

## Upgrades to the Station 1 & 2 hodoscopes at E-906/SeaQuest

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### Abstract

In RUN I of the E-906/SeaQuest experiment, a marked deficiency in the rate capability of the Station 1 & 2 hodoscopes' PMT's prompted work to upgrade the Station 1 & 2 PMT bases. Transistorized PCB's were manufactured for purpose of upgrading the existing PMT bases to be able to achieve higher rate capabilities. This document outlines the steps taken to upgrade the existing PMT bases with the new circuit boards.

In Appendix A, a photographic comparison of the exchanged parts is given. The corresponding circuit diagrams of these parts is given in Appendix B.

### Upgrade Note:

This upgrade process is restricted only to the PMT base circuit board and internal wires. All other components under the Operations Readiness Clearance will remain unchanged: HV supply, cable installation, PMT's, and iron canisters.

### Upgrade Process: Deconstruction

The Original Base



1. Unscrew the legs from the connector cap,
2. Cut the wires to disconnect the cap from the top board
3. Clip all the through-hole components to remove the top board



4. Desolder the bottom board from the socket

We then have all the components completely deconstructed:



### Upgrade Process: Assembly

The old boards are discarded, and the new board is introduced



1. The new board is soldered onto the socket
2. The legs are hot-glued onto the gray plastic spacer
3. The connector cap is screwed into place on top of the copper spring metal



4. The board's wires are connected to the underside of the connector cap  
The finished product next to the original



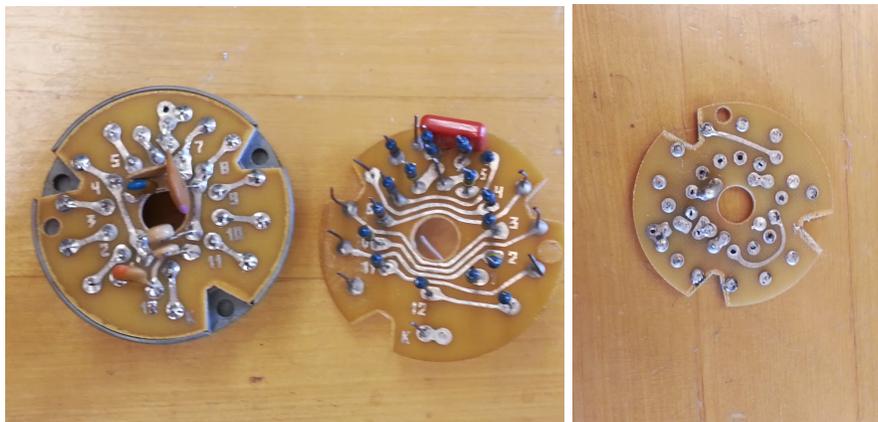
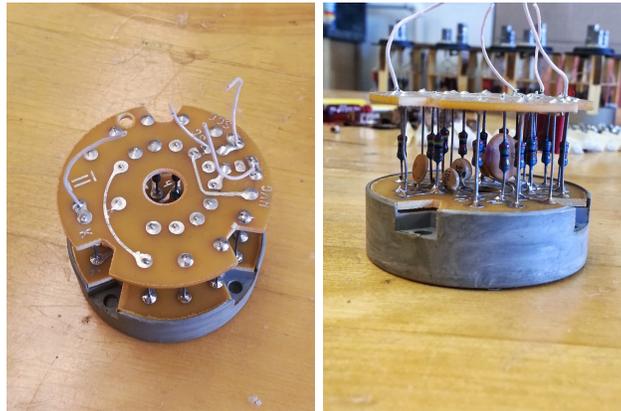
### **PMT Base Differences**

The differences between the two bases are:

1. New motherboard and daughterboard (assembled by manufacturer) in place of original two-layer boards
2. New 26 AWG stranded wires (assembled by manufacturer) connecting board to connectors
3. Hot glue attaching legs to the plastic spacer ring



