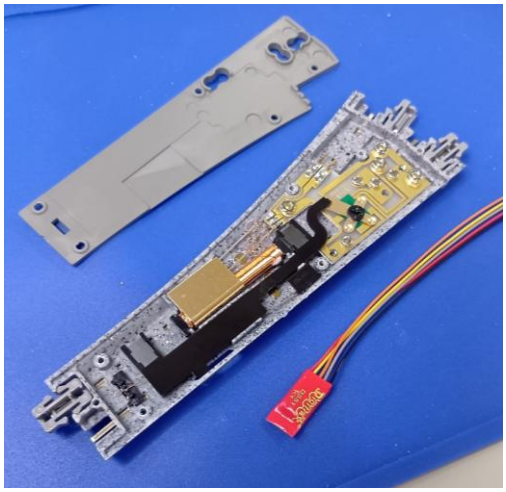
UNITRACK Electric Turnouts DCC Guide



Introduction

Why DCC?

The DCC protocol allows multiple turnouts to be controlled automatically, making it easy to define routes for your trains. Whether you are setting up a temporary layout or building a permanent installation, turnout decoders eliminate the need for extensive control wiring. This allows turnouts to be installed anywhere on the layout without concerns about cable runs back to the control panel.

Advantages of KATO Turnouts

All KATO UNITRACK turnouts and crossovers are equipped with an integrated switch machine. As a result, only a turnout decoder is required for DCC operation.

KATO Decoders

KATO offers two decoders for turnouts.

① **DS51K1 (29-064)**, which is compatible with the DCC protocol and all KATO-UNITRACK turnouts.

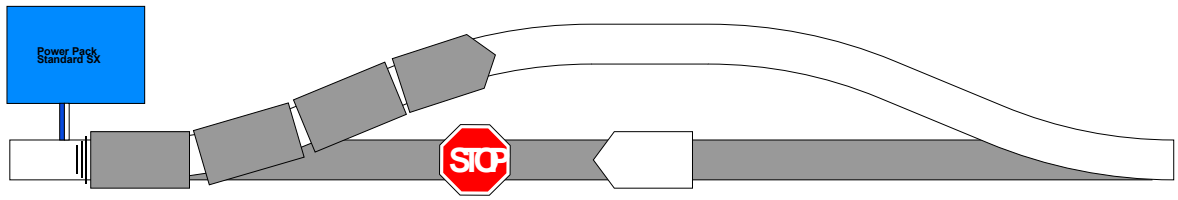
② **DS52 turnout decoder (29-065)**, which can provide sufficient power to simultaneously operate all four turnouts of the double crossover track.

Contents

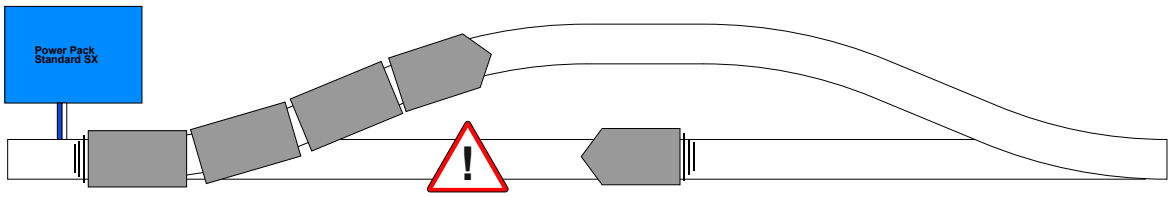
UNITRACK Electric Turnouts
“Power Routing” Function

What is the “Power Routing” Function?
The “**Power Routing**” function supplies track power **only** to the route selected for travel, while **automatically** isolating the non-selected route.
This allows multiple trains to be operated independently on the same layout by creating simple stopping sections.

For example:
One train can remain parked on a siding while another is running. After changing the turnout, the parked train can be started without risk of the two trains colliding.



Without the Power Routing function, both routes remain permanently supplied with track power.
As a result, all trains on the powered tracks will start moving as soon as power is applied.
This makes independent train control impossible and **increases the risk of collisions**.



When is “Power Routing” useful?
The “Power Routing” function is particularly useful for **temporary analog layouts** (such as floor layouts), as it eliminates the need for complex wiring. However, it can also be used on **digital** layouts whenever an **intentionally unpowered section of track** is required, such as a storage track or siding track.

When should I disable the “Power Routing” function?
Disabling the “Power Routing” function ensures that all connected tracks remain **continuously** supplied with track power, **regardless** of turnout position. This may be desirable for certain specialised layout configurations.

In digital operation, not only locomotives and trains but also connected accessories, such as turnouts, require a continuous track voltage in order to **function properly**. If the “Power Routing” function remains enabled, changing a turnout may unintentionally **cut** power to part of the layout. Trains in that section would stop, lighting and sound functions would be interrupted, and digitally controlled turnouts could no longer be operated.

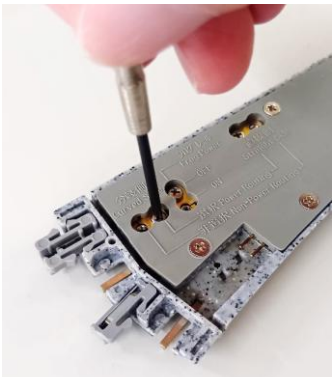
For this reason, **disabling** the “Power Routing” function is **recommended for digital operation**. This ensures that all connected tracks remain permanently supplied with track power, regardless of the turnout position.

