CONVRTR-60 Configuration Variables (CV)

Use the AirWire T5000 throttle to setup the CONVRTR-60 CVs as well as the attached decoder. Only a few CVs are used by the CONVRTR-60 and these are usually programmed at the same time as when programming attached decoder.

When programming the address, the throttle will automatically send the proper sequence of CVs to the attached decoder regardless of the number of digits in the address.

The CONVRTR-60 accepts both SERVICE PROGRAM commands and OPS PROGRAM commands.

Do not use OPS PROGRAM to change the address.

CV #	Factory Value	Value Range	Description
1	3	0-99	1-99 Primary Address
8	135	135	CVP Manufacturer ID
17	0	0-605	Loco Address Hi-Byte
18	0	0-605	Loco Address Lo Byte
29	2	0-605	Decoder configuration
200	0	0-16	Frequency Select

CONVRTR-60 Warranty Information

This warranty covers substantial defects in materials and workmanship in the CONVRTR-60 module.

What This Warranty Does Not Cover

This warranty does not cover any problems which result from improper installation, modifications, battery polarity reversal, improper operation, leaking batteries, excessive battery voltages, excessive decoder current draw, incorrect connections to decoders, abuse, accidents, or acts of God such as excessive heat, floods, damage caused by exposure to moisture and rain, lightning, earthquakes, volcanic events, tidal waves or hurricanes.

Warranty Duration

The coverage of this warranty lasts for 90 days. After this period, standard repair rates apply. Depending on the problem, CVP reserves the right to repair or replace.

Help, Repairs and Returns

If you purchased your CONVRTR-60 from one of our AirWire900 dealers, please call them first. They are your best and quickest source for answers to questions about CONVRTR-60. They are also experts in installation and offer such services should it be required. If you purchased your CONVRTR-60 ***direct*** from CVP Products, call us first.

If you are asked to return an item to CVP for service, you must follow the instructions on the website listed under the "Repair Services" link. There you will find the street address plus other helpful tips about how and where to send items to CVP Products.

Do not send items to us for repair without first obtaining authorization and an RMA.

CONVRTR-60 Electrical Ratings

Maximum Input Battery Voltage	**24 Volts DC**
Minimum Input Battery Voltage	**6.3 Volts DC***
Minimum Surge Current without Tripping	**55A**
Maximum Continuous Current (thermally limited)	**6A at 100°C**
Over-Current Trip (Min/Max)	**55A to 98A**
Reverse Polarity	**Not Protected**
FCC ID Number X7J-A10040601	**Part 15 Compliant**

*Decoder dependent - it might need a higher input voltage to operate reliably

CVP Products P.O. Box 835772 Richardson, TX 75083-5772 www.cvpusa.com 972-238-9966

DEC 2016 r0

The AirWire900®
CONVRTR-60™ User Guide

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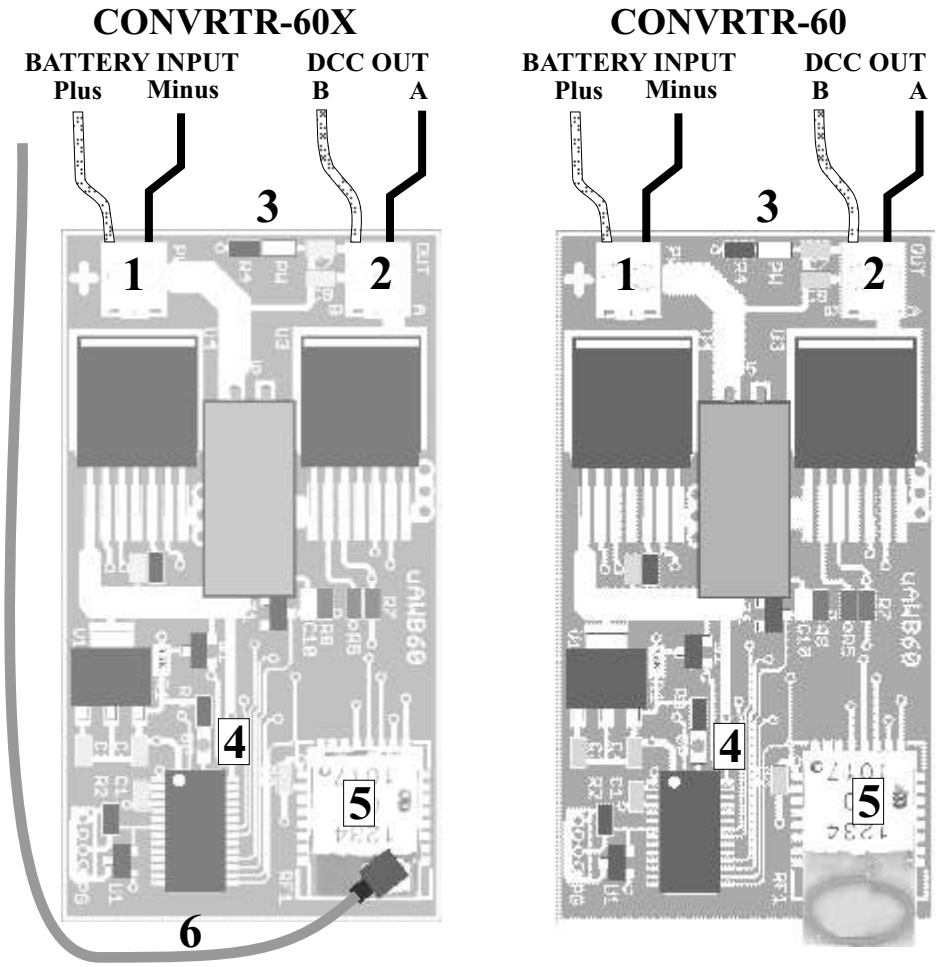
Need Help? Contact Your Dealer/Installer First!

Should you have any questions regarding your CONVRTR-60, your dealer is the best source of information, tips and techniques. Also, almost all dealers do CONVRTR-60 installations or can recommend good installers. It might take a little more time and cost more, but you'll be assured of an installation that works and works well the first time.

