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SIGNAL ISOLATOR

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**BC145 Signal Isolator Board  
Installation and Operating Manual**

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i.  **SAFETY WARNING! Please read carefully:**

Be sure to follow all instructions carefully. Fire and/or electrocution can result due to improper use of this product.

This product should be installed and serviced by a qualified technician, electrician, or electrical maintenance person familiar with its operation and the hazard involved. Proper installation, which includes wiring, mounting in proper enclosure, fusing or other over current 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 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. 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 11/92)

 This product complies with all CE directives pertinent at the time of manufacture. Contact factory for detailed installation instructions and Declaration of Conformity.

## I. INTRODUCTION

The BC145 Signal Isolator is used to isolate, amplify and condition DC voltage and current signals from any source (motors, tachs and transducers) which will provide most adjustable speed motor controls with a voltage following input. The maximum output voltage of the isolator is 10 volts, which is a linear function of the input signal.

The BC145 is versatile since it can accommodate a wide range of input voltages (0 - 25\*, 0 - 120 and 0 - 550V DC) and, in addition, a wide range of input current signals (4 - 20 mA, 10 - 50 mA and 1 - 5 mA). The Voltage/Current ("VLT/CUR") jumper is used to change the BC145 from a voltage to current input.

BC145 is a unipolar input, providing 0 - 10V input. For Regenerative Drives with bipolar  $\pm 10V$  input, other Signal Isolators are available.

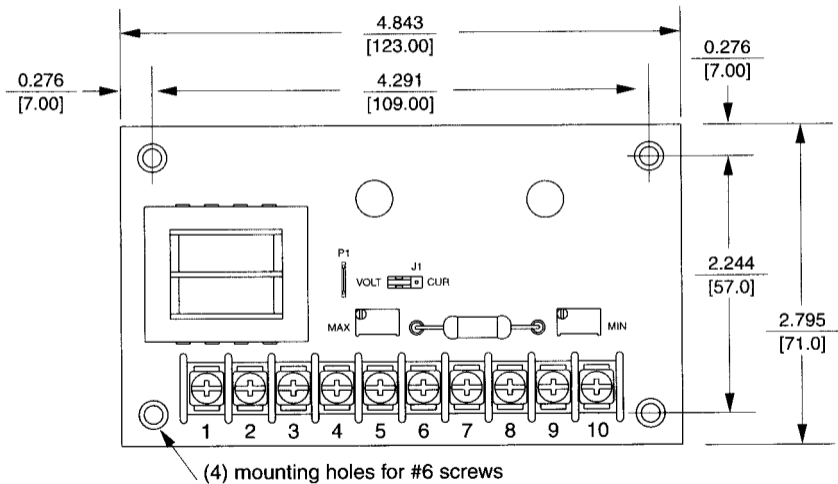
A built-in power supply enables the BC145 to be controlled with a 5K $\Omega$  remote potentiometer (connect potentiometer to terminals "P1," "5" and "6" - see page 9). The potentiometer can also be wired for Auto/Manual Operation.

*\*The input range of 0 - 25V is the maximum voltage that can be applied to terminals "5" and "6". The minimum input voltage is 0 - 5 volts, which can achieve an output voltage of 0 - 10 volts. The unit is factory calibrated so that a 0 - 10V DC input yields a 0 - 10V DC output.*

## II. MOUNTING

Mount the Signal Isolator using (4) 6-32 screws (not included). Use the Control Layout and Mechanical Specifications drawing on page 3 to locate the mounting holes. The unit is designed to be mounted in any position providing its components do not come in contact with grounded or live wiring.

