North Raleigh Model Railroad Club

Application Note

Modifying Digitrax UP5 Universal Panels to Power LocoNet Devices

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Since Rail Sync signals are not needed for Digitrax throttles and radio receivers/transceivers it is possible to use wires 1 and 6 in the LocoNet cable for other purposes when connecting to such devices. One such very useful purpose is to provide additional power to devices connected to the LocoNet that do not require Rail Sync signals, so those devices do not otherwise load down the Rail Sync signals. Two such purposes are:

- Connect a series of UP5s or equivalent together and have them powered using a single cable to make the connection from one unit to the next, ensuring that throttles plugged into the UP5s get the proper voltage to operate. The use of a single cable is important so that modular layouts, such as NTRAK, can be easily hooked up and disconnected. Such an arrangement can reduce or eliminate the need to connect power supplies, such as the PS14, to individual UP5s.
- UR90 IR receivers, UR91 receivers and UR92 duplex transceivers can also be powered through the same arrangement as the throttles. The UR devices draw about 60 mA each or about the same as two throttles. Like throttles and the UP5s the URs can draw their power from pins 1 and 6 on the rear LocoNet jacks.

A Digitrax PS14 Power Supply can output 300 mA which should be sufficient to support about 10 throttles or four UR units. A regular LocoNet cable can support this amount of current over pretty good distances without excessive voltage loss.

This approach is designed to use the regular LocoNet cable, flat with 6 wires and RJ connectors on each end, as the cable. UP5's with some simple modifications, are the devices that create and inject power into wires 1 and 6.

Note – Digitrax has neither reviewed nor approved these modifications. You are responsible for understanding and safely applying these modifications.

Technical Description of the UP5 Circuits

There are five jacks on the UP5 for LocoNet cables to plug into. Pin 2 and pin 5 on each jack are connected together and are the LocoNet Signal Ground connection. Pin 3 and pin 4 on each jack are connected together and are the LocoNet Data Lines. In summary, pins 2, 3, 4, and 5 respectively on each jack are connected together. The modifications described here do not affect pins 2, 3, 4, or 5 in any way.

Pin 1 and pin 6 on one rear jack are connected to pin 1 and pin 6 on the other rear jack respectively. This passes the LocoNet signals from one rear jack to the other.

The UP5 has a +14 VDC bus on the board. The voltage to this bus can come from any of six sources; pin 1 or pin 6 on the rear jacks (the Rail Sync signals), the Rail A or Rail B screw terminals on the rear, the +14 VDC power jack on the side, or from a wire connected to the solder pad between the two rear jacks, which in turn is connected to a 14 VDC source. Diodes are used to feed the voltage from these sources to the +14 VDC bus. Whichever source has the highest positive voltage will supply the bus.

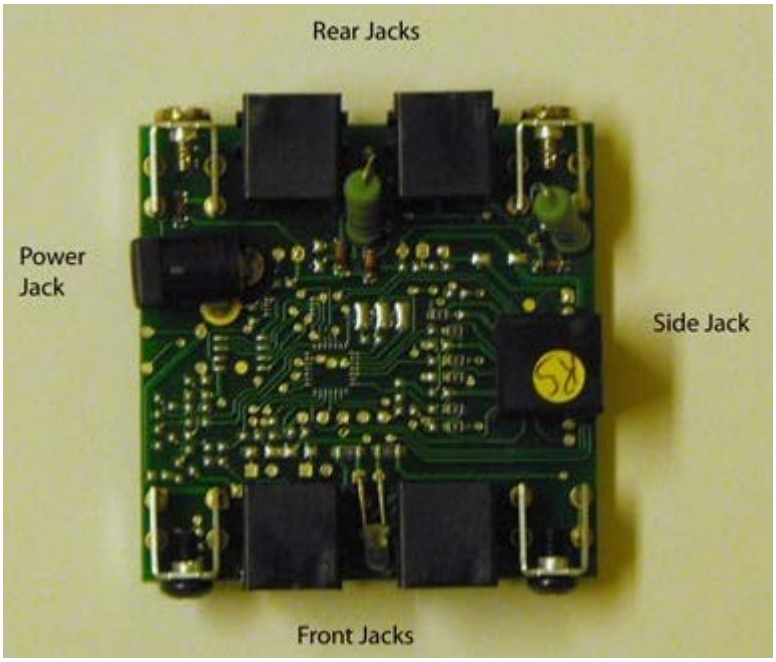
Pin 1 on the two front jacks is connected to the +14 VDC bus via a 22 ohm resistor. The resistor acts to limit current in case of a short circuit when a throttle is plugged in. Pin 6 on the two front jacks is connected to pin 6 on the two rear jacks. A throttle can draw power from either pin 1 or pin 6 of its plug. Thus, a throttle plugged into a UP5 can draw power from the +14 VDC bus or from the Rail Sync signal on pin 6. This can be a potential problem under certain circumstances. The first modification to the UP5 will change this and improve the power available for throttles at the front two jacks.

