# Identifying Ballast Tubes
# and
# Plug-in Voltage Dropping Resistor Units

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Ballast tubes are glass or metal-enveloped plug-in tubes that contain a ballast resistor. They are employed in battery-powered receivers, dc receivers, and some ac/dc receivers. The ballast tube differs from units which use a dropping resistor in that the resistive element in the ballast tube is designed to decrease it's resistance as the current decreases, thus maintaining a constant current flow over a considerable voltage range. In the voltage-dropping resistor units, the voltage drop will be directly proportional to the current flowing through it. As the current increases, the voltage drop across the resistor also increases.
When the ballast tube is connected in series with the tube filaments in a receiver they maintain a fairly constant current flow through the filaments over a considerable range of voltage variation.
Plug-in voltage-dropping resistors are mounted in a perforated metal enclosure with a plug-in base.

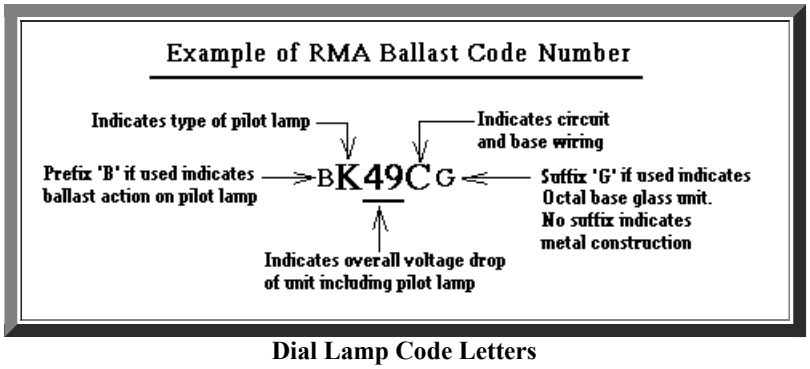
### Development of the Ballast Tube and Drop-in Ballast Resistor

In early ac-dc radio receivers, a voltage dropping resistor (consisting of a wire-wound type resistor) was used to reduce the line voltage to the value need for the series filament string. This resistor was first mounted under the chassis. The heat generated by this resistor was communicated to the nearby parts such as, other resistors, coils, capacitors, ect. Because of this, the under-chassis mounting proved unsatisfactory.
The resistance line cord was the next step to solve this problem. This was a resistive element as a third wire incorporated into the cloth-covered line cord. This spread the heat generated out over a larger area which cause the line cord to become warm to the touch when the set was operated. Since line cords were subject to frequent flexing, the resistive element often broke, rendering the set inoperative. If the line cord became tangled or rolled up, dangerous temperatures would develop due to concentrating the heat in a small area, which increased the danger of a fire hazard.
The next step was to incorporate the dropping resistor into a perforated metal cylindrical casing for heat conduction and radiation. This was affixed to a plug-in base which allowed for mounting on top of the chassis for better cooling. Some were also mounted in glass envelopes. When the metal tube was introduced, the metal envelope was immediately pressed into service for use on these resistors, with a standard octal base.
These units were designed to not only provide voltage-dropping for the filament string, but taps were provided to supply voltages for various pilot lamps.
The 'ballast' resistive element was the answer to provide a constant voltage drop with voltage variations.

### The RMA Standard Plug-in Resistor Designation Code

The introduction of the drop-in ballast resistor to replace the resistive line cord resulted in each manufacturer making his unit slightly different from other manufacturers. Some use 4-pronged bases, while other use octal bases. The was no standard numbering system. This non-standardization meant that many different versions were manufactured which made it difficult for the radio service man to service receivers with these units.
The RMA Code was an effort to alleviate this non-standardization. It was an attempt to standardize the circuit arrangements and reduce the number of different circuits.
The RMA system of type numbers consists of three main parts and a possible supplementary prefix letter and suffix letter. These are:

- **First:** a 'letter' (or letters) designating the type and current rating of the pilot lamp (or lamps) and the line current the unit is designed to be used with.
- **Second** a 'series of digits' indicative of the overall voltage drop across the entire resistor system comprising the unit (including the pilot lamp or lamps) when 300 millamperes (0.3 amp) flow through it.
- **Third:** a 'letter' indicating the circuit arrangement of the resistor elements comprising the unit and the base pins of the unit (see figures a-k below) .
- **Fourth:** if the unit provides ballast action on the dial lamp section, the prefix letter 'B" is used at extreme left.
- **Fifth:** if the unit is of the octal-based *glass* type, a suffix letter 'G' is placed at the extreme right. No suffix is used when the unit is of all-metal construction.