Contents

CONVRTR-60 module
Test Diode
This User Guide

CONVRTR-60 Connections



CONVRTR-60 Board Familiarization

1. Battery Input Terminals: Connection to the battery goes here. The positive pad is labeled with a + sign and the pad is square. The battery negative connection is to the round pad. The CONVRTR-60 is polarity sensitive. **Reversing the polarity will destroy the CONVRTR-60.**

2. DCC Output Terminals : Connect these two pads to the DCC decoder. Use # 20 - #24 AWG stranded wire to make all connections.

3. Green PWR LED Indicator: Glows bright green when power is applied.

4. Red GP LED Indicator: Glows steady bright red when an AirWire throttle is set to the CONVRTR-60's frequency (regardless of loco address).

5. Radio Module: This is the sensitive radio receiver. Keep it away from metal objects. The CONVRTR-60 on the right has a built-in antenna. It has a built-in antenna which is the dark oval on the blue circuit board.

6. Removable Antenna: The CONVRTR-60X on the left has a jack for use with different types of external antennas. A 3 inch whip antenna comes with the CONVRTR-60X. Keep the antenna away from all wiring for best reception.

Use Track Power? - Not Recommended, But...

Warning

The CONVRTR-60 is designed for battery powered operation. Attempting to operate from power scavenged from some other form of track power can damage the battery and possibly the CONVRTR-60. Therefore attempting to use or recharge the onboard battery is highly discouraged.

However, we realize that this may be of interest to some users, especially if they intend to operate their battery powered locomotive on powered track. There are no specific precautions for the **CONVRTR-60**. However, it must stay within the absolute maximum ratings listed on the back page.

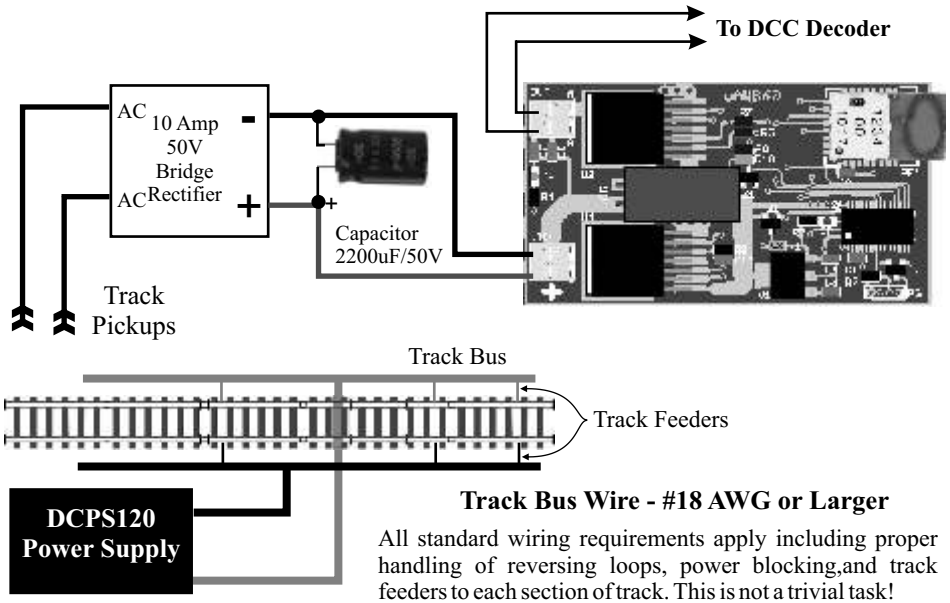
Use A Bridge Rectifier To Insure Proper Polarity for CONVRTR-60 Power Input. Insert a bridge rectifier between the CONVRTR-60 DC input and the source of external DC power. Doing so insures proper polarity regardless of the source power polarity.

Use Only Pure and Well Regulated DC. The power supply must be well regulated. It must not have any ripple. A minimum specification of 5% regulation is recommended. CVP's DCPS120 power supply can be used.

Set Power Supply Voltage to about 15 volts DC. The peak DCC voltage at the output of the CONVRTR-60 will be approximately equal to the DC voltage at its power input terminals.

Clean Wheels And Clean Track Are Mandatory if power is not supplied by batteries.

Wiring The Railroad Is A Long And Boring Chore. If you use battery powered locomotives, there is no need to worry about reverse-loops, turnout wiring, dead frogs, opposing point switch wiring, route control wiring and the many other wiring requirements related to properly powering locomotives through the rails.



Track Bus Wire - #18 AWG or Larger

All standard wiring requirements apply including proper handling of reversing loops, power blocking,and track feeders to each section of track. This is not a trivial task!

The DCPS120 Power supply is a 120 Watt, adjustable DC power supply with excellent load regulation. The output voltage is variable from 15V to 24V. It has built in overload and short circuit protection. It is available direct from CVP Products. See the website for ordering details.

Battery Considerations And Options

Selection of a suitable battery is based on the battery size, the available physical space, the battery voltage and the battery capacity or runtime. Each factor has a direct influence on the other factors. The general guidelines will get you started down the right path. However, once you have completed your first installation, you'll be much better prepared for subsequent installations. There is no right or wrong battery answer. Let your skills and your experience guide your decisions.

Battery Voltage

The CONVRTR-60 is optimized for 14.8V Lithium-Ion battery packs. Up to 22V is OK.

Runtime or Battery Capacity

A battery's capacity is labeled on the side of the battery. Capacities can be stated in either milli-Amp-hours or simply Amp-Hours. If the label says 500mAh, the battery will deliver 500mA for one hour. If it says 6.8Ah, the battery will deliver 6.8 Amps for one hour.

Battery Protection

Lithium battery packs are extremely safe with exceptionally long lifetimes when they are equipped with an internal protection circuit board. When buying packs, make sure it has the protection board built in.

