. Remove the 4 screws and separate the halves. You should be able to spot and replace the regulator by now. Make sure you get the cable connecter back into place and all the way "forward" before you tighten the screws.

Any "after-market" cards will need to have the regulators jumpered on them also. Most of them will only have a +5 regulator. They will almost always be in the lower right hand corner. Remove and jumper them as usual.

One notable exception is the "Geneve" computer card (or Myarc 9640). This cadillac has from 5 to 7 regulators on it. They are removed and jumpered the same as any other regulators. Be VERY careful with these cards. The "Traces" on these cards are extremely delicate and must be handled with the utmost caution!!!!

As with any project of this type, if you undertake this mission the company will dis-avow any knowledge of your actions. This tape will self destruct in 5 seconds (cut to theme music, and close-up of smoking PEB).

P.E. BOX Power Modification - Part 4

"Cool Hand Luke!"

by Mike Doane

"IBM" power in a T.I.!

Well, we have made it this far with no mishaps (that minor one where we had to call the Fire Department we won't discuss). Now it is time to finish the final step. The removal and replacement of the ol' "coffee warmer" power supply INSIDE the T.I. console.

Tool List:

- Phillips screwdriver
- Soldering iron and solder
- Wire cutters
- Electrical tape
- Apx. 4 feet of 4 strand electrical wire (minimum of 20 gauge, I used "trailer" wire. You can find this article at almost any auto parts store or "Ace" hardware store. It is color coded and also plastic coated for durability.)
- 2 sets of 4 pin connectors (2 male and 2 female). I used Radio Shack connectors #'s 274-204 and 274-205. These are stout connectors with a good strain relief attached. Matt Matthews uses a 4 pin "microphone" style connectors with good results. Any type of 4 pin connector may be used.
- Small "flat" screwdriver
- Small container for screws, etc.
- "Volt/Ohmmeter"

First disconnect the console power transformer from the wall and console. Discard the transformer. Turn the console switch to the "off" position. Turn the console upside down with the "on-off" switch facing you. Insert the flat screwdriver beneath the front edge of the "slide" switch and pry the "slide" off (those converting a "tan" console can ignore this step). Now, take the Phillips screwdriver and remove the 7 screws holding the console halves together. There should be three screws on the "top" or "far" end and four on the "near" or "bottom" end. I say "should" because when the console was originally shipped there were seven. However, in the process of "cleaning" or repairing your console over the years you may have, ahem, "forgotten" to replace all of them. It is said the difference between a "mechanic" and a "technician" is the fact that a "mechanic" will replace all screws, bolts, and brackets removed while a "technician" does not need all those "extra" parts.

Lift the top part of the console (actually the "bottom" but I'm not going to argue semantics at this late stage of the game!) and set it aside. In the lower left of the console you will notice a "small" circuit board (apx. 3 1/2" by 4"). Remove the two screws holding it on. Do not remove the one screw which is recessed. Lift up this C.B. There will be a white plastic "clip-on" connector attached to the board. Disconnect this by squeezing the "clip" and pulling. Lift out the old "power" receptacle (con nected to the wires still attached to the C.B.) and the wires which may be taped to the metal shield. Discard the C.B. and wires. Lift out and discard the remainder of the old "on-off" switch which you will find lying in the slot.

Now might be the time to give your computer that thorough cleaning you have been meaning to do for the last 2 years or so!

Hold the white plastic connector going to the computer with retaining clip up and wires going AWAY from you. The voltages are: (left to right)

Pos.(+) 5	Ground	Pos.(+) 12	NEGATIVE(-) 5 Volts

Tape and label each wire about 3" inches away from the connector. Snip the wires at the connector and discard the connector. Strip and tin the ends of these wires. Cut a 5" long piece of the 4 strand wire. Strip and tin both ends of this section of wires. (Yeah, yeah, I know I did not tell you to plug up your iron, so sue me!). Solder each wire leading from the console to one wire of the 5" section (so help me, NOBODY better call me and tell me they connected all the wires to ONE wire and now their console won't work!), and tape each connection. Take the MALE connector and open it up. Remove the metal pin and they just slip apart. The strain relief will come off if you remove the screws and bend each metal bracket back. Slide the cover part of the connector over the wires. Connect the NEGATIVE 5 volt wire to pin #2 FIRST!! BJ and I fought this connector until she found the easiest way to do it is to solder the #2 pin first! Then the +12 volt wire to pin #1. Then the POSITIVE 5 volt wire to pin #3. Finish with the ground to pin #4. Slip the connector back together (there is a small pin which slides into the hole to hold it together), you might have to do a little touch-up on your soldering in order to make the connector fit. UNPLUG your soldering iron and put it into your hip-pocket (just checking to see if anyone is paying attention!) and scream. The set-up you have now should be:

Pin #1	Pin #2	Pin #3	Pin #4
+ 12 volts	(-) 5 volts	+ 5 volts	Ground

String the new wire and connector out the cut out for the old power transformer plug. Tape the wires to the metal heatshield. Place the top/bottom of the console into place, replace and tighten all the screws (however many there might be!). Set the console aside.

Take your soldering iron out of your hip-pocket (don't worry, the heat will have cauterized the wound!) and plug it in. Strip and tin both ends of the section of wires you have left. You can cut the length to whatever size you want. Connect one female end and one male end to the length of wires. Make sure you follow the color coding you used on the console. If you did not get color coded wire make SURE you "ohm-out" EACH connection with it's corresponding pin number!!! Set this cable aside.

Strip and tin the four wires you have extending from your P.E. BOX (HEY! Remember the previous article?) and attach them to the remaining connector. Unplug the soldering iron and put it away. Assemble all the connectors if you have not done so. Connect your voltmeter and turn on the P.E. Box. Check the

voltages on your P.E.B. connector first. If they are hunky-dory then power down and connect your extension cable. Turn on the power and check the voltages at the end of this cable. OK? Power down again and connect your console to the cable. Connect the monitor cable and turn the power on. You should have the T.I. screen on your monitor! If you do, then power down again and connect the "fire-hose" cable. Power up and you are running with "real" power now!! Your console will remain so cool, you wil be able to feel the "heat" actually generated by your X-Basic cartridge!

There are many different things which "could" have been done in this article. I, myself, would recommend the use of "heat-shrink" tubing in place of electrical tape to cover the connections. I would use "grommets" for all holes drilled in metal where wires pass through. I use a "Dremel" tool with cutting wheels and various stones to make the holes and removal of the studs. I have tried to write this article using the "simplest" methods which should be available to everyone in the T.I. community. I hope this series of articles have helped you to learn more about this fine machine we are still learning about and enjoying. I think you will enjoy this "conversion" to a "switching" style power supply and your faithful T.I. will continue to serve you for many more years.

As per the usual warning, if something goes wrong, TOUGH!!!

