

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 readily 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.

red, and the third, the signal lead is white, 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

Fascia controllers (supplied separately) 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. 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.

In the following **Hold Select** means push a button down and hold it for 1 second. **Push Button** means push the button down and immediately release.

Programming the Servo Positions Manually

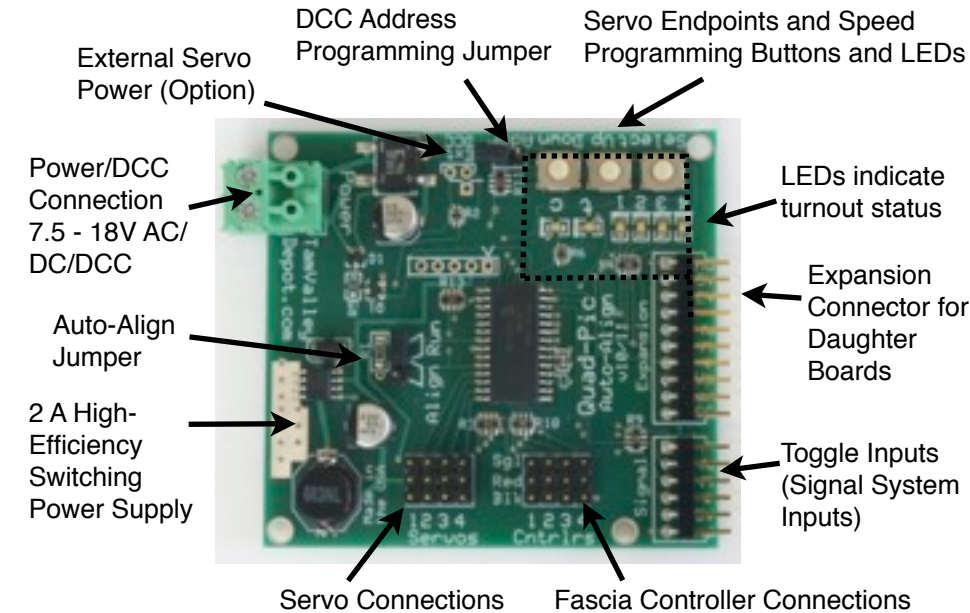
Note: Install the fascia controllers first to set the sense of throw/close. The system ships with the servo endpoints set close to the center position. To program the final positions, use the 3 buttons marked Select, Up and Down. Verify the Run/Align jumper is on **Run**. **Hold Select** until the **c** LED starts flashing. You can then program the **servo1** closed (**c**) position by **repeatedly pushing the Up/Down** buttons. **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. (**t** and **c** LEDs flash alternately). **Press Up/Down** to set the speed. The servo will move to show you the speed.



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.

Hold Select to exit and save the programming mode.

Auto End Point Seeking - The board has a current sensor built in which will find the endpoints automatically if there are hard endpoints. Move the Run/Align jumper to **Align** and enter the alignment mode by **Holding Select**. Select the servo to align by **Pushing Select**, and then **Push Down**. Next set the current limit with **Up/Down** to one of 8 values. The lower 4 values have **c** lit and the upper 4 have **t** lit. The higher the value, the more the force on the points. On the other hand, too low a value may end too soon at a sticky point. The default value of 3 is a good starting point. The servo will move to the center position - this is a good time to verify that the throw-bar is centered and to adjust it. **Push Select** to start the auto-seeking function. In general you want the lowest current that will snug the points up to the stock rails. To abort, **Push Select** before the alignment has finished. You can swap the 2 endpoints with **Push Up**. To leave the alignment mode, **Hold Select**.



Installation

Mount the decoder with the supplied screws and standoffs through the mounting holes in the board corners. *Make sure to keep the decoder away from conductive surfaces such as metal that could short the board. Also you can damage the board if let a hot DCC wire touch the board.* Connect the decoder to your DCC track bus.