## Appendix A: A Closer Look at the Original and New PCB's

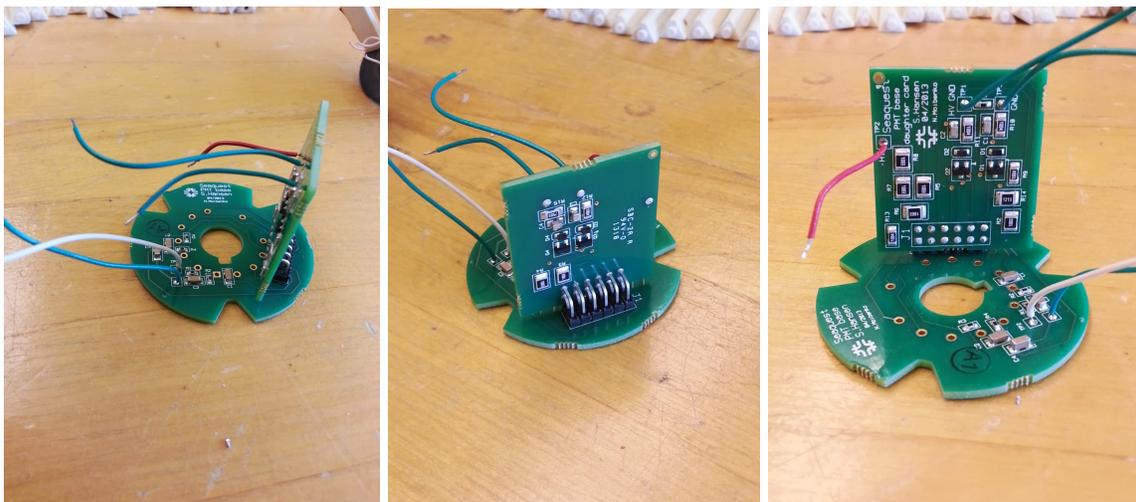


Top Left: Top view of original base circuit board

Top Right: Side-view of original base circuit boards

Bottom Left: Top view of bottom board on left, bottom view of top board on right

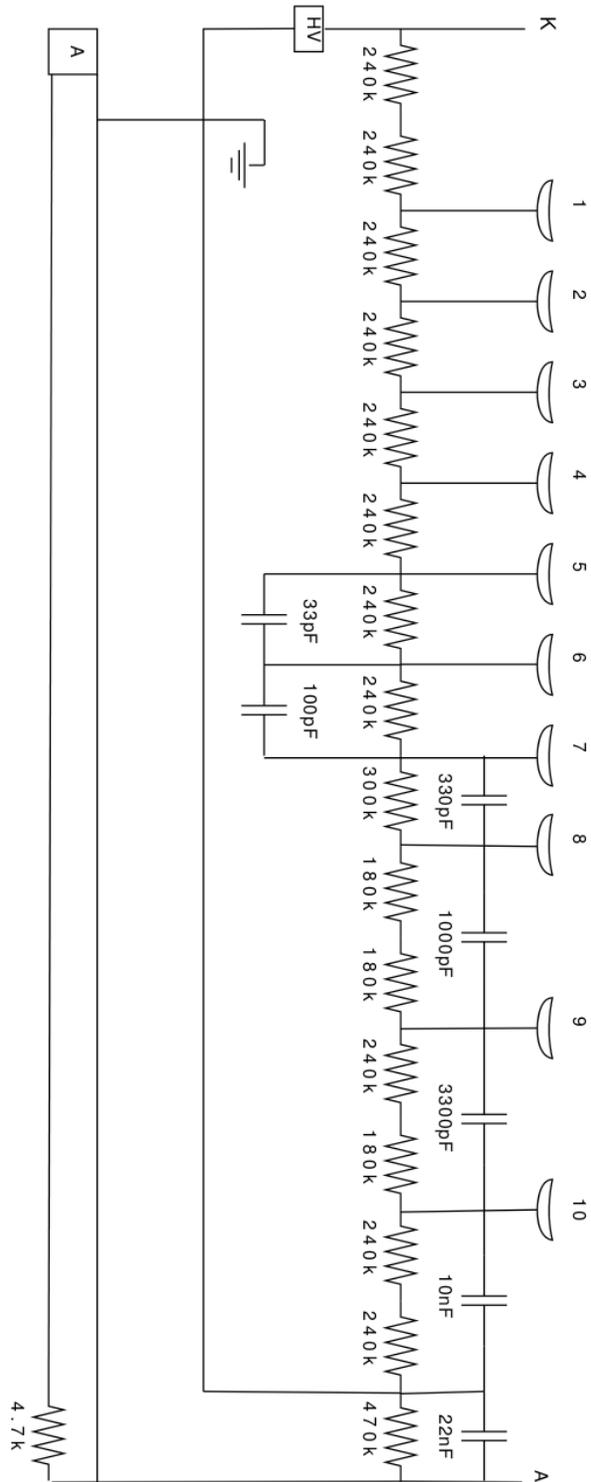
Bottom Right: Bottom view of bottom board