**FIGURE 1 – CONTROL LAYOUT & MECHANICAL SPECIFICATIONS (INCHES / [mm])**  
 (Illustrates Factory Setting of Jumpers and Approximate Trimpot Settings)



**TABLE 1 – GENERAL PERFORMANCE SPECIFICATIONS**

AC Power Requirements	115 or 208 - 230V AC, 50/60 Hz <sup>(1)</sup>
Signal Input Voltage <sup>(2)</sup>	0 - 25, 0 - 120, 0 - 550V DC
Signal Input Current <sup>(2)</sup>	1 - 5, 4 - 20, 10 - 50mA <sup>(3)</sup>
Maximum Output Voltage	10 Volts
Maximum Output Current	10mA
Range of "MIN" Trimpot	± 3 Volts
Range of "MAX" Trimpot	0 to 2 times the input voltage with maximum of 10 Volts
Linearity <sup>(4)</sup>	± 0.1%
Temperature Drift <sup>(4)</sup>	4 mV per °C
Temperature Operating Range	0 - 50 °C

**Notes:**

1. To achieve full specifications input voltage must be within ± 10% of nominal.
2. Floating (non-grounded) or grounded input signal may be used.
3. To change from 4 - 20mA to 1 - 5mA remove R3. To convert to 10 - 50mA add a 150Ω 1W resistor across terminals "5" and "6." See figure 3.
4. Specifications are based on an output of 10 volts.

### III. WIRING.

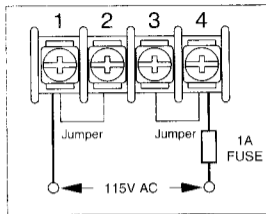


**Warning! Read Safety Warning on page 1 before attempting to use this control.**

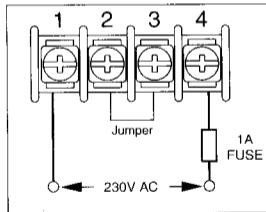
**Warning! To avoid erratic operation do not bundle AC Line and motor wires with potentiometer, voltage following, enable, inhibit or other signal wiring. Use shielded cables on all signal wiring over 12" (30 cm) – Do not ground shield.**

- A.** AC Power – The BC145 is powered with either 115 or 230V AC, 50/60 Hz by arranging the jumpers between terminals “1” to “4” properly. See figures 2A and 2B. Be sure unit is wired in accordance with the National Electric Code and other codes that may apply. It is recommended that a 1 amp fuse be installed in series with the AC line.
- B.** Input Terminals – A voltage or current signal from a microprocessor, tachometer, transducer, etc. is to be connected to terminals “5” through “8.” The selection of the proper terminal is based on the maximum level of the input signal. See figures 3 and 4.

**FIGURE 2A – 115V CONNECTION**



**FIGURE 2B – 230V CONNECTION**



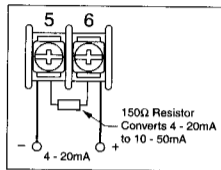
## i. Current Input Signal



**Warning! Read Safety Warning on Page 1 before attempting to use this control.**

**Note:** The Voltage/Current (VLT/CUR) jumper must be in "CUR" position. Connect the negative current signal input to terminal "5" and the positive to terminal "6." The BC145 is factory calibrated so that a 4 - 20mA signal will provide a 0 - 9 Volt output. The input range can be converted to a 10 - 50mA range by attaching a 150 $\Omega$  1W resistor across the current input terminals "5" and "6." See figure 3. Control must be recalibrated when the 150 $\Omega$  resistor is installed. The range of signal input can be changed to 1 - 5mA by removing resistor R3 from the printed circuit board.

**FIGURE 3 – CURRENT INPUT SIGNAL CONNECTION**



Recalibrate the Signal Isolator to follow a 4 - 20mA current signal input as follows:

1. Connect a 10V DC meter (digital DC meter is suggested) to terminals "9"(-) & "10" (+).
2. Apply the minimum input current (4mA) at terminals "5" and "6."
3. Adjust the "MIN" trimpot to an output voltage of 0 volt DC.
4. Set the input current to 20mA and adjust the "MAX" trimpot so that the output voltage is at the desired level (9V DC).
5. Repeat steps 3 and 4 if extreme accuracy is required. The Signal Isolator is now calibrated to provide 0 - 9V DC output with a 4 - 20mA input.
6. Use the "MIN" and "MAX" trimpot if other than 0 - 9V DC output is required with the respective input current range.



