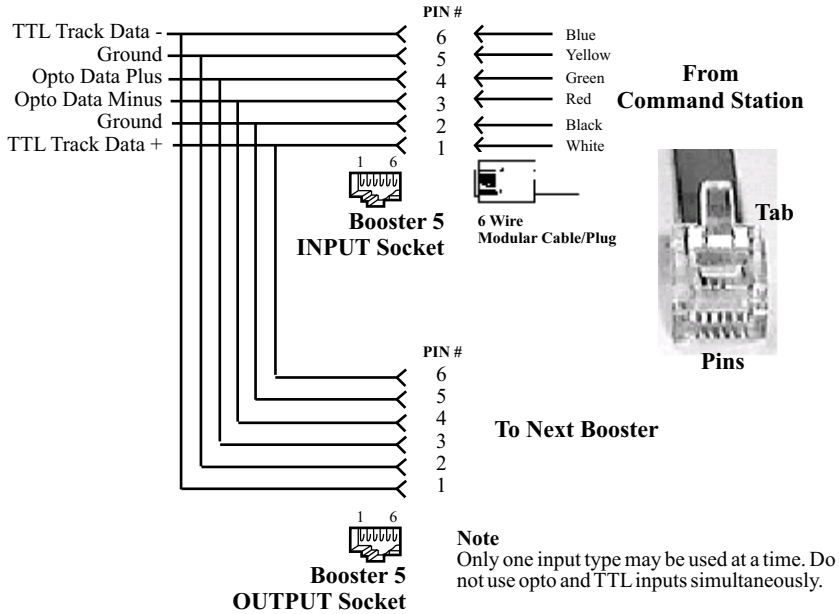
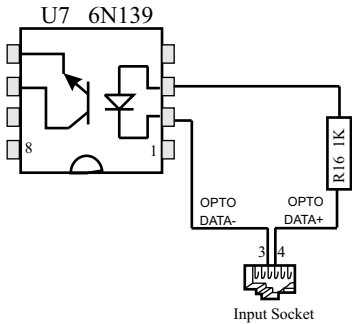


## Booster5 Control Bus Input Technical Information



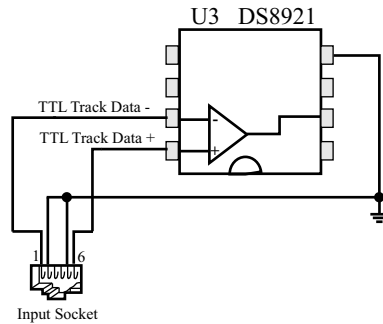
### Optoisolated Input Circuit



#### For Optoisolation of Control Bus

Maximum Input Current . . . 40mA (peak)  
 Minimum Input Current . . . 10mA  
 Current Gain Minimum . . . 300%  
 Minimum input voltage . . . . 9Vpeak  
 Maximum input voltage . . . 20Vpeak

### Differential TTL Input Circuit



#### Meets Requirements of EIA-RS422 Standard

Minimum Input Voltage . . . . . 200mVp-p  
 Maximum Input Voltage . . . . . +/-10V  
 Max Differential Input Voltage . . . +/- 12V  
 EasyDCC Source Voltage (H) . . . . 5V  
 EasyDCC Source Voltage (L) . . . . 0.2V

# BOOSTER



## Installation and Operation Guide

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ZONEMASTER SERIES**

## External Transformer Selection And Safety Precautions

*Some of the recommended transformers require attachment of 115/220VAC cords and fuses. High voltage AC is dangerous. Shocks due to improper or unsafe high voltage wiring practices can be FATAL. Cover all exposed connections and solder joints with heat shrink tubing and electrical tape. Keep the transformer and associated wiring out of the reach of children and pets. If you are not familiar with electrical safety precautions, ask a qualified person to make the high voltage AC connections for you.*

The Booster5 requires a source of low voltage AC or DC with the desired value typically set by the locomotive scale. The absolute maximum input voltage is 24VAC or 28VDC. The transformer should have a current rating of 5 amps. Lower current transformers may be used but the Booster 5 will not be able to deliver its full rated output and it is possible the short circuit sensor may not trip reliably.

**HO/O scale (using 12VDC motors):** the required input voltage is between 16 and 18 volts; either 50 or 60 cycles is OK. Higher voltage transformers are not recommended because of excessive heat dissipation in the linear regulators. The PS5 from CVP Products is recommended for HO/O scale. It's output is 18VAC at 5 amps.

