

### How to Estimate Available Power

As stated before, the wattage rating of a transformer tells you how much power it will take from your household mains. However, all of this power is not available for your train. From about one-quarter to one-eighth of the total wattage taken from the lines is used up by the transformer itself in transforming the power from high to low voltage. This wattage loss becomes apparent in the warming up of the transformer as it is used.

A transformer operating continuously for long periods of time or in warm surroundings will be able to deliver less power than one used intermittently or in cool surroundings. As the transformer warms up in use its output voltage and wattage will drop gradually.

As an example, a 90-watt No. 1033 transformer should not be used to deliver more than 60 watts of usable low-voltage power. A 275-watt ZW transformer should not be counted on to supply more than 200 watts. It is important to take this loss into consideration when estimating the amount of equipment your transformation can operate.

**Table for Selection of Transformers**

Transformer	Capacity	Recommended for Operating the Following
1033	90 watts	One "O27" outfit with smoke and whistle; few track or signal accessories.
RW	110 watts	Any "O" outfit with smoke and whistle; few switches and other accessories.
TW	175 watts	Any "O" outfit with a considerable number of accessories.
KW	190 watts	Two "O" outfits with smoke, whistle, switches and other accessories.
ZW	275 watts	Any practical railroad system with two or more trains, etc.

**"Wipe Your Track Regularly"**

### How to Connect Transformers in "Parallel"

When the power requirements of a model railroad are so large that more than one transformer is needed, the best practice is to use one transformer to furnish variable voltage for the track and reserve other transformer for lights and accessories. In some cases, however, when several trains are operated at the same time in various insulated sections of system, it might be necessary to use more than one transformer for the track itself.

To connect two transformers to the track they must be properly "phased" so that the high and low peaks of their alternations coincide. If they do not, a short circuit will be created whenever locomotive contact rollers bridge across a fibre pin separating two insulated portions of track.

To "phase" two transformers proceed as follows: Connect the "U" binding post from each transformer to the No. 1 clip of a lockon attached to a piece of track. Set the output voltages of the two transformers at the same point and plug the transformer cords into a wall outlet. Then touch together a pair of wires leading from the "A" binding posts. If you get a strong spark indicating a short circuit reverse the plug of one of the transformers. Once you have determined the correct position of the two plugs mark them in some way so that you will be able to connect them correctly in the future. You can connect the two transformer cords permanently by wiring them to the same plug.

When the transformers are in phase their ground or common posts can be connected to the outside ground rail, and the available voltage circuits used to supply several different voltages required by the various insulated portions of the center power rail.

Even when the transformers are in phase, however, you must be careful to set the voltage of the two adjacent sections at approximately the same point when transferring a locomotive slowly from one circuit to the other. Otherwise its rollers may bridge the insulating pin long enough so that the partial short created at that moment will stop the locomotive.