

ARTWORK IDENTIFICATION

(5/1/14)

One of the most confusing issues regarding PC board documentation and photoplots is the revision of the unassembled (bare or raw) PC board, the revision of the assembled PC board and the revisions of the individual photoplots.

First is the unassembled PC board. The revision of the board should be the revision of the drill drawing. Anything that affects the photoplots, the drilling information, or the drawing itself results in a change in revision level of the drawing which then causes a change in the revision of the bare board. This can result in a board going through many revisions, but that is a necessary fact. If revisions change too many times without actual design changes, then that calls for looking at the cause of the frequent changes.

The film (we will refer to film, but you may only be thinking of the individual Gerber format file) representing each layer of a PC board is part of the tooling necessary for manufacturing the board. In many instances, there is no accounting of the status of each piece of film. This meant that for something as simple as a silk screen change, all photo tooling would be scraped. It is not hard to figure out this could cost a lot of money and time for a simple change. During the period 1981-1983 the following film identification/issue number system was developed and refined. It has been in use in a number of companies and appears to work well. Each piece of film receives an identification number consisting of the part number of the bare PC board prefixed by some sort of layer identifier and followed by an "issue number". The issue number is just a revision indicator. It is not called revision and is not a letter so as not to confuse it with the revision letter of the board itself. Each piece of film carries its own issue number starting at 1. Any change to that particular piece of film increments the number by 1. It is not necessary for all film for a board to have the same issue number. Any issue number changes also results in a board/drill drawing revision letter change. Any time a changed piece of film (or plot file) leaves the designers hands, the issue number must change. There have been many scrap boards made because the wrong piece of film or plot file went to the board shop. This may mean an issue number or board revision which was never used to make a board. A new revision letter is cheaper than a box of scrap PC boards.

The following is a list of example film ID numbers.

AWT123456789/ISS.1 - Top side ArtWork for board 123456789
AW1123456789/ISS.1 - 1st inner layer ArtWork for board 123456789
AW2123456789/ISS.1 - 2nd inner layer ArtWork for board 12345789
AW3123456789/ISS.1 - 3rd inner layer ArtWork for board 12345789
AW4123456789/ISS.1 - 4th inner layer ArtWork for board 12345789
AW5123456789/ISS.1 - 5th inner layer ArtWork for board 123456789
AW6123456789/ISS.1 - 6th inner layer ArtWork for board 123456789
AW7123456789/ISS.1 - 7th inner layer ArtWork for board 123456789
AW8123456789/ISS.1 - 8th inner layer ArtWork for board 123456789
AWB123456789/ISS.1 - Bottom side ArtWork for board 123456789
SMT123456789/ISS.1 - Top side Solder Mask for board 123456789
SMB123456789/ISS.1 - Bottom side Solder Mask for board 123456789
SST123456789/ISS.1 - Top side Silk Screen for board 123456789
SSB123456789/ISS.1 - Bottom side Silk Screen for board 123456789
SPT123456789/ISS.1 - Top side Solder Paste for board 123456789
SPB123456789/ISS.1 - Bottom side Solder Paste for board 123456789

Film should be identified in a consistent manner. How about below the board outline and to the left. Putting the identifier in the same general location makes it easy for the fab people to quickly determine if they have the right film. Why not make a PC board CAD part to make the job easier. Like:

AWT123456789/ISS.1

During the prototype stage of a PC board design, the bare board may go through many changes before the board assembly is released. This is OK (though try to get things right as soon as possible, each time a board is made costs a lot of money). What this means is the bare board revision and the assembled board revision may not be the same. That is why there should be different part numbers for both (along with their revision letters). So with all these different numbers and letters, how can you tell what version of a board you may be holding in your hand?

The bare board should be identified in copper. One possibility would be some marking on the bottom side



of the board. At least the part number is needed along with a revision letter. But with the marking in copper in the bottom side of a board does that mean the bottom side film must change with every change anywhere on the board? How about putting multiple revision letters on the bottom side (like ABCDE). The board shop can easily mask off (edit out, whatever) the unnecessary letters when doing a run of your boards. The next time the bottom side of the board does come up for change, put a new series of letters in starting with the current revision (like CDEFG). Since a PC board CAD part was made for the film identifiers, why not make one for the board identifier. Like:

123456789
REV ABCDE

You might also like to have your company name along with the part number (a little extra advertising). Like:

BRAINSTORMS unLTD
123456789
REV ABCDE

If the bare board is identified in copper on the bottom of the board, why not identify the assembled board on the top. If the board has a silk screen (which should be the case), put the assembly identifier there. You probably want the company name and the assembly part number. Putting a revision letter with the assembly could be messy, as it is possible to have a assembly change without having a bare board change. That would mean the assembly revision in the silk screen would be wrong. Perhaps some sort of stamp could call out the assembly revision. You also probably would want to date stamp the assembly. So, just put the assembly revision and date stamp together. To make it easier to stamp, an opening in the solder mask (every board other than single sided, or pads only should have a solder mask) should be made. You may also want the marking MADE IN U.S.A. (or wherever) on the board . Sounds like another PC board CAD part.

BRAINSTORMS unLTD
ASY123456
MADE IN U.S.A.
(open area in solder mask for stamping)

Due to the ever decreasing board size along with ever increasing circuit density, it may be best to break up the CAD parts for the identifiers into separate pieces to allow for more flexibility in locating on the board. Sometimes actually locating the marking may be difficult, but it needs to be done!

OK, the bare board is identified, the assembled board is identified, each piece of film is identified, how does one know what film makes what bare board, or what bare board makes what board assembly? Drawings (and parts lists) must identify what pieces make up the whole. All the individual film (Gerber files) and drill files should be listed on the drill / fab drawing along with their issue numbers. Looking at the fab drawing (which carries the drawing / part number of the bare board) one should be able to tell exactly what is needed to make the bare board. There is almost no need for an accompanying text file with all the files as sent to the board shop.

That takes care of the bare board under this system. How does the assembly relate to the bare PCB? The assembly drawing (or specification or parts list) for the assembled board should reference the proper revision of the bare board for a given assembly revision. Not doing so results in a good chance a board gets assembled using the wrong bare board. Before you say "Well we don't build our boards so we don't have to worry about all this.* Can you guarantee all your assemblies and boards are 100% correct? Don't try to pass that buck off to the assembly house. Take responsibility yourself. Besides, what if your company goes to another assembly house? Then what?