**LGB/G scale (using 18VDC motors):** it is perfectly all right to use the same HO/O scale power supply but the motor voltage and top speed will be about 25% lower than from a regular LGB/G scale power supply. For the Booster5 to achieve full G scale motor voltage, the required input voltage must be between 20 and 24 volts; either 50 or 60 cycles is OK. For best results, use the lowest voltage transformer that provides the desired track voltage. If more output current is needed, use the Booster10.

The table summarizes commercially available transformers (Primary = 115VAC) that are suitable for use by the Booster 5. The part numbers are manufacturer part numbers with distributors listed where known. You may have to shop around for a supplier in your area. Transformers are heavy so try locating one in your local area before turning to mail order suppliers. For international locations, the key specification for the transformer is the secondary voltage and current.

| <u>Manufacturer</u> | <u>Distributor</u> | <u>Stock Number</u> | <u>Secondary</u> | <u>Amps</u> | <u>Scale</u> |
|---------------------|--------------------|---------------------|------------------|-------------|--------------|
| CVP Products        | CVP Products       | PS5 (2)             | 18 VAC           | 5           | N-HO/S       |
| CVP Products        | CVP Products       | 16vt (1)            | 16VAC            | 5           | N-HO/S       |

(1) Bare transformer, requires cord and fuse (not supplied)  
 (2) Fully assembled includes metal box, switch, fuse, cord and output terminals

### WARNING

The Booster5 is is not a toy and is not designed to be operated by children. The Booster5 is a high power device capable of supplying 5 Amps of continuous current into a load at up to 24 volts. Read and follow all directions and installation instructions. Do not expose the Booster5 to moisture. Do not operate the Booster5 in a damp environment. Never block the ventilation grills or vents. CVP Products shall not be responsible for any claim or loss of any nature arising directly or consequentially from the construction or use of equipment described.

## Recommended Booster-5 Wiring

When installed and wired properly, the Booster-5 it will provide years of trouble free performance. However, the Booster-5 can and will supply up to 125 Watts of power. To provide optimum performance as well as insure safe operation, it is important to use good wiring practices.

The Booster-5 is protected against excessive current draw. During a short circuit, the Booster-5 senses the excess current and automatically shuts itself off. However if the "short" is through small wire or through the small contacts of a locomotive pickup, it is possible that the sensing circuit will not be triggered.

**"Bus wires,"** used to distribute track power, should be at least #14 AWG diameter. The large diameter wire minimizes voltage drops and insures proper operation of the short circuit sensing circuitry. Either stranded or solid wire may be used although stranded bus wire is a little easier to handle. If small wire is used, like ordinary telephone wire, it will become warm to extremely hot as the current flowing through the wire increases. When boosters were limited to a few amps, this was seldom the cause for concern. However, if a "partial short circuit" occurs, a condition where the short circuit current is insufficient to trip the electronic circuit breaker, the Booster-5 will happily push up to 5 amps into the short. The end result will be the nasty smell of burned insulation and possibly melted plastic shells. If high current flows through the partial short for a long period of time, there is a risk of burning the contacts and melting plastic holders. This is particularly important for N scale.

**"Feeder wires"** which attach the track to the bus, should be #18 or #20 AWG and attached every few feet.

## Safety Considerations

**Do not bypass or change the short circuit time delays.** The Booster-5 has been designed to provide about 100% of maximum current for about 0.2 seconds before tripping the Electronic Circuit Breaker. After about 3 seconds, the breaker is automatically reset. Changing the time delays can result in damage to turnout points, wiring and the Booster-5. If there is a location that is a source of constant derailments or momentary short circuits, FIX IT!

**Provide adequate ventilation.** Never block the chassis vents. Mount the Booster-5 in an area free of obstructions. Dust should not be allowed to accumulate around the vent.

**Never bypass the internal fuse.** The internal fuse protects the Booster-5 in the event of a catastrophic internal failure.

**Use the proper transformer.** Always use the correct transformer and never parallel transformers unless specifically designed to do so. Never use a high voltage transformer if the Booster-5 is to be used at low track voltages. The linear regulators will have to dissipate the excess voltage as heat which can result in premature failure.

**Be careful with reversing modules.** Reversing modules must be rate to handle the full Booster-5 current unless they are part of a power distribution module. Make sure reverse loops must always be longer than the train. There is the potential for damage to decoders and the Booster-5 should metal wheels bridge the loop's gaps if the polarity is incorrect.

**Disconnect power before opening the Booster-5.** Seems rather simple and obvious. But it's usually the simple things that trip you up.

