

## COIL PRESSURE GAGES FOR SSC ARC QUADRUPOLE MODELS

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A gage has been developed for reading coil prestresses at the pole of the inner and outer conductor layers in the 1-M SSC Arc Quadrupole models constructed at LBL. The gage consists of a two piece machined block which replaces the entire pole area of the stamped collar laminations (Fig. 1). Each block has a full-bridge strain gage circuit and is calibrated to read coil prestress during assembly, cooldown and excitation. Gage wire leads are brought out through slots in the collar and yoke laminations. Gage installation and function is facilitated by assembling short gage collar packs in the area of the gage. The use of quad collar packs throughout the magnet may save assembly costs as well as be advantageous due to the pole area being "solid" which will reduce collar to coil bearing load at the pole.

The calibration procedure starts with a measurement of the zero load gage output at 300 K, 80 K, and 4 K. Each bridge circuit is powered with a constant 10 ma current and the bridge voltage is read as the load is changed. The gage pack assembly is then completed and placed in a fixture with cured coil segments bearing against the pole area. Load is applied to the coil horizontal centerline which is transmitted azimuthally through the coils and applies a known load to the gage and surrounding collar pole area. Coil load is cycled between zero and 16,000 psi and voltage readings are taken. A typical calibration curve is shown in Fig. 2. Presently no method is available to repeat this "in pack" calibration at 80 K or 4 K. The only thing that is precisely known about the 80 K and 4 K calibration curves is their zero load intercept values (measured as described above). Starting with these

intercepts, the cold calibration curves are then generated with a slope reduced about 10% from the warm calibration slope. The 10% reduction comes from average warm to cold slope change for dipole coil pressure gages. A method and fixtures are being worked out which will enable direct gage calibration at 80 K. The gage calibration shown in Fig. 2 has an output of about 3000 psi/mV. The outer pressure gage is sensitive to both outer coil azimuthal pressure and to the radial load from the inner gage. This outer gage response to inner layer pressure is calibrated as well and in the case of the LBL Q1A-1 model was about  $-8 \times 10^{-5}$  mv/psi of inner layer azimuthal pressure.