How is the “Power Routing” Function enabled and disabled?
Almost all UNITRACK turnouts and crossings in both N scale and HO scale feature an adjustable “Power Routing” function.

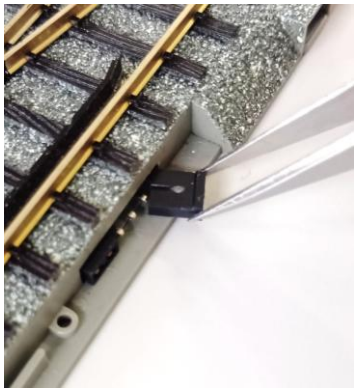
In most cases, the setting can be changed using the **screws** located on the **underside of the turnout**.

For the HO scale R867 mm electric turnouts, the function is configured using jumpers.

For detailed instructions, please refer to the operating manual supplied with the respective turnout.



↑ Electric Turnout #4 (20-221)
N-Scale



↑ Electric Turnout #6 (2-861)
HO-Scale

DCC Decoder Installation (DS51K1)
General Introduction

This guide explains the installation of the turnout decoder **DS51K1 (29-064).**

Preparation

Before starting, make sure you have all of the necessary equipment and prepare a suitable work space.
It is recommended to work on a **flat surface** to prevent small parts and tools from rolling away.

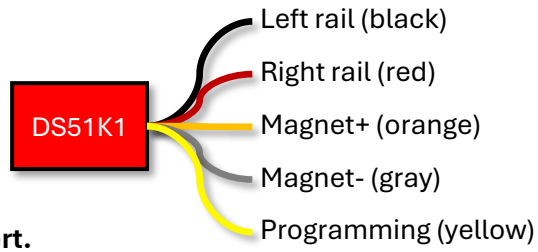
Required Tools:
- Soldering iron
- Side cutters
- Wire stripping tool
- Phillips screwdriver (PH0)
- Tweezers
- Thin double-sided adhesive tape

Decoder Wires

Each decoder wire serves a different function. When adjusting wire lengths, refer to the colours and lengths shown in the accompanying diagrams.

While the general installation principles remain the same, the exact installation method varies depending on the turnout type.

Please refer to the instructions for the specific turnout you wish to convert.

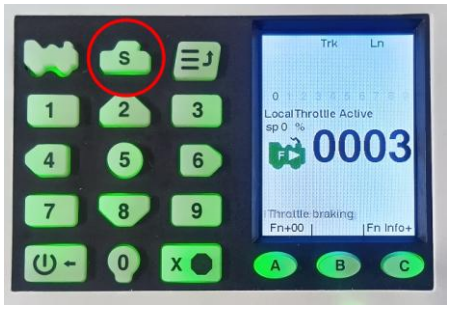


Initial Function Test

After soldering the wires, you should perform a test run to check the proper functioning of the turnout decoder and the switching mechanism before installing the turnout in your layout.

① Connect a **feeder track** to the single track end of the turnout and **connect it to your DCC system**.
Leave the turnout upright to prevent the mechanical components from falling out.

② Switch on the track power and **select turnout control mode**.
In its factory settings, the decoder has **address "1"** and should be accessible under this address.



On the D103, turnout control mode is selected using the **"S" key** in the top row of the keypad (this may vary depending on the manufacturer and model).

③ Try operating the turnout using your DCC system. If necessary, slightly lift the turnout so that the switching mechanism can move freely.

If the turnout cannot be operated, check the following:
- Ensure that the mechanism is not blocked and can move freely.
- Check for loose wires or short circuits.

The individual instruction pages will indicate when to perform an initial function test.
When prompted, please refer to this page.

DCC Decoder Installation (DS51K1)
Electric Turnout #4 R481-15°

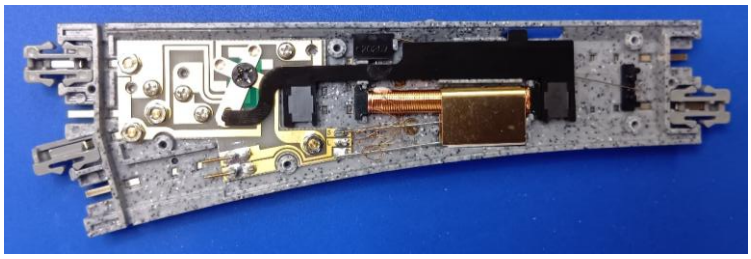
This guide explains the installation of the turnout decoder **DS51K1 (29-064)** into the **electric turnout #4, right (20-221).**

EP481-15R

20-221 Electric Turnout #4, Right R481-15°

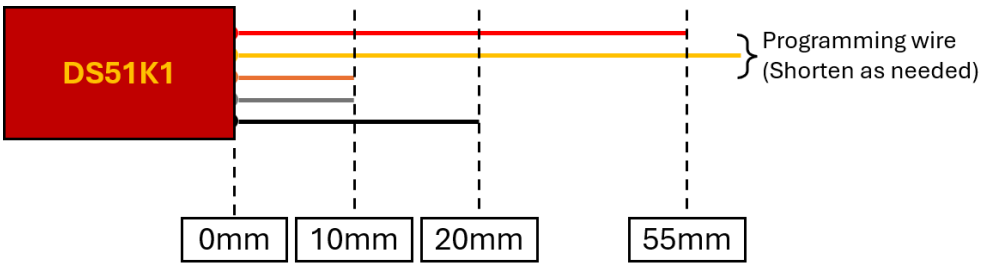
STEP 1: Installing the Decoder

① Place the turnout **upside down** on the work surface.
Using a Phillips screwdriver, **remove the five marked screws** from the underside and lift off the cover.