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 (supplied separately) in to the bank of servo connection pins as shown. Servos have three wires, the power leads are black or brown and

DCC Operation

The decoder comes from the factory programmed for addresses 1-4. To move a servo, issue the stationary decoder command (on Digitrax this is called *switch* on NCE use *Select Accy*). Send throw, (t) or close (c) (NCE calls these N and R). 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.

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 (LEDs start flashing) and issue an accessory command exactly as you would to throw a turnout. 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.

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 at the desired address. 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.

Reset to Factory Defaults

The decoder has built-in memory so that it will remember its last state after the power is turned off. To reset the memory to the factory defaults (Address 1-4, servos centered), hold down Up and Down simultaneously while turning on 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

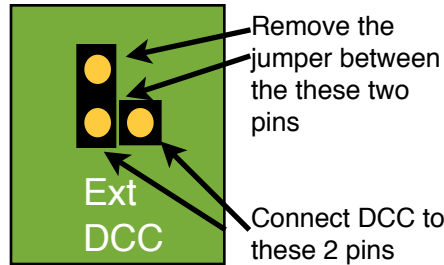
The decoder can be used to switch turnouts on DC layouts using the button controller. You will need to supply power to the decoder through the rail connector. The ACC terminals of a power pack can be used or any power source from 9-24V AC or 7.5-18V DC will work. **DO NOT USE the rail connections of a DC Power Pack as they provide chopped DC and will cause erratic behavior.** Polarity is not important.

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.

Signal Input Port

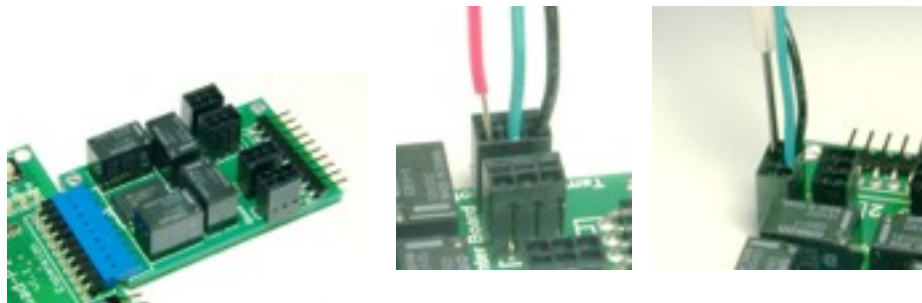
The 6-pin Expansion Port can be used for toggle switch inputs. Connect one leg of the toggle to ground and the other (on DPDT use the middle leg) to the input pin. The output of a signal system can also be connected. Use 10K resistors on both ground and inputs to ensure that no adverse currents flow.



External Servo Power (Option)

If you are not using a separate booster for your accessories then you will probably want to connect the main power of several boards to a large power supply and hook up the DCC signal to the DCC input as shown in the figure.

The servos use 5 V power and require about 150 mA per servo.



Frog Relay Daughter Board

The Relay Daughter Board is to 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.

How to remove a wire by using a flat blade in rectangular hole to release spring

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 polarity (right photo).

CV Programming (Optional)

*Note: All the functions can also be programmed with the three programming buttons, so DCC programming is not required, nor is a DCC system required. The address is best set with the **Addr** jumper (see above).*

The decoder can be programmed in three ways to enable it to work with most DCC systems.

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. CVs can not be read back in this mode, although you

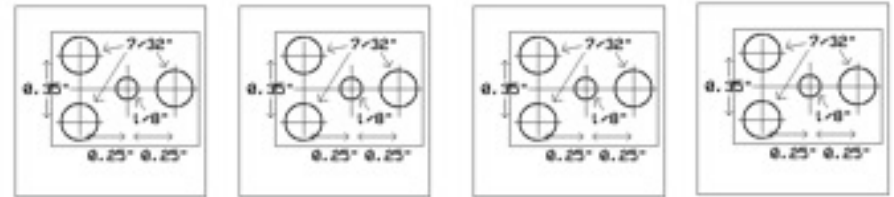
can see the affects of the commands immediately. Not all DCC systems support this mode however.