End

ONLY IN AMERICA

"He drove his German car made of Swedish steel and interior of Argentine leather to a gasoline station, where he filled up with Arab oil shipped in a Liberian tanker and bought two French tires, composed of rubber from Sri Lanka.

"At home, he dropped his Moroccan briefcase, hung up his Scottish tweed wool coat, removed his Italian shoes and Egyptian cotton shirt, then donned a Hong Kong robe and matching slippers from Taiwan.

"More comfortable now, he poured a cup of hot Brazilian coffee into an English coffee mug, set a Mexican placemat on an Irish linen tablecloth atop a Danish table varnished with linseed oil from India. Then he filled his Austrian pipe with Turkish tobacco, lit it, and picked up a Japanese ballpoint pen with which he wrote a letter to his congressman demanding to know why the United States has an unfavorable balance of trade."

BABY-AT POWER IN A TI PEB

by Jack Mathis

Note: Read completely before starting. This project is it to be done at your own risk!

I own a Geneve with a Myarc HFDC and started experiencing problems with my hard disk drive and the Geneve. Even with heat sinks on all the voltage regulators the two cards were getting extremely hot. A 200 Watt Baby-AT power supply has enough power to melt down all the cards I have and still more power for two hard drives and two floppys. This power supply has 21 amps of 5 volts and 7.5 amps of 12 volts and .5 amps of -12 volts.

First I had to completely disassemble the PEB. Remove the existing power supply from the box including the transformer and fan. Next was make a template for the new power supply to fit at the fan opening. Cut out the back of the box so the power supply would fit and drill mounting holes.

The next problem I ran into was the cables to the drives weren't long enough. I had to add two 1.5 foot - four wire cables to the new power supply. Remove the bus board of the PEB and disconnect the wires from it. Locate which wires from the new power supply are Ground, +5 volts, +12 volts, -12 volts. The +5 volt wire must be attached to pins 1 and 2. The Ground to 3,5,7....; the -12 volt to 57 and 58; the +12 volt to 59 and 60. Check for shorts between these pins! Install the bus board, connect the power wires to the off and on switch, power on, and again check voltages.

Mount the power supply, and reassemble the box, but DON'T install the cards. All the voltage regulators on ALL the cards now need to be jumpered. Locate all the 7805 and 7812 regulators on all the cards. Install a jumper wire from the left and right lead on all these regulators. Locate the 79L12 on the RS232 card and jumper from the middle and right lead with the flat side toward you (voltage in and voltage out).

Install and test one card at a time and check for smoke.

WARNING: After jumpering the regulators, NEVER re-install these cards into an unmodified box. The card WILL be damaged unless you first remove the jumpers from ALL regulators.

This project took me approximately 8 hours the first time and nearly that long when I did it for another ###er. Both systems have been running fine for about two months now. All cards are running very cool, including the Geneves and HFDCCs. The power supply is also running cool and quiet. Included on the power supply is a switched plug that can be used for a monitor, external drive, etc....

Switching Power in a TI - Addendum

by Matt Matthews

One of the most important things to be closely scrutinized when placing a switching power supply in your T.I. PE Box is, be sure all GROUNDS are in the right place. When I installed the small board back into the foot of the interface cable, after removing the regulator normally residing there, I inadvertantly allowed a bit of the foil shielding in it to contact the ground portion of the board. Needless to say it threw me for a couple of days until I gave up and went back through all my proceedures, whereon I found my problem.

The 85 watt power supply was doing such a good job of driving my four card two drive PE Box I decided to install a remote third drive. for power I just y'ed into the drive cables behind the drives, bored a hole and ran them out the back of the PE Box, securing them with a line keeper and installing a standard AMP connector and ribbon cable.

I think this is the limit for this power supply. Make any of these modifications at your own risk. If you decide to try it I will help in any way I can.

Matt Matthews
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Safford, AZ 85546-3621
(602)428-6910

No More Coffee Warmer

by Matt Matthews

Ok, now that you have your PEBox (peripheral expansion box) modified with a high wattage, switching power supply (IBM style), it's time you got rid of that coffee warmer which resides inside your TI console. You know, the one which is always causing your computer to lock up due to power fluctuations and heat dissipation.

Here is the way to do it with recommendations from Mike Doom, (Grin) ah, I mean Mike Doane, the Southwest 99'ers Cool Card and Console Guru.

Of course, if you attempt to do this, it is at your own risk, and I never met you, haven't ever even heard of you. However, I will be happy to furnish you with Mike's phone number and/or address.

Remove the bottom of your console, if you don't know how you shouldn't be trying this without help.

Remove the two screws that secure the old power supply to the case. Disconnect the "MOLEX" junction which connects the power supply to the mother-board, lift out the receptacle at the rear (where the cord from your wall transformer plugs into your console) and set the power supply aside.

The schematic shows the voltages supplied to the "MOLEX" plug are as follows. It is recommended you double check with a Voltmeter (pay attention! - one of the lines is a "negative" five volts).

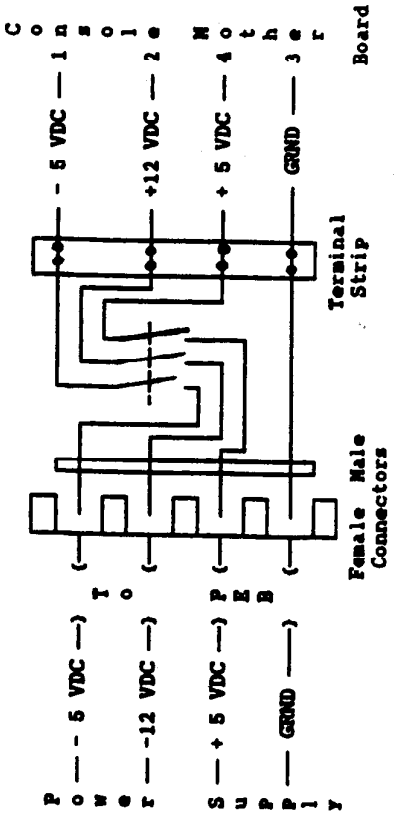
PIN #1 - 5 VOLTS
PIN #2 +12 VOLTS
PIN #3 GROUND
PIN #4 + 5 VOLTS

You will need:

1) A length of 4 conductor wire of sufficient length and size to carry the current which is required. I believe 4 wire telephone cable would do it.
2) A 4 pin male plug and matching female receptacle for connecting your power from the PEBox.
3) A TPST (triple pole-single throw) switch must be used if you wish to retain your console "ON-OFF" switch. If you do not want this option, your console will turn on/off with the PEBox switch.

I used a short piece of junction block glued to the inside top of the console to make my connections. It is not a necessity, just a neat way to make the desired connections.