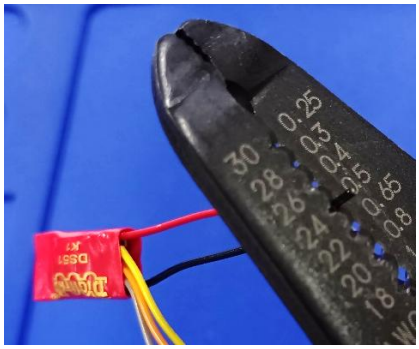
! Take care not to damage the mechanism or the magnet's fine wires.

② Before connecting the decoder, **cut the connection wires** to the lengths shown in the diagram below.
The yellow wire is used only for programming and may be shortened as required.

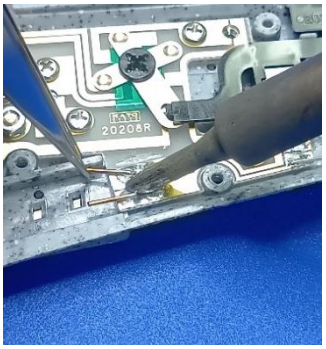


Avoid leaving the wires longer than necessary, as this can make installation more difficult.

③ Strip **5 mm** of insulation from each wire.
If necessary, tin the wire ends to prevent stray strands.



④ Begin by **desoldering the connection pins** for the connection cable or cutting them off using side cutters.

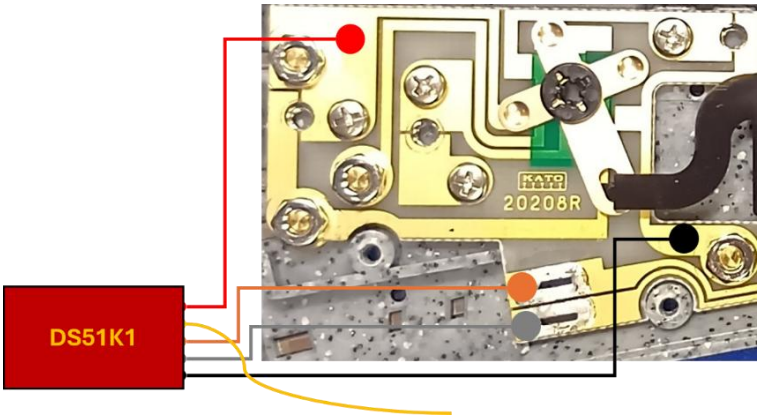


! During desoldering, ensure that no connection is created between the two conductor tracks.

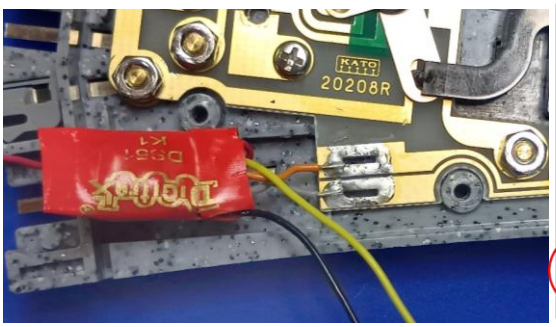
⑤ Next, connect the decoder wires as shown in the diagram below.

First, solder the orange and grey wires used to control the switch motor.

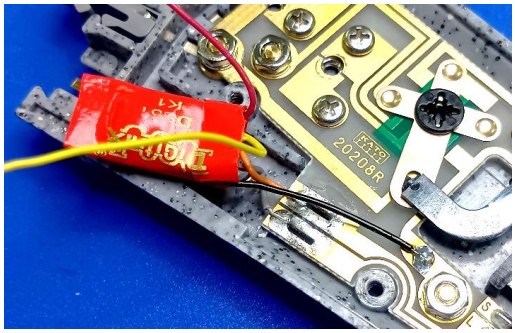
To ensure that the physical position of the switch blades matches the position indicated by your DCC system, **connect the grey wire to the <u>outer</u> conductor track** and the **orange wire to the <u>inner</u> conductor track**.



With this configuration, the turnout will be in the “closed” state when set for the straight route and in the “thrown” state when set for the diverging route ➡

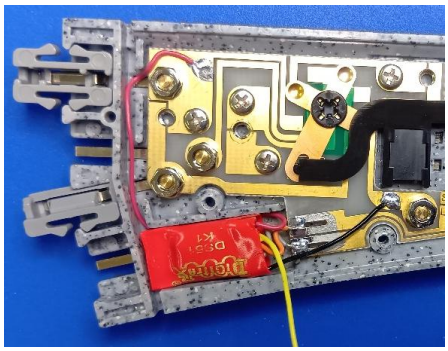


⑥ Next, **connect the black wire to the conductor track** by applying solder to the conductor track first, and then soldering the wire in place.



After soldering, ensure that no traces have been bridged.

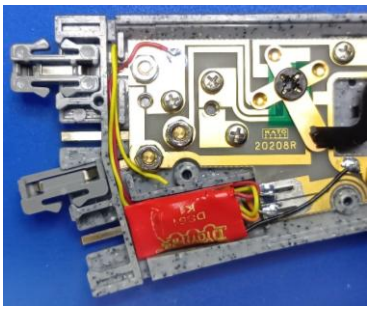
⑦ Solder the **red wire** to the copper pad in the **upper left corner** of the PCB.



Route the wire through the cable guide, then **secure the decoder** in the recess beneath the diverging track using double-sided adhesive tape.

