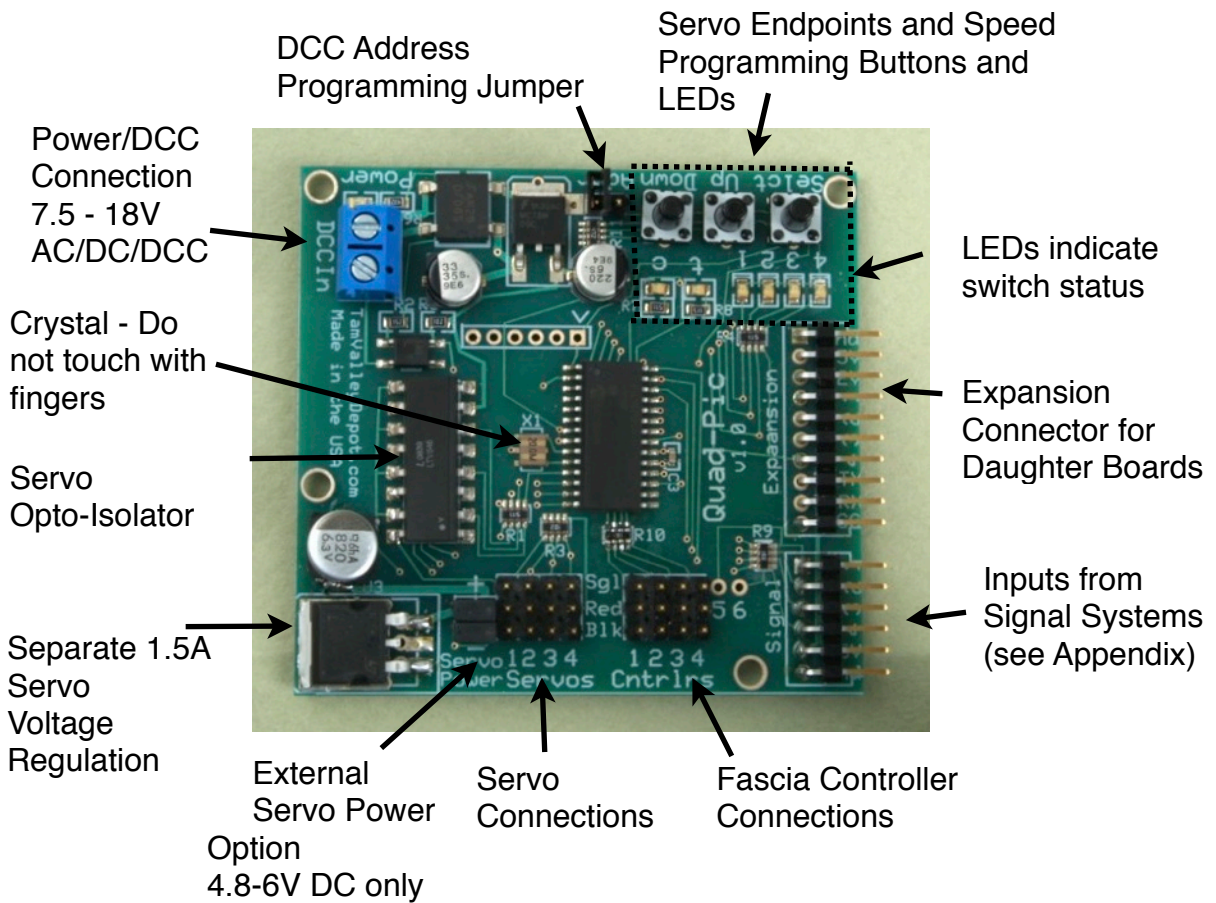


Overview

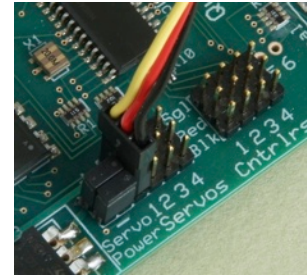
The Quad-Pic Servo Decoder will control 4 turnouts with either DCC command control or manually by pressing a button. It can also be used for animation projects. It uses R/C airplane servos which are ready available and inexpensive. The decoder gets its power directly from the track bus. The servos can either be powered from the same bus or from a separate power supply. The Quad-Pic can also control other devices such as semaphores, crossing gates and so forth by connecting them to the servo arm.