Suggested Battery Suppliers

First check the sizes and capacities of the available CVP Products' batteries. See the CVP website for the latest offerings. If none of the batteries meet your needs, then check the other companies listed below. Each offers literally hundreds of cells and battery packs. There are many more vendors but they come and go at a furious pace. It may be beneficial to spend some time shopping on the Internet to compare prices and availability.

There is one precaution when purchasing from the internet. Beware of sellers that don't show stock availability. They will take your order, charge your credit card but might not ship your order for many weeks or months. If availability is not stated, call the supplier and ask. But if they don't know or won't tell you, take your business elsewhere. Don't support this unethical business practice.

Also, beware of extra fees when ordering batteries. Some vendors may tack on an extra handling fee, implying that it is fee charged by the carrier. However, there is no such fee when batteries are shipped via ground service. Always request UPS ground service.

CVP Products
P.O. Box 835772
Richardson, TX 75083
972-238-9966
www.cvpusa.com

All-Battery
436 Kato Terrace
Fremont CA 94539
(510) 979-9969
www.all-battery.com

*** Battery Space**
860 South 19th street
Richmond, CA 94804
(510)560-2328
www.batteryspace.com

PowerStream
1163 South 1680 West
Orem UT 84058
(801)764-9060
www.powerstream.com

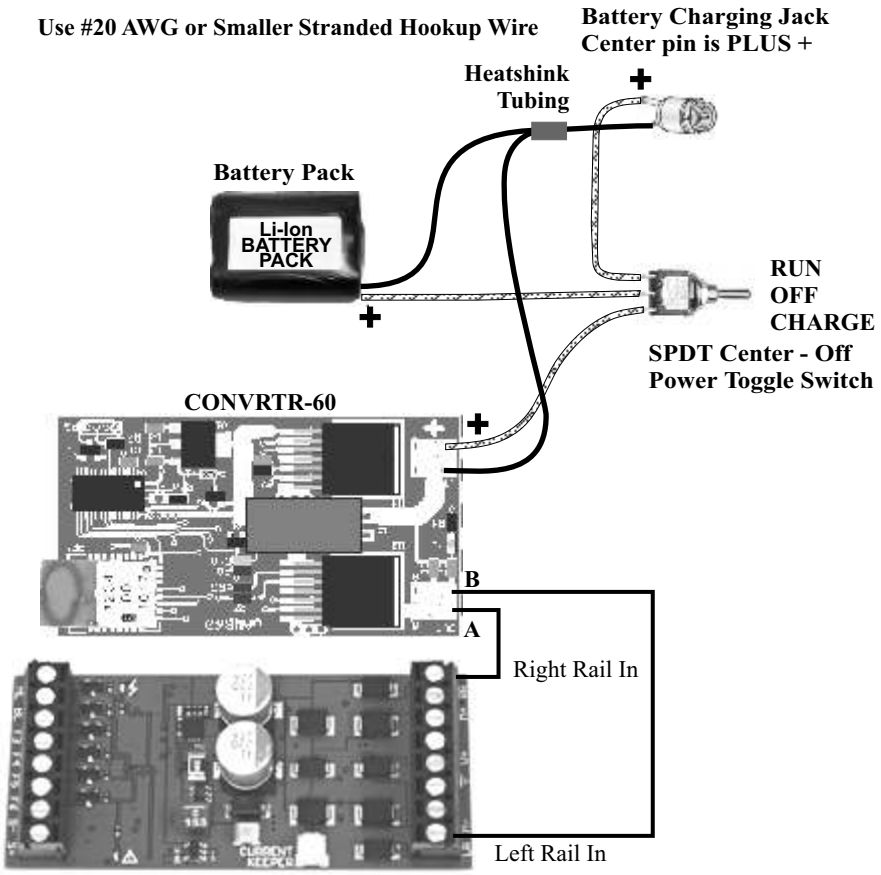
Mouser Electronics
1000 North Main Street
Mansfield, TX 76063
(800) 346-6873
www.mouser.com

*** Caution**

When ordering batteries, always request United Parcel Service (UPS) **Ground** Shipping. Some vendor of batteries, but not all, may add "Hazardous Material Handling Fees" or other special handling fees when shipping Lithium batteries.

Example Hookup Diagram

Hookup To A Soundtraxx ECO-400 4-Amp Decoder



Motor And Lighting Hookup Not Shown

Wiring Guidelines

Neatness Mandatory: Installation of the CONVRTR-60 and the DCC decoder will be in tight spaces with minimum clearances. Take extra care and extra time to keep wiring neat, with wires trimmed to the proper length and clear of mounting holes.

Basic CONVRTR-60 Connections: This is easy. There is a input terminal block for the battery connection. The input is polarity sensitive. There is an output terminal block for connecting the DCC decoder..

Verify Battery Polarity: There is no protection against polarity reversal. Connecting the CONVRTR-60 to the wrong polarity will destroy it. Use the suggestions on the next page if you are not sure of the polarity.

Battery Requirements: The CONVRTR-60 will operate with battery voltages as low as 8.2V and as high as 22 volts. If using the higher voltages, you must first verify that the attached DCC decoder will tolerate higher battery voltages.

Pick the highest energy capacity battery for which you have physical space. Energy capacity is stated in milliamp-hour abbreviated mAhr or Amp-hours. This rating states how much current can be supplied by the battery for 1 hour. A 500mAhr rating means the battery will supply 500mA or 0.5A for one hour. A 3.4Ah rating means the battery will supply 3.4 Amps for one hour. Higher values offer longer running time but the battery will be physically larger.

Make sure the battery fits the available space. There are many types and sizes available. Pick the battery that offers the best compromise in space and energy capacity. For easiest installation of a larger battery, use a separate battery car or a dummy locomotive.

See the battery suggestions and recommendations section at the end of this booklet.

DCC Decoder Types: Any NMRA-DCC compatible decoder may be connected to the CONVRTR-60. For sound+motion, the TCS-WWOW or the Soundtrax Tsunami are recommended.

When connected to the CONVRTR-60, the DCC decoder will operate and can be programmed as if it were sitting on the track and powered by a DCC system.