⑧ The yellow wire is used only for programming the turnout decoder and **does not** require a permanent connection. Route it so that it **does not interfere** with operation or make electrical contact with other components.

In this example, the yellow programming wire is routed through the cable guide, with its end positioned beneath the PCB. Once the cover is refitted, the wire remains inside the turnout. ➡



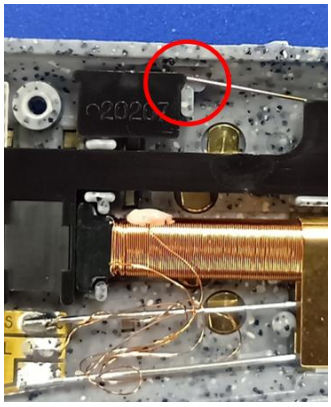
STEP 2: Initial Function Test

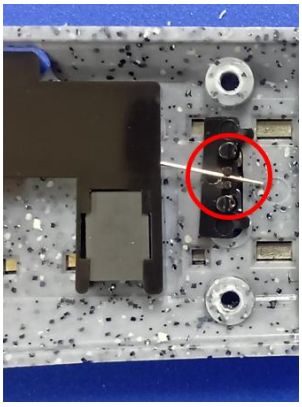
An initial function test can now be carried out. **Please refer to p. 3**

STEP 3: Reassembly

① Before refitting the cover, check that all components of the switch drive are **correctly positioned**.

In particular, ensure that the **switch blade spring** is properly seated in its guides, as it can easily become displaced.

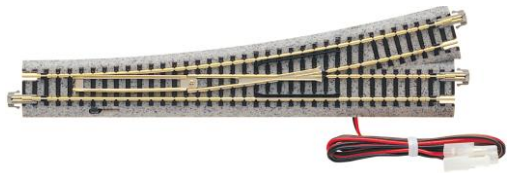




② The turnout can now be closed. **Place the cover back on** and tighten the five screws to **secure** it in place.

This guide explains the installation of the turnout decoder **DS51K1 (29-064)** into the **electric turnout #4, left (20-202).**

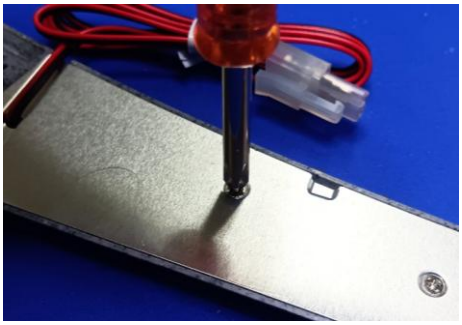
EP718-15L

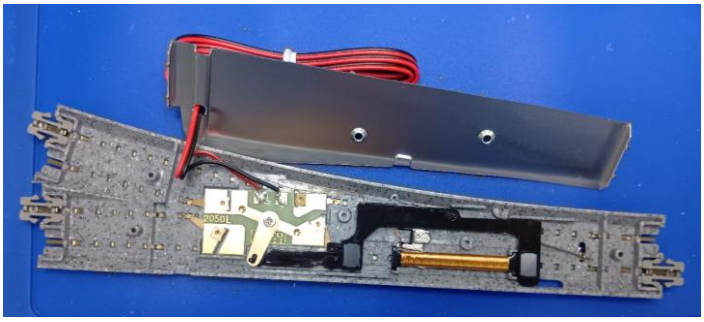


20-202 Electric Turnout #6, Left R718-15°

STEP 1: Installing the Decoder

① Place the turnout **upside down** on the work surface.
Open the housing by **loosening the two screws** with the Phillips screwdriver.



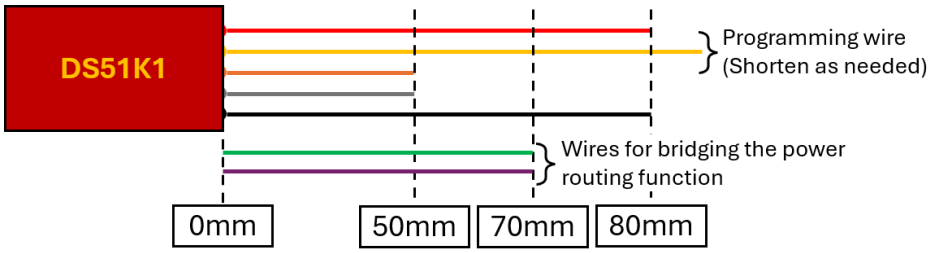


The cover is held in place by metal tabs on the short sides.

Using a **pointed tool**, such as tweezers, **carefully grip the cover** at the center on one side and **gently lift** it until the metal tabs come free and the cover can be removed.

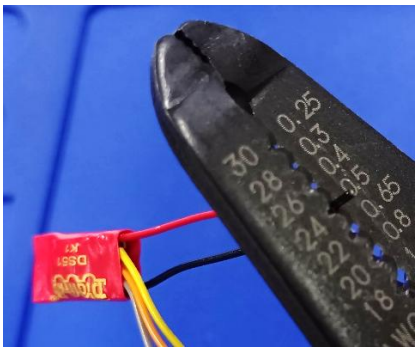
! Make sure that neither the mechanism nor the fine wires of the magnet are damaged when removing the cover, and place the opened turnout carefully on the work surface.

② Before connecting the decoder, **cut the connection wires** to the lengths shown in the diagram below.
The yellow wire is used only for programming and may be shortened as required.

