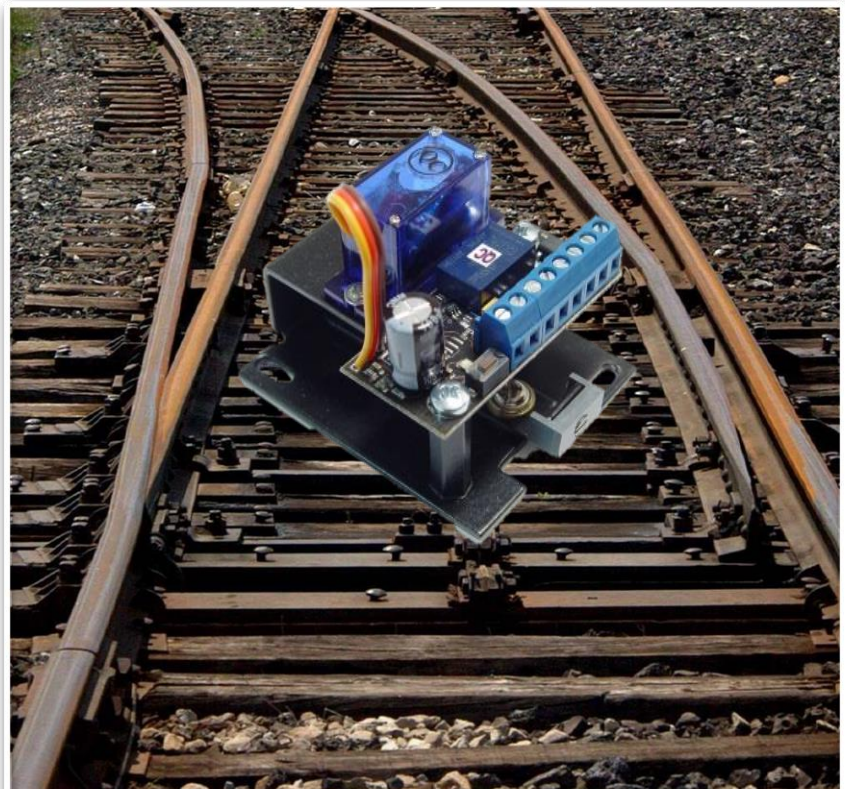
TD Servo

User Manual Preliminary Version
- version 0.0.2 –



by TEHNO LOGISTIC

Please read this manual carefully before carrying out the installation!!! Although our products are very robust, incorrect wiring may destroy the module!

During the operation of the device the specified technical parameters shall always be met. At the installation the environment shall be fully taken into consideration. The device must not be exposed to moisture and direct sunshine.

A soldering tool may be necessary for the installation and/or mounting of the devices, which requires special care.

During the installation it shall be ensured that the bottom of the device should not contact with a conductive (e.g. metal) surface!

Content

1. Features

- Slow motion servo drive with integrated decoder
- Usable in any NMRA compatible DCC system
- Individual addresses in the range of 1-2048
- Freely usable 2 pair contact outputs (NC/NC) with latching relay
- Decoder reset by entering a numerical value in CV8
- Turnout position swapping programmable in CV38
- Address programming mode or continuous programming mode
- Programmable speed step and duration of travel

