ELECTROMAGNETIC GAGE EPOXYING TECHNIQUE

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Note: This technique is a variation of the technique used by Lee Koller. The variations came as a result of having problems with the gage coming off with the backing when the backing was removed.

Step 1:

Clean the PMMA or Sapphire surface on which the gage is to be epoxied with ethyl alcohol.

Step 2:

Mix up a batch of Epon 815 epoxy using the normal 4 to 1 ratio by weight with hardener. Evacuate it approximately 3 minutes.

Step 3:

Paint the epoxy on the substrate surface using a small paint brush. Cover an area bigger than the gage with a thin coat. Note: the epoxy wets the PMMA or Sapphire much better than it wets the gage back. In fact, it just beads up on the gage backing.

Step 4:

Remove the gage from the plastic cover and being careful not to touch it with your fingers, clean it with a dry cotton swab just to get dust and dirt off.

Step 5:

Put the gage on the painted surface and press down on the back with your finger. Center the gage by sliding it around.

Step 6:

Put a small PMMA block (which just covers gage) on it and put it in a plastic holding fixture using the tension developed by the bent cross piece to make the screw (which has been adjusted to the right height), hold the block tightly on the back of the gage. Be careful not to move gage as it is best if the gage does not have to be repositioned after it is evacuated.

Step 7:

Evacuate the assembly for 15 to 30 minutes.

Step 8:

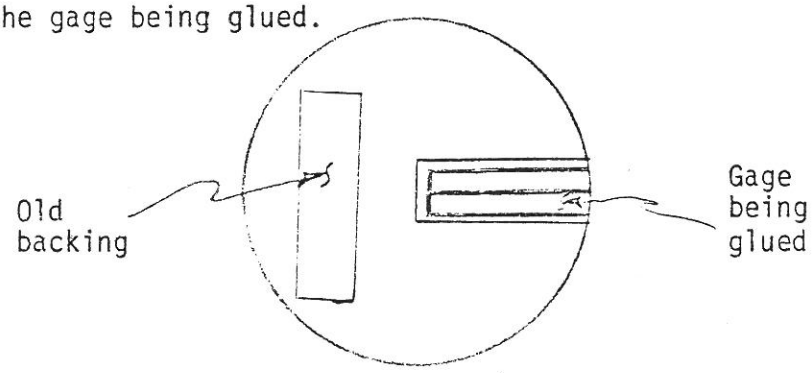
Remove from vacuum, and take substrate out of fixture. Recenter gage if required, although it is best not to move it.

Step 9:

Use dry Q-Tips to wipe off excess epoxy around the gage--don't use any solvent on the Q-Tips. Wipe the epoxy into a thin layer but don't worry about getting it all off as a thin coat wipes off easily with alcohol after epoxy has cured. Be sure to wipe excess right close to gage since back is 0.002" thick and will leave a little ridge around it that is quite thick and hard to remove later. Also remove any glue on the back of gage by the same technique.

Step 10:

Put a back from a gage that was previously glued in an appropriate position on the substrate so the PMMA block in the next step will rest evenly on the gage being glued.



Note: Prior to doing this, I noticed the top end of the gage had a very thin glue coating and the outside end had a thick coating. This has eliminated the problem.

Step 11:

Put a block on the substrate the same size as the substrate, if possible. Position it and then tape the two pieces together on the side with duct tape. THIS KEEPS THE BLOCK FROM SLIDING ON THE SUBSTRATE AND, HENCE, THE GAGE FROM MOVING OUT OF POSITION.

Step 12:

Put assembly on a lapped plate and put a weight on it. Use a weight of 3.5 to 5 kilograms. Too much weight will squeeze all the epoxy out and the gage will stick to the backing better than the substrate.

Step 13:

Let it set for about an hour, then take it apart and clean the block and the substrate again using only dry Q-Tips on the gage.

Step 14:

Put assembly back together and let it set up overnight or in less time in the oven (about 4 to 5 hours at 110° F).

Step 15:

After disassembly, put several drops of alcohol on the gage so the gage is in a small puddle of alcohol. Start at one corner of the backing and using sharp tweezers, slide one side under one corner. Then push the point between the backing and the substrate. The backing should come loose easily and the alcohol will run inbetween. Carefully and slowly remove the backing material by this technique. You may want to do the sides and the end and then go down the middle. I have not found a best way yet.

Step 16:

Clean the excess epoxy off with Q-Tips lightly wetted with alcohol, rubbing in the direction of the copper leads. You may also make several strokes perpendicular to the leads but I suggest not a lot. Use light to medium pressure being careful not to rub too long in one spot. If the gage is glued down properly, you should be able to take all the excess epoxy off so only the gage is visible--you will be surprised how much rubbing can be done without damaging the gage. Change Q-Tips often as epoxy tends to come off in small chunks and attach itself to other parts of the substrate. This may be cleaned off using wetted cotton balls.

This process has routinely yielded bonds of 5 microns or less (sometimes the measurements indicate no glue bond thickness but in this case I am sure the gage was imbedded slightly in the PMMA).