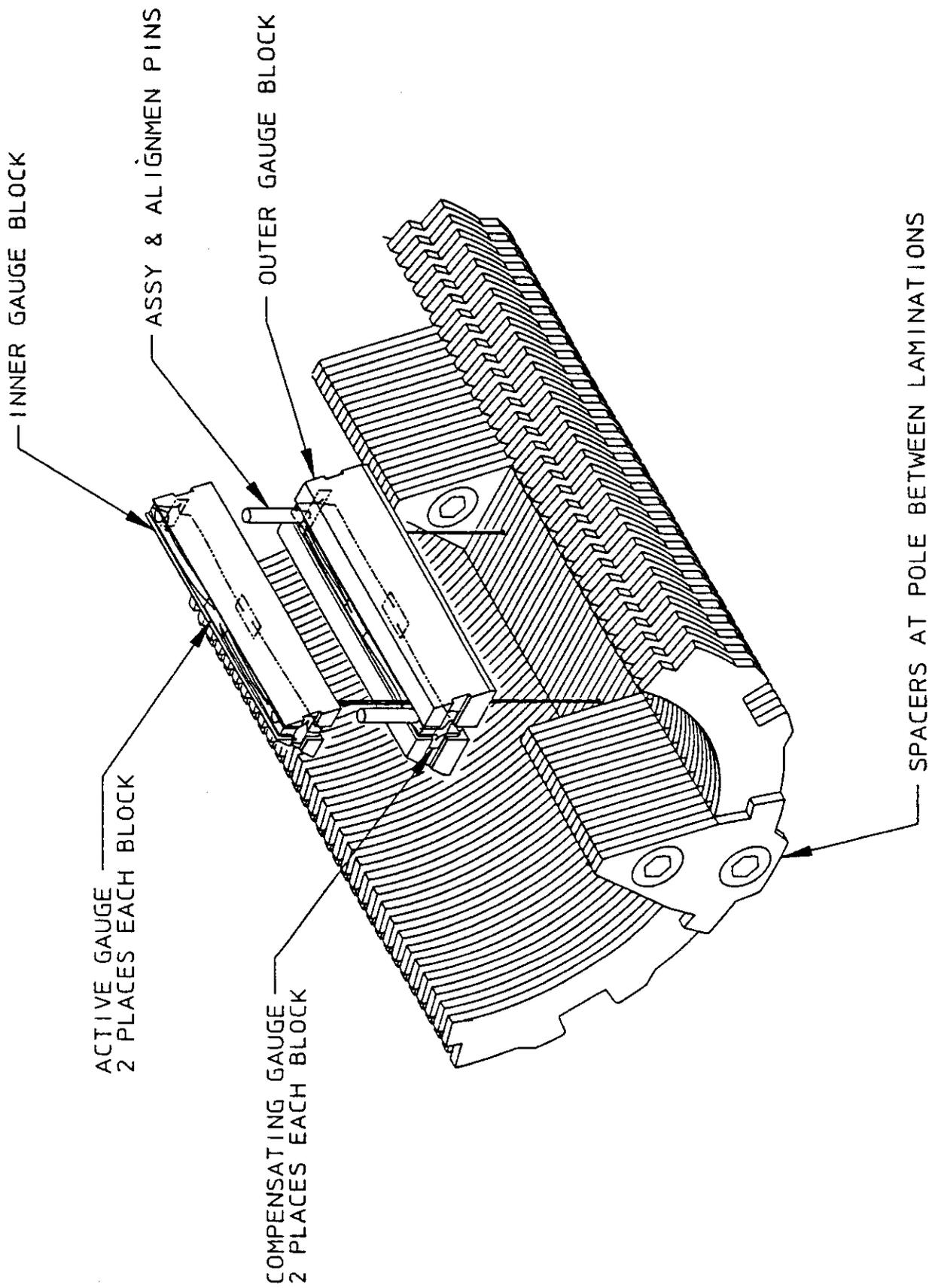


FIG. 1 ARC QUADRUPOLE GAUGE PACK ASSEMBLY

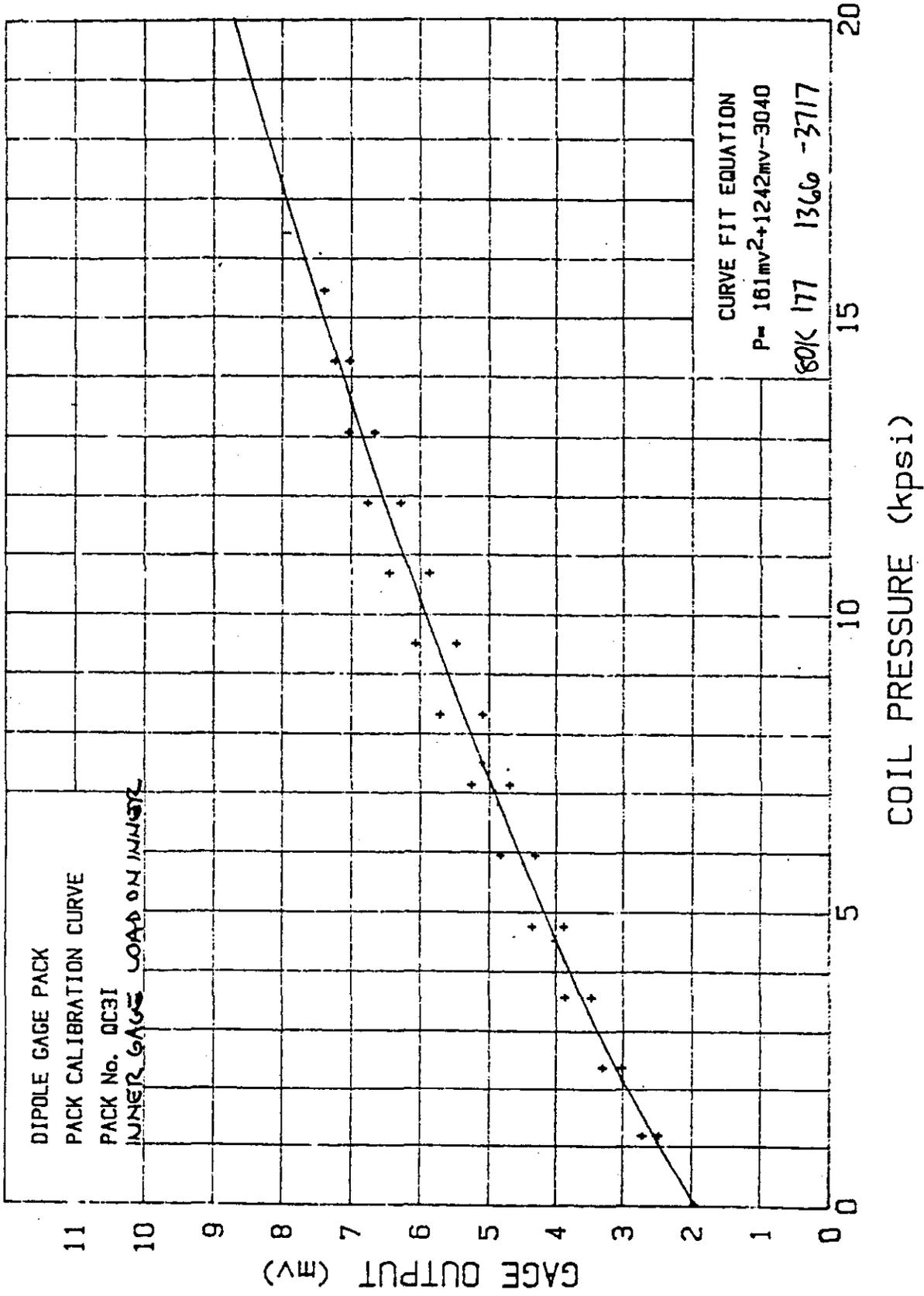


Fig. 2. Typical gage pack calibration curve