2. Package Content

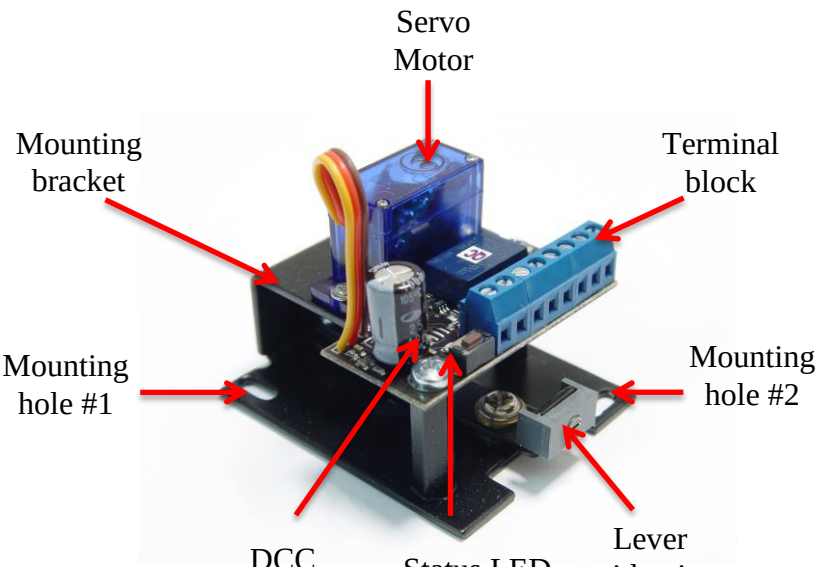
The TD Servo modules are supplied in carton boxes. Check when unpacking the product if the following parts are present: 1 x TD Servo module, 2x mounting screws, 2x 100 mm long spring wires (1x 0.8 mm diameter, 1x 1.0 mm diameter).

3. Technical parameters

- Power supply voltage: 8-24 V rail voltage (DCC)
- Power consumption: <50 mA
- Maximum contact output current: 1 A
- Dimensions: 60 x 44 x 38 mm (LxWxH)
- Weight: 50 g
- Class of protection: IP00
- Operating temperature: 0 to +60 º C
- Storage temperature: -20 to +60 º C
- Moisture: max 85%

4. General description

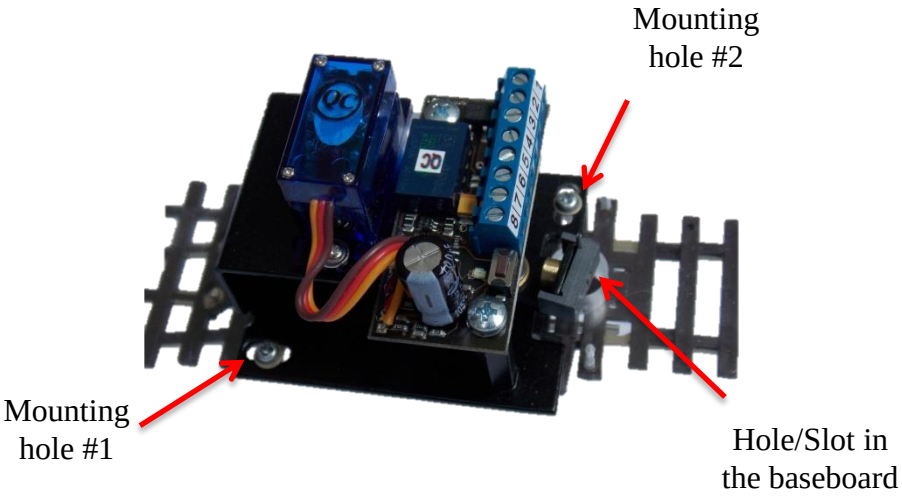
The slow motion TD Servo has been developed specially to offer a smooth realistic switching of the turnouts. The low current consumption servo motor coupled with a precision driving mechanism offer high torque and exact positioning of the turnout points. The integrated DCC decoder has 2 pairs of auxiliary output contacts usable for feedback, frog polarization or light signal changing. The TD Servo module has been designed to be mounted under the layout. The spring wire is transmitting the linear motion from the lever through the layout board to the turnout point.



(Bottom view)

5. Mounting the TD Servo on the layout

The TD Servo module has to be mounted under the layout. The mounting is extremely flexible due to the 2 slotted mounting holes. Drilling a hole or milling a slot directly under the turnout point is necessary.