I got my hardware at an "Electronic City", but I am sure any electronics store (Radio Shack, etc.) would have at least the first two items. The "on-off" switch is a hard to find item. I have the switch, Mike does not, and he has had no trouble using the PEBox switch. My console is completely cool, and as an added bonus, I don't have the wall transformer or its plug to contend with.



By HAROLD LITER

That is the Question! With my TI 99/4A and 4 floppies, hard drive, P-box and Console all working just fine. Then why take the P-Box all apart down to the last screw.

1. I did not like a separate box with power supply for the hard drive.
2. Another external box with power supply for (2) 3.5" floppies.
3. The heat from the console power supply and P-Box.
4. The P-box fan noise.

After thinking about this for some time, I decided I would do something about it. I purchased a baby IBM AT 200 watt Power Supply. This one came with the off/on switch attached to a cable.

******

Now for the TI parts not used.
The P-box power supply complete.
The P-Box power supply switch.
The Console power supply at module slot.
The TI original fan in the P-Box.
The wall transformer that plugs into the 110 volt/ac, and console connector.

******

Now comes the dissembling of the P-Box down to the last screw. Measuring, cutting, filing and drilling, with a lot of checking along the way.

I used the 3.5" 1.44 meg floppy as drive (1) and (2) with 2880 sectors each. (You need a Myarc H/F disk controller for the 2880 sectors). These are Sony drives in teac 5.25" adaptor kits for 3.5" micro floppy disk drives. The drives are gray in color. CS-235 made in Taiwan. The (2) 3.5" are installed just left of the #1 card slot. Attached to the top of the old TI Power supply cover.

The 200 Watt IBM Power Supply is inside attached to left side wall back corner, in place of the TI power supply. Next to the Power supply is a 20 meg. hard drive 3.5" Seagate ST-125. All inside the old TI- power supply cover. The (2) 5.25" Half-hight drives are in the original place, and are drives (3) and (4) with 1440 sectors each. All the power now comes from the IBM 200 Watt power supply in the back of P-Box.

I connected the console using 4 wires inside a 1/4" clear sleeve to a small 4 pin female connector. This connects into a male connector on the P-box with a plate. The 4 wires are for -5 Volts, Ground, +12 Volts and +5 Volts. A new 12 volt L.E.D. with resistor was added to indicate that the console is on or off. (The console power supply was removed and now gets it power from the IBM power supply through the 4 wires). I have the monitor, P-Box and printer plugged into a plug strip with a switch. All on or all off, using the printer switch as needed.

Jumpers must be added to the +12 volt and +5 volt regulators, shorting them out, as these regulators are no longer used.

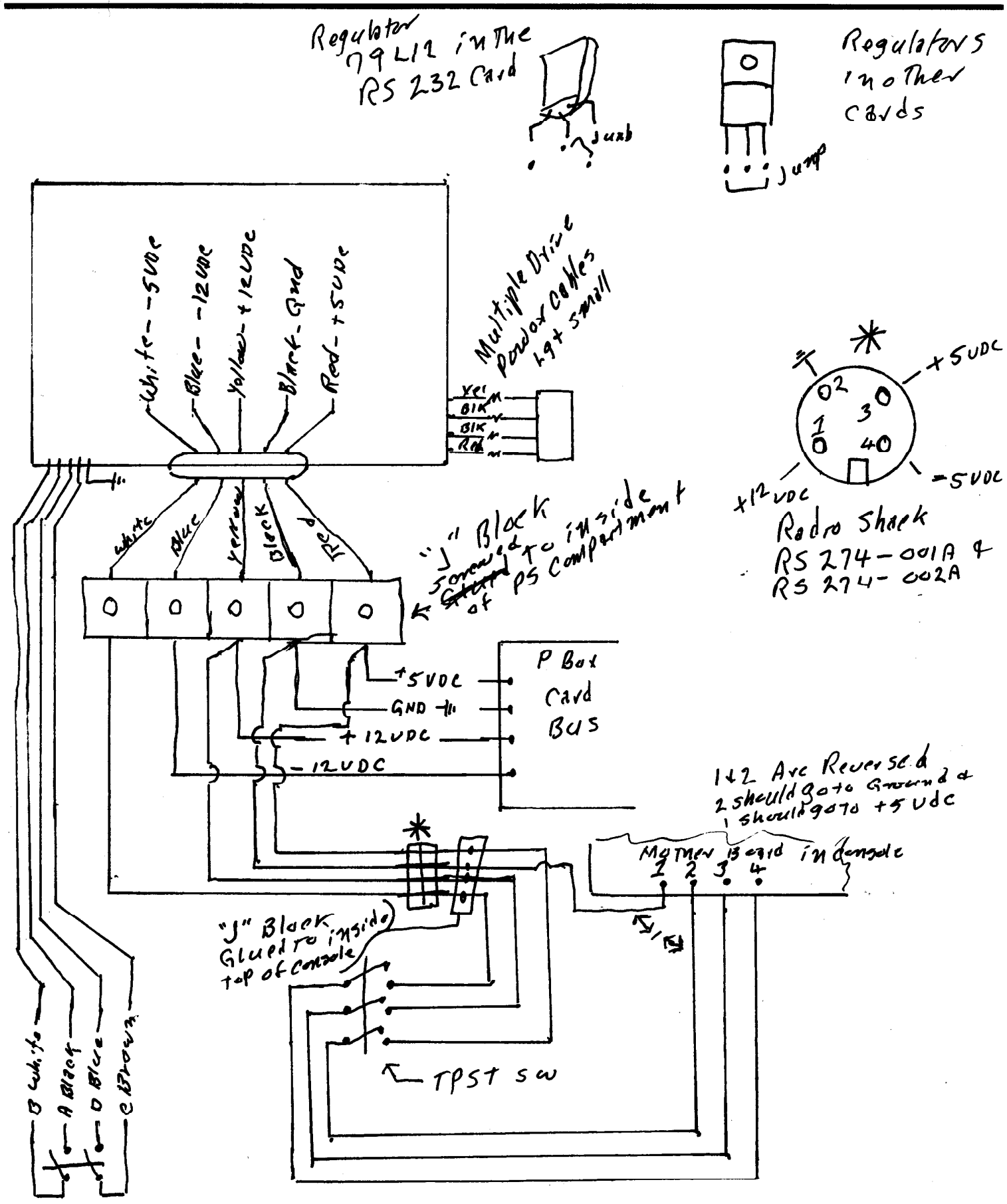
Cards with jumpers installed CANNOT BE USED IN AN UNALTERED TI P-BOX WITH THE OLD POWER SUPPLY AS THIS WILL DAMAGE THE CARDS . I PUT A 1/2" RED DOT ON THE CARDS AS A WARNING THAT THE CARD HAS JUMPERS ON THE REGULATORS.