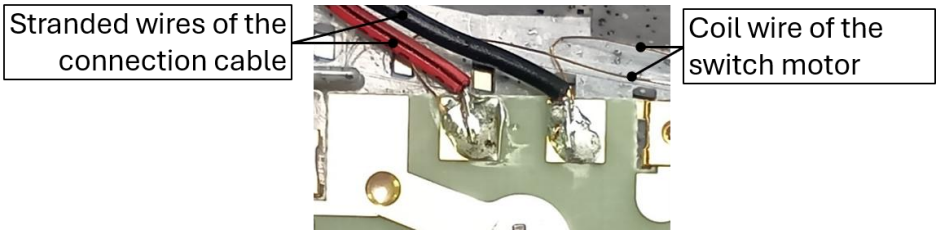


Avoid leaving the wires longer than necessary, as this can make installation more difficult.

③ Strip **5 mm** of insulation from each wire.
If necessary, tin the wire ends to prevent stray strands.



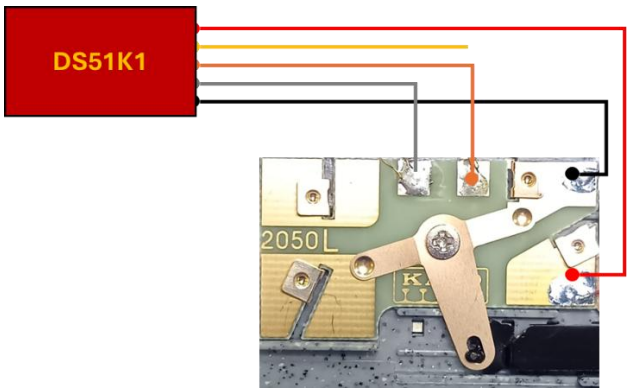
④ Start by **desoldering the red and black wires** of the connection cable from the switch motor.



The wires of the connection cable and the coil wires of the switch motor are connected to the same pads on the PCB.

Therefore, **make sure that the fine coil wires do not come loose** during desoldering and remain connected to the pads.

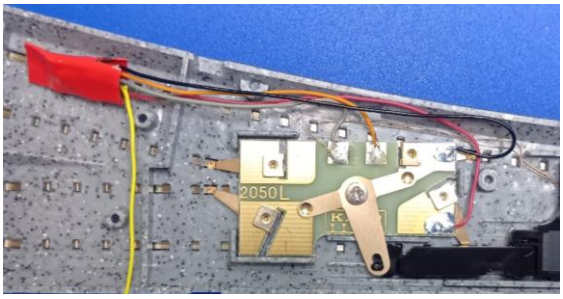
⑤ Next, connect the decoder wires as shown in the diagram below.



Solder the **orange** and **grey wires** used to control the switch motor to the pads from which the switch motor connection wires were previously removed.

To ensure that the physical position of the switch blades matches the position indicated by your DCC system, connect the **grey wire to the left-hand pad** and the **orange wire to the right-hand pad**.

⑥ The yellow wire is used only for programming the turnout decoder and **does not** require a permanent connection. Route it so that it **does not interfere** with operation or make electrical contact with other components.



← With this configuration, the turnout will be in the “closed” state when set for the straight route and in the “thrown” state when set for the diverging route.

Note: The “power routing” function is still active. It is recommended to disable this function for digital operation. To deactivate this function, please follow the instructions in the next section.

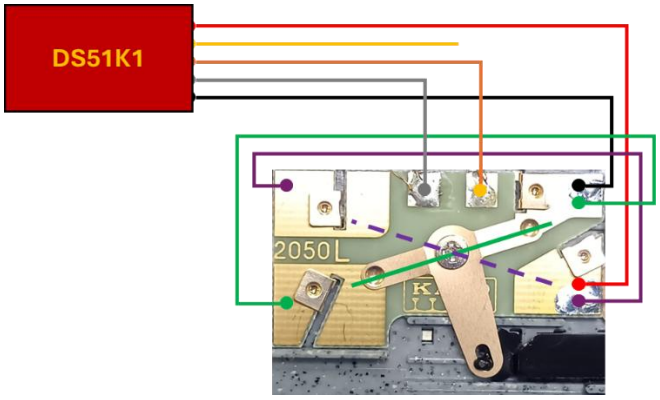
STEP 2: Bridging the Power Routing Function

To disable the power-routing function, the corresponding circuit on the PCB must be **bridged**.

This requires **two additional wires** to be soldered to the PCB.

In this example, green and violet wires are used to make them easy to identify.

The diagram shows the PCB with the additional bridging wires installed. ➡

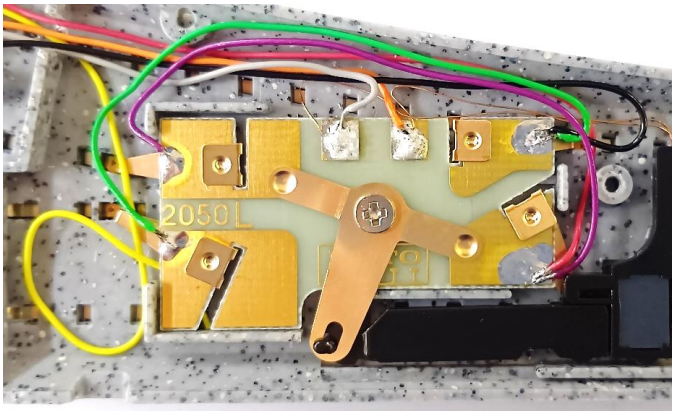


① Cut the bridging wires to a length of **70 mm**.

② Strip **5 mm** of insulation from each wire.
If necessary, tin the wire ends to prevent stray strands.