The UP5 documentation says that the side jack on the UP5 is the same as the front jacks. This is not correct. Pin 1 and pin 6 on the side jack are connect to pin 1 and pin 6 respectively on the rear jacks, so the side jack is wired pin for pin to the rear jacks. The second modification will change this so that the side jack becomes the source of the powered devices, such as UR devices.

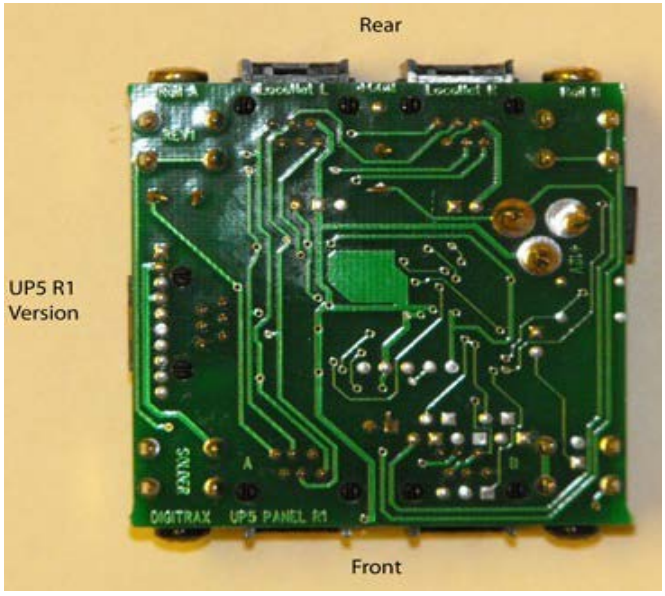
Power from either the +14 VDC jack on the side of the UP5 or from the pad on the rear between the two jacks is routed to the +14 VDC bus through another 22 ohm resistor. The resistor limits the current available from a PS14 connected to the UP5. The final modification will be to bypass this resistor.

Modifying the Digitrax UP5 Universal Panel

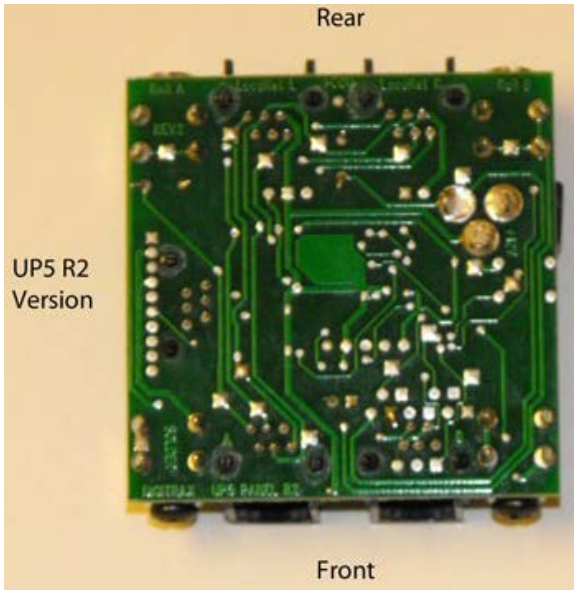
There are two versions of the UP5 — R1 and R2. Although slightly different, for our modifications the two boards can be considered identical. Note also the many unused traces on the UPO5 board. This is because the same circuit board is used by Digitrax for both the UP5 and the UR92 Duplex Radio Transceiver.