The cables for the 3 1/2" drives go inside the box on the front side between the front of the box and the card rack to the hard floppy disk controller card and then to the two 5 1/4 drives. The cable for the hard drives runs under the front flange that holds the card connectors, under the two 5 1/4 floppies, up the right side of the p-box in the drive chamber and out to the controller card.

I cut out the p-box fan opening and installed the IBM 12 volt fan on the outside of the p-box over the hole that was cut out.

the power for all the drives and the p-box cards comes from the IBM power supply. I mounted two 6 terminal strips where the old transformer was and connected the wires to them.

I use a navarone widget to reset the console, if necessary, as the off/on switch is not there. This system has been running for over a year. This modification is well worth it. This information is what I did. All changes are at your on risk . If you would like more details, write to BUG NEWS or HAROLD LITER, 732 West 147th Street, GARDENA CA. 90247


Regulator 79L12 in the RS 232 Card
Gnd
Jump
Regulators in other cards
White - -5VDC
Blue - -12VDC
Yellow - +12VDC
Black - Gnd
Red - +5VDC
Multiple Drive power cables 4 pin small
Red
Blk
Blk
Red
+5VDC
-5VDC
+12VDC
Radio Shack
RS 274-001A &
RS 274-002A
"J" Block Soldered to inside of PS Compartment
+5VDC
GND
+12VDC
-12VDC
P Box Card Bus
1 & 2 Arc Reversed
2 should go to Ground &
1 should go to +5 VDC
Mother board in console
1 2 3 4
"J" Block Glued to inside top of console
TPST sw
White
Black
Blue
Brown
PEB on-off

Be careful with jumpering of regulators

This comes from Mike Doane, of Tucson, Arizona. He writes:

It has become alarming to hear of the number of Texas Instruments users whom are creating problems with one specific hardware update.

I am speaking of the conversion of PEB power supplies. I am a strong advocate of changing the internal power supplies to an IBM-style of transformer. It is an improvement which is long overdue and I am glad to see it advanced.

However, there is one major fact which has been overlooked in every article I have read. I have also noticed the fact that almost everyone who has converted a PEB claims no appreciable reduction of heat in their cards. The problem is created by the modification they have done.

The regulators on the cards themselves are still being activated! They are being "back-fed" through the output leg by the cards themselves. This, in effect, tells the regulators they are still active.

The purpose of a regulator is to restrict voltage to a specific level and dissipate the excess voltage in the form of heat transfer. In the normal state of things, the unregulated current enters the input leg, is regulated and exits the output leg to supply the card with constant, regulated voltage.

What is done, in essence, with the "jumpering" (connecting a small piece of wire between the input and output legs) is to tell the regulator it is being activated (through the input leg) and then telling it. However, it is not working through the output leg.

Regulators are not very smart. They are designed to work by discerning the difference between power-in and power-out. We, in effect, lobotomize their "thinking" process with the jumpering process. They are not designed to be activated without a specific amount of voltage supplied to the input leg. This is usually a figure of approximately one and one-half volts and above its voltage rating. In the case of a +5 volt regulator, this figure would be 6 to 6½ volts. The card then sheds the excess voltage and supplies the needed voltage.

We are creating a "mental" breakdown by introducing power to both legs. The regulator is still active, even though it is jumpered. It is still attempting to regulate the power and is creating heat.

I speak from experience on this. Tom Wills, Jack Mathis and I managed to actually explode a 7805 regulator and blow a quarter-inch hole completely through a Myarc HFDC. The cause was from jumpering the regulator. It was an expensive and frustrating lesson.

The fix for this is simple. Remove the regulators and *then* jumper across the input/output legs. Why would you want them on there anyway? If the power supply you have installed surges, your card is toast anyway. Since you jumpered the regulator, the power is going right past it. Don't tell me it is so you can simply remove the jumper and install it in a non-altered box. You are better off never swapping your system cards between different systems (between a stanard TI PEB and an "updated" one). I don't care how many warning labels you put on the card. You are asking for trouble.

I recommend that all your PEBs be converted to the IBM-style power supplies. The cost is so low and the price of repairs to your cards is so high you really can't afford not to. A power supply costs $30 while a typical charge to repair a card is $50.

As usual, any and all modifications/repairs to your system and its components are done with the full assumption of the owner's risk.

Warning about power supply project

You better know what you are doing before jumpering voltage regulators as noted in Al Beard's article in the April MICROpendium ("Gaining peace of mind").

The main problem is the statement "The modification involves jumpering out of *all* the voltage regulators on each board." This is not correct for the TI Cards P Code, 32K Memory and Disk Controller. There is a -5V regulator on each of these cards that must not be jumpered out! The saving grace is that, on at least most of these cards that were made, the -5V regulators are 79L05 and look like a plastic transistor and would, therefore, be overlooked by the instructions in this article. Anyone doing modifications on third party cards should be aware that only 7805, 78M05, 7812, 78M12, 7912 and 79M12 voltage regulators may be jumpered out. *No 79l05, 79M05 or 7905 regulators should be jumpered out!*

Another problem is that on many of the TI RS232 cards there is a 79L12 regulator that should be jumpered out and this is one of those plastic transistor look-alikes whose exact pinout may vary—get help on this one!

Repaired cards may also be a problem as someone may have substituted a 7905 for a 79L05 which works well, except it must not be jumpered out.

I hope this saves some unnecessary repairs.

Jack Miller
Trenton, Michigan

PC PS in the PEB
by John F. Willforth

Got a dead P.E.B. (Peripheral Expansion Box)? Are your Myarc HDFC or 9640 cards turning brown and operating when they feel like it? Does carrying that heavy PEB to meetings cause regular trips to the chiropractor. Does putting another disk drive or more hardware in the PEB cause you a head ache or sleepless nights, not to mention an empty wallet? If you can relate to any of the above, you may want to read on.

A.L. Beard wrote an article explaining generally the placement of an IBM PC power supply in a PEB replacing the TI transformer and regulator card. The transformer being the HEEAAVVYY unit. I intend to include enough information to accomplish the same thing with the New Style PEB, which Mr. Beard said he knew little about. The New Style PEB can be identified easily by the ON/OFF switch. The New Style PEB switch rocks, push on the top to turn PEB on, push the bottom to turn the PEB off.

The power supply in both styles of PEB are linear, not switcher, and are heavy, inefficient (low power and high heat), and costly to repair. If your transformer is bad let's say, you must either order one (over $75.00), or you could send the PEB back to TI for a guaranteed repair at something between $50.00 and the cost of the transformer.

Availability of a PC power supply as well as it's cost must be considered before you begin this hardware mod. to your PEB, as well as your ability to do it. I used an old PC power supply taken from an original IBM PC. The power that is available is considerably less than is available from newer XT and AT power supplies. This one was free! You should get a 135 watt or greater power supply. I can't imagine you being able to stuff enough of ANYTHING inside a PEB and add external power (DC) for stand-alone drives to draw excessively on a 150 W. PC power supply. I'm going to describe in the next couple pages what I learned putting the PC power supply in the N.S. PEB.