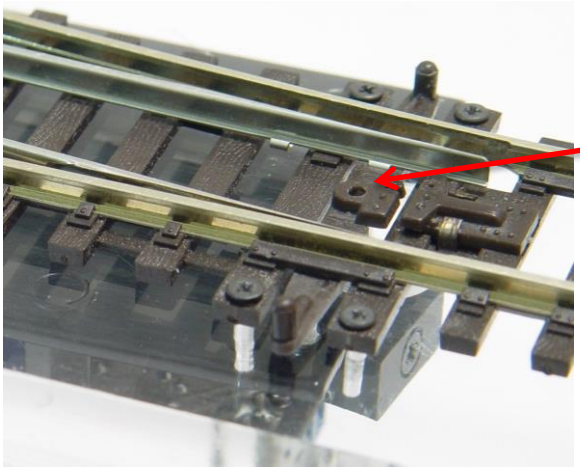


(Bottom view, with the turnout in transparency)

Please check that there is sufficient clear area under the turnout. The hole/slot can be typically located in the center of the rails, but with off center mounting can be located outside them.

To ensure a smooth point operation of the turnouts, prior to the mounting of the TD Servo please check the free movement of the points.

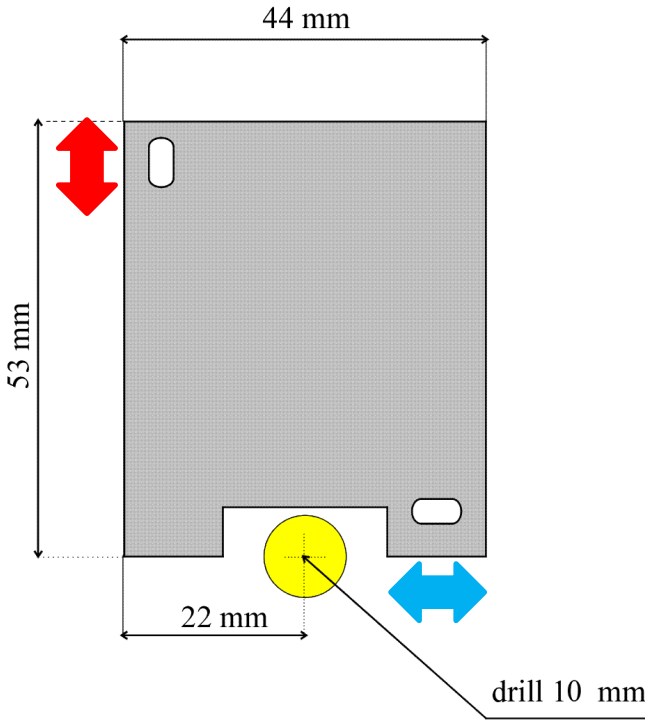
Most of the turnouts have a small aperture located in the center of the point, which can be used to pass through the spring wire. If the aperture does not exist, additionally drilling a small hole (0.8-1.0 mm) in the point of the turnout may needed.



This small aperture will be used as a guide to drill a 0.8-1.0 mm hole through the road bed and baseboard. Next, drill up through the baseboard and road bed a 10.0 mm hole being extremely careful to not destroy the turnout.

If the turnout is already mounted on the layout, if possible, flex it in upper direction away to prevent the contact with the drilling bit.

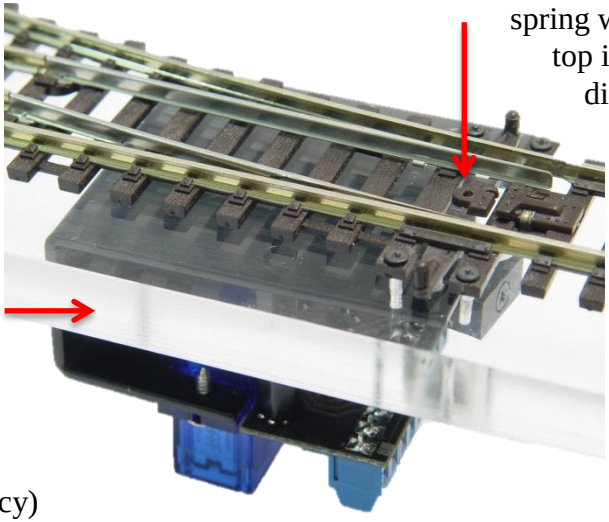
Please use the below drilling template in the next page for exact positioning of the mounting screws and the hole/slot (layout bottom view).



