



BC145 SIGNAL ISOLATOR BOARD

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Important:

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Table of Contents

Chapter 1

Introduction

Safety Warning	1-1
General Performance Specifications	1-4

Chapter 2

Installation

Mounting Instructions	2-1
-----------------------------	-----

Chapter 3

Wiring

AC Power	3-1
Input Terminals	3-2
Current Signal Input	3-2
Voltage Signal Input	3-4

Chapter 4

Adjustments

Output Signal	4-1
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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 0-550VDC) and, in addition, a wide range of input current signals (4-20mA, 10-50mA and 1-5mA). 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 Ω remote potentiometer (connect potentiometer to terminals “P1”, “5” and “6”). 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 0-10VDC input yields a 0-10VDC output.*

SAFETY NOTICE

A Warning statement indicates a potentially hazardous situation which, if not avoided, could result in injury or death.

A Caution statement indicates a potentially hazardous situation which, if not avoided, could result in damage to property.

A Note indicates additional information that is not critical to the installation or operation.

WARNING: This equipment may contain voltages as high as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.

SAFETY NOTICE Continued

- WARNING:** Electrical shock can cause serious or fatal injury. Be sure that all power is disconnected and there is no voltage present from this equipment or equipment to which it is or will be connected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation and start-up procedures.
- WARNING:** Electrical shock can cause serious or fatal injury. Verify there is no voltage phase-to-phase or phase-to-neutral at the motor leads before connecting motor to this control. Motor may have high voltage present even when disconnected from this control.
- WARNING:** Do not use motor overload relays with an automatic reset feature. These are dangerous since the process may injure someone if a sudden or unexpected automatic restart occurs. If manual reset relays are not available, disable the automatic restart feature using external control wiring.
- WARNING:** This unit has an automatic restart feature that will start the motor whenever input power is applied and a RUN (FWD or REV) command is issued. If an automatic restart of the motor could cause injury to personnel, the automatic restart feature should be disabled.
- WARNING:** Using a jumper to eliminate the start/stop function will cause the motor to run at the Main Speed Potentiometer setting when the AC line is applied.
- WARNING:** If possible, do not adjust trim pots with the main power applied. Electrical shock can cause serious or fatal injury. If adjustments are made with the main power applied, an insulated adjustment tool must be used to prevent shock hazard and safety glasses must be worn.
- WARNING:** Do not use this drive in an explosive environment. An explosion can cause serious or fatal injury. This drive is not explosion proof.
- WARNING:** When the Enable jumper is installed, the drive and motor will start and run when AC power is applied, when power is restored after a momentary power loss, or after an overload or TCL fault is reset. The user must ensure that automatic start up of the driven equipment will not cause injury to operating personnel or damage to the driven equipment. The user is responsible for providing suitable audible or visual alarms or other devices to indicate that the drive may start at any moment. Failure to observe this warning could result in severe bodily injury or loss of life.
- WARNING:** Do not use start/stop, inhibit or enable functions as a safety disconnect. Use only an AC line disconnect for that purpose. Failure to observe this warning could result in severe bodily injury or loss of life.
- Caution:** Disconnect motor leads (A1 and A2) from control before you perform a Dielectric Withstand test on the motor. Failure to disconnect motor from the control will result in extensive damage to the control. The control is tested at the factory for high voltage / leakage resistance as part of Underwriter Laboratory requirements.

SAFETY NOTICE Continued

Caution: Do not connect AC power to the Motor terminals A1 and A2. Connecting AC power to these terminals may damage the control.

Caution: Baldor recommends not to use Grounded Leg Delta transformer power leads that may create ground loops. Instead, we recommend using a four wire Wye.

Caution: Suitable for use on a circuit capable of delivering not more than 5,000 RMS symmetrical short circuit amperes listed here at rated voltage.

Caution: Adjusting the current limit above 150% of the motor nameplate rating can cause overheating and demagnetization of the PM motor.

Caution: Do not leave the motor in a locked rotor condition for more than a few seconds since motor damage may occur.

Caution: Shunt wound motors may be damaged if field windings remain energized for an extended period of time without armature rotation.