Installation

Install the decoder by placing it near the turnouts you want to control and the fascia/control panel where you want to mount the switches. Mount the decoder with a couple of wood screws through the mounting holes, or use double sided tape. In some cases you may just want to leave the decoder floating and tack down the wires around the decoder to keep it in place. *Make sure to keep the decoder away from conductive surfaces such as metal that could short the board. Also you can kill the board if let a hot DCC wire touch the wrong part of the board.* Make certain the board is free to ventilate the excess heat.

Connect the decoder to your DCC track bus just as you would connect a piece of track. Generally speaking it is best to have your accessory decoders in their own power district and ideally with their own booster. Tam Valley Depot makes a special accessory booster that will keep the accessories powered at all time so that a locomotive short on the track will not disturb your turnouts.



Servo Connection

Plug the servos in to the bank of servo connection pins as shown. Servos have three wires, the power leads are black and red and the third, the signal lead is white, brown, yellow or orange depending upon the brand. Plug the servos in so that the signal lead is inboard and the black wire is towards the edge of the board. If you do it incorrectly, it won't hurt anything, but the servo won't move.

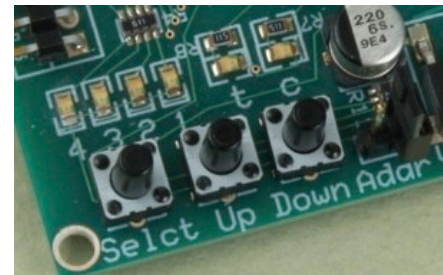
Button and LED Indicators - Fascia Controllers

The controllers supplied with the board can be used for manual operation of the servos. The controllers use the same wires as servos to make things simpler. Connect these so that the white/signal wire is inboard as for the servos (see pictures) for the main board. On the controller the white wire is on the side away from the LEDs. The controllers can be rotated about the central screw for left-hand or right-hand turnout operation.

To change the position of a servo press the button briefly. The corresponding LED will change on both the controller and on the main board. Note that when you hold down button it causes one of the LEDs to turn on while the button is held down - this is normal and does not indicate a problem.

DCC Operation

The decoder comes from the factory programmed for addresses 1-4. To move a servo, issue a DCC accessory command by entering the address into the DCC system and then issue either a "t" or "c" command. On Digitrax systems the accessory commands are accessed with the "Switch" button. Consult your manual if you are unsure how to issue accessory commands on your system. You can also change the turnout position manually with a button. Simply press the button to toggle the turnout position. If you have installed the LEDs, the LEDs will change to indicate the turnout position. Note that it takes a second or two for the points to move after the command is issued so avoid pressing the button repeatedly. It won't hurt anything but the points may not move to the intended position - in any case the LEDs indicate the position the final position.



Programming (Training) the Servo Positions

The system ships with the servo endpoints set close to the center position. To program the final positions, use the 3 buttons marked Select, Up and Down. **Press and hold Select for about 1 second** until the *c* LED starts flashing. You can then program the **servo1** closed (*c*) position by **repeatedly tapping the Up/Down** buttons Each tap moves the servo about 1 degree. **Press Select** briefly again to move the servo1 thrown (*t*) position and use **Up/Down** to set the *t* position. The *t* LED will be lit. **Press Select** again to change the servo speed with **Up/Down**. The *t* and *c* LEDs flash alternately to indicate speed-set mode.

Press Select again to go to **servo2** and repeat until all 4 servos are set. Each press of Select will move to the next servo position (the controller LEDs will indicate the current position) until you have cycled through all 4 servos and then it returns to the servo1 closed position.

Press and hold Select for approximately 1 second to exit the programming mode.

DCC Address

The decoder responds to accessory (stationary decoder) commands and ignores commands meant for locomotives (i.e. mobile decoders). See your manual for your how to send an accessory command with your DCC system if you are unsure. Your throttle may call accessories “switches”.

To program the DCC address, place the jumper across the two **Addr** pins and issue an accessory command. The decoder will store the address and flash the LED twice to indicate it has been successfully programmed. The decoder uses 4 consecutive addresses starting with 1-4, the next groups are 5-8, 9-12, 13-16 and so forth. See the table in the appendix for a handy reference for those of us who are algebraically challenged. You only need to enter the first number of each group to program all four. At each address there are two positions “t” for thrown and “c” for closed (also called “normal” and reverse” or “off” and “on” depending upon the throttle manufacturer). *Be sure to remove the jumper when finished programming.* It can be stored on a single pin.

See the DCC Appendix for programming the decoder CV's.

Routes

The decoder interprets addresses in the range 513 through 1024 as **routes**. It will drive all 4 of the servos to a set position when it receives a previously programmed route command. This is very handy for setting up a group of turnouts to reach a particular yard or staging track. Several decoders can share the same route commands so that a given route command can control as many turnouts as needed. The decoder can remember up to 40 route commands.