**Dial Lamp Code Letters**

| Designating Code Letter | Pilot or Dial Lamp |
|---|---|
| K | Mazda No. 40 (rated at 6.3 volts @ 150 ma. and has a *brown* bead) |
| L | Mazda No. 46 (rated at 6.3 volts @ 250 ma. and has a *blue* bead) |
| M | Mazda No. 50 or 51 (rated at 6-8 volts @ 200 ma. and has a *white* bead) |

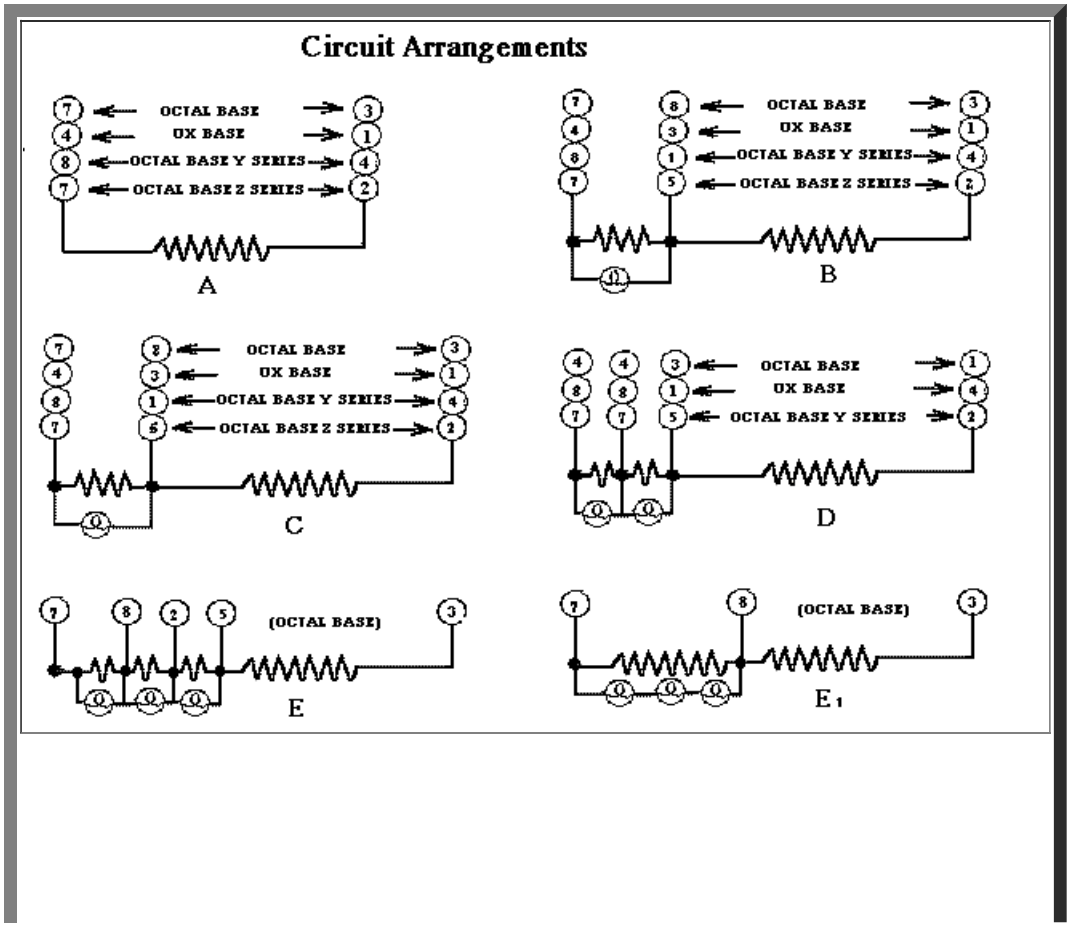
Dial Lamp Data

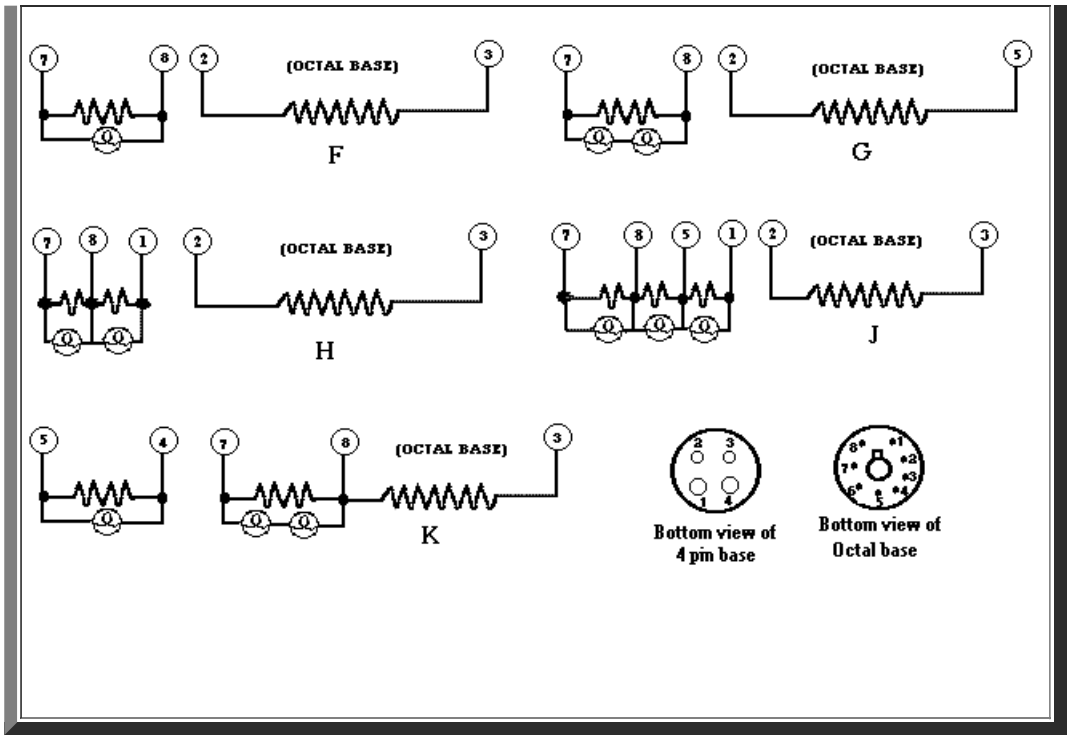
**Most Common Values of Voltage Drop Ratings**

There are about seven common values of voltage drop ratings used in ballast tubes as listed below.

| Voltage Drop | Tube Complement |
|---|---|
| 90 | 1-25 volt tube |
| 80 | 2-6.3 volt and 1-25 volt tubes |
| 55 | 2-6.3 volt and 2-25 volt tubes |
| 49 | 3-6.3 volt and 2-25 volt tubes |
| 42 | 4-6.3 volt and 2-25 volt tubes |
| 36 | 5-6.3 volt and 2-25 volt tubes |
| 23 | 3-6.3 volt and 3-25 volt tubes |

To determine the circuit arrangement (the letter following the voltage drop), refer to the diagrams below. These circuits are labeled A-F in accordance with the RMA code. The small numbers at the terminals of each circuit refer to the numbers of the based pins to which these terminals of the resistors are brought out. The correct base pin numbers are specified for the various types of bases which may be employed in the unit.



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