

KBLC™ * DC Motor Speed Control Installation and Operating Instructions

*Patent Pending

TABLE 1. ELECTRICAL RATINGS

MODEL NUMBER	AC LINE VOLTAGE (VAC)**	MOTOR VOLTAGE (VDC)	RATING WITHOUT AUXILIARY HEATSINK			RATING WITH AUXILIARY HEATSINK		
			AC LOAD CURRENT (RMS AMPS)	DC LOAD CURRENT (AVG. AMPS)	MAX. HP	AC LOAD CURRENT (RMS AMPS)	DC LOAD CURRENT (AVG. AMPS)	MAX. HP
KBLC-120	120	90-130	9.0	6.0	1/2	18.0	12.0	1
KBLC-240*	240	180	9.0	6.0	1	18.0	12.0	2

*240 volt models are available with step down output. They provide a 90 volt DC output with a 240 VAC input. Models are designated with an "S" suffix (eg.: KBLC-120S). If motor is shunt type use half voltage field connection F+ and L₁.

FOR TECHNICAL ASSISTANCE CALL TOLL FREE (OUTSIDE NY STATE ONLY) 1-800-221-6570

TABLE 2. PLUG-IN HORSEPOWER RESISTOR® CHART

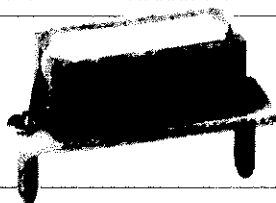
MOTOR HORSEPOWER RANGE*		Plug-In Horsepower Resistor® Resistance** Value (Ohms)	KB P/N
Armature Voltage 90-130V DC	Armature Voltage 180V DC		
1/100-1/50	1/50-1/25	1.0	9833
1/50-1/30	1/25-1/15	.51	9834
1/30-1/20	1/15-1/10	.35	9835
1/20-1/12	1/10-1/6	.25	9836
1/12-1/8	1/6-1/4	.18	9837
1/8-1/5	1/4-1/3	.1	9838
1/4	1/2	.05	9839
1/3	3/4	.035	9840
1/2	1	.025	9841
3/4	1-1/2	.015	9842
1	2	.01	9843

* Motor horsepower and armature voltage must be specified when ordering so that proper resistor will be supplied.

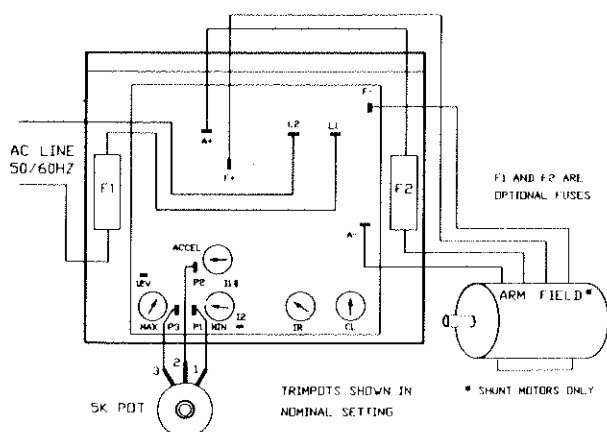
** For overlapping motor horsepower range use lower value Plug-in Horsepower Resistor.

PLUG-IN HORSEPOWER RESISTOR®

A Plug-in Horsepower Resistor® must be installed to match the KBLC™ to the motor horsepower and voltage. See Table 2 for the correct value. Plug-in Horsepower Resistor® are stocked by your distributor.



KBLC™ CONNECTION DIAGRAM



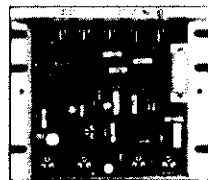
CAUTION: If control is wired to a transformer, it is advisable to switch the secondary to disconnect power. If the primary is switched, additional snubber capacitors may have to be added across the transformer output to prevent damage to the power bridge.

NOTE: (Shunt motors only) For 90 Volt dc motors with 50VDC fields and 180 Volt dc motors with 100VDC fields use half voltage field connections F+ and L₁.

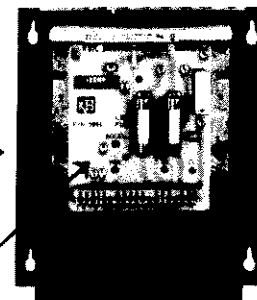
CAUTION: Do not bundle potentiometer connections (P₁, P₂, P₃) and Inhibit™ connections (I₁, I₂) with AC line or motor wires.

WARNING: Armature Switching. Do not switch the armature in and out of circuit or catastrophic failure will result. If armature switching is required for dynamic brake or reversing, use Models KBPB, KBCC-R or KBRG.