Receiving

Each control is thoroughly tested at the factory and carefully packaged for shipment. When you receive your control, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your control.
2. Verify that the part number you received is the same as the part number listed on your purchase order.
3. Do not unpack until ready for use.

Table 1-1 General Performance Specifications

Description	Specification
AC Power Requirements	115 or 208-230VAC, 50/60Hz (1)
Signal Input Voltage ⁽²⁾	0-25, 0-120, 0-550VDC
Signal Input Current ⁽²⁾	1-5, 4-20, 10-50mA (3)
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 (4)	±0.1%
Temperature Drift (4)	4mV per °C
Temperature Operating Range	0-40°C / 32-104°F
Operating Humidity Range (% Relative, Non-Condensing)	0 - 95
Storage Temperature	-25 to +85°C / -13 to +185°F

Note: (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 convert from 4-20mA to 1-5mA, add a 1kΩ 1/4W resistor across terminals "5" and "6". To convert to 10-5-mA, add a 150Ω 1W resistor across terminals "5" and "6". See Figure 3-3.

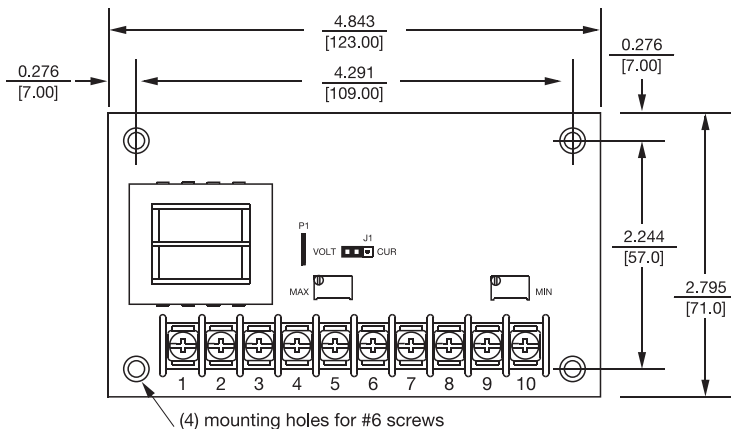
(4) Specifications are based on an output of 10 volts.

Mounting Instructions

Mount the Signal Isolator using (4) 6-32 screws (not included). Use the Control Layout and Mechanical Specifications drawing 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.

2-1 Control Layout & Mechanical Specifications (Inches/[mm])

(Illustrates Factory Setting of Jumper J1)



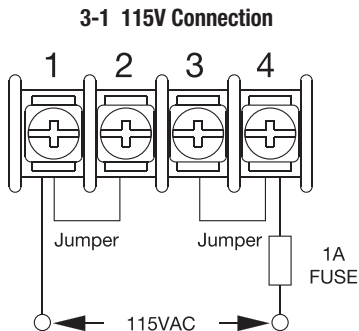
Wiring

WARNING: READ SAFETY WARNINGS BEFORE ATTEMPTING TO USE THIS CONTROL.

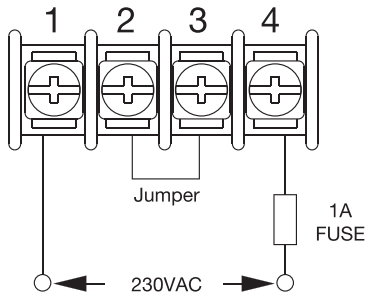
Caution: To avoid erratic operation, do not bundle AC Line and motor wires with potentiometer, voltage following, enable, inhibit or other signal wiring. Use shielded cables on all signal wiring over 12" (30cm). The shield should be earth grounded on the control side only.

AC Power

The BC145 is powered with either 115 or 230VAC, 50/60 Hz by arranging the jumpers between terminals "1" to "4" properly. See Figures 3-1 and 3-2. Be sure unit is wired in accordance with the National Electrical Code and other codes that may apply. It is recommended that a 1 amp fuse be installed in series with the AC line.



3-2 230V Connection



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 Figure 3-3, Table 3-1 and Figure 3-4.

