The results of the $Q$-weak experiment at the Thomas Jefferson National Accelerator Facility are presented. The experiment performed the most precise measurement of the parity-violating electron-proton scattering asymmetry at low momentum transfer, resulting in the first direct determination of the weak charge of the proton (the weak force analog to the electric charge of the electromagnetic force) and the most precise value of the weak mixing (Weinberg) angle, measured in a semi-leptonic reaction. Since the weak mixing angle is precisely predicted by the Standard model, these results provide new limits on physics beyond the Standard Model and are complementary to direct searches for new physics at high energy colliders. The requirements of the most precise measurement of the electron-proton scattering asymmetry posed technical challenges resulting in the design of a custom-built apparatus consisting of a triple collimator system, a resistive copper-coil toroidal magnet and eight fused silica Cherenkov detectors, and with significant improvements in Jefferson Lab LH$_2$ target power, helicity-correlated beam properties, and polarimetry. The detector array absorbed the total scattered electron rate of about 7 GHz read out in integrating mode by custom-built modules. Dedicated low-current measurements were used to determine the momentum transfer with a set of drift chambers before and after the toroidal magnet. The technical aspect of the $Q$-weak experiment will also be presented.