③ Connect the wires as shown in the previous diagram or the photograph on the right.

Solder the **violet wire** between the **lower-right and upper-left pads**, and the **green wire** between the **upper-right and lower-left pads** on the PCB.



STEP 3: Initial Function Test

An initial function test can now be carried out. **Please refer to p. 3**

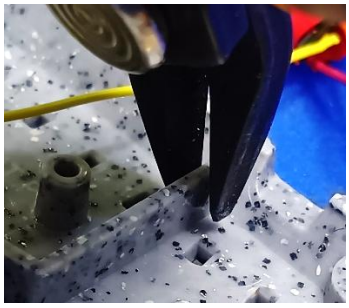
STEP 4: Modifying the Housing for Cable Routing

The turnout housing must be modified to route the decoder wires. The decoder is installed beneath the diverging track embankment, requiring an opening in the web.

① Using side cutters, make **two vertical cuts** approximately **5 mm** apart and remove the material between them.

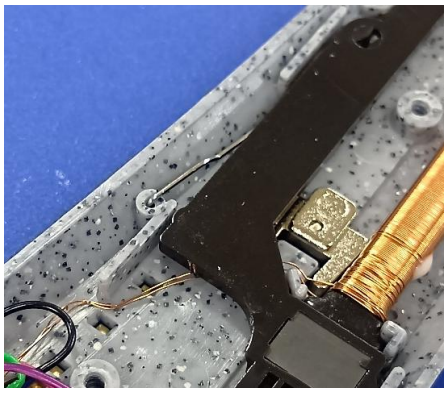
② **Smooth the cut edges** to prevent the wires from being damaged by sharp edges.

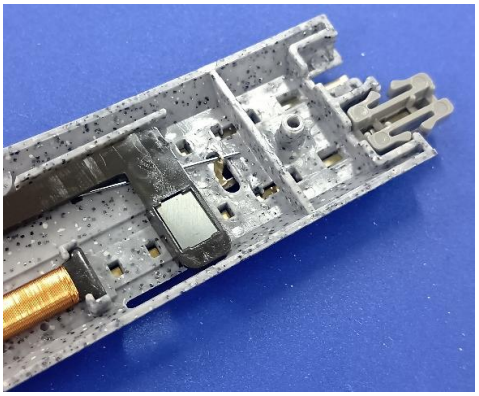
③ Finally**, secure the decoder** in place using double-sided adhesive tape.



STEP 5: Checking the Mechanism and Closing the Housing

① Before refitting the cover, check that all components of the switch drive are correctly positioned.





In particular, ensure that the **switch blade spring** is properly seated in its guides, as it can easily become displaced.

② Fit the cover starting from one side and **gently flex it** until the metal tabs on the opposite side engage. Then tighten the screws to secure the cover.

DCC Decoder Installation (DS51K1)
#2 Electric Y Turnout

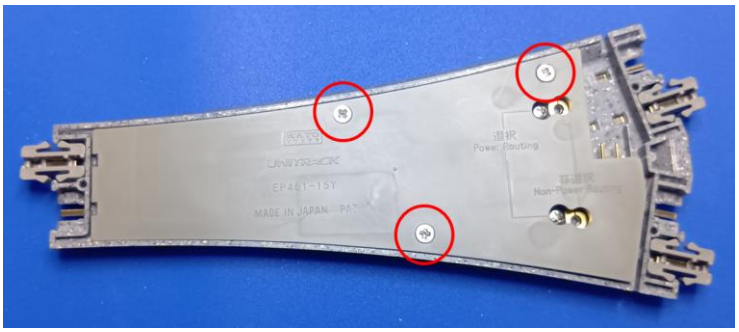
This guide explains the installation of the turnout decoder **DS51K1 (29-064)** into the **#2 electric Y turnout (20-222).**

EP481-15Y

20-222 #2 Electric Y Turnout

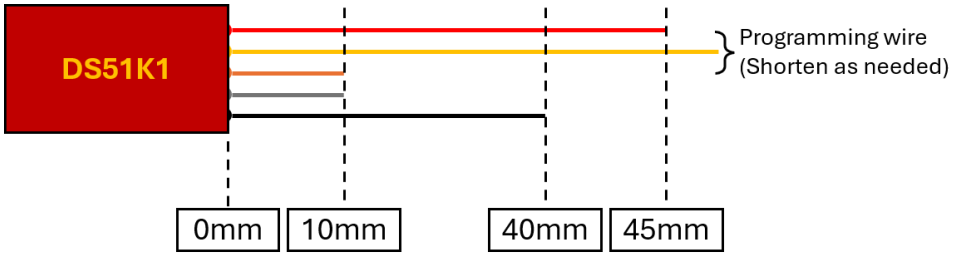
STEP 1: Installing the Decoder

① Place the turnout **upside down** on the work surface.
Open the housing by loosening the three screws with the Phillips screwdriver.

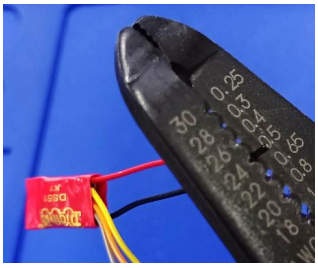


! When removing the covers, take care not to damage the mechanism or the fine wires connected to the solenoid.

② Before connecting the decoder, **cut the connection wires** to the lengths shown in the diagram below.
The yellow wire is used only for programming and may be shortened as required.