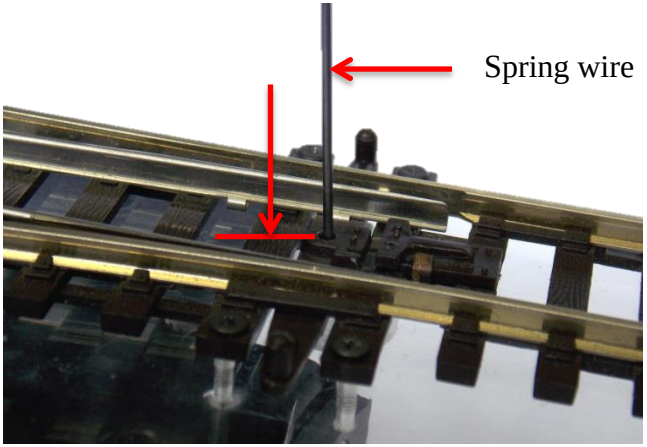
Exact centering of the mounting bracket can be made with shifting in the direction of the two double headed arrows. The mounting bracket has to be fastened to the baseboard with the supplied 2 screws.

Off center operation is possible, and requires the shifting of the hole/slot (colored yellow in the above illustration) in the direction of the blue double headed arrow outside the rails.

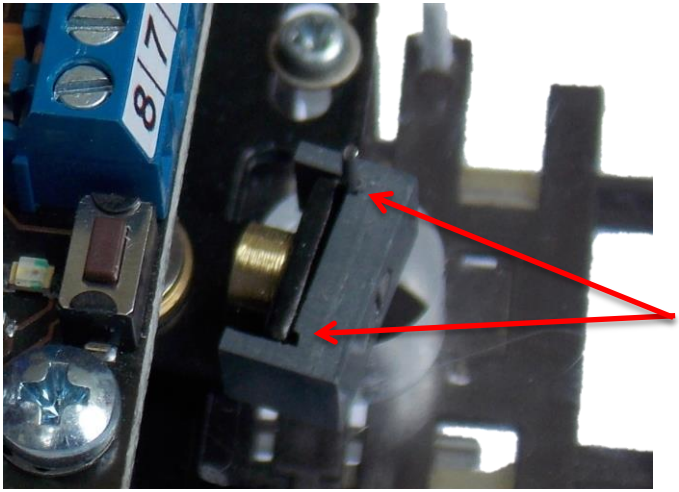
The spring wire will be inserted after the whole servo assembly is mounted to the layout.



The end of spring wire has to be aligned with the top level of the point of the turnout.

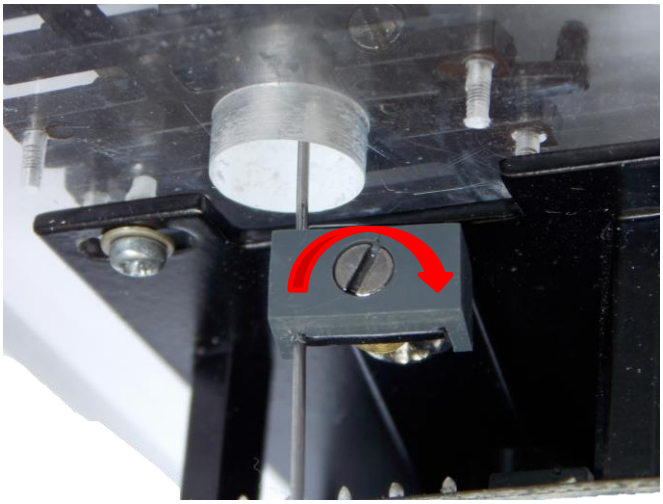


Insert the spring wire in the holder in one of the grooves at the sides.



