KBBC SERIES
MICROPROCESSOR CONTROLLED
BATTERY POWERED DC/DC
Variable Speed Motor Control

for 12, 24, 36 and 48 Volt
PM and Series Wound DC Motors
thru 2HP Continuous Duty and 4HP Peak Duty

TYPICAL APPLICATIONS
• Scooters • Personnel Carriers • Carts • Electric Boats
• Portable Pumps • Lifts • Floor Polishers

DESCRIPTION
The KBBC series of battery powered variable speed controls are designed for 12, 24, 36, and 48 Volt PM and Series Wound DC motors. Microcontroller design provides superior performance and ease of tailoring to specific applications. Operating in a regenerative mode, precise and efficient control is obtained using state-of-the-art MOSFET technology. The KBBC operates at a switching frequency of 16 kHz, which provides high motor efficiency and quiet operation.

The KBBC contains many standard features such as current limit, short circuit protection, speed potentiometer fault detector, overtemperature sensing, and undervoltage/overvoltage protection. A variety of trimpots are provided, which can be used to tailor the control to exact specifications. The control also contains LEDs that indicate “power on” and “status.” A DC power contactor allows a low power switch to turn the control on and off. Reversing contactors provide arcless forward, stop, and reverse operation. In addition, a brake driver circuit is used to power an optional electromagnetic brake.

The KBBC can be controlled in several ways, such as single-ended or wigwag speed potentiometer and 0 - 5 Volts DC signal following. The controls contain a built-in heat sink that also serves as a mounting base.

STANDARD FEATURES
• High Frequency PWM Operation: Reduces motor noise and increases efficiency.
• Controlled Acceleration and Deceleration: Provides timed acceleration to set speed and deceleration to zero speed.
• Diagnostic LEDs: Provide indication of power on (PWR ON) and control status (STATUS).
• Built-In Reversing Contactor: Provides forward/reverse operation with a low power reversing switch or with a center-off throttle potentiometer (wigwag).
• Run Relay: Used to turn on or off equipment or signal a warning if a fault has occurred.
• Brake Driver Circuit: Powers an optional electromechanical brake (current regulated and short circuit protected).
• Key Switch Operation with Built-In Battery Power Contactor: Allows the use of a low power switch to turn control on and off.
• Inhibit Circuit: Allows control to be turned off electronically with a separate low power switch.
• Latching Circuit: Allows momentary switches to start, stop, and reverse the control.
• Limit Switch Circuit (Stop Forward and Stop Reverse): Allows limit switches to be used to immediately stop the control in forward or reverse directions.
• Single-Ended or Wigwag Potentiometer Control: Allows the Main Speed Potentiometer to be used as single-ended (zero speed is at 0% rotation) or wigwag (zero speed is at 50% rotation).

PROTECTIVE FEATURES
• Electronic Current Limit: Protects the motor and control against overload.
• Polarity Protected: Prevents control damage if the battery is wired incorrectly.
• Short Circuit Protected: Protects main power transistor from failure due to a short at the motor.
• Overtemperature Protection: Reduces control output as the transistors reach maximum operating temperature.
• Overvoltage Protection: Will turn off the control if the battery voltage exceeds 125% of nominal.
• Undervoltage Protection: Will turn off the control if battery voltage reduces below 65% of nominal.

SAFETY FEATURES
• Potentiometer Fault Circuit: Turns the control off if a short, open, or ground occurs at the potentiometer.
• High Pedal Disable Function: Prevents control startup until the potentiometer returns to zero.

TRIMPOT ADJUSTMENTS
• Timed Brake Delay (T-BRK): Sets the delay time before the brake is engaged.
• Current Limit (CL): Sets the current limit (overload), which limits the maximum current to the motor.
• IR Compensation (IR): Sets the amount of compensating voltage required to keep the motor speed constant under changing loads.
• Deceleration (DECEL): Sets the amount of time for the motor to decelerate from the set speed to zero speed.
• Acceleration (ACCEL): Sets the amount of time for the motor to accelerate from zero speed to the set speed.
• Minimum Speed (MIN): Sets the minimum motor speed.
• Reverse Maximum Speed (RMAX): Sets the maximum motor speed in the reverse direction (a % of FMAX setting).
• Forward Maximum Speed (FMAX): Sets the maximum motor speed in the forward direction.
**GENERAL PERFORMANCE SPECIFICATIONS**