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 Addr 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. 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. The SPROG II (use Direct Bit mode) also works very well. *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. (*Note: there is a built-in Ack circuit on this version of the Quad so connecting a servo is no longer necessary to generate an Ack pulse).*

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	40		
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
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 vice versa.
37	servo2Closed	98	0-200	
38	servo2Thrown	115	0-200	

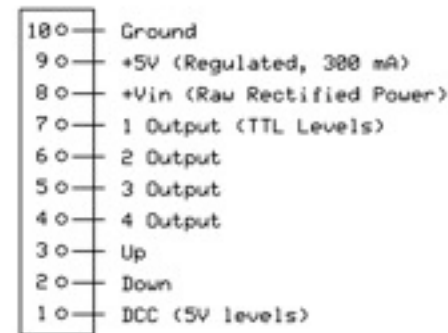
CV	Function	Default	Range	Notes
39	servo2Speed	5	1-40	
40	dccReverse2	0	0-1	
41	servo3Closed	98	0-200	
42	servo3Thrown	115	0-200	
43	servo3Speed	5	1-40	
44	dccReverse3	0	0-1	
45	servo4Closed	98	0-200	
46	servo4Thrown	115	0-200	
47	servo4Speed	5	1-40	
48	dccReverse4	0	0-1	



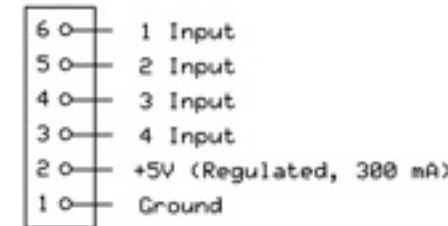
Fascia Controller Drilling Templates

Appendix

DCC Address Groups	Continued
1, 2, 3, 4	41, 42, 43, 44
5, 6, 7, 8	45, 46, 47, 48
9, 10, 11, 12	49, 50, 51, 52
13, 14, 15, 16	53, 54, 55, 56
17, 18, 19, 20	57, 58, 59, 60
21, 22, 23, 24	61, 62, 63, 64
25, 26, 27, 28	65, 66, 67, 68
29, 30, 31, 32	59, 70, 71, 72
33, 34, 35, 36	73, 74, 75, 76
37, 38, 39, 40	and so forth to 512

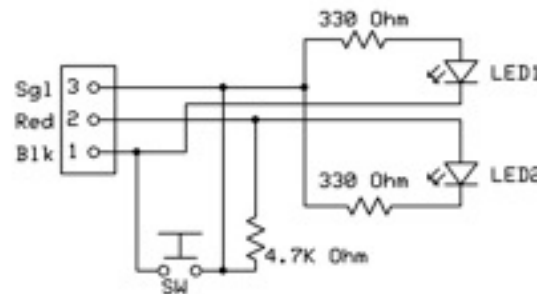


Expansion Port Wiring

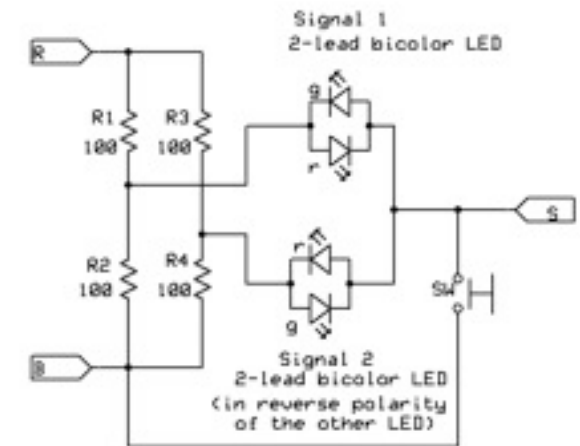


More Help

If you need more help or have any suggestions/comments please email me (Duncan McRee) at dmcree@tamvalleyrr.com.



Fascia Controller Schematic for Single Color LEDs. 4.7K resistor is optional but will increase noise rejection,



Wiring diagram for bicolor 2-lead LED