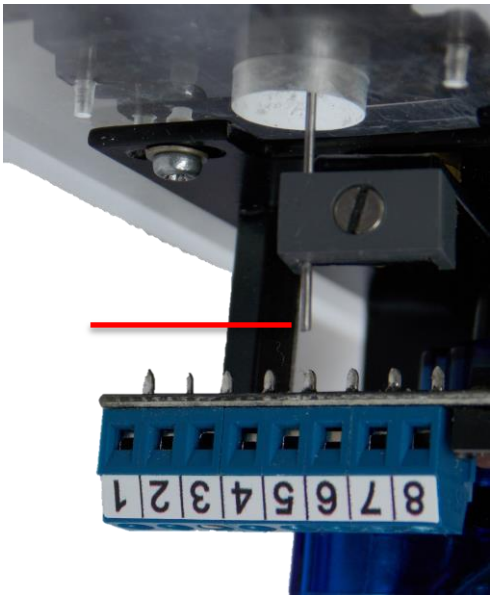
(Bottom view)

After the top end of the spring wire is aligned, tighten the holder to the lever with a small screwdriver.



(Bottom view)

Shorten the excess of the spring wire, as ilustrated.

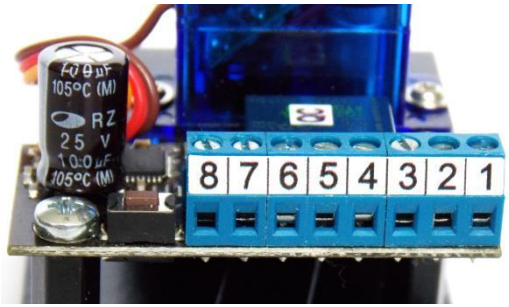


(Bottom view)

Turnouts produced by some manufacturers contain an internal center spring (Peco turnouts for example) which cause snapping of the points to the rail sides while the TD Servo module is performing a slow motion cycle. We recommend the removal of those center springs before the turnouts are mounted on the layout. After the removal, please check the free operation of the points.

6. Wiring the decoder

The 8 contacts of the terminal block are labbelled 1 through 8. The table below contain their description.

