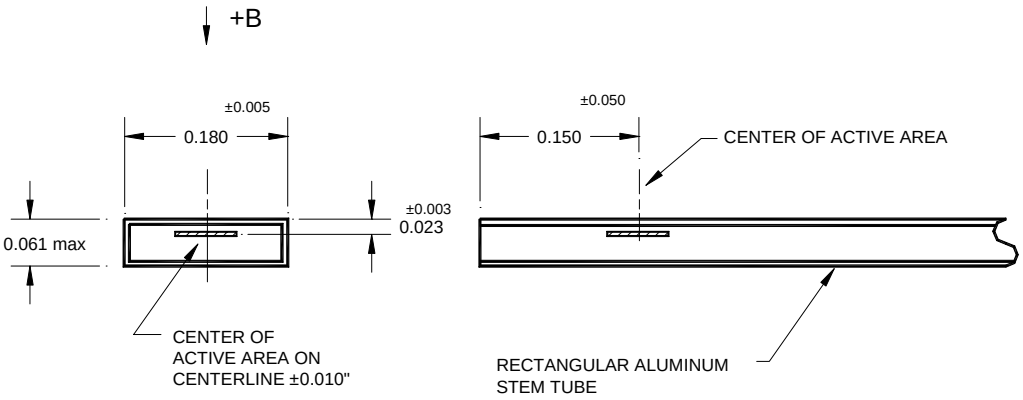
Measuring Magnetized Mass Standards

1) The Gaussmeter Probe

The magnetic field will not be uniform over the total area of a mass standard. Therefore, it is very important that a fairly thorough examination of the weight‘s surface be conducted.

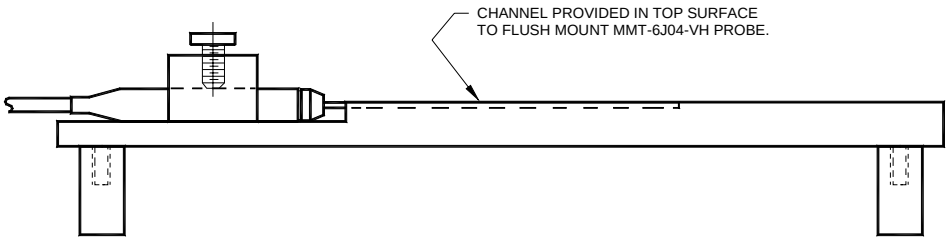
The gaussmeter probe Hall sensor is very small and can be considered a “point” measurement device. Most users have settled on the Lake Shore Model MMT-6J04-VH as the standard for these tests. The figure, below, shows the location of the sensor in this probe.



Note that the “active area” of the probe is closer to one side. This side should be nearest to the mass standard during measurement. An easy method of insuring that this is the case is to position the Lake Shore logo on the probe handle towards the weight.

2) The Holding Fixture

A fixture to hold the probe during measurement is mandatory. This fixture serves two main purposes. One, it accurately locates the probe with respect to the weight and insures repeatability with time. Second, the fixture protects the fragile probe. All Hall effect probes are very susceptible to damage from bending or compression, and a fixture can minimize these effects. This is especially important in the case of low field measurements. Probe damage may not halt operation, but will certainly increase noise and reduce resolution. The figure on the next page shows a typical fixture.



Some Fixture Suggestions:

No ferrous materials in its construction; use plastic, aluminum, or brass.
Make the channel for the probe stem between 0.063" and 0.065" deep.
Cover the total flat fixture surface with 0.002 to 0.004" thick clear plastic.
The Lake Shore Logo should be "Up" as shown above.
The fixture should be mounted on a nonmagnetic table with few ferrous objects near by.

3) Making the Measurements

Since the magnetic field values are very low, it is of major importance that the gaussmeter and probe are well warmed up and that the ambient temperature is stable. A stable zero is a must. The following steps are suggested:

a) Set the gaussmeter on DC Field, FILTER ON (8-points, 2% window), 30.0000 gauss RANGE, MAX HOLD ON.
b) With the mass standard away from the probe, zero the gaussmeter. No ferrous objects within 10 feet of the test station should move after the gaussmeter is zeroed. If the first attempt to zero does not produce a value below 0.0030 gauss, re-zero until this value or lower is obtained.
c) Press MAX RESET and immediately place the weight over the sensing area (see paragraph 1, above) of the probe. Move the mass standard slowly back and forth over the sensing area. Be especially careful to measure the field at the corners of the weight.
   This should all be completed in less than 15 seconds. Record the maximum value shown on the lower line of the gaussmeter display.
d) Re-zero as in (b), and retake the data in (c). Use the highest value recorded.
e) Depending on the size and shape of the mass standard, additional data may be taken on the sides and top. It is advised that any sections formed by a machining process be given careful attention. The same procedure can be followed.

It must be understood that this method was never intended to allow the user to distinguish between magnetic field values, such as 18 milligauss vs. 21 milligauss, but is the lowest cost procedure for determining whether a mass standard is magnetized or not.