Opening the PEB to gain access to all it's wonders involves, first making sure the AC POWER IS REMOVED. Lift the lid to gain access the cards. Remove ALL (incl. the interface card attached to the firehose) the cards and any disk drives in the drive port. Turn the PEB over and remove all screws with the exception of the two that hold the black plastic block that rested under the disk(s) in the drive port. Turn the box upright and remove all in the rear except the two that hold the top cover latches. There remains just two more to remove, they are located on the outside left and right rear corners of the PEB. Now hold down on the center of the PEB (area where the circuit cards plugged into the PEB, called the system bus), and slide the outer housing (sides and front), away from the main PEB assembly.

Observe locations of the large transformer and the regulator card mounted to the left of the transformer from back to front. Note the routing of the floppy/hard disk power cable, as well as where three unregulated DC voltages and ground enter the system bus , (identified with brown, yellow, black, and green wires attached, just to right of the transformer).

Carefully remove the regulator card, by first disconnecting the three snap on connectors that connect to the card, and with a long phillips screw-driver remove the two screws that hold the plastic mounting bracket. Four screws must then be removed from the circuit card to free up the bracket for use later to support the new PC power supply safely. Remove four nuts that hold the PEB transformer to the base. As you lift the transformer pull each spade lug connector from it's connection in the PEB. NOTE: If you are chicken, mark and diagram all wires and connection first, just in case you find a reason to try to put this back together the way it was. You will probably have to cut several wire-ties in order to remove the transformer since TI while assembling tried to tidy up things.

If you want and feel confident as a good experienced hardware constructor, you may want to remove the system bus board so you can remove the four wires attached, and clean the holes properly as well as do a good job soldering the new wires from the PC power supply into these four eyeletts. These four holes could give you problems if attention is not given to wire dressing and proper soldering. GROUND is all around each hole!!! The BLK hole is ground however.

cont. next page

If you are not adventuresome, you can always cut these four wires two or three inches from their attachment to the card nd use either shielded crimp couplings co join the wires (available from Radio Shack) or even heat shrinkable tubing placed over soldered connections. I used both types of connections,

I'm going to label all major components with an alpha designator, followed by an identified point on that component to make a list of point-to-point wiring and for text references. I'll explain as we go along.

First, with the items I've already described removed, be sure you have a RED wire going from item "I" point "L" in Fig. B to item "S" point "2a" in Fig. C, in other words: IL to S2a. That is easy isn't it? The next is a WHITE wire from IN to S1a. Study it. Here is the entire AC wiring list:

I120 to S2 IL to S2a IN to S1a
S1 to TPC2# S1 to FA* IF to TPC1#
IF to FC* (# * means no polarity and may be exchanged to it's like point)

FIG. A
"ITEM E"

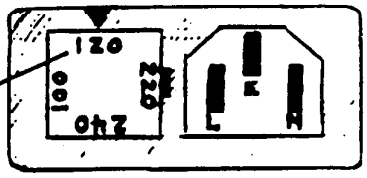


Fig. A is only included here so you can see the FUSE and it's special way of being inserted to select for input of AC voltages. Pulling and rotating the fuse actually selects different taps on the transformer you removed. This means that if you have LOW AC voltage you can just by rotating this fuse, so that 100 is located at the top. increase the internal DC voltages. If you have 220 VAC at your home, rotate the fuse to put 220 at the top. Fig. A is an external view.

FIG. B
"ITEM I"

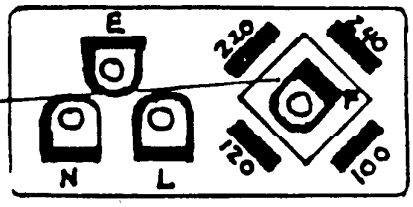
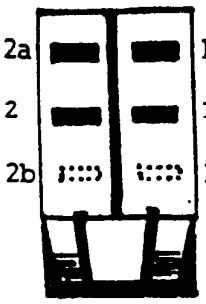


Fig. B is an internal view of the power input and fuse connectors - "I".

FIG. C
"ITEM S"



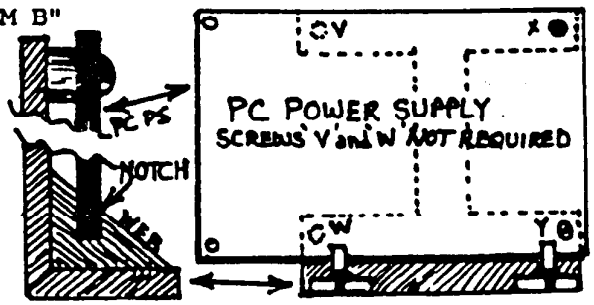
Power Switch Double-Pole Single Throw Contacts 2a and 1a are at the bottom near the base.

The RED and White wires I described in the column to the left and down one, are already in place and will be located under the new circuit board. The rest of the AC wiring will have to be done after the PC power supply board , the system bus board and fan items are prepared.

I mention the fan, remove it especially if you intend to reverse it's direction to quiet the PEB operation, otherwise you may want to leave it in place so that when you install the PC power supply, you can refer to it for contention of space.

The plastic bracket that held the regulator in place may now be examined to see how you might mount the new PC power supply in very much the same way as was the the original regulator. See Fig. D for a suggestion on notching the plastic support webbing to provide a new slotted area on the bracket which can act as a guide and as support for the bottom of the new card. The top of the card and any already existing mounting holes should be taken into consideration when making this study.

FIG. D
"ITEM B"



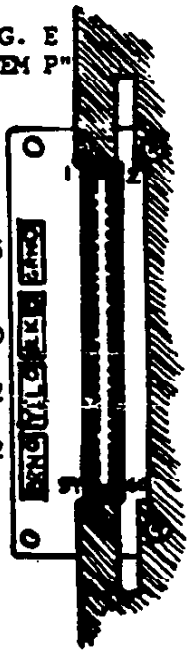
I'm running out of space for this month, so while your looking for the PC power supply, I'll be finishing this article and maybe making corrections to what I've already written. If you already have the idea you may want to go ahead. If you do, you may want to get in touch because ALL PEB cards must be modified. Next Month - JFW

PC PS in the PEB (part 2)

by John F. Willforth

If you decide to solder the four wires directly to the system bus board (see Fig. E below, clean the holes very well and as you dress the selected wires from the new PC power supply, be careful not to nick the strands since nicked wires may break and dance around the top surface of the system bus board (eight slot board in PEB that you plug the PEB cards into), causing shorts between +12, -12, and the +5 DC lead and the killer ground is very tight around those three holes on the board. Do not allow too much lead to extend past the bottom of the board, since shorts then could exist to the metal below.