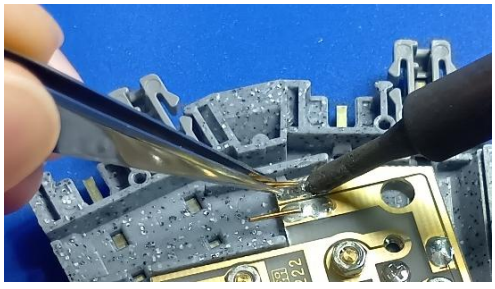


③ Strip **5 mm** of insulation from each wire.
If necessary, tin the wire ends to prevent stray strands.



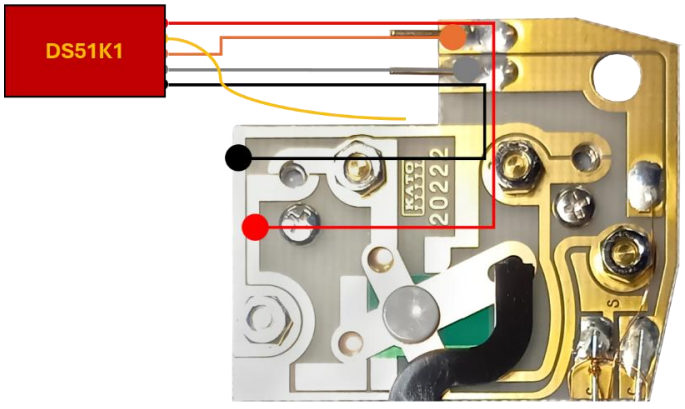
Avoid leaving the wires longer than necessary, as this can make installation more difficult.

④ Begin the installation by **desoldering the connector pins** from the lead wire (or cutting them off with side cutters).

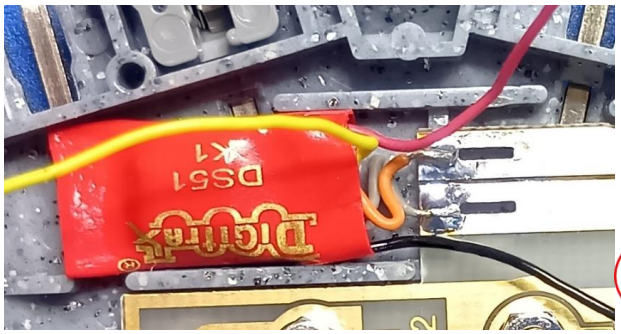


! Take care not to create an electrical connection between the two PCB tracks while desoldering.

⑤ Next, connect the decoder wires as shown in the diagram below.



The orange and grey wires used to control the solenoid are connected first. Solder the **orange wire to the upper** PCB track and the **grey wire to the lower** PCB track.



This configuration ensures that the turnout is set to the **left-hand route** when the decoder is in the **"Closed" position** and to the **right-hand route** when it is in the "**Thrown**" position.

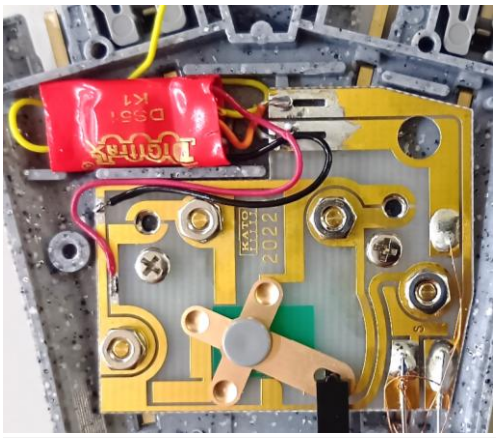
⑥ Next, solder the **black wire** to the PCB track running along the **upper left-hand edge** of the circuit board.

First apply a **small amount** of solder to the **track**, then solder the wire in place.

⑦ Solder the **red wire** to the **adjacent PCB track**.

! Once complete, check that no solder bridges have formed between the PCB tracks.

⑧ Route the decoder wires so that they **do not** interfere with the switching mechanism at the bottom of the circuit board.



Note: Connecting the decoder in this way retains the turnout's power-routing function.

Secure the decoder in the recess to the left of the turnout motor connection using double-sided adhesive tape.

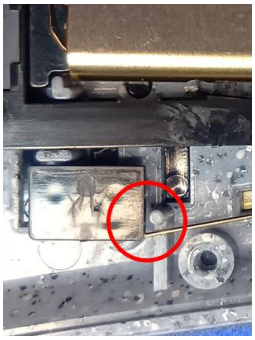
(The yellow wire is used only for programming the turnout decoder and does not require a permanent connection. Route it so that it does not interfere with operation or make electrical contact with other components.)

STEP 2: Initial Function Test

An initial function test can now be carried out. **Please refer to p. 3**

STEP 3: Reassembly

① Before refitting the cover, check that all components of the switch drive are correctly positioned.



In particular, ensure that the **switch blade spring** is properly seated in its guides, as it can easily become displaced.

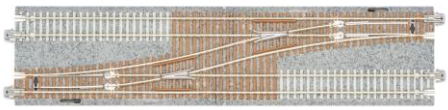
② The **yellow** programming wire can be tucked away in the **cable routing channel.**

③ The turnout can now be **closed**. Refit the cover and secure it using the three screws.