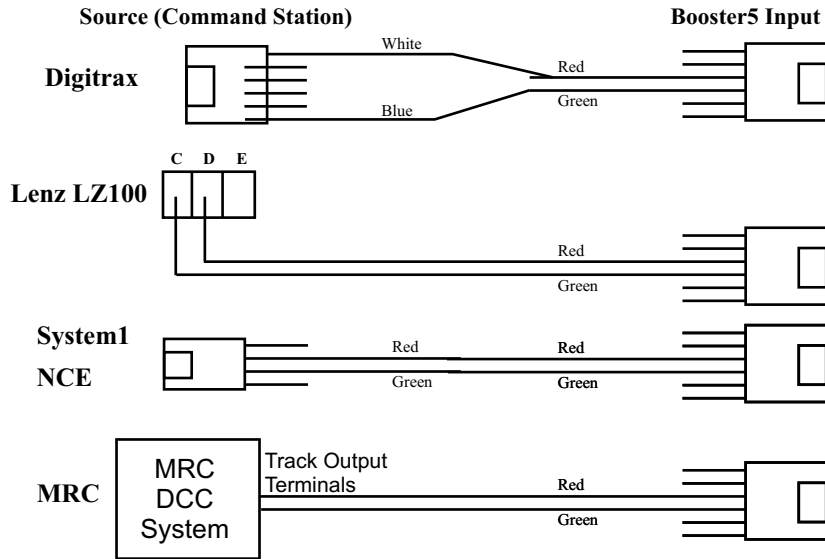
**Always use a ground fault interrupter (GFI) on the transformer primary.** This is very important for safe use of the Booster-5 outdoors. A GFI is cheap insurance against electrocution.

## Additional References and Suggested Reading

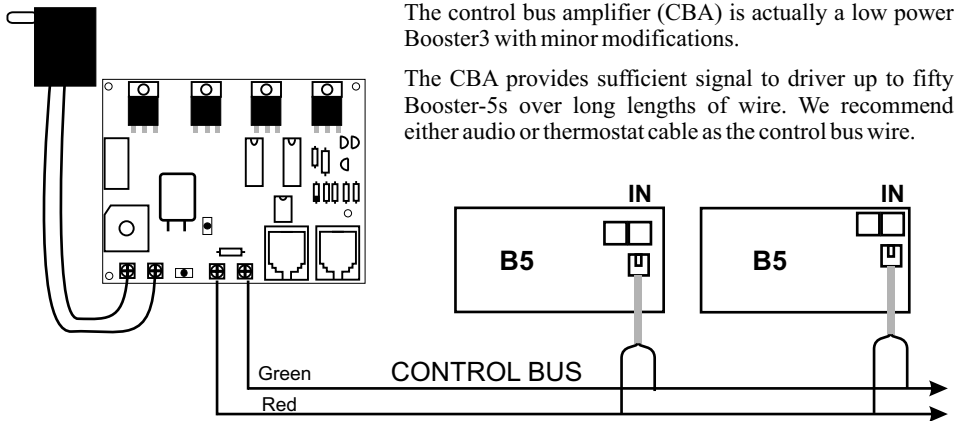
"How To Wire Your Layout" by Andy Sperandeo, Kalmbach Publishing. A basic book on layout wiring. Includes a section on DCC wiring.

<http://www.WiringForDCC.com> is a site created and maintained by Alan Gartner. It has many tips on wiring practices including a tutorial on turnouts and a section on wiring for large scales.

## Adapter Cable Construction For Other Systems



## EasyDCC Optoisolated Control Bus and Input Connections

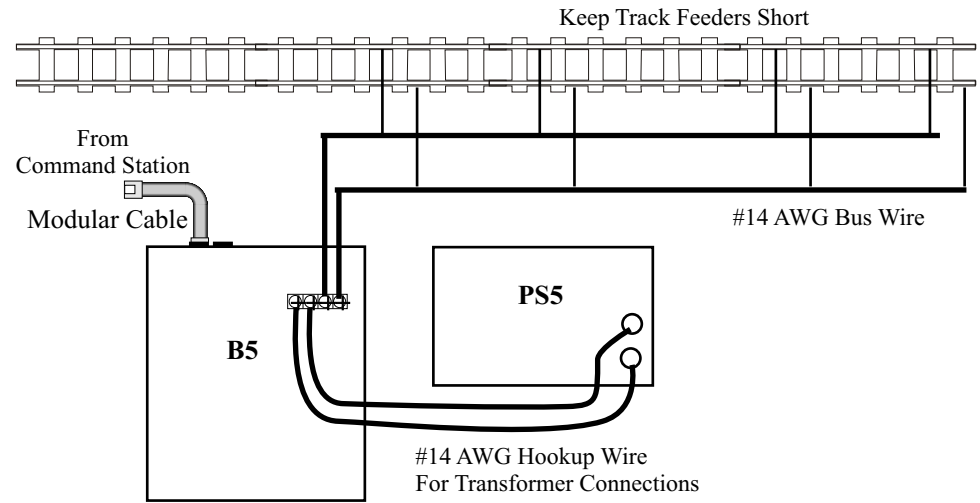


When using a CBA or a standard Booster3, the input AC voltage should be about 12VAC source rated at about 1A. For USA and Canada, we recommend the 12vt wall transformer. Connect the CBA input jack directly to the Command Station's Booster jack. The CBA's output are the two terminals labeled track. Connect these to the two control bus wires.