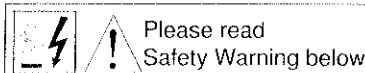
BASIC KBLC™



Auxiliary
Heatsink
Part No.
9861



Barrier Terminal Board
Part No. 9884



Please read
Safety Warning below

KBLC™ mounted on KB Auxiliary Heatsink (optional) and with Barrier Terminal Board (optional).

LOCATION AND MOUNTING: The KBLC™ controls should be mounted on a flat surface and located in an area where it will not be exposed to contaminants such as water, metal chips, solvents or excessive vibration.

When mounting in an enclosure the air space should be large enough to provide adequate heat dissipation. The maximum allowable ambient temperature at full rating is 50°C/122°F. Consult factory if more information is required.

SAFETY WARNING—PLEASE READ CAREFULLY: This product should be installed and serviced by a qualified technician, electrician or electrical maintenance personnel familiar with its operation and the hazards involved. Proper installation which includes wiring, mounting in proper enclosure, fusing or other overcurrent protection and grounding, can reduce the chance of electric shocks, fires or explosion in this product or products used with this product, such as electric motors, switches, coils, solenoids and/or relays. Eye protection must be worn and insulated adjustment tools must be used when working with control under power. This product is constructed of materials (plastics, metals, carbon, silicon, etc.) which may be a potential hazard. Individual material safety data sheets (MSDS) are available upon request. Proper shielding, grounding and filtering of this product can reduce the emission of radio frequency interference (RFI) which may adversely affect sensitive electronic equipment. If information is required on this product, contact our factory. It is the responsibility of the equipment manufacturer and individual installer to supply this safety warning to the ultimate user of this product. (SW effective 3/91.)

Do not use Inhibit or Enable circuits as safety disconnects. Use only the AC Line for that purpose. The circuitry of this control is not isolated from the AC line.

INITIAL SETUP AND WIRING

1. Install proper size Plug-in Horsepower Resistor® (See chart).
2. The KBLC can be connected to a standard 120V or 240V 50/60 Hz AC line [Be sure the AC input voltage corresponds to the control voltage rating and the motor rating (e.g. 90-130VDC motor on 120VAC and 180VDC motor on 240VAC)].
3. Follow the recommended supply wire sizes.
4. Follow the NEC and other electrical codes that apply. Be sure to fuse each AC line conductor which is not at ground (earth) potential. (Do not fuse neutral or grounded, earthed conductors).
5. Connect control in accordance to connection diagram.

TABLE 3. MINIMUM SUPPLY WIRE SIZE REQUIREMENTS

MAX. MOTOR AMPS (DC AMPS)	MAX. MOTOR HP 90V	MAX. MOTOR HP 180V	MINIMUM WIRE SIZE (AWG) Cu Only	
			MAX. 50 FOOT RUN	MAX. 100 FOOT RUN
6.0	1/2	1	16	14
12.0	1	2	14	12*

* Maximum recommended wire size.

VOLTAGE FOLLOWING: All models can be controlled with an isolated analog reference voltage (0-9VDC) in lieu of the main speed potentiometer. The voltage is connected to P₂(+) and F-. The control output voltage will linearly follow the input voltage. The source impedance of the input should be 10K ohms or less. The Min trimpot can be used to provide an offset speed. If an offset is not required adjust the Min to 0+ or 0- speed as desired. The Max trimpot is rendered inoperative in the voltage following mode. Use auxiliary trimpot to limit the control range. If the input signal is not isolated, or is a current signal (4-20ma), the KBSI-240D Signal Isolator must be used. It will allow direct connection to process controllers and microprocessors.

CAUTION: 1. The voltage feeding P₂ and F- must be isolated from the AC line. Do not ground P₂ or F- to set up a zero or ground reference.
2. Do not bundle signal wires to P₂ and F- with AC line or motor connections. If signal wires are over 18", use shielded cables.

FUSING: The KBLC has provision for adding a built-in AC line fuse and armature fuse. The AC line fuse protects the control against catastrophic failure. If the fuse blows, the control is miswired, the motor is shorted or grounded, or the control is defective. The armature fuse provides overload protection for the motor and control. Choose the proper size armature fuse by multiplying maximum dc motor amps by 1.7. **NOTE: Be sure to fuse each ungrounded AC line supply conductor. Do not fuse neutral or grounded conductors. All fuses should be normal blow ceramic 3AG, ABC or equivalent.**

1. **AC Line Fuse** is chosen according to the maximum rating of the control:
8 Amp fuse for all motors up to 1/2 HP-90V and 1 HP-180VDC.
12 Amp fuse for all motors up to 3/4 HP-90V and 1 1/2 HP-180VDC.
15 Amp fuse for all motors up to 1 HP-90V and 2 HP-180VDC.
(Use Buss ABC, Litt. 326 ceramic fuse or equivalent.)
2. **Armature Fuse** can be chosen in accordance with the fuse chart. **Note:** The armature fuse is calculated based on the approximate full load DC current rating of the motor times a form factor of 1.5. If motor has characteristics not consistent with these approximations, a different fuse value may have to be used. Fuses are available from your distributor. Also available is a Fuse Kit (KB Part #9870) containing 700 assorted fuses.

