

## #84708 DIGITAL PULL METER INSTRUCTIONS FOR USE

This meter has a multitude of applications. We have illustrated model railroad use below. You may devise a similar set-up to measure the pulling force of various types of model power systems...for airplanes, boats, trucks, etc.

Please read through these instructions completely before using. There are helpful hints that may facilitate use of this instrument.



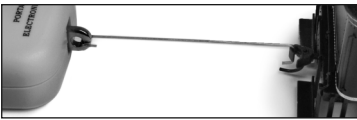
### A. Remove battery protector

On the rear side of the meter, pop open the compartment cover. Remove the insulating tab under the battery contact. Replace the cover.



### B. Form the drawbar

Use a needle-nose plier to form the supplied brass rod into the approximate shape shown in the above photo. The exact shape is not critical. Simply make a square hook of suitable size to fit inside the knuckle of the couplers you use. The other end attaches to the meter's hitch. It should be free enough to swivel, but should not fall out of the meter on its own.



### C. Make a drawbar pull test

Place and hold the meter on the track as shown in the above picture. Hook the drawbar through the locomotive coupler, and be sure there is no pulling force on the drawbar. Press the ON button on the meter (you will hear a beep when any button is pressed) and wait for the start-up display to clear. Press the UNIT button to select between oz, kg and lb. Now, gently run the locomotive away from the meter until the locomotive starts to slip its wheels. The display shows the amount of tractive pulling force your locomotive is capable of developing.

**Hint:** You may find it convenient to simply have your locomotive coupler push on the meter hitch. This will also indicate the locomotive's ability to move a train.

**Note:** The meter is capable of reading increments of .005 kg. This is equivalent to 0.17 oz or 0.01 lb. When set to UNITS other than kg, the display will round off the reading to the nearest 0.1 oz or 0.01 lb. The capacity of the meter is about 10 kg (22 lbs or 352 oz) while pulling on the hitch, or 6 kg (13 lbs or 208 oz) while pushing on the hitch (pushing will indicate a negative value).

To reset the meter, press the TARE button.

To light the display, press the LIGHT button.

You may also measure the pulling force of multiple locomotive lashups and see if the pulling force is a simple addition of the individual locomotives' pulling forces.

If you wish, you can fabricate a pocket for the meter from plastic or wood and anchor it to your test track. You may also use the bracket on the top of the meter to anchor it to the test roadbed.

To conserve battery power, the meter will automatically shut itself off after 90 seconds of inactivity.

### Further information:

Place additional temporary weight on the top of your locomotive and see how the pulling force changes. Be careful not to overload and burn out the motor. The wheels should always be able to spin when the load on the coupler exceeds the pulling force.

Notice also how the cleanliness of your track and wheels affects the pulling force. You may also experiment to find out which type of rail (nickel silver, brass, steel, etc.) works best for pulling force.

You may also use the meter (instead of a locomotive) to pull a train of cars. Note the reading on the meter. Divide the reading by the number of cars to determine the average number of cars pulled per ounce.\* You may then create a table for your locomotive roster that lists the pulling power (in cars) of each one. If you have grades on your layout, use the meter to pull the train uphill at your steepest location.

*\*Use this figure to determine the number of locomotives needed to pull your train around your layout.*

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