Top (component) side of UJ(5



Bottom side of R1 version

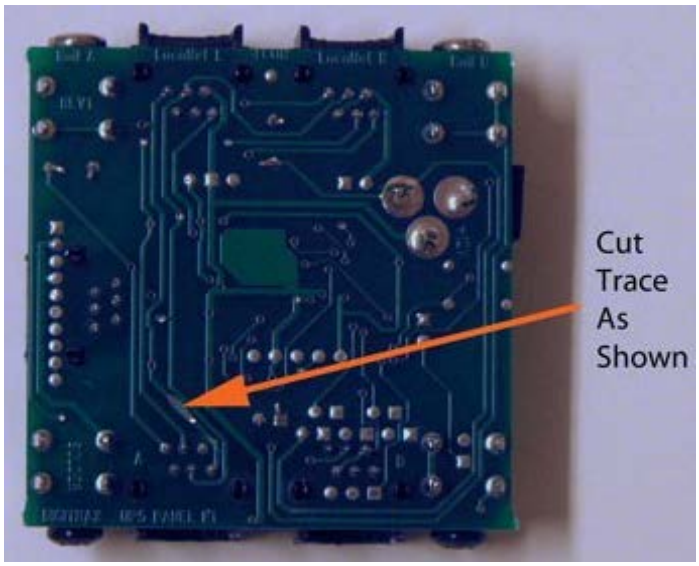


Bottom side of R2 version

As stated above, there are three simple modification to the UP5. You should familiarize yourself with the entire process by reviewing this entire section before proceeding. There are two ways to accomplish step 3. Cutting traces, as shown in Step 3, tis preferred o removing the resistors, as shown in Step 3 (alternate).

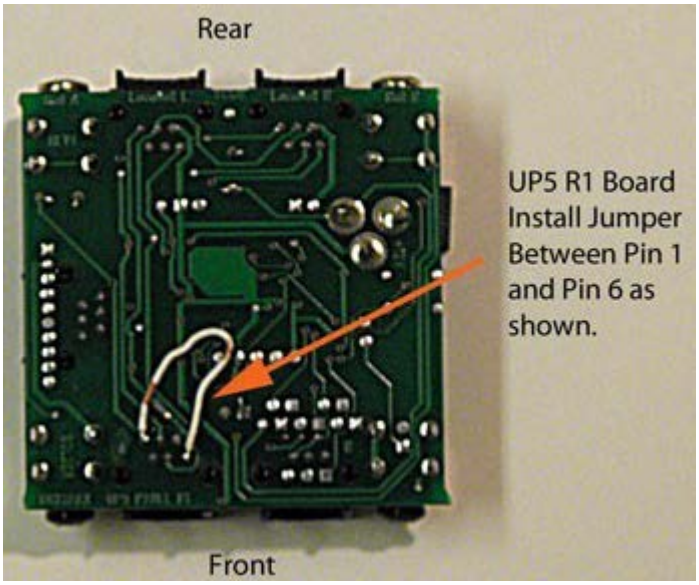
The first modification is to the disconnect pin 6 on the front jacks from pin 6 on the rear jacks and to connect pin 6 on the front jacks to pin 1 on the front jacks so that both pin 1 and pin 6 of the front jacks are supplied +14 VDC from the +14 VDC bus through the 22 ohm resistor.

Step 1: Place the board with the component side down. Referring to the photo below, identify the trace going to pin 6 of the front jack identified by the letter “A”. Cut the trace as shown.