TABLE 4. ARMATURE FUSE CHART

90VDC MOTOR	180VDC MOTOR	APPROX. DC MOTOR CURRENT (AMPS)	FUSE RATING (AC AMPS)
HORSEPOWER			
1/30	1/15	.33	1/2
1/20	1/10	.5	3/4
1/15	1/8	.65	1
1/12	1/6	.85	1-1/4
1/8	1/4	1.3	2
1/6	1/3	1.7	2-1/2
1/4	1/2	2.5	4
1/3	3/4	3.3	5
1/2	1	5.0	8*
3/4	1-1/2	7.5	12*
1	2	10.0	15*

*Also used as AC Line Fuse.

ADJUSTMENTS AND CONTROL FUNCTIONS

The KBLC™ has been factory adjusted to provide 0 to full speed range using the speed control knob. Minimum and maximum speed trim pots are provided to change the speed range from other than 0 to full speed. An acceleration start trim pot (located directly behind the MIN trim pot) is factory set to provide motor acceleration from 0 to full speed over a time period of 2 seconds (approx.) each time the AC power is applied. The current limiting (CL, or torque output) adjustment is factory set to approximately one and a half times the motor rating. The IR Compensation (IR) is factory adjusted to provide excellent motor regulation under normal operation. **Safety warning must be read and understood before making adjustments.**

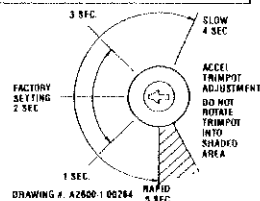
NOTE: In order for the IR comp and CL trim pot settings to be correct, the proper Plug-In Horsepower Resistor™ must be installed for the particular motor and input voltage being used. Do not attempt to change the settings of the trim pots unless absolutely necessary since they are factory adjusted to near optimum settings.

IMPORTANT NOTE: Readjusting the Accel time will affect the Max speed and IR Comp settings which will have to be readjusted (see this Section). If the Accel time is decreased to the minimum time of .5 seconds (6 o'clock trim pot position), then increase the IR trim pot 25% CW rotation and decrease the MAX trim pot 20% CCW rotation. If the Accel time is increased to the maximum time of 4 seconds (full rotation), then decrease the IR and increase the MAX as per above percentages of rotation.

The following procedure, presented in order of adjustment sequence, should be used when readjusting all trim pot functions:

A. **Acceleration Start.** (ACCEL trim pot is located directly behind the MIN trim pot.) If the ACCEL is to be readjusted to different times, adjust the trim pot to the desired time according to diagram.

B. **Maximum Speed Adjustment.** Turn Speed Control Knob to full speed (maximum CW position). Adjust max. speed trim pot to new desired setting.



NOTE: Do not attempt to adjust the max. speed above the rated motor RPM since unstable motor operation may occur. For moderate changes in the max. speed, there will be a slight effect on the min. speed setting when the min. speed is set at zero. There may be significant variation in the min. speed setting if the min. speed is at a higher than zero setting.

C. **Minimum Speed Adjustment.** If a higher than zero minimum speed is desired, readjust the minimum speed by turning the speed control knob to zero setting (full CCW position). Then adjust the Min. Speed Trim pot to the desired setting.

NOTE: The min. speed adjustment will affect the max. speed setting. Therefore, it is necessary to readjust the max. speed after the min. speed, and it may be necessary to repeat the sequence until both the min. and max. speeds are set to the desired levels.

D. **Current Limit (CL/Torque Adjustment).** CL circuitry is provided to protect the motor and control against overloads. The CL also limits the inrush current to a safe level during start-up. The CL is factory set to approximately 1.5 times the full load rating of the motor. (CL trim pot is nominally set to approx. 50% of full CW rotation.)

NOTE: The correct value Plug-In Horsepower Resistor™ must be installed in order for the CL and IR comp. to operate properly.

To set the CL to factory specifications adjust as follows:

1. Set speed control knob at approximately 30-50% CW rotation. Set CL trim pot to full CCW position.
2. Connect a DC ammeter in series with the armature lead.
3. Lock shaft of motor (be sure CL pot is in full CCW position). Apply power and rotate CL pot CW until DC ammeter reads 1.5 times motor rating (do not exceed 2 times motor rating).