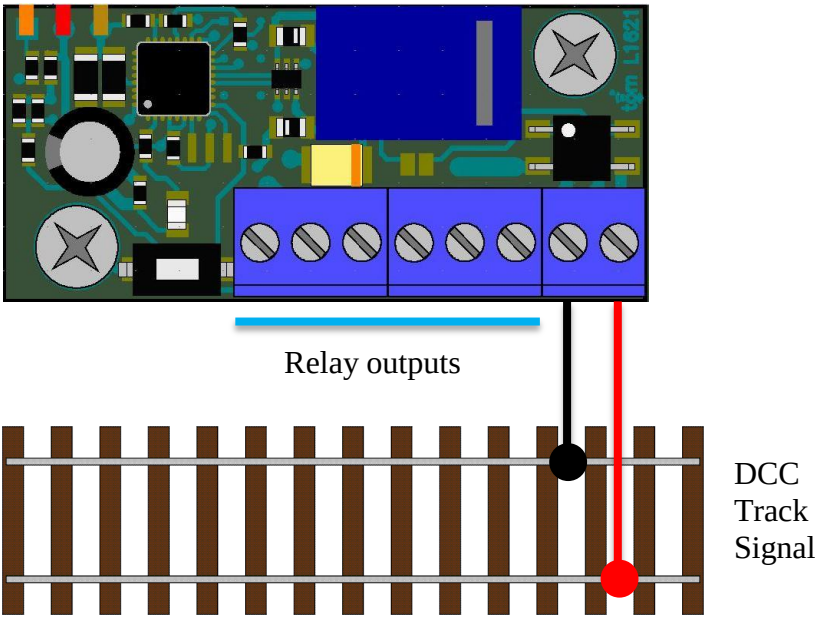


Contact No.	Signal Name	Description
1	DCC1	DCC/DC connection
2	DCC2	DCC/DC connection
3	Out1 NC	Relay circuit1, normally closed circuit
4	Out1 COM	Relay circuit1, common terminal
5	Out1 NO	Relay circuit1, normally open circuit
6	Out2 NC	Relay circuit2, normally closed circuit
7	Out2 COM	Relay circuit2, common terminal
8	Out2 NO	Relay circuit2, normally open circuit

For a proper operation, the DCC1/DCC2 contacts must be connected to the digital track signal. The relay outputs are freely usable, please see the application examples in chapter 8 “Relay Outputs”.

Make sure the turnout in which you are to installing the decoder is not powered. Installing under voltage can destroy the decoder.

Servo motor wire connections



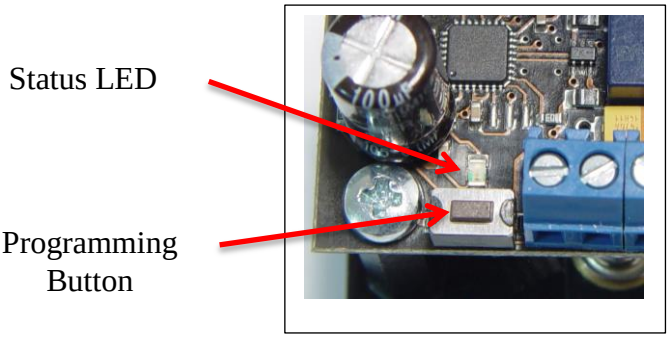
The TD Servo module ca be used also in analog operation, please see chapter 11 for details.

7. Address and position programming

The decoder address and the position limits of the servo motor can be programmed on the main track without a connection of the decoder to the programming track.

At powering up of the TD Servo, the servo motor will perform a reference run to calibrate its zero position. This is a normal operation, after that it will stay stable in one of its end position and the status LED will be continuously on.

To program the decoder of the TD Servo it must be switch into programming mode with a single press of the programming button.



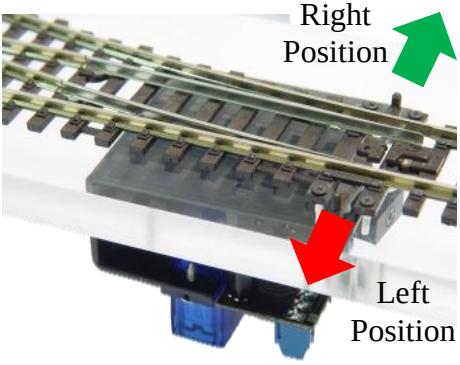
The decoder will acknowledge the entering into the programming mode by cyclically flashing shortly the status LED followed by a longer pause.

The decoder is programmed to address 1 (T0001) by the factory. This address is for the accessory decoders and is not identical with the locomotive addresses. Between the addressing of the Roco system and other NMRA compliant DCC systems, there is an offset of 4 addresses. Address 0001 of the decoder will be displayed as address 0005 in a Roco system.

The following steps are required to program the address of the decoder (we assume that the decoder is already in programming mode):

- Switch your command station/throttle in the turnout command mode and select the desired address for your decoder
- Perform a straight/branch switch using the direction buttons of the command station/throttle
- The decoder will save the address and will leave the programming mode

By convention the two end positions of the servo motor are noted as left position and right position on a standard right turnout.



The images above and on the left are illustrating the left position (which corresponds to the RED turnout command sent from the command station), and the right position (which corresponds to the GREEN turnout command sent from the command station).

If the position of the TD Servo module is changed relative to the turnout, please take in consideration the correspondence of the servo motor end positions and the turnout commands.