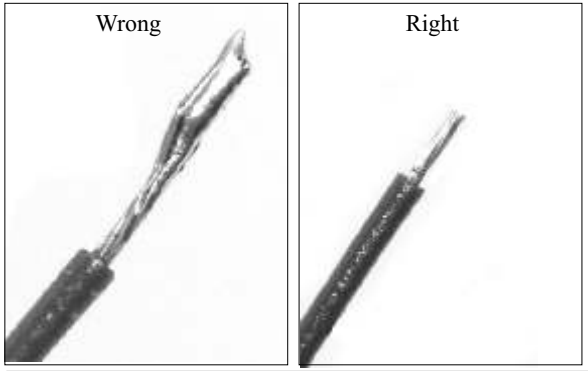
Wire: Small and flexible #20 - #24 AWG stranded wire is best although almost any kind of wire can be used. Use multiple colors to prevent confusion or polarity reversal.

Power Switch and Charging Jack: A power switch is not absolutely necessary. You can equip the battery with a simple plug and socket and that becomes the power switch. A latching reed relay can substitute for a switch. See page 10 for details.

Connecting Wires To Terminal Strips

If using stranded wire, it should always be tinned.

Remove about ½ of an inch of insulation from the wire. Tightly twist the individual strands together. Use a soldering iron and heat the wire. Then apply a small amount of solder to the wire strands. This process, called tinning, keeps stray wires from shorting across to the adjacent terminal or to other areas of the board. Trim the tinned wire to about 1/4 inch.



When inserted into the terminal, only a tiny part of the bare wire will be visible.

Notice that the wire has been trimmed in the "right" image.

Always use different wire colors.

The terminals will accept wire as large as 20-22 AWG. However, the twisting and tinning may thicken an already large wire to the point where it doesn't fit.

Troubleshooting Tips - *continued*

CONVRTR-60 Was Running But Suddenly Stops and Won't Restart

1) Battery is depleted. Recharge the battery.

2) Jamming. Make sure that another throttle is not jamming your frequency and/or address.

3) Mechanical failure inside the locomotive.

4) Some kind of fault with the attached DCC decoder

CONVRTR-60 Won't Run At All After Installation

1) Battery is depleted. Recharge the battery

2) Jamming. Make sure another throttle is not jamming your frequency or address.

3) Throttle not set to proper frequency or address. Set the throttle correctly or use the JUMP MODE to program the CONVRTR-60 to the desired frequency. If you are not sure what the frequency is, follow the instructions in the section labeled, 'Forgotten Frequency."

4) Some kind of wiring fault is continuously tripping the CONVRTR-60's protection. The most common cause is a pinched wire shorting to an adjacent wire or simply incorrect wiring. There may also be a problem with the attached motion/sound decoder.

Operational Considerations

Beware of Lurking Locomotives When Using SERVICE PROGRAM Mode
SERVICE PROGRAM mode is a broadcast command that can be heard and understood by any other AIRWIRE decoder or CONVRTR-60 sharing the same frequency as the CONVRTR-60. If another decoder receives the command, it too will be programmed. Play it safe and make sure to turn off power to all locomotives not being programmed.

Beware of Other Transmitters
The CONVRTR-60 decoder operates in an unlicenced band shared by many other transmitters. These transmitters can create interference, cause intermittent throttle operation or failure of one or more of your decoder's 17 frequencies. The sources of these external interfering signals can be from your own home or from adjacent homes and businesses. They can also be from other CVP wireless equipment.

Here's a list of devices known to have caused interference problems to AirWire900 equipment: wireless devices attached to computers, TV/Radio/Entertainment-center, remote controls, cordless telephones, alarm systems, baby monitors, unlicenced personal communication devices, lawn sprinkler controllers, remote starter switches, cordless light switches, outdoor lighting controllers, toys, wireless headphones, and games. Of course, if you have additional wireless throttles, make sure each is on its own frequency; two throttles on the same frequency will jam each other.

If you find a strong interfering signal on one or more of your frequencies, don't use those frequencies. You must select another, different frequency.

Never Use RTV or Silicon Adhesive On The CONVRTR-60
NEVER use RTV or other liquid adhesive to attach the CONVRTR-60 to the locomotive. That material is conductive and will destroy the CONVRTR-60. Use only double-sided foam tape.

Placement Suggestion For Best Range - Metal Locomotives
If possible, mount the CONVRTR-60 horizontally and as high as possible within the locomotive. If you are using the CONVRTR-60X with a whip antenna, a vertical antenna may offer better range although you should also try horizontal. Keep the whip antenna away from motor and battery wiring as much as possible. Never let it touch anything metal. For metal locomotives, the use of the external antenna is mandatory. Make sure the antenna is as far outside of the metal chassis as possible.

Not Sure About The CONVRTR-60's Frequency?
Not sure about the CONVRTR-60's frequency? Don't worry. Use the forgotten frequency procedure to set it to what you need. It's fast and painless as described on page 10.

LED Indicators For Troubleshooting

Assuming you can see the little LED indicators on the CONVRTR-60 board, they will provide you with some hints as to the causes of poor, erratic, or non-operation.

The PWR Green LED will always be on if power of the correct polarity is applied and turned on. Even if the voltage is above or below normal, this LED will be on. If it is off, when you think it should be on, check that the battery is charged, and verify correct wiring of the battery and switch. Make sure the power switch is "On."

The GP Red LED offers several indications that can serve as an effective aid to troubleshooting.

Steady On: it says the throttle frequency matches the CONVRTR frequency.

Slow Blink: CONVRTR is in count down mode prior to entering Jump Mode. You must turn on a throttle with a matching frequency to cancel Jump Mode. The GP LED will go dark after one minute.

Dark: there is no throttle present that matches the CONVRTR frequency setting and it has now entered Jump Mode. To cancel this mode, power cycle the CONVRTR and make sure the throttle is set to the CONVRTR's frequency.