When connecting to the Booster-5, be sure to use only the input jack. **DO NOT USE STANDARD CABLES TO INTERCONNECT BOOSTER-5's.** Build an adapter cable from a standard 6 conductor cable and plug. Use only the red and green wires (pins 3 and 4) to connect to the control bus. You must maintain proper phasing. All red wires must connect to the control bus red wire and all green wires must connect to the control bus green wire.

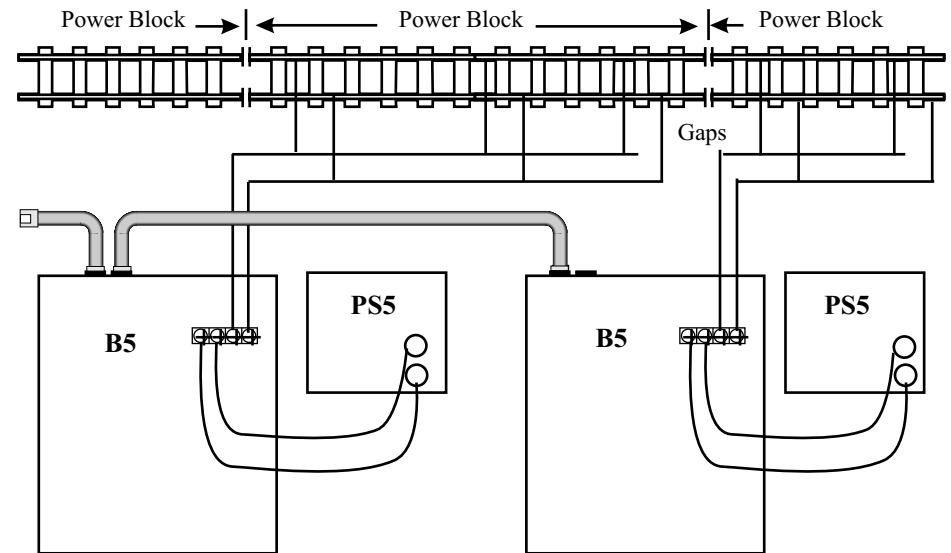
All Booster-5 inputs must be connected the same way. Do not reverse the control bus wires.

## Booster-5 Basic Hookup



**EasyDCC** users may use the standard 6 conductor modular cable to connect the Booster-5 directly to your Command Station. If other Booster-5s or Booster3's are in use, simply connect the Booster-5 INPUT jack to the previous booster's OUTPUT jack. For other systems, an adapter cable must be used. See page 4 for detailed information.

## Booster5 Hookup Multiple Boosters And Power Blocks



## Setting the Output Track Voltage

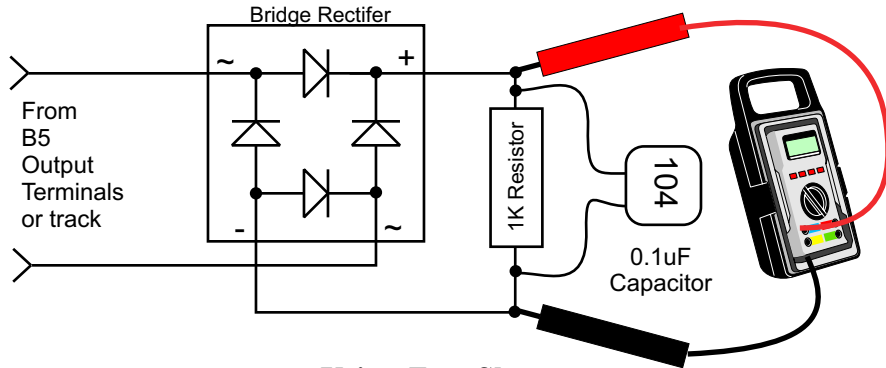
The most accurate way to set the track voltage is with the simple test circuit shown in below. The circuit converts the track signal to regular DC which is easily measured with any type of DC voltmeter. By measuring the DC voltage, you may accurately set the desired MAXIMUM motor voltage supplied by the Booster-5. The Booster-5 adjustment can then be used to set the desired voltage.