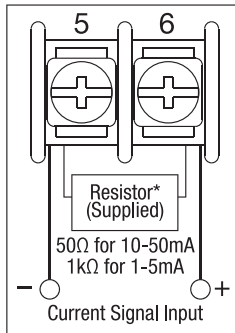
Current Signal Input

WARNING: READ SAFETY WARNINGS BEFORE ATTEMPTING TO USE THIS CONTROL.

The Signal Isolator accepts 4-20mA DC input to provide 0-9VDC output. Connect the current signal input common (-) to Terminal “5” and the positive (+) to Terminal “6”, as shown in Figure 3-3. Other current signal input ranges can also be used by installing appropriate resistors across terminals 5 and 6. Calibrate the Signal Isolator in accordance with the procedure described below.

Note: Two resistors for 10-50mA and 1-5mA inputs are supplied in the hardware bag included with this kit.

Figure 3-3 Current Signal Input Connection



4-20mA DC Signal Input:

No resistor required. Set Jumper J1 in "CUR" position.

10-50mA DC Signal Input (Use Large Resistor with Color Code "Brown-Green-Brown"):

Install the 150Ω - 1W resistor across Terminals "5" and "6". Set Jumper J1 in "CUR" position.

1-5mA DC Signal Input (Use Small Resistor with Color Code "Brown-Black-Red"):

Install the 1kΩ - 1/4W resistor across Terminals "5" and "6". Set Jumper J1 in "VOLT" position.

Procedure to Calibrate the Signal Isolator When Using Current Signal Input:

1. Connect a DC voltmeter (a digital voltmeter is suggested) to Terminals "9" (-) and "10" (+).
2. Apply the minimum signal input current to Terminals "5" (-) and "6" (+).
3. Adjust the MIN Trimpot on the Signal Isolator to obtain an output voltage of 0VDC.
4. Apply the maximum signal input current to Terminals "5" (-) and "6" (+).
5. Adjust the MAX Trimpot on the Signal Isolator to obtain an output voltage of 9VDC.

Voltage Signal Input

WARNING: READ SAFETY WARNINGS 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:

3-1 Voltage Input Signal

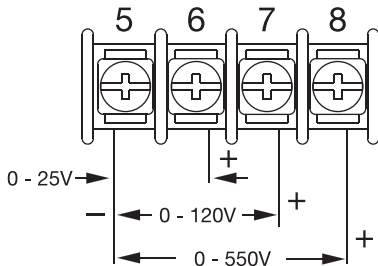
Input Terminals	Minimum Input Voltage Range	Maximum Input Voltage Range
5, 6	0-5	0-25
5, 7	0-25	0-120
5, 8	0-120	0-550

Connect input voltage signal to proper input terminals as indicated in Figure 3-4.

1. Connect a 10VDC 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 3-4 Voltage Input Signal Connections



- Connect the armature of the leader motor to the BC145 input terminals “5” (-) and “7” (+).
- 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.
- Reset the armature voltage of the leader motor to 90V. Adjust the “MAX” trimpot to the desired output voltage.

- Note:** (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.
- When readjusting the “MIN” and “MAX” trimpots, always set the minimum voltage first and then the maximum voltage.
 - 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.

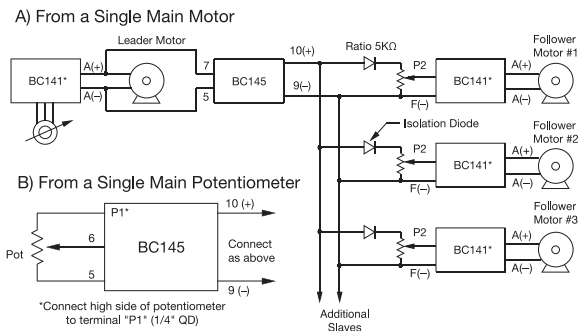
Output Signal

WARNING: THE CONTROLS ENABLE CIRCUIT IS INOPERATIVE WHEN USING THE BC145 SIGNAL ISOLATOR CONNECTED AS SHOWN IN THE FOLLOWING DIAGRAMS.