Setting the left/right turnout limits requires the following steps:

- Press the programming button twice (we assume that the address was already set). The decoder will acknowledge the entering into the left position programming mode by cyclically two short flashes of the status LED followed by a longer pause.
- Each branch switch command (RED button) sent from the command station/throttle will move the turnouts point in the direction of the red arrows, while each straight switch command (GREEN button) sent from the command station/throttle will move the turnouts point in the direction of the green arrows.
- Move the points of the turnout to the desired left end position using the branch/straight commands. Do not tension too much the point to the rail side, it is not needed. The servo motor keeps its position without too much tension.
- After the left limit was set, press the programming button for the third time. The decoder will acknowledge the entering into the right position programming mode by cyclically three short flashes of the status LED followed by a longer pause.
- Move the points of the turnout to the desired right end position using the branch/straight commands as it was described above.
- After the right position was set, a fourth press of the programming button will save the settings, and will exit the decoder from the programming mode. The status LED will be on continuously.

8. Advanced programming

All the CVs of the decoder can be accessed in a permanent programming mode. The decoder must be connected to the programming track of the command station to perform these operations.

After you have placed the decoder in programming mode (please see chapter 7 for doing this), CV41 has to be written with the numerical value 1. After the programming is finished, the numerical value 0 must be written in CV41.

The address of the decoder and the left and right end positions can be directly programmed in the decoder's CVs. However, we recommend doing this with the method described in chapter 7.

It is not possible to read out the CV values from the decoder.

The switching direction of the turnout can be inverted by entering the value "1" in CV38. As a result the switching will be inverted for the same sent straight/branch commands.

The switching of the relays can be activated by entering the value "1" in CV39. If you want to invert the relays switching direction, instead of the value "1" please enter the value "2". The default "0" value if CV39 will keep the relay disabled.

The movement speed of the lever can be adjusted with CV42 and CV43 (see the CV table). Recommended values for CV42 are in the range 0.. 6, for CV43 are in the range 1..10.

9. Relay outputs

Description will follow

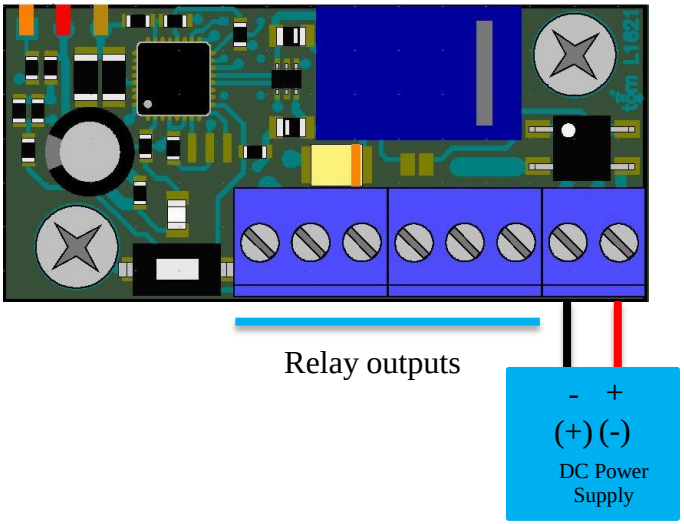
10. Decoder reset

The TD Servo module is delivered in factory configuration, with the CV values specified in the column "Default value" in the CV table (see chapter 12). At any time, the decoder can be restored to the default values by performing a reset. The reset procedure consists of programming any numerical value to CV8 while the module is in programming mode.

11. Analog operation

The TD Servo module can be used in analog (DC) mode if a DC voltage in the range of 12-18 Vdc is applied to the contacts 1, 2 (DCC1, DCC2).

Servo motor wire connections



The points of the turnout will move to the left or right end position, depending on the polarity applied. During the DC operation all the previously set parameters in DCC mode (switching polarity, relay on/off, switching speed) will be valid.