### JUMPER SELECTABLE FEATURES

- **JA** - **Battery Voltage (VOLTAGE - 12/24/36/48)**: Selects nominal battery voltage.
- **JB** - **Motor Current (CURRENT - 10A/20A/30A/40A)**: Selects nominal motor current.
- **J1** - **Signal Type (SIG - VF/POT)**: Selects voltage following or potentiometer operation.
- **J2** - **Speed Potentiometer Mode (SPD - SE/WW)**: Selects single-ended or wigwag speed control.
- **J3** - **Current Limit Mode (TCL - NTCL/TCL)**: Selects non-timed current limit or timed current limit.
- **J4** - **High Pedal Mode (HPD - NHPD/HPD)**: Selects non-high pedal disable or high pedal disable.
- **J5** - **Deceleration Mode (STP - DEC/FIX)**: Selects adjustable or fixed (0.1 second) deceleration when a stop command is given.
- **J6** - **Direction Switch Type (LATCH - OFF/ON)**: Selects maintained or momentary direction commands.
- **J7** - **Cycling Mode (CYCL - OFF/ON)**: Selects cycling of relay which is used to brake the motor.
- **J8** - **Relay Output Contacts (RLY - NO/NC)**: Selects normally open or normally closed Run Relay contacts.

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### ELECTRICAL RATINGS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Part No.</th>
<th>Nominal Battery Voltage (Volts DC)</th>
<th>Nominal Motor Voltage (Volts DC)</th>
<th>Continuous Duty</th>
<th>Intermittent Duty (2 Minutes)</th>
<th>Peak Duty (7 Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maximum HP</td>
<td>Amps DC</td>
<td>Maximum HP</td>
<td>Amps DC</td>
<td>Maximum HP</td>
</tr>
<tr>
<td>KBBC-24M</td>
<td>9500</td>
<td>12</td>
<td>0 – 12</td>
<td>1/2</td>
<td>40</td>
<td>3/4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24</td>
<td>0 – 24</td>
<td>1</td>
<td>40</td>
<td>1 1/2</td>
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<tr>
<td>KBBC-44M</td>
<td>9501</td>
<td>12</td>
<td>0 – 12</td>
<td>1/2</td>
<td>40</td>
<td>3/4</td>
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<tr>
<td></td>
<td></td>
<td>24</td>
<td>0 – 24</td>
<td>1</td>
<td>40</td>
<td>1 1/2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36</td>
<td>0 – 36</td>
<td>1 1/2</td>
<td>40</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>48</td>
<td>0 – 48</td>
<td>2</td>
<td>40</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note:** Custom units are available with various voltages and currents with or without DC Power Contactor or Reversing Contactor.

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*FMAX trimpot is also used as an input/output gain potentiometer.*
Notes: 1. If Key Switch is not used, a connection must be made between the red wire of Connector P1 and quick-connect Terminal B+ for the control to operate.

2. RUN FWD and RUN REV Direction Switches are not used in wig wag operation.


Notes: 1. Set Jumper J1 to the “VF” position.

2. If using multiple drives, their voltage inputs must be isolated from each other.
GREEN AND RED STATUS LEDs

<table>
<thead>
<tr>
<th>Control Status</th>
<th>Green LED</th>
<th>Red LED</th>
<th>Flash Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run</td>
<td>On</td>
<td>Off</td>
<td>Slow</td>
</tr>
<tr>
<td>Stop</td>
<td>On</td>
<td>Off</td>
<td>Quick</td>
</tr>
<tr>
<td>Current Limit (Warning)</td>
<td>Off</td>
<td>On</td>
<td>Steady</td>
</tr>
<tr>
<td>Undervoltage (Warning)</td>
<td>On</td>
<td>On</td>
<td>Slow</td>
</tr>
<tr>
<td>Overvoltage/Undervoltage Fault (Shutdown)</td>
<td>On</td>
<td>On</td>
<td>Quick</td>
</tr>
<tr>
<td>Overtemperature Fault (Shutdown)</td>
<td>On</td>
<td>On</td>
<td>Slow Alternating</td>
</tr>
<tr>
<td>Main Speed Potentiometer Fault (Shutdown)</td>
<td>On</td>
<td>On</td>
<td>Quick Alternating</td>
</tr>
<tr>
<td>Motor or Brake Fault (Shutdown)</td>
<td>On</td>
<td>On</td>
<td>Double Quick Alternating</td>
</tr>
<tr>
<td>Timed Current Limit (Shudown)</td>
<td>Off</td>
<td>On</td>
<td>Quick</td>
</tr>
</tbody>
</table>

*Flash Rate: Slow = 1 second on / 1 second off. Quick = 0.15 second on / 0.15 second off.