FIG. E
"ITEM P"



We've some confusion to deal with when reconoiter-ing DC power output from the PC power supply board. The location of these DC voltage outputs vary with each power supply. They'll probably be considerably low if read with a meter and no load is applied. To assist in this area, try plugging a disk drive into one of the disk power connectors coming from the PS power supply. Mount the new PS (power supply) in the PEB and with only the disk drive plugged in and AC provided to the PS at TPC1 and TPC2, from S1 and IF, CAREFULLY power the unit up. Now you can short pins 16 and 15 on the disk drive together to turn on the motor to the disk drive. This causes an increase in +12 volt draw on the PS. Pins 15 and 16 are on opposite sides of the logic board on the disk drive where you would plug in the 34-pin ribbon cable. They are the eighth pin on a side counting from the end of the board that has a notch between the second and third edge connectors. All odd pins are ground so it doesn't matter which pin you touch on the odd pin side.

Locate by metering, the +5, +12 and -12 wires coming from the PS. Also find the many grounds. You will note that there are many +5, +12 and Grounds on the board but usually only one -12. Use the extra disk power connector(s) to measure the +5 and +12. Note as you do the colors of the wires, because the manufacturers usually keep the same colors for the voltages and ground on the PS units and this would make identification of the DC power on the PS much more precise.

If all looks good at this point, you may want to hook up the power to the system bus Item "P" in Fig. E. It shouldn't matter which ground and which +12 or which +5 you use, but I believe that your choice will be limited to the one -12 volt wire you find.

You can reinstall the fan if you reversed the field (laminated zink plates shown in Fig. G) to quiet the PEB. Connect IF to FC and S1 to FA or visa-versa (it doesn't matter this is Alternating Current were talking about here). By the way, to reverse the fan, remove the plastic fan blades (a very hard pull), then remove the two screws that hold the fans main parts together. By the way, it might be smart to mark the main three housing parts, so you KNOW that you actually did turn the field 180 degrees. All other parts remain in exactly the same position. Watch where the small washers on the armature shaft are (how many and on which end) and be sure not to lose any. You may find that doing this, will make all the work worthwhile.

FIG. F
"ITEM T"

Note that there can be many connectors for the various voltages on the board, and they can be located anywhere on the PS board.

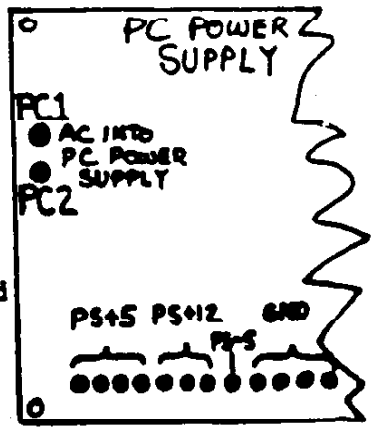
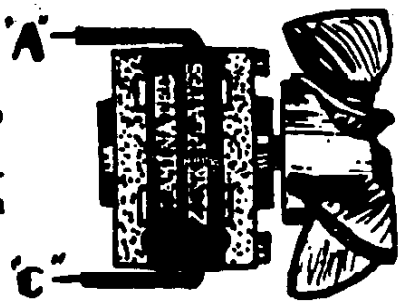


FIG. G
"ITEM F"

You may want to lubricate the two brass bushings on the fan while you have the PEB apart.



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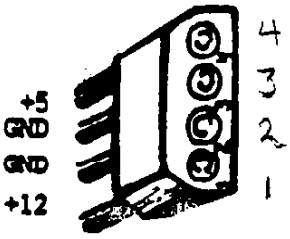
Below in Fig. H, Item "D" you may reference the pin-outs for a disk power connector. They are the same in the PEB as the ones found on the new PC power supply. The connectors are both identical but the wire colors will, in all likelihood be different. There may also be only one wire running to the number 2 and 3 pins since these are both ground, and a loop of wire is sometimes used between these two pins. i.e.: You may have only three wires from the new PC PS. This is OK.

FIG. H
"ITEM D"



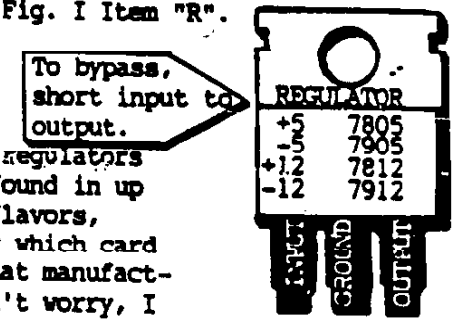
None of the connectors on the new power supply is likely long enough to reach the drive port with enough to spare to allow for comfortable hook-up of disk drives. It will then be prudent to splice the old PEB disk drive power cable to the new PC disk power cable using information you gathered and I've provided to this point. Use the voltage/wire color table that you should have drawn up earlier. You can survive if you failed to do any thing about checking voltages, if you at the very least NOTED ALL THE +5, +12, -12 and GROUND WIRE COLORS on the new PS or at the VERY LEAST have a means to accurately meter the voltages on a live power supply. The better you note the items I mentioned earlier, the less difficulty you will encounter.

CHECKPOINT

With no PEB cards installed, the new PS installed and all the AC wiring (7 wires connected, shown just above FIG.A) the DC to the system board (see FIG.E), and the DC voltages to the disk power connector (see FIG. H above), and at least one disk drive connected to that disk power connector, APPLY POWER. Note that you can't get anywhere accurate DC voltage readings without a load on most of the new switcher power supplies. If the fan runs, you don't smell anything, you can start getting excited! A quick check of the voltage pins on the disk power connector, followed by shorting pins 15 and 16 on the 34-pin connector should prove that you are doing pretty well. Now, CAREFULLY meter the four connections shown in Fig. E to see that the +5 DC is present on the point marked GRN (green not ground), ground should be on the point labeled BLK (black), that -12 DC is present on the point marked YEL (yellow), and finally +12 DC is on point marked BRN (brown). I wondered what TI would have done if the wire manufacturer ran out of green, black, yellow or brown wire since they etched the colors of the wires right into the board. With all the mistakes I make, I'd never dare etch a variable into a board.

If all still looks good, it is time to learn the FINAL step in upgrading the PEB, and that is the modification(s) to the individule PEB cards, including the seldom thought of PEB interface card. This card plugs into the left-most slot in the PEB. Remove the cover and find a component that resembles the regulator shown in Fig. I Item "R".

FIG. I
"ITEM R"



These regulators will be found in up to four flavors, depending which card and by what manufacturer. Don't worry, I can help you here by saying that they all look the same, have numbers that appear to be very close and confusing, but all that doesn't matter. Just look for at least one on every card, and up to three on some cards like the GENEVE (9640). The regulator was chartered with the job of reducing and controlling the RAW DC voltages fed to them from the old TI PEB type power supply. Since the new PC power supply already does this, they can be bypassed.