To program a route set all the points in the desired position, put the **Addr** jumper into position as above, and then issue an accessory command in the range desired. The LED will flash to indicate it has been programmed. The number of flashes indicate the number of routes programmed. If the same address is programmed a second time it will overwrite all earlier routes at that address.

Note: Many DCC systems have their own route programming built in to the controller. You are free to use this system and ignore the route system built into the decoder - or you can use both systems if you wish for different situations - it's your railroad.

Memory

The decoder has built-in memory so that it will remember its last state after the power is turned off.

Reset to Factory Defaults

To reset the memory to the factory defaults (Address 1-4, servos centered), hold down Up and Down simultaneously while toggling the power. The t and c LEDs will flash 3 times to indicate a reset.

Installation of servos

There is a detailed article on mounting servos available online from the Model Railroad Hobbyist Magazine http://model-railroad-hobbyist.com/download/mrh_issue3 and at the Tam Valley Depot website.



Servo Extensions

If the wire is too short to reach the decoder after installation, servo extenders in various lengths are available from Tam Valley Depot or at your local R/C hobby shop. Alternatively you can splice in extra lengths of wire. The servos normally draw little current so that any wire 26 gauge and above will work well. How many extensions can you add? In a test I was able to add 15 feet of 26 gauge extensions and the servos still worked well - at 20 feet the servos stopped working. A heavier gauge wire should allow longer extensions, although I haven't made any tests.

The same extensions can be used for the controllers.

Y Extensions - Two servos or two controllers can be connected to the same port with a “Y” cable. Both servos will operate simultaneously in the same direction and speed. If two controllers are on a Y then both will show the same indication and, if either button is pushed, the turnout will switch. If the internal power supply is being used (the default) no more than a total of 6 servos should be connected to a single Quad.

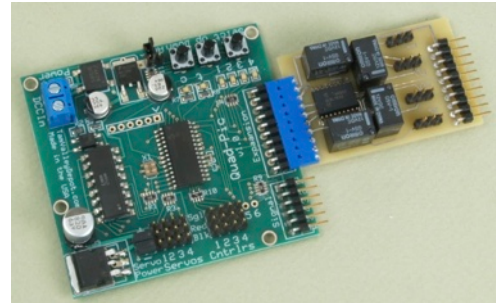
Using the Decoder on DC Railroads

The decoder can be used to switch turnouts on DC layouts using the button controller. You will need to supply power to the decoder through the rail connector. The ACC terminals of a power pack can be used or any power source from 9-24V AC or 7.5-18V DC will work. Polarity is not important as the bridge rectifier on the decoder board will correctly rectify the voltage. You will need to connect a momentary switch to control the points.

Expansion Port

The 10-pin Expansion Port can be used to add a daughter board to add more functionality to the decoder.

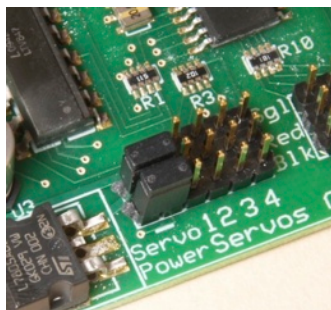
For example, the expansion board pictured to the right can be used to add 4 relays to switch frog power. Notice that this board also has an Expansion Connector allowing more boards to be daisy-chained.



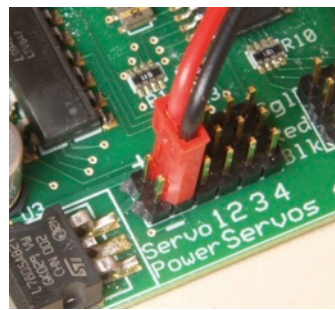
Keep an eye out at tamvalleydepot.com for more daughter boards. I am always looking for good ideas - don't hesitate to send suggestions to dmcrec@tamvalleyrr.com

Signal Input Port

The 6-pin Expansion Port allows for adding inputs from signal systems. A Signal Input board is available that provides input terminals as well as jumpers to invert the sense of the signals. This board has opto-isolators so there is no need to have a common power system between the servo subsystem and the signal system.



Jumpers configured to use internal 1A voltage regulator.



Connection for external 4.8-6V power supply. Red lead is (+).

External Servo Power (Option)

The servos can be powered from the internal voltage regulator or from an external power source. If you have connected the board to your DCC system you may want to use an external power supply for the servos to lessen the load on your DCC system. (The other option is to use a separate accessory DCC booster to power your accessories).