## ii. Voltage Input Signal



**Warning! Read Safety Warning on Page 1 before attempting to use this control.**

Note: The Voltage/Current (VLT/CUR) jumper must be in the VLT position (factory setting). The BC145 is designed to accept a wide range of input voltage signals as follows:

**TABLE 2 – VOLTAGE INPUT SIGNAL**

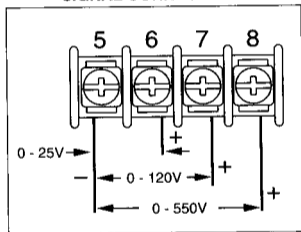
Input Terminals	Minimum Input Voltage Range	Maximum Input Voltage Range
5, 6	0 - 5	0 - 25
5, 7	0 - 25	0 - 120
5, 8	0 - 120	0 - 550

Connect input voltage signal to proper input terminals as indicated in figure 4.

1. Connect a 10V DC meter (digital meter is suggested) to terminals “9” (-) and “10” (+).
2. Apply the maximum input voltage that would be supplied from tach, transducer, etc.
3. Adjust the “MAX” trimpot to the desired output voltage.

**Example:** A follower motor is to follow the output of a leader motor with an armature voltage range of 0 - 90V.

**FIGURE 4 – VOLTAGE INPUT SIGNAL CONNECTIONS**



- a) Connect the armature of the leader motor to the BC145 input terminals "5"(-) and "7"(+).
- b) Set the armature voltage of the leader motor to zero (0). Adjust the "MIN" trimpot so that the output at terminals "9" and "10" reads zero (0) volts.
- c) Reset the armature voltage of the leader motor to 90V. Adjust the "MAX" trimpot so that the output voltage is 9V DC.

**Notes:**

1. When setting the output voltage using the "MIN" and "MAX" trimpots the voltage or speed of the driven motor can be read directly instead of using the output of the BC145.
2. When readjusting the "MIN" and "MAX" trimpots, always set the minimum voltage first and then the maximum voltage.
3. Trimpots allow approximately 20 turns for the full range of adjustment. If during the adjustment procedure the output stops changing, try reversing the direction of rotation of trimpot.

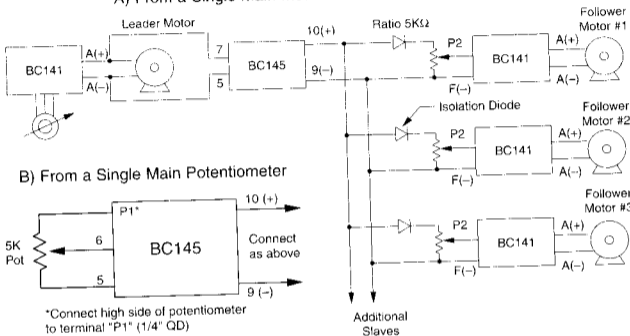
#### **IV. OUTPUT SIGNAL**

The output signal from the BC145 is obtained from terminals "9" (-) and "10" (+). Connect the output directly to the signal following input terminal of the speed control. For multiple follower motors, several controls can be driven from a single BC145. Be sure the AC line connections to the follower control are to the same phase (eg, L1 to L1 and L2 to L2 of all controls.)

The output from the BC145 can be scaled to control the speed control over any desired speed range. Adjust the "MIN" trimpot to provide the desired minimum speed and the "MAX" trimpot to provide the desired maximum speed.