One way is to remove the item, and put a jumper wire across the outer two holes that are left (staying clear of the center hole, ground). Another way is to not remove the component, but to just jumper the outer two leads. The regulator will then be quiescent and inert.

Bypass the regulator in the PEB interface card, reassemble, and install the card in the PEB. Connect the firehose to the TI-99/4A, and power up the PEB, followed by the TI console, (unless you have a 9640, GENEVE) in which case you won't have

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a fire-hose attached. In this case I think that you are going to have to do as Mr. Beard did, modify your 9640 board as described (short-out the three voltage regulators or remove and jumper) and just try it.

```
*****************************************
**** This project should not be under ***
**** taken by any but experienced     ***
**** project doers, or those with a   ***
**** lot of money to replace the unit ***
**** that no longer works. I cannot   ***
**** take responsibility for misprint ***
**** errors or your failures to com-  ***
**** ply with instructions. As a mat- ***
**** ter of fact I'm sure that I'm    ***
**** speaking for the User Group that ***
**** prints this article as well as   ***
**** any other reprint. J.F.W.        ***
*****************************************
```

All cards that are installed in the PEB will now have to be modified as shown in Fig. I to the items that look like the voltage regulator, and it is VERY IMPORTANT to note that unless the jumpers are removed, these cards can never be used in a standard PEB with the old style linear PS inside. The reason is that if jumpers are in place, RAW +16, RAW -16, and RAW +8 VDC (actually as much as 50% above these values is possible) will be put on the voltage pins of chips which are not designed to be operated at these extreme levels. Basically all chips on a board can be "SMOKED". Here is a simple rule:

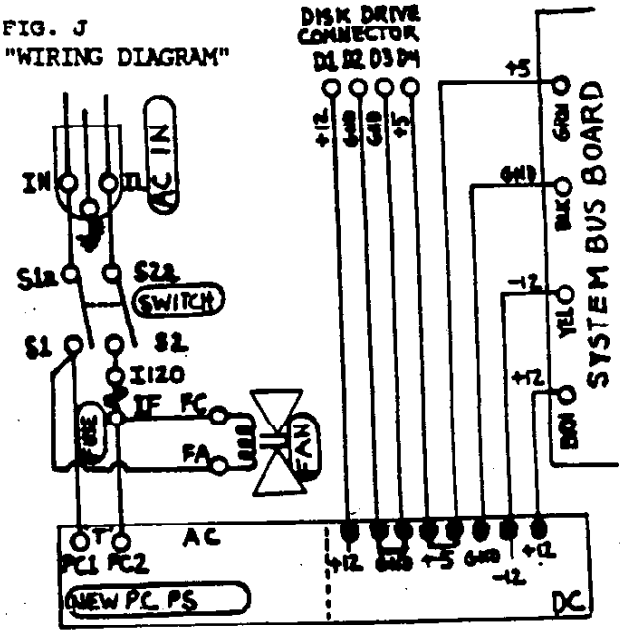
Any PEB board, modified or unmodified may be put in a modified PEB, but only a modified card will function, the unmodified card will fail to function but is not damaged.

An unmodified PEB will DESTROY ALL cards that are modified.

SUGGESTION, place a bright red or yellow sticker attesting to the fact that the card should never be placed in an unmodified PEB on the TOP SURFACE of that card.

I might mention here that if you wish to modify your old style TI PEB, the type with the PUSH switch (not the rocker type described in this article), the units are primarily different in the area of the transformer and the fuse. Since the fuse is easily located this should cause no problems, and the transformer will be removed completely anyway, you should be able to reference the wiring diagram in this column and modify any PEB that TI released. You can either solder directly any wire to a spade lug connector, but putting a shielded female lug connector would make adjustments, repair, and disassembly much easier should it become necessary.

FIG. J
"WIRING DIAGRAM"



I know that many things may be confusing in the last four and three quarter pages. but please read the entire article carefully first, locate all the items in your PEB, and familiarize yourself with your new PC power supply. Chart all measured voltages in the PEB and on the new PS to wire color. If you feel more comfortable just wire as indicated above. Some people won't need all the detail I've tried to place here. Caution with repeated checking as you go along is always wise.

You can even use the DC fan from the new PC power supply, but you will have to plug it into the new PS and not wire it to the AC as was your old PEB fan. This could give you a quieter PEB, depending on the fan that was in your new PS. Try in either case to have the air flow into the PEB and not out of the PEB (this is the reason for a muffled quieter PEB.

This is the end of the PEB power supply upgrade (modification) article. You should be referencing five pages, if not something is missing. I hope that you will benifit a great deal from this article.

Maybe you'd like to make the PEB into a MINI-TOWER, with the TI-99/4A inside? Might be next! ML J.F.W.

****
** PC PS IN THE PEB (part 3) **
** by John F. Willforth **
** Reprinted from West Penn 99'ers **
****

Parts one and two are as correct as I can get things the first time. This should be considered more of an addendum to the original article. I have one very important addition to add and some construction hints.

First, I failed to mention the +5 volt regulator in the foot of the "firehose" connector that plugs in the console's right side. Without a bypass of this regulator as was done in the PEB interface card, the PEB and all it's cards will not be found by the console (CPU) on power-up. No damage will be done to the PEB or to the cards in the PEB. If you've not been able to get your unit to work, try checking this out.

If your PEB will have less than three slots left, I think that a 200 watt power supply would be a better choice (over a 150 watt). This will depend of course on if you are using let's say two 1/2 height floppies as well as a hard drive in the PEB with the 5 I/O, interface, controller cards and can't calculate the power drawn by these cards. Don't settle for 135 watt supplies! Ask Mike. By the way Mike Sealy drew it to my attention that I missed the regulator in the foot of the firehose.

An alternate construction idea would be in mounting the PC PS PCB (Personal Computer Power Supply Printed Circuit Board). Cut a sheet of plexiglass or plastic to use as an intermediate mounting media for the PC PS PCB as large as the mounting holes on the PCB (this should be at least large enough to span the holes on the plastic bracket that originally supported the TI PS PCB. see FIG. D of part 1). When this is done, you will see that by manipulating the relationship of the three parts, you can develop a convenient and secure position for the new PC PS PCB within the PEB PS cavity Use the piece of plastic as an adapter in other words.

The PEB is but 17 1/4" high if set vertically. If you are a GENEVE owner, you could make a great mini-tower. A neat way to do that, would be to remove the 5 rubber feet from the bottom of the PEB and relocate 4 of them at the corners of the end you would feel most comfort- able with as the bottom. If the now exposed bottom of the PEB is too unattractive, think of making a solid metal plate (Aluminum would be easy to work with), 11 1/2" x 17 1/4" to attach to the bottom. The 6 screws holding the cover to the base plate (around the perimeter of the bottom on the PEB) could be removed and replaced with screws tapered and recessed into the new bottom plate. If you would like to really provide a clean looking bottom, use double-sided tape.