From Left to Right: Side view, rear view of daughter board, front view of daughter board



## Appendix B: Circuit Diagrams



NOTES: Ground of the HV supply to the ground of the anode output separated, where they were connected with the 22nF capacitor and 470k resistor in parallel, in order to

1) keep the noise on the HV ground away from the anode

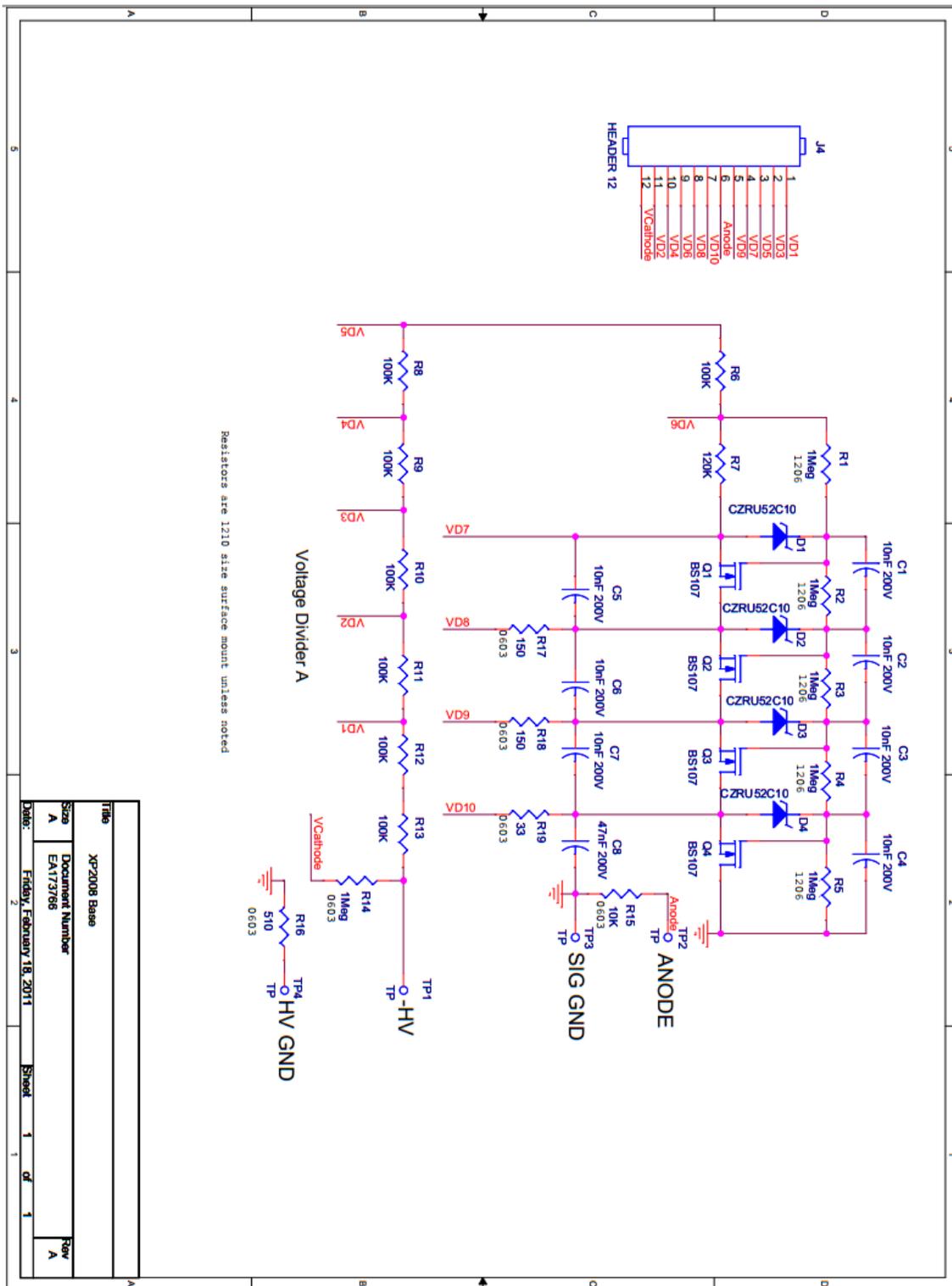
2) to avoid non-linear effects coming from the final 10th dynode

On some bases, the ground of the HV supply and anode output are shorted together with a braid.

Precision: +/- 22% (S), 33pF only +/- 10% (K)

Original base circuit diagram (both boards)





New base circuit diagram (both boards)