Erratic blinking on and off: the throttle is set to a power level that is too low or the throttle is too far away or both.

Troubleshooting Tips

Train Stops When It Is Far Away - This is an easy one. You need to set the decoder's loss of signal timer, set CV11 to a value of 0. Any other value and the locomotive will come to a halt when the throttle signal is gone and the timer has expired.

Throttle Loses Control When Locomotive Is Far Away - This is just the normal limitation of the radio system. Do not expect the throttle to control the train when it is a thousand yards away. However, if your railroad is in a large loop, then leave the throttle on its original setting and let the train come back to you.

Horn/whistle Won't Stay On When F2 is Pushed And Held - This is usually caused by a combination of noisy motors and distant operation and is not actually a problem. Instead, it is an automatic feature of the CONVRTR-60. If for any reason, the CONVRTR-60 stops receiving throttle commands, and the last command was horn ON, then it will automatically issue a horn OFF command after a preset amount of time.

Limited Reception Range - There are many causes that contribute to shorter than expected range. In no particular order, here's a list of items known to impact the range.

Antenna parallel to motor or battery wiring: Keep all wiring away from the antenna.

Metal shell: If loco has a metal shell, the antenna must be outside of the metal shell.

Noisy motor: Consider remotoring with a low current, high efficiency motor. Not only will the range be better but the battery will last much longer.

LOCO Runs If Throttle Is OFF
This is easily solved since it is the decoder causing this. The decoder must have the analog conversion turned off. To do this, program the decoder's CV29 to a value of 2 if the loco address is between 1 and 99. For loco addresses higher than 99, program the decoder's CV29 to a value of 34. These values turn off the analog conversion.

The troubleshooting list below assumes that the CONVRTR has been properly installed and was working OK. The bold face type is the symptom.Common causes are described with the most common listed first and the least common listed last.

Any condition that trips the CONVRTR's self protection will require a power cycle to reset it. In other words, turn off power to the CONVRTR and then turn it back on.

continued on next page

Recommended Soldering Tools and Solder

Soldering small wire is not difficult. However, if you don't have the correct tools, proper soldering is difficult and frustrating.

Use Small Diameter Rosin Core Solder. The choice of solder is also important. One of the things to remember is to never use acid core solder. Acid core solder will destroy the board and components. The best solder for electronics work is small diameter, 0.015 to 0.02 inch "no-clean-flux" core solder. Larger diameter solder should not be used as there is a risk of putting too much solder on the pad which will short out adjacent pads.

Use A Small Diameter Soldering Iron. Do not use so-called soldering guns. These are very high wattage and will damage delicate traces, pads and components. A 60 watt, temperature controlled iron is the best.

Tool Source: The following part numbers and prices are from Mouser Electronics www.mouser.com. They are an excellent supplier that we use as often as we use Digikey.

Apex Soldering Iron, 60W, Temperature Controlled	578-WP60
Soldering Iron Stand and Sponge Holder	578-PH100
60/40 Rosin Core Solder Roll	738-13427

Keep The Soldering Tip Clean. Buy an inexpensive soldering iron stand, that includes a holder for a small sponge. Keep the sponge damp. Swipe the tip across the damp sponge to clean it before soldering. Don't clean after soldering - the excess solder protects the tip. Before turning off the iron's power, put a blob of solder onto the tip. This solder coats the tip and prevents oxidation.

Always Twist and Tin Stranded Wires Before Using. Stranded wire must have their individual strands twisted together followed by applying a small amount of solder - this is called tinning. It makes soldering the wire to the board much easier.

Soldering Tips

- Do Not use too much solder. A tiny amount is all that is needed.
- Never apply the solder directly to the iron and attempt to 'paint' it onto the lead.
- Proper soldering takes a little patience. This is the most important part of learning to solder. You must watch and wait if you want to have a good solder joint. Soldering can not be rushed.
- When the joint has cooled, trim the excess lead using the wire cutters. Do not cut off the solder joint - rather trim the lead to the top of the joint.

Hookup Wire and Heatshrink Tubing Source

To avoid confusion and possible damage, always use different colored wires for hookup. Standardize on what each color does. Take a few minutes to document your installation. Make a record of the colors used and take pictures of your installation. You might remember what you did a month from now. But what will you remember a year from now?

The suggested hookup wire comes in 100 foot rolls. This wire is #30 AWG, stranded and tinned. More important is the thin outer insulation. Share the cost of this wire among friends - the roll will last a long time.

Hookup Wire Color and Digikey Part Numbers:	**www.digikey.com**
Red #30 AWG Stranded and tinned	A1851R-100-ND
Black #30 AWG Stranded and tinned	A1851B-100-ND
Orange #30 AWG Stranded and tinned	A1851A-100-ND
Grey/Slate #30 AWG Stranded and tinned	A1851S-100-ND
Blue #30 AWG Stranded and tinned	A1851L-100-ND

Heatshink Tubing Kit of various diameters also from digikey.com

Heatshrink Kit - 180 variety pak of 6 inch pieces	Q2Z1-KIT-ND

Verifying Battery Polarity - It's Cheap Insurance!

Verify Battery Connector And Wire Polarity!

If you don't have a VOM meter, use the testing diode that came with your CONVRTR-60 to verify that you have the plus and minus leads properly identified before permanently connecting the battery. There is no protection for reversed battery polarity.

To verify proper identification of the two battery wires, use the steps below. This is a temporary hookup. Do not allow the battery wires to short together or brush against the board. This will damage the board and the battery.