If you operate a 99/4A, you can do the same, but you would probably find that the diskette drives would be best located on top. The firehose would be closer to the surface where the console itself is located. This mini-tower concept, in either case, is nice if you want to put the PEB on the floor. Think about it. The floppies would be up a knee level; it doesn't matter where the hard drive is within the PEB, so long as it is mounted in accordance with the rules for installing your particular drive (SOME DRIVES MUST BE MOUNTED HORIZONTALLY). The noise would most certainly be reduced, and valuable desk-space would be increased.

More can be done to improve the PEB, and the next article will point to another idea. ---- more later JFW

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* HOW TO MAKE A DISKETTE CASE by Phil Van Nordstrands *
* Johnson Space Center UG, League City, TX *
****

Do you have stacks of disks sitting around, some grouped with rubber bands?

Possibly you have fancy plastic cases but they don't always solve the problem of disk storage and organization! I have two plastic cases that hold more than 50 disks, but I save them for master disks and others that I don't ever use, leaving a problem of how to store the rest--the ones I want to be able to find in a hurry.

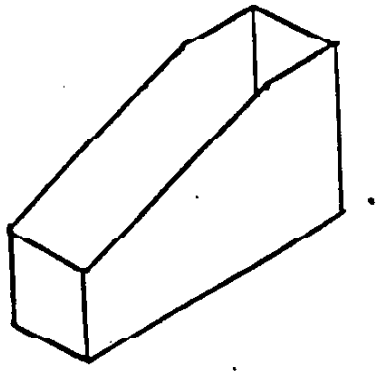
The solution I came up with is to make simple storage cases from empty dry food containers. I have one box for my TIPS disks, one for my GENIAL TRAVelER disks, one for my PR-BASE disks, and one for my TI-Writer file disks, etc. They are a light weight, scaled down version of the magazine holders advertised at over $3 each in an office supply catalog.

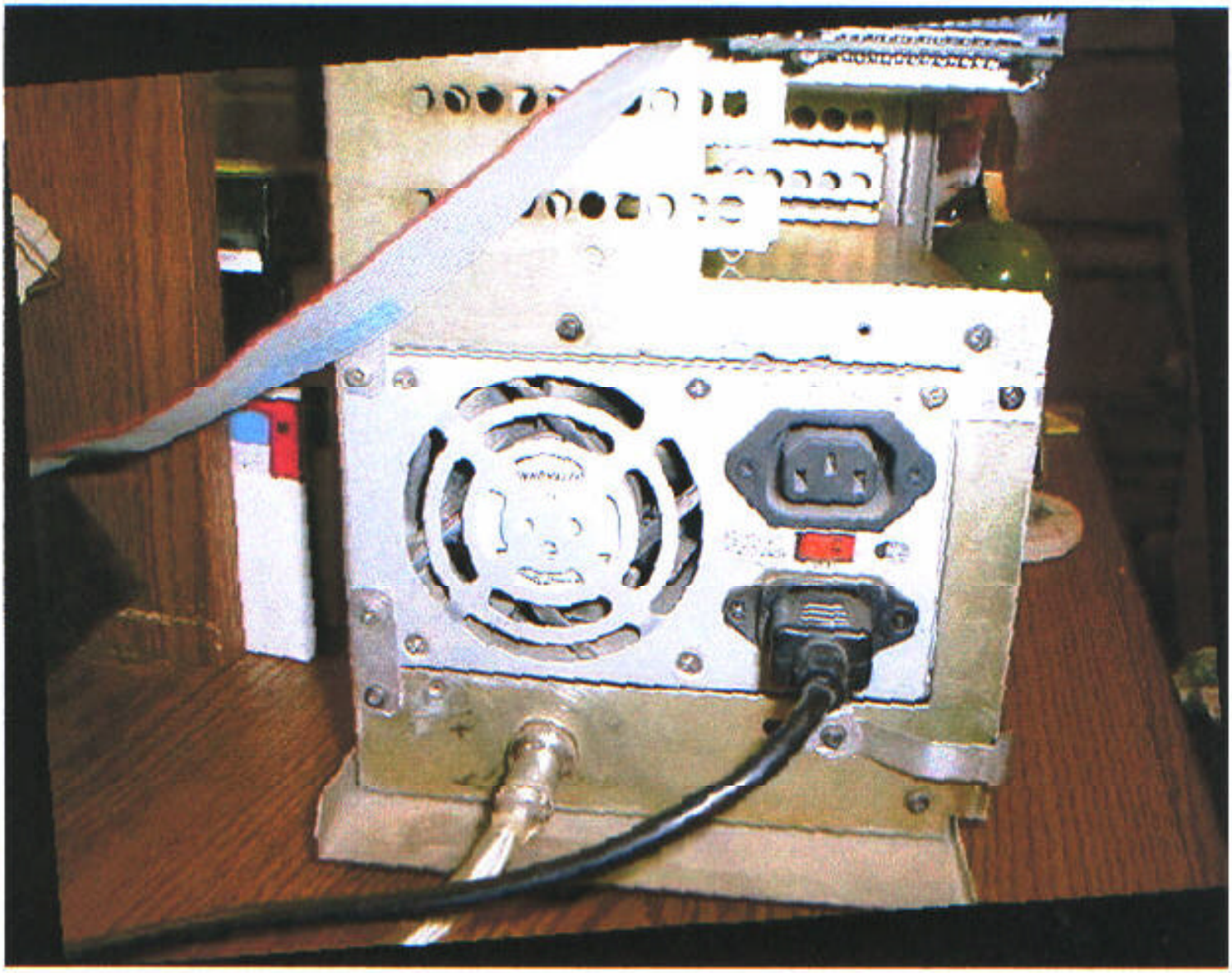
The boxes I use are about 5 5/8" deep and 2 1/4" wide. They hold about 20 disks and are made from Waverly cracker boxes. I also have one made from a Bisquick box that is slightly deeper.

They are made by cutting down the cardboard boxes to a height of about 4 inches. You can leave the sides straight and horizontal or you can be more elegant by curving the two wide sides or sloping them down to about 3 inches high in front.

To make them look neat and hide the advertising, cover the sides with contact paper. I use the imitation wood grain paper, but anything goes.

I have also made cases for magazines and soft cover computer manuals from 9 inch boxes and cases for small software booklets for 5 1/2" deep boxes.





Dr. Good,

These pictures may be too large for placing on the web. I have sent them along so that the method of cutting the Aperture in the VF Box and the mounting can be seen.

The large picture shows the Receptical for Powering and External Drive

Al Wolff