*[note: the actual motor voltage will be somewhat dependent on the decoder design and may be slightly lower than the test circuit measurement.]*

If you already have a brand X booster, and you want to match the Booster-5 to it, first use the test circuit to measure the brand X voltage. Then connect the test circuit to the Booster-5 output and set the measured DC voltage to the same value. For best results, all boosters should have the same output voltage.

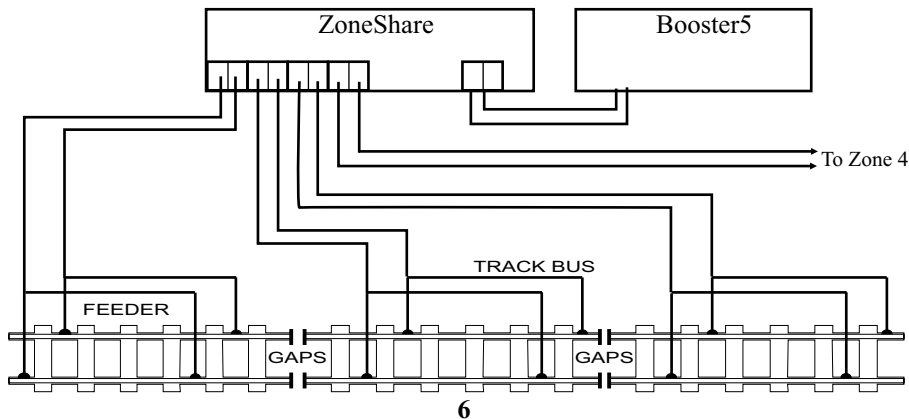
Use a non-metallic small screwdriver to set the adjustment potentiometer. Rotate the potentiometer clockwise to raise the output voltage and counterclockwise to lower the output voltage.

Actual track voltage is the measured DC voltage plus the diode bridge voltage drop which is about 1.5 volts. However, the measured voltage is actually close to the top voltage supplied by the decoder to the motor when running at full speed. For example, if the measured DC voltage is 13 volts, the expected motor voltage at full speed is about 12 volts.



## Using ZoneShare

The ZoneShare allows a single Booster5 or Booster10 output to be split into 4 different and isolated outputs. One of the outputs has an autoreverse function. For detailed information, download the ZoneShare Installation Manual from the website.



## Control Bus Input

**EasyDCC** users may use the standard 6 conductor modular cable to connect the Booster-5 directly to your Command Station. If other Booster-5s or Booster3's are in use, simply connect the Booster-5 INPUT jack to the previous booster's OUTPUT jack.

**For all other systems**, you must use an adapter cable. The illustration on page 3 shows how to build an adapter cable.

**Optoisolation** is available for the control bus input. The back page shows the internal wiring of the two jacks and the two types of inputs accepted by the Booster-5. Correct operation of the Booster-5 requires the use of the correct jack and cable. For EasyDCC users that need optoisolation, see page 3 for the required components. Call if you have any questions.

Do not use the OUTPUT connector if the optoisolated inputs are in use.

There are many modular cable accessories that can help you build a professional and reliable modular cable control bus. Accessories may be purchased at most computer or electronics stores as well as through mail order and internet web sites.

## Modular Cables

If your system uses a modular type cable between boosters, check your system's documentation to determine the type of cable used. For example, EasyDCC uses a "telco" style cable while Digitrax uses a "data" style cable. Both cable types look alike but are electrically different. For more details and illustrations, see the EasyDCC installation and operation manual.

A telephone style cable flips the pin wiring at each end; pin 1 at the left plug connects to pin 6 at the right plug. Data style cable maintains the pin 1 to pin 1 connection between cable ends. Either cable type may be used with the Booster-5 as long as you are aware of the difference and insure proper connection to the appropriate jack.

Cable making is easy when the correct tool, plugs and modular cable are used. Modular cable may be constructed with either solid wire or stranded wire for the individual conductors and the correct plug must be used to insure a reliable connection. Do not use a plug designed for stranded wire on solid conductor modular cable.

## Modular Cable Supplies

| Item   | Radio Shack Stock # | Mouser Stock # |
|--|---------------------|----------------|
| 6 conductor crimp plug (for stranded type)                                       | 279-421             | 154-UL6236     |
| 6 conductor cable (stranded type)  | 278-874             | 172-UL6010-FT  |
| Crimp tool (for attaching plug to cable)   | 279-405             | 382-2196       |
| 7-foot modular cable with RJ12 plug on one end and 6 spade lugs on the other end | -                   | 154-3004       |