To use external power, connect the power to your the board as shown and connect the other end to your power supply. The supply should provide regulated 4.8-6V DC.

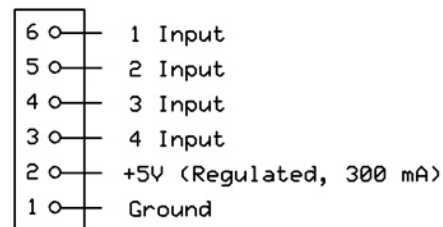
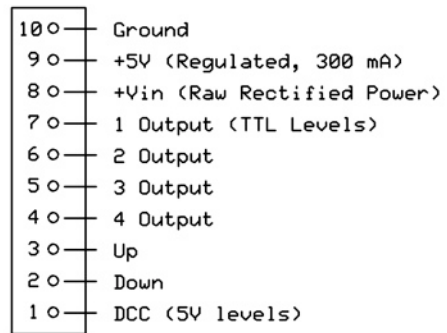
More Help

If you need more help or have any suggestions/comments please email me at dmcrec@tamvalleyrr.com.

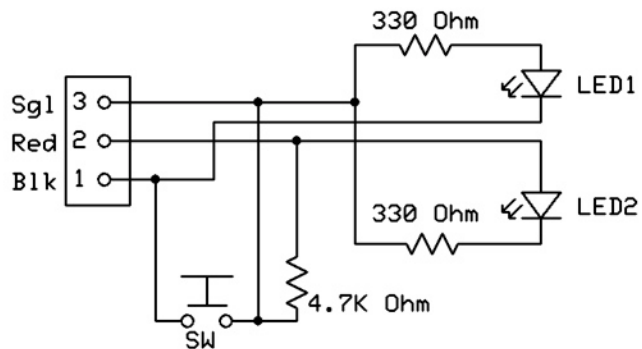
Appendix

DCC Address Groups
1, 2, 3, 4
5, 6, 7, 8
9, 10, 11, 12
13, 14, 15, 16
17, 18, 19, 20
21, 22, 23, 24
25, 26, 27, 28
29, 30, 31, 32
33, 34, 35, 36
37, 38, 39, 40
41, 42, 43, 44
45, 46, 47, 48
49, 50, 51, 52
53, 54, 55, 56
57, 58, 59, 60
61, 62, 63, 64
65, 66, 67, 68
59, 70, 71, 72
73, 74, 75, 76
77, 78, 79, 80

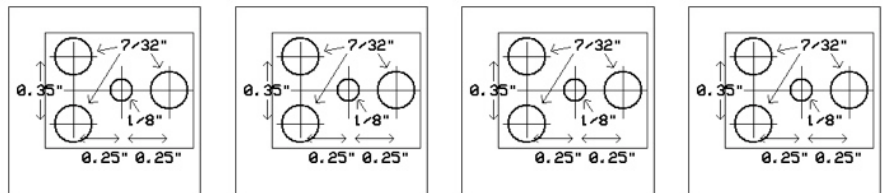
and so forth to 512



Expansion Port Wiring



Fascia Controller Schematic

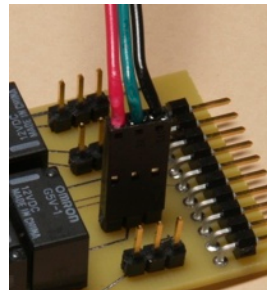
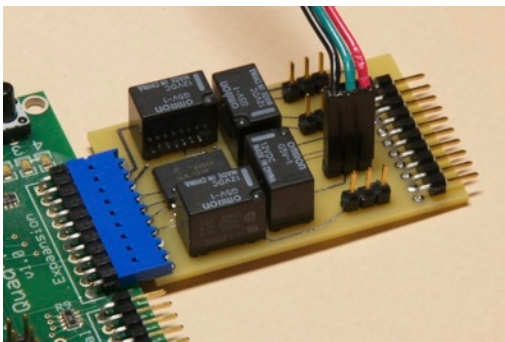


Fascia Controller Drilling Guide (Actual Size)

Frog Relay Daughter Board

The Relay Daughter Board is used to switch power to the turnout frog. It can also be used as a general purpose relay under DCC control.

Plug the daughter board in to the 10-pin Expansion Port. It fits in only one orientation.