E. **IR Compensation Adjustment.** IR compensation is provided to substantially improve load regulation. If the load presented to the motor does not vary substantially, the IR adjustment may be set at a minimum level (approximately 1/4 of full setting). The control is factory adjusted to approximately 3% regulation. If superior performance is desired (less than 1% speed change of base speed from 0 to full load), then the IR comp should be adjusted as follows:

NOTE: Excessive IR comp. will cause control to become unstable, which causes motor cogging.

1. Set IR comp. trim pot at approximately 25% of CW rotation. Run motor unloaded at approximately 1/3 speed and record RPM.
2. Run motor with maximum load and adjust IR comp. trim pot so that the motor speed under load equals the unloaded speed per step 1.
3. Remove load and recheck unloaded RPM. If unloaded RPM has shifted, repeat procedure for more exact regulation.

The control is now compensated to provide minimal speed change under large variations of applied load.

SWITCHING CIRCUITS

AC Line Switching. The KBLC™ can be turned "on" and "off" using the AC Line. Auto Inhibit™ circuitry contained in the KBLC™ automatically resets critical components each time the AC line is interrupted. This, along with Acceleration Start and CL, provides a smooth start each time the AC line is connected.

WARNING: Do not disconnect and reconnect the Armature with the AC line applied or catastrophic failure will result.

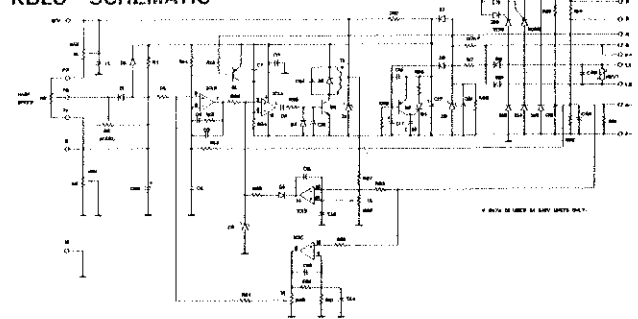
Armature Switching. If the armature is to be disconnected and reconnected with AC power applied the Inhibit Circuit™ must be simultaneously activated and deactivated. Connect I₁ and I₂ together to activate the Inhibit Circuit™.

Reversing and Dynamic Brake. KB has developed the APRM™ which provides anti-plug "instant" reversing and solid state dynamic braking. The APRM™ is built in as standard in all KBCC-R suffix models and in all KBPB™ models. *Patented

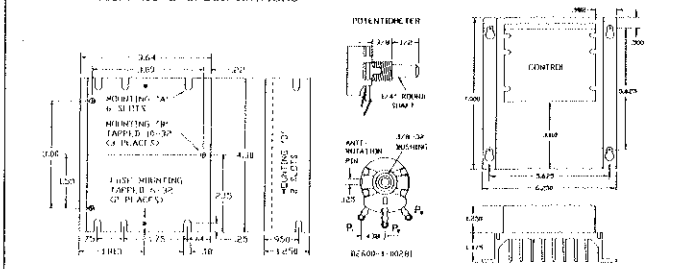
LIMITED WARRANTY

For a period of 18 months from date of original purchase KB will repair or replace without charge devices which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. The foregoing is in lieu of any other warranty or guarantee expressed or implied, and we are not responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person, caused by items of our manufacture or sale. Some states do not allow certain exclusion or limitations found in this warranty so that they may not apply to you. In any event, KB's total liability, under all circumstances, shall not exceed the full purchase price of this unit. (Rev. 10/84)

KBLC™ SCHEMATIC



MECHANICAL SPECIFICATIONS



ACCESSORY ITEMS FOR KBLC™ CONTROLS available from your distributor



Signal Isolator
KBSI-240D
Part No. 9431



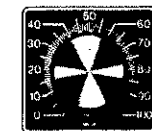
Auxiliary Heatsink
Part No. 9861



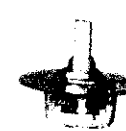
Current Sensing
Relay/Overload
Protector
Part No. 9106



Radio Frequency
Interference Filter
Part No. 9107



Knob/Dial Kit
Part No. 9832



Potentiometer Kit
P/N 9111 Carbon
P/N 9831 Wire Wound



AC Line/Armature
Fuse Block Kit
Part No. 9849



Barrier Terminal
Board-P/N 9884. Also
available with Signal
Isolator-P/N 9443

The information contained in these instructions is intended to be accurate. However, the manufacturer retains the right to make changes in design which may not be included herein



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