Right end position (equivalent to the straight command)	DCC1 (contact1)	Positive polarity
	DCC2 (contact2)	Negative polarity
Left end position (equivalent to the branch command)	DCC1 (contact1)	Negative polarity
	DCC2 (contact2)	Positive polarity

To avoid the servo motor reference run at each polarity change, use of a double pole switch and a non-polarised capacitor is recommended. Please see the ilustration below.

Illustration will follow

12. CV Table

CV	Default Value	Value Range	Description
1	1	0-63	Base (block) address of the decoder (6 bits)
8	-	-	Any numerical value written in the CV will reset the decoder to factory defaults (see "Default Value" column)
9	0	0-7	Extended block address of the decoder , value between 0 and 7 (3 bits)
35	40	0-110	A (left) Position Limit Value
36	70	0-110	B (right)Position Limit Value
37	0	0-3	Position address of the decoder (0..3)
38	0	0/1	0 - Normal switching direction (straight/branch) 1 – Inverted switching direction (branch/straight)
39	0	0-3	Swap Relay Position, bit position, 0bit 0= Relay OFF, 1= Relay ON, 1bit 1=Swap relay position
41	0	0/1	Continues CV Programming Mode, To Enter Continues Programming Push Button once (1 Led Flash), 0-Exit Continues CV Programming Mode
42	0	0-15	Servo Sweep period. CV42= 0 > Sweep Period= 0.5s, CV42=1=>0.75s, CV42=2=>1s,..
43	1	1-40	Servo Step variation delay, Total Sweep Period = CV42 * CV43. CV43 =1 is fastest variation, Increase CV43 to slow down the movement, ex. CV42 =0 (0.5s) and CV43=6, Total Sweep Period = 0.5 * 6 = 3s

13. Accessory decoder addresses

According to NMRA standards address decoders and accessories are organized into groups of four addresses, called block addresses (often called “decoder address”). There are a total of 512 block / decoder addresses so we can drive a maximum of 2048 (512 x 4 = 2048) turnouts. Although most digital command stations (including the Roco), displays the individual address of the decoder, for correct address should keep in mind the relationship between the block / decoder address and individual turnout address. Block address of the accessory decoders is determined using CV1 and CV9 (in binary CV1 uses 6-bit resulting decimal values in the range 0-63 and CV9 uses 3 bits, resulting decimal values in the range 0-7). The formula for block/decoder address is:

block address = CV1 + 64*CV9

Most decoders contain control circuits for 4-8 turnouts, and the block/decoder address implicitly assign addresses for the 4-8 outputs in consecutive order. If decoders are addressed individually you must specify the individual address in the group. Thus we specify the number of the turnout inside the group in CV37 (1-4). The individual address is calculated as follows:

individual address = (block address - 1)*4 + CV37

Roco system allows the use of block address “0” and because of this there is an offset of 4 individual addresses. On the next page we have presented a partial table with individual addresses by CV1and CV9. The full table can be found on our website.

Block/ Decoder Address	CV9 Value	CV1 Value	Value CV37			
			1	2	3	4
			individual addresses			
1	0	1	1	2	3	4
2	0	2	5	6	7	8
3	0	3	9	10	11	12
4	0	4	13	14	15	16
5	0	5	17	18	19	20
6	0	6	21	22	23	24
…….	…….	…….	…….	…….	…….	…….
60	0	60	237	238	239	240
61	0	61	241	242	243	244
62	0	62	245	246	247	248
63	0	63	249	250	251	252
64	0	64	253	254	255	256
65	1	1	257	258	259	260
66	1	2	261	262	263	264
67	1	3	265	266	267	268
68	1	4	269	270	271	272
69	1	5	273	274	275	276
70	1	6	277	278	279	280
…….	…….	…….	…….	…….	…….	…….
125	1	61	497	498	499	500
126	1	62	501	502	503	504
127	1	63	505	506	507	508
128	1	64	509	510	511	512

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