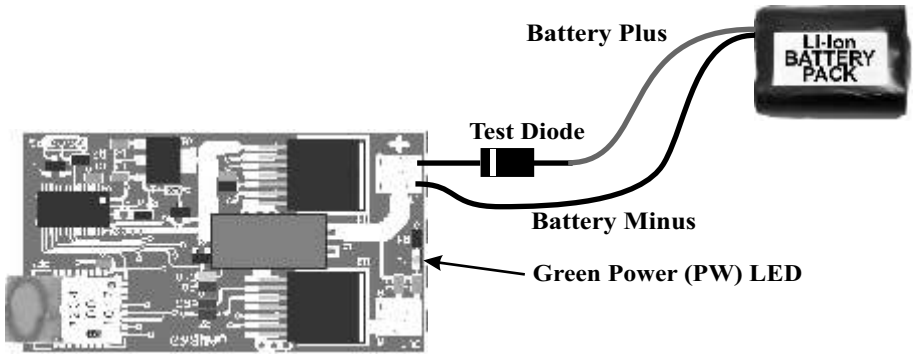
Step 1: Temporarily solder the black or negative wire from the battery (or what you think is the negative wire) to the pad labeled BN.

Step 2: Temporarily solder the banded end of the test diode into pad labeled with the large plus symbol.

Step 3: Touch the battery plus wire (or what you think is the plus wire) to the free end of the diode (the non-banded end). If the green power (PWR) LED turns on, then the polarity is correct. Label the battery's plus wire and note its color.

If the green LED does not turn on, first verify that the banded end of the diode is in the CONVRTR's + pad. If that is correct, then reverse the two battery wires. If the green LED now turns on, mark the wire connected from the battery to the diode as the + wire.

Once you have confirmed and identified the proper polarity, mark the wires or make a drawing so that you can refer to it when you are ready to make the permanent hookups. Disconnect the diode - do not leave it attached. It wastes too much energy to be permanently installed.



Caution
Remove the test diode after checking polarity. It is too small and will become too hot if it is kept in the circuit.

Warning!
Reversing the input polarity to the CONVRTR-60 will damage it beyond repair. This is not covered by the warranty.

Using OPS PROGRAM Mode

The CONVRTR-60 both understands and passes on to the attached DCC decoder, any OPS programming command from an AirWire throttle. This feature allows the attached decoder to be reprogrammed without modifying any other decoder that may be sharing the same frequency.

When using the OPS PROGRAM mode, the throttle must be set to the same frequency and the same address as the locomotive. If either is wrong, the command will not be received.

For the attached DCC decoder, any CV supported by the decoder can be changed. Any change to the decoder using OPS PROGRAM mode, takes effect immediately. Be sure to have your decoder's user guide available to verify the desired CV number for the effect or action to be changed.

OPS Programming Of The CONVRTR-60, is also possible for its own CVs. As with the attached decoder, don't use OPS programming to change the locomotive address. The complete list of CVs inside the CONVRTR-60 are listed on the back page.

Do not change CV1 using OPS PROGRAM mode which is the decoder address.

Use only SVC PROGRAM mode to set the locomotive address so that both the microBooster and the attached decoder receive the same address.

Overloading And Overheating Fault Protection

Note: Battery Built-Protection can cause loss of power to the CONVRTR. This cause is easily determined because the battery will not automatically reset itself. The CONVRTR must be disconnected or switched off for the battery to reset. If this continually occurs, you must obtain a battery with a higher continuous discharge current rating.

The CONVRTR is self protecting and self-resetting. In the event of an overload or a short circuit, or if the CONVRTR-60 gets too hot, it will momentarily and automatically shut off its DCC output to protect itself. If the train was running, it will stop momentarily. If the train was idling, the sound and any lights will turn off momentarily. Both of these conditions are because the DCC output has been shut off. Nothing is damaged if this occurs. After about a 4 second delay, the CONVRTR-60 will resume normal operation. If the fault condition still exists, it will shut off again. You need to determine what caused the CONVRTR-60 to shut down and remedy it.

The 6 A continuous current rating is not an absolute limit. Output current can be higher if there is sufficient ventilation of the decoder. But if there is limited or no ventilation, the maximum current could be less. Also, if the CONVRTR-60 is operated in a hot environment, this might also limit the maximum available current.

A thermal overload (overheating) will cause the CONVRTR-60 to shut down also. The thermal overload can be caused by several factors or combinations of factors. These factors include inadequate ventilation, higher than normal motor current, or battery voltages higher than 14.8 volts. Provide more ventilation if this is a continuous problem and the continuous load current is below 6 amps.

Stage 1 Overload Protection starts at about 10 Amps. This allows continuous operation up to 10A provided the transistor over-temperature limit is not activated. Regardless of the temperature, if the load current exceeds 10 Amps for more than a second, the CONVRTR-60 will disable the output, wait about 4 seconds and then re-enable the output.

Stage 2 Overload Protection trips at a minimum of 55 Amps. If this amount of current is sensed, the CONVRTR-60 shuts down immediately. This high current is likely due to a short circuit between the CONVRTR's two outputs or if one of the outputs is shorted to battery plus or minus. Once the short circuit is removed, the CONVRTR-60 will self-reset and resume normal operation.

Total current load on the CONVRTR-60 is the sum of the amperage from the motor, sound effects and lights. Thus incandescent bulbs should be replace by LEDs. Not only are LEDs significantly brighter but they require much less current and have a very long lifetime.

Operating Notes For Frequency Jump Mode

These notes discuss what happens with "Jump Mode" under various operating conditions.

- The jump mode is canceled and normal operation resumes if a throttle is turned on that matches the present CONVRTR-60 frequency **within one minute** of the CONVRTR-60's power being turned on.
- If the CONVRTR-60 jumps to frequency 0 because you waited too long to turn on the throttle, just power cycle the CONVRTR-60 and make sure the throttle is turned on within one minute.
- The jump to frequency 0 is temporary and **nothing is changed** in the CONVRTR-60. You must now set the desired frequency before turning the power off again.
- The CONVRTR-60 will not jump to frequency 0 if any throttle with a matching frequency is on within one minute of turning on the power, regardless of the throttle's loco address.

Using OPS PROGRAM Mode During Jump Mode

If you are confident you know the CONVRTR-60's assigned locomotive address, then you can use OPS PROGRAM to change the CONVRTR-60 assigned frequency. If you are not sure, use SERVICE PROGRAM mode. OPS PROGRAM is the safest way to change the CONVRTR-60 assigned frequency and insures no other decoders will have their frequency changed. The only caution is that you must know the CONVRTR-60 assigned loco address.