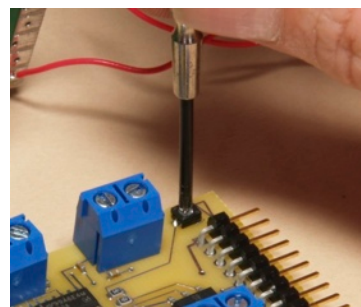
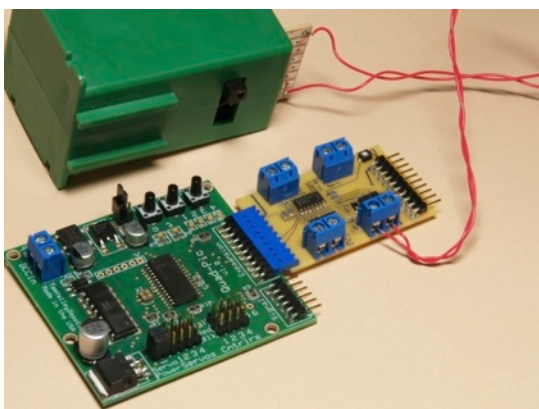
Plug the frog wires in to the 3-pin connectors. The frogs are numbered and correspond to the same number servo. The green wire is connected to the frog and the other two wires connect to the track.

If the polarity is reversed simply reverse the 3-pin plug and correct the problem (right photo).

Stall-Motor Daughter Board

The Stall-Motor Daughter Board is used to drive 4 stall-motor switch machines (such as the Tortoise™).

Plug the daughter board in to the 10-pin Expansion Port and connect the stall motors to the numbered blue terminal blocks. You can now switch the stall-motor either by the fascia controller or DCC command to the corresponding address. To change the speed of the motor use a small philips-head screwdriver on the pot as in the photo on the lower right. If the motor drives in the wrong direction swap the drive wires in the block to reverse the direction.



DCC Programming (Optional)

The decoder can be programmed in three ways to enable it to work with most DCC systems. (All the functions can also be programmed with the three programming buttons, so DCC programming is not required, nor is a DCC system needed to use the Quad-Pic for driving servos.)

The default address is 1 when the decoder ships or if a factory reset is done.

- 1) **OPS mode for Accessory Decoders (programming on the main).** If this mode is available then it is the preferred mode. It can be done with the decoder in place. While there is no way to read back CVs in this mode you can see the affects of the commands immediately. Not all DCC systems support this mode however.
- 2) **OPS mode as locomotive #1 (programming on the main).** If the programming jumper is ON then the decoder will respond to OPS mode commands address to loco address 1. It will do this even if its accessory decoder address is not 1 but only if the programming jumper is ON. Make sure you do not have a locomotive addressed as 1 on the track at the same time. Also put the jumper ON for only one Quad at a time. *Remove the jumper when done!*
- 3) **Direct Mode on a programming track.** This is probably only useful for initial setup as it is inconvenient to move the decoder to the programming track. For the decoder to have its CVs read back at least one servo must be connected to generate the acknowledgment pulse used in reading back CVs. Also a programming booster may be needed as is often the case for sound locomotives, since the decoder draws a fair amount of power. We can recommend the PowerPax by DCC Specialties. *Even if the decoder is not able to respond to CV read commands it will still respond to CV writes properly.* The t and c LEDs will flash briefly if the write is successful.

CV Table

CV	Function	Default	Range	Notes
1	Address	1	1 - 127	The decoder responds to a group of 4 consecutive addresses see table on previous page
2 - 6	Not used			
7	Version	37		
8	Manufacturer	59		NMRA assigned Manufacturer ID
9	High address	0	0-7	
10 - 28	Not Used			
29	Configuration	0		No uses of CV29 are currently supported
30 - 32	Not Used			
33	Servo1Closed	94	0-200	100 = Centered, 0 = minimum and 200 is maximum throw for all the servo ranges
34	Servo1Thrown	106	0-200	
35	Servo1Speed	5	1-40	1 = slow creep and 40 = very fast

CV	Function	Default	Range	Notes
36	dccReverse1	0	0-1	Controls the reversing of DCC throw commands - i.e. if set to 1 then a "c" is interpreted as "t" and <i>vice versa</i> .
37	servo2Closed	98	0-200	
38	servo2Thrown	115	0-200	
39	servo2Speed	5	1-40	
40	dccReverse2	0	0-1	
41	servo3Closed	98	0-200	
42	servo3Thrown	115	0-200	
43	servo3Speed	5	1-40	
44	dccReverse3	0	0-1	
45	servo4Closed	98	0-200	
46	servo4Thrown	115	0-200	
47	servo4Speed	5	1-40	
48	dccReverse4	0	0-1	