**FIGURE 5 – LEADER/FOLLOWER VOLTAGE FOLLOWING SYSTEM WITH MULTIPLE MOTORS**

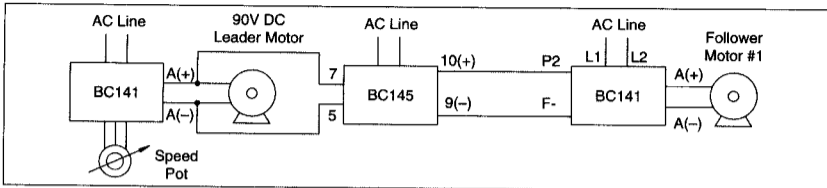
**A) From a Single Main Motor**



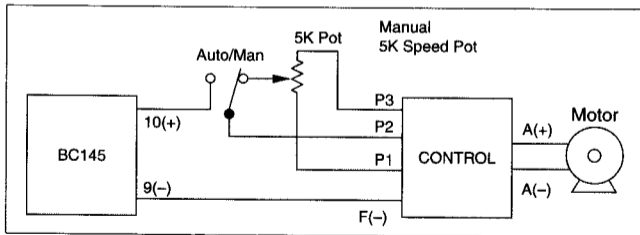
A 10K ratio potentiometer is used to control up to ten (10) follower motors.  
 If a 5K ratio potentiometer is used, up to five (5) follower motors can be controlled.

- WARNING!** If Signal Isolator is connected to multiple speed controls;
- 1) Multiple controls must be powered from the same phase of AC line.
  - 2) The positive input terminal to each speed control must be installed with a 1 amp - 600V isolation diode as shown.
  - 3) Multiple speed controls can not be used with PWM, Regenerative or Adjustable Frequency Drives (Inverters).

**FIGURE 6A – LEADER/FOLLOWER VOLTAGE FOLLOWING SYSTEM**



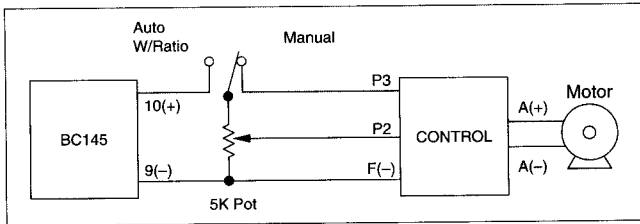
**FIGURE 6B – PROCESS CONTROL WITH AUTO/MANUAL SWITCH**



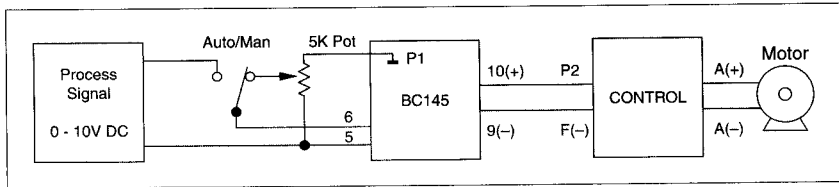
The BC145 can be wired in an Auto/Manual mode which will allow manual override of an automatic process. See figure 6B.

**FIGURE 6C – PROCESS CONTROL WITH AUTO (RATIO POT)/MANUAL SWITCH**

The following circuit provides for dual purpose usage of the speed pot. In the "AUTO" mode it is used for ratio control and in the "MAN" mode it is used for manual speed adjustment.



**FIGURE 6D – AUTO/MANUAL OPERATION WITH POTENTIOMETER ON BC145 INPUT**



**Note:** The preceding circuit provides for the speed pot to be used in "MAN" mode only. In "AUTO" mode, the process control signal is supplied directly to the signal isolator.

#### **V. LIMITED WARRANTY**

For a period of 2 years from date of original purchase, BALDOR will repair or replace without charge controls 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. This warranty is in lieu of any other warranty or guarantee expressed or implied. BALDOR shall not be held 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 the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply.) In any event, BALDOR's total liability, under all circumstances, shall not exceed the full purchase price of the control. Claims for purchase price refunds, repairs, or replacements must be referred to BALDOR with all pertinent data as to the defect, the date purchased, the task performed by the control, and the problem encountered. No liability is assumed for expendable items such as fuses.

Goods may be returned only with written notification including a BALDOR Return Authorization Number and any return shipments must be prepaid.

**BALDOR**  
**MOTORS AND DRIVES**

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