- Step 1: Turn off **all** AirWire throttles. This is very important since it is the absence of any throttle signal that forces the CONVRTR-60 to temporarily jump to frequency 0.
- Step 2 - Turn off the CONVRTR-60 and then turn it back on. .
- Step 3 - Wait at least one minute. If you can see the GP LED, it will slowly blink during the wait time. After the wait time is up, it will be dark. You must wait the full minute.
- Step 4 - Turn on your throttle and set it to frequency to 0. Enter the decoder's address. If visible, the CONVRTR's red GP LED will now turn on steady.
- Step 5 - Use **OPS PROGRAM** to set CV200 to the desired frequency. Be sure and reset your throttle to the new frequency. A power cycle is not needed.

Resetting CONVRTR-60 To Original Factory Settings

CV8 is used to reset the CONVRTR-60 back to original settings as it comes from the factory. Both the CONVRTR's locomotive address and its frequency will be changed back to the original settings. After issuing the factory reset command, the CONVRTR-60's address will be 3 and its frequency will be frequency 0.

The CONVRTR-60's reset command will have no affect on the attached decoder.

If you know your CONVRTR's present radio frequency, set your throttle on the same address and frequency.

If you do not remember the radio frequency, you must first use the forgotten frequency command to reset the radio frequency. Once this is done, then you can reset the CONVRTR to its original factory values. See page 7.

Turn on the T5000 by pushing MENU. Verify it is set to the same frequency as the CONVRTR-60.

1. Push MENU twice followed by 4 to select SVC PROGRAM mode.
2. Press 8 and then ENT to enter CV8.
3. Press 1,3,5 then ENT to enter the reset value. All other values are rejected.
4. Press ESC to exit SVC PROGRAM mode.

At this time, the CONVRTR-60 has been reset to factory defaults. It will be on address 3 and frequency 0.

Remember, the attached DCC decoder is still on its original locomotive address. Now is the time to set both the CONVRTR and the attached decoder to the desired address.

Basic Hookup

Basic CONVRTR-60 Connections: This is easy. The power input terminal block is for the battery connection that are polarity sensitive. The output terminal block is for connecting the DCC decoder.

Decoder Output Terminal Block is where the decoder's track input wires connect. If the decoder uses individual wires, and the manufacturer follows the NMRA color code, the red and black wires are the track input wires. Connect these to the A and B output terminals. Polarity doesn't matter.

Power Switch provides a way to switch the battery between running and charging. A center off slide or toggle switch offers three positions: Run, Off, Charge. Only the positive conductor needs to be switch so a single-pole, double-throw, center-off switch is best. The switch is not absolutely necessary. A simple plug and socket for battery connection provides a convenient way to disconnect the battery and connect it to a charger. This method is commonly used when there is no space for a switch or if the battery needs to be quickly changed out.

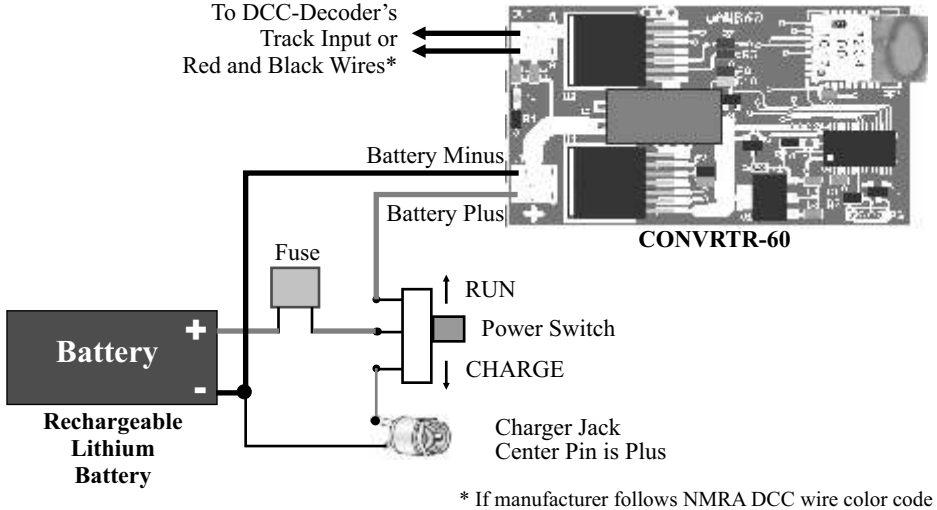
Charging Jack is a great addition providing there is space. A variety of jacks are available from Mouser Electronics. A partial list is in the AirWire G3 User Guide, available from the CVP website.

A Fuse Is Not Required. If your battery has the protection circuit board, the external fuse can be eliminated.

However, if your battery has no internal protection, you should include a fuse to prevent a short circuit from overheating the wires. Insert the fuse between the switch and the battery. The drawing shows a polyfuse inserted at the proper location. Either a one-time automobile fuse rated at 5 amps or a 6A self-resetting polyfuse are good choices.

Not: Fuse ratings can be confusing. Use the following notes as a guide. A 5 Amp automobile fuse will blow at 5 amps. But a 6 Amp polyfuse will hold at 6 Amps and open at 12 amps.

Page 3 shows the connections for typical high current DCC decoder.



* If manufacturer follows NMRA DCC wire color code

No Surge Current Resistor!

A surge current limit resistor (shown for other members of the CONVRTR series) is not required for the CONVRTR-60. Its ability to deliver up to 55 Amps for a short duration allows it to power up multiple sound decoders without tripping its internal protection.

Installation Tips

Disconnect Track Pickups

The locomotive track pickup contacts and wiring must be disconnected and removed before hooking up the CONVRTR-60 especially if the locomotive has a factory installed DCC decoder.

If the track pickups are not removed, there is a risk that the onboard battery voltage may appear on the track pickups and thus on the rails. Contact between an external power source and the onboard battery will short out and destroy the battery and CONVRTR-60.