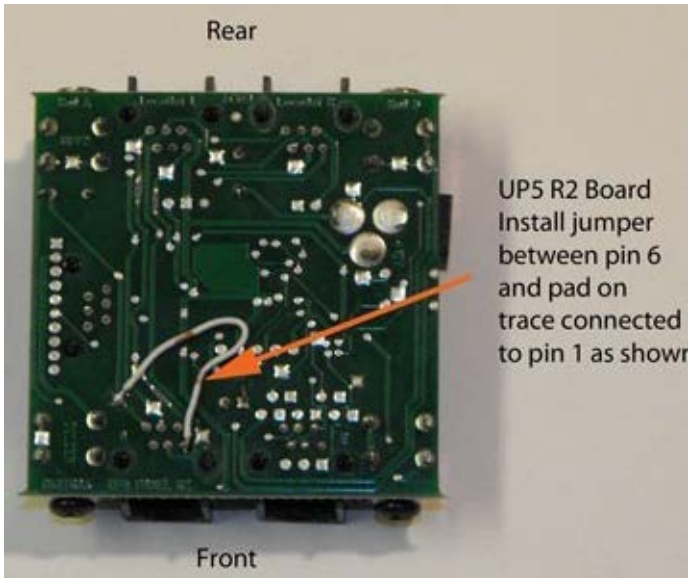


Step 1

Step 2: Solder a wire from pin 6 on the “A” jack to either pin 1 of the jack (on an R1 board, see photo below at left) or to the square pad on the trace going to pin 1 (on an R2 board, see photo below on right).



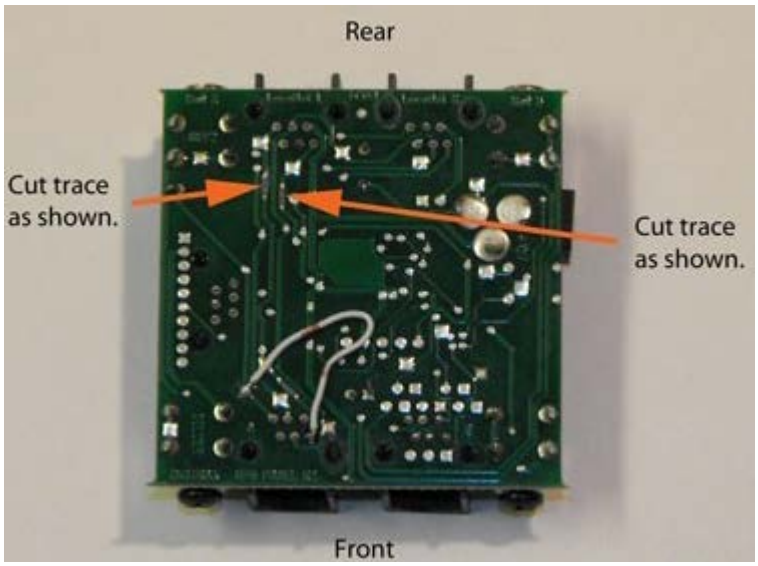
Step 2 on R1 version board



Step 2 on R2 version board

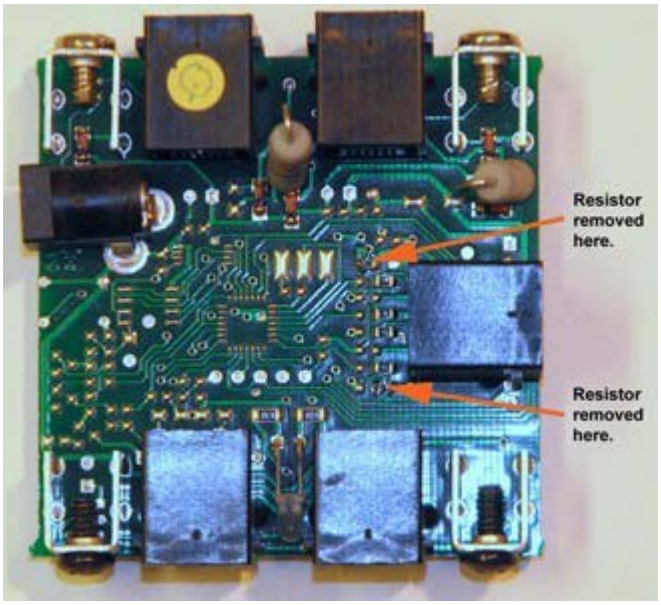
The second modification will disconnect pin 1 and pin 6 of the side jack from pin 1 and pin 6 of the rear jacks and instead connect pin 1 and pin 6 of the side jack directly to the +14 VDC buss. This makes the side jack the source of power for the connected devices.