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 (e.g., 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 4-1 Leader/Follower Voltage Following System with Multiple Motors



Note: * The BC141 controls depicted above and in the following diagrams could also be other models in your application - BC142, BC142-5, BC142-6, or BC155.

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 in Figure 4-1.
- 3) Multiple speed controls cannot be used with PWM, Regenerative or Adjustable Frequency Drives (Inverters).

Figure 4-2 Leader/Follower Voltage Following System

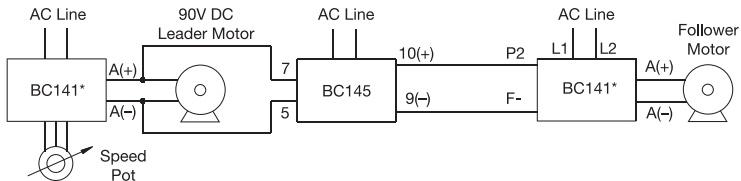
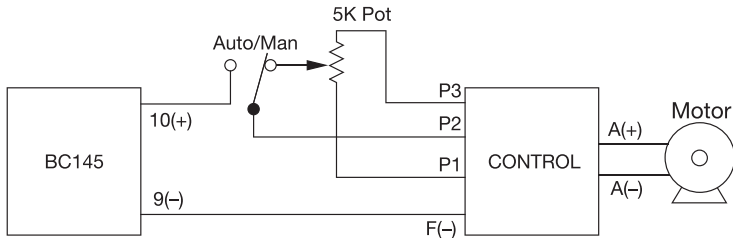


Figure 4-3 Process Control with Auto/Manual Switch - Connection for Models BC141, BC142, BC142-5, BC142-6, and BC155



Note: The BC145 can be wired in an Auto/ Manual mode which will allow manual override of an automatic process. See Figure 4-3.

Figure 4-4 Process Control with Auto/Manual Switch - Connection for Models BC154, BC154-SI, BC154-R, BCWD140, BC160, and BC354

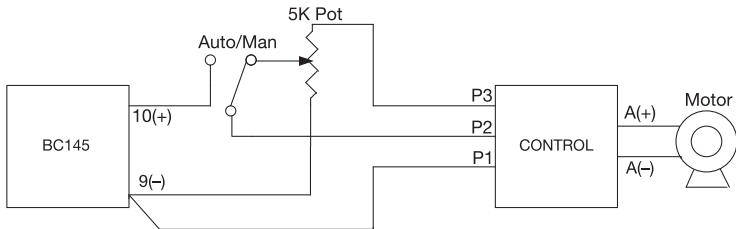
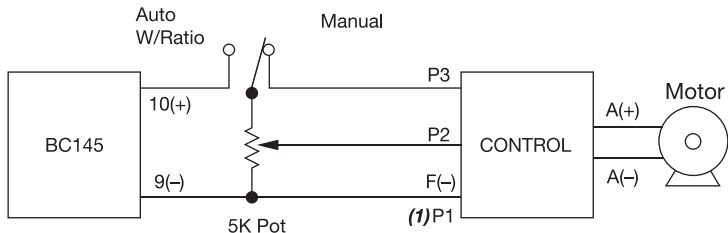
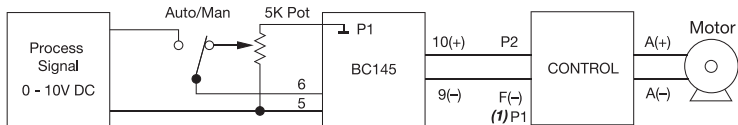


Figure 4-5 Process Control with Auto (Ratio Pot)/Manual Switch - Connection for Models BC141, BC142, BC142-5, BC142-6 and BC155



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

Figure 4-6 Auto/Manual Operation with Potentiometer on BC145 Input - Connection for Models BC141, BC142, BC142-5, BC142-6 and BC155

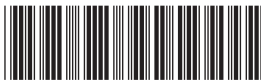


Note: (1) For models BC154, BC154-SI, BC154-R, BCWD140, BC160, and BC354, connect BC145 terminal 9 (-) to terminal P1 instead of F (-).

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 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.



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