"The Right Control
for your Application"

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SUBJECT: PLUG-IN HORSEPOWER RESISTOR® (PHR)

KB Electronics is unique with our usage of a Plug-In Horsepower Resistor® (PHR) in most models of our DC Drives to sense motor current. Most of our competitors use a fixed soldered-in resistor. This technical note explains why KB Drives require a PHR when the competition uses a fixed resistor, and the advantage to the customer of the Plug-in Horsepower Resistor®.

First let's consider the time and effort necessary for KB to manufacture the PHR. If you look closely at one, you will discover it consists of a small printed circuit board, two male standoff pins and a soldered current sensing resistor. In addition, the speed control circuit board must have two female pins staked, soldered and properly aligned. Competitors solder the resistor to the board and they are finished. You don't have to be an accountant to figure out which method is easier, and less expensive to build.

Ask yourself, why does KB insist on using the PHR when the competition doesn't. The answer can be found in the KB slogan, "The Right Control For Your Application." We do it because we believe our customers have more important things to do then calibrate DC Drives. We believe our customers deserve a control which is ***factory*** calibrated. The fact of the matter is, most customers don't take the time to calibrate DC Drives. Unfortunately, they run the risk of demagnetizing a PM motor or cause it to burn up due to overload. They may even cause damage to their machinery by having the CL setting of the DC Drive greater than the motors rating. Read on to find out why.

The purpose of the PHR is to sense the motor's load current and provide a feedback signal to the drive. The signal is used by the ***Current Limit*** and ***IR Compensation*** circuits. The CL and IR are preset at the factory, based on the signal from the PHR. The current limit circuit is very important. Its job is to limit the maximum current that the DC motor can draw. If the current is too high (as stated above), it may cause machine damage, motor over-heating or demagnetization of the motor's permanent magnet fields which will cause the motor to lose torque. When properly calibrated, the CL circuit limits the motor current to 150% of the ***motor's*** full load rating. The IR Compensation circuit calibrates the motor's load regulation abilities, helping it to maintain proper speed regulation under changing load conditions. These characteristics vary according to the size of the motor.

So why does KB use the PHR rather than a fixed resistor? All DC Drive motor speed controls are capable of operating a wide range of motor sizes. In the

case of a control with a fixed sensing resistor, the resistor must be sized according to the largest motor with which the control can be used. One of our competitors offers a ½ HP DC Drive but says it can be used on motors up to 1.0 HP if they attach it to an auxiliary heatsink. The question is, what is the control calibrated for? If it is calibrated for ½ HP and it is used on a ½ HP DC motor all is well. If he uses it on a 1.0 HP motor, the motor will not develop its rated torque and the IR circuit will be over compensated. What if the drive is calibrated for 1.0 HP and he uses it on a 1.0 HP motor all is well but if he uses it on a ½ HP motor there will be a good chance of putting more than 1 HP worth of current (the ***control's*** capacity) through the ½ HP motor, causing a burned out motor, possible machine damage and unnecessary downtime.

If this same machine had a KB DC Drive, the Plug-in Horsepower Resistor would have been correctly sized for the motor. The result is that the CL and IR compensation circuits would be ***factory calibrated*** for the motor's characteristics. No matter how it was adjusted, the CL trimpot would not allow more than 200% of the ***motor's*** full load current, providing adequate protection for the motor and machine.

Although the customer must remember to install an individual Plug-in Horsepower Resistor with each KB speed control, its use provides a ***benefit*** for the ***customer***. The resistor is correctly selected once the ***motor's*** HP, voltage rating and full load current are known. A PHR reference chart is shown in the beginning or our catalog. Please note that a separate section of the chart is provided for SCR and PWM DC Drives, as well as SCR and PWM rated motors.

Please call me if you have any questions.

Sincerely,

Richard Fritts
National Sales Manager