Using Locomotives With Factory Installed DCC Decoder

This is one of the easiest installations since the DCC decoder is already installed. Your only task is to determine if the battery, CONVRTR, switch and charging jack will fit inside the locomotive or require a trailing car or dummy loco.

Open up the locomotive and locate the track pickup wires going to the decoder. Unsolder these wires from the decoder or removed the plastic clips to free the wires. It is mandatory that ALL track pickups are disconnected from the decoder.

With the track pickup wires removed, decide how to route the wires from the locomotive's decoder to where the CONVRTR-60 and battery are located. Be sure that all splices are insulated with heatshrink tubing. Don't use plastic tape because it will unravel over time resulting in exposed wires.

Quick Start Instructions

This "Quick Start"section assumes you have either installed the CONVRTR-60 and the DCC decoder or you are testing the two devices on the bench. As delivered from the factory, the CONVRTR-60's frequency is set for 0 and its address is set for 3. First hookup the CONVRTR-60 and the decoder.

Step 1: Turn Power On To The CONVRTR-60

- The CONVRTR-60's green LED will glow brightly indicating power is connected.
- If you have not done so, now turn on your AirWire throttle and set it to frequency 0. If your DCC decoder is brand new, set the throttle to loco 3 which is the default address for nearly all decoders. If it came already installed in the locomotive, the decoder's address is usually the cab number.
- When the throttle is turned on and set to the proper frequency, the CONVRTR-60's red LED will glow brightly. If the red LED is not on, then your throttle is not on the proper frequency. Do not proceed to step 2 until both of the CONVRTR-60's red and green LEDs are on steady.

> The next step is very important. By setting the loco address into the attached decoder, the CONVRTR-60 gets the same address at the same time. Without doing this, the "stuck horn/whistle" feature will not work. The CONVRTR-60 must know to what loco address the "horn/whistle off" command is sent to. If you forget to do this, the decoder will continue to operate normally although the "stuck horn/whistle" feature is disabled.

Step 2: Set the Decoder Address Into The CONVRTR-60 Using SVC Program Mode

- Select SERVICE PROGRAM mode on your throttle. For T5000 throttle, press menu twice and then push the number 4.
- For T5000 users, push 1 and push ENT to select CV1 for changing the address.
- Enter the decoder address that you want to use. The address must be unique. The loco's cab number is always a good idea. Once you have entered the numbers, push ENT.
- Address 0 is not allowed. If you accidentally use 0, start over and use the desired address.

Step 3: Set the Throttle To The New Address And Run!

- If the new address is not already in your T5000 throttle, enter the address using #, nnnn, # where nnnn is the locomotive address. Set the direction, turn up the speed knob and run the train.

continued on next page

Quick Start Instructions - *continued*

- For T5000 users, you can store the decoder address and the CONVRTR-60's frequency in your throttle memory by pushing the LOCO MEM key twice. This is not mandatory but does make it easier to recall the address and automatically set the proper frequency in the throttle. For older AirWire throttles, see the appropriate user manual.

Two Very Important Decoder Setup Requirements

1. Turn Off Decoder Analog Conversion if this feature is available in the attached decoder. Use the SVC PROGRAM mode to set CV29 to one of the following values based on the decoder's locomotive address. Failure to make the change to CV29 will result in unexpected high speed runaway if the decoder is powered on without a throttle powered on and set to the CONVRTR-60's frequency.

For address between 1 and 99: Set CV29 to a value of 2.

For address between 100 and 9999: Set CV29 to a value of 34.

2. Set The Decoder Packet Timeout Value To 0 if this feature is available in the decoder. Use the SVC PROGRAM mode to set CV11 to a value of 0. This will permanently disable the feature. Without setting CV11's value to 0, the locomotive will stop if it goes out of range of the throttle. The preferred setting of 0 allows the locomotive to continue running at its current speed until it comes back into the throttle's range. If you would rather have the loco come to a stop when it is out of range, then set CV11 to a value other than zero. The value entered is the number of seconds that will elapse before the decoder automatically stops the locomotive if it no longer is receiving throttle commands.

Changing The CONVRTR-60 Frequency

As delivered, the CONVRTR-60 is set to frequency 0. If you want to use a different frequency, follow the series of steps below. The procedure below uses the **SVC PROGRAM** mode of your T5000 throttle. Verify that all other locos sharing the same frequency are turned off or they too will be changed.

- Select SVC PROGRAM mode. On the T5000, push MENU twice, and then push the 4 key.
- Enter 200 followed by ENT. CV200 is the memory location where the desired frequency is to be stored inside the CONVRTR-60. It is remembered even if battery is disconnected.
- Enter the desired frequency number, from 0 to 16, and push ENT. Note that the red LED goes out because the decoder is now on the new frequency.
- Push ESC to cancel OPS mode.
- Change the throttle to the new frequency and verify the locomotive runs normally.

Forgotten Frequency? - Resetting CONVRTR-60 Frequency

There may come a time when the CONVRTR-60 no longer responds to what you believe is the correct frequency, or you can not remember the correct frequency. If this occurs, follow this procedure called the "Jump Mode." This feature will temporarily force the CONVRTR-60 to frequency 0 where you can make a permanent frequency change. There are a few guidelines to consider about the Jump Mode, and these are discussed on the next page.

Warning: make sure there are no lurking powered decoders assigned to frequency 0 or they too will have their frequency changed.

Step 1 - turn off all AirWire throttles. This is very important. It is the absence of a throttle signal, plus turning the CONVRTR-60's power off and then back on (a power cycle), that allows theCONVRTR-60 to temporarily jump to frequency 0 where you can set a new frequency.

Step 2 - Turn off the CONVRTR-60 if it was powered on.

Step 3 - Turn on the CONVRTR-60 and wait at least 60 seconds.

Step 4 - Now turn on your throttle, and set it to frequency 0.

Step 5 - Use SERVICE PROGRAM to set CV58 to the desired frequency.