Step 3: Place the board with the component side down. Referring to the photo below, cut the two traces near the back of the rear jack identified as LocoNet "L" to disconnect pin 1 and pin 6 of the side jack from the rear jacks.



Step 3

Step 3 (alternate): If you prefer removing the two zero ohm resistors to cutting traces, place the board with the component side up. Referring to Figure 8, identify the zero ohm surface mount resistors at the back of the side jack that make the pin connections for the the jack. Remove the resistor closest to the rear of the board to disconnect pin 1 and remove the resistor closest to the front of the board to disconnect pin 6. Leave the 4 resistors in the middle alone. You can touch a soldering iron directly to the zero ohm resistors for a few seconds and the resistors should lift away from the board as you withdraw the iron.

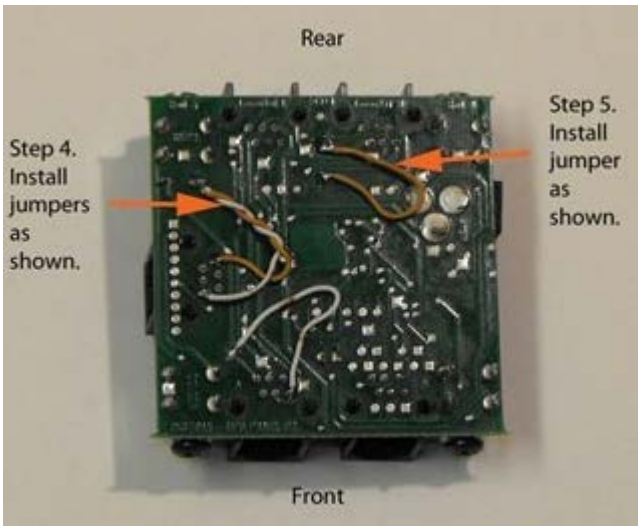


Step 3 alternative

Step 4: Refer to the next photo. Place the board with the component side down. Connect a wire to pin 1 on the side jack and another wire to pin 6 on the side jack. Connect the other end of both wires to the +14 VDC bus at the 22 ohm resistor between the side jack and the Rail "A" screw terminal on the back of the UP5.

Our third and final modification will bypass the 22 ohm resistor that limits the current available to the +14 VDC bus from a PS14 connected to the UP5.

Step 5: Refer to the photo below Place the board with the component side down. Connect a wire to the two ends of the 22 ohm resistor between the two rear jacks of the UP5. This will bypass this resistor.



Step 4 and Step 5

This completes the modifications to the UP5 and provides the ability to power LocoNet devices over wires 1 and 6 when the device is connected to the side jack. You will have cut 3 traces and installed 4 jumpers if you used Step 3. If you chose Step 3 (alternate) then you will have cut one trace, removed 2 resistors, and installed 4 jumpers.

Using the Modified UP5

Some things to remember when powering a LocoNet device from the side jack using wires 1 and 6 for 14 VDC power:

- The two rear jacks are tied together, pin for pin. The configuration of the signals on the cable going into one rear jack are the same as the cable going out of the other rear jack. This is no different from an unmodified UP5.
- The signal configuration of the side jack of a modified UP5 is always a powered LocoNet jack. If the modified UP5 has a PS14 plugged into it, then the PS14 is the source of power for the side jack. If there is no PS14 connected to the modified UP5, then the source of power for the side jack is the signal coming in on pins 1 and 6 of the rear jacks.

  Note – the signal configuration of the front jacks of a modified UP5 is also always a LocoNet jack. However there is a 22 ohm resistor that limits the current available through pins 1 and 6 on the front jacks.
- UR90, UR91 and UR92 radios can be powered by a modified UP5 originating from the side jack of the modified UP5. Each radio draws about the same current as two throttles, so do not power more than 4 radios from one modified UP5 circuit.

It would also be best to avoid plugging throttles into a modified UP5, if possible. This will avoid the possibility of a throttle corrupting the power going to the radios.

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