DCC Decoder Installation (DS51K1)
Double Track #4 Single Crossover Turnout

This guide explains the installation of the turnout decoder **DS51K1 (29-064)** into the **Double Track #4 Single Crossover Turnout, Left (20-230).**

SX248L



20-230 Double Track #4 Single Crossover Turnout, Left

STEP 1: Preparing the Turnout

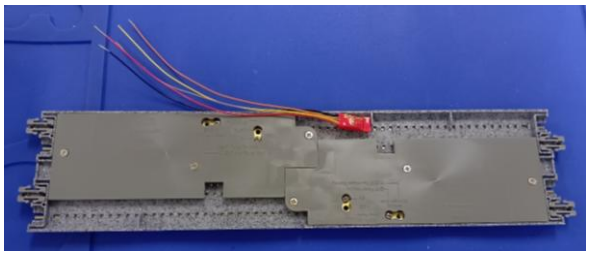
To allow the decoder to receive power from the track supply during operation, the turnout's **Power Routing** function **must be disabled**.

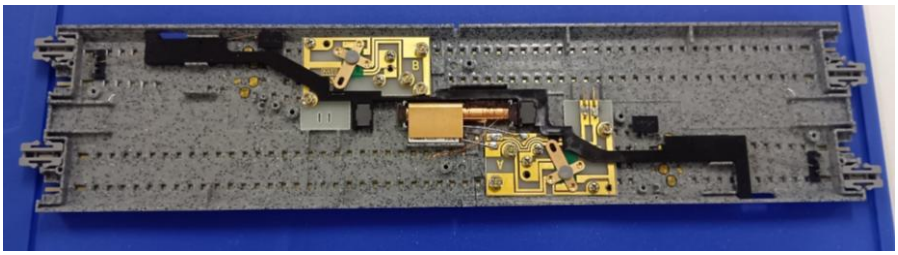
On the underside of the turnout, reposition the screws to the setting marked “**Non-Power Routing**”.

This setting should be completed before proceeding with decoder installation.

STEP 2: Installing the Decoder

① Place the turnout **upside down** on the work surface.
Open the two housing covers by **removing the six screws** with the Phillips screwdriver and carefully lift off the cover.





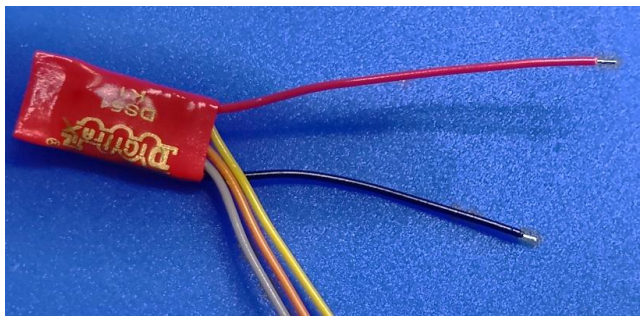
The decoder will be installed beneath the track bed, between the ballast shoulder and the housing cover.
It is important that the decoder is positioned **on the side with the functional connector socket**, so that the decoder wires do not interfere with the turnout drive mechanism.

② Once you have determined the desired position of the decoder, you need to **determine the correct wire lengths**.
Place the decoder in its intended position and route the wires to their respective connection points on the circuit boards.

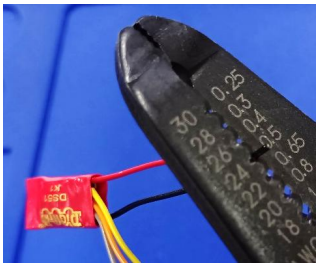
For this example, the following wire lengths are recommended:

Black: 32 mm **Red: 37 mm** **Orange: 45 mm** **Grey: 45 mm**

Avoid leaving the wires longer than necessary, as this can make installation more difficult.



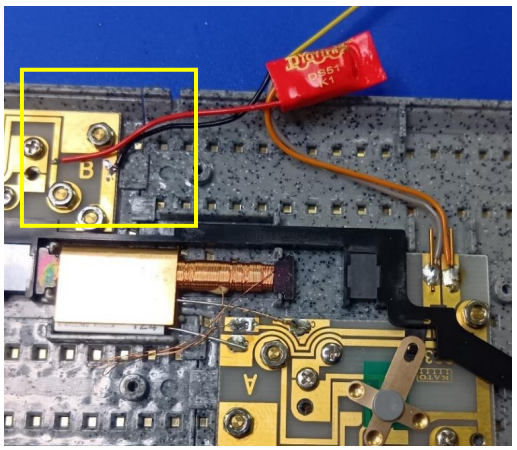
③ Strip **5 mm** of insulation from each wire.
If necessary, tin the wire ends to prevent stray strands.



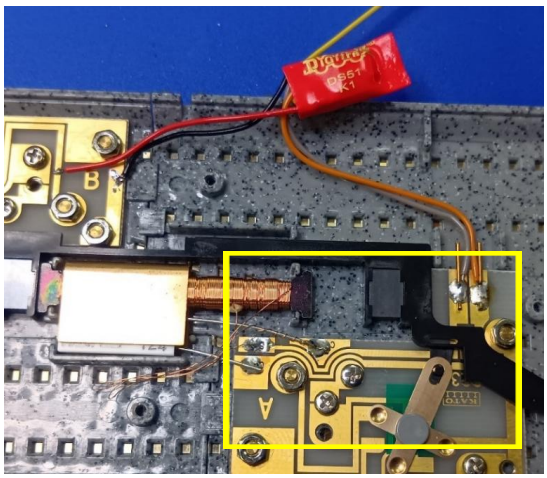
④ Both the **black and red wires** need to be soldered to the circuit board marked **“B”**.

Solder the wires to the two PCB tracks (copper tracks) located to the **left and right of the “B” marking**.

Red wire → left-hand track
Black wire → right-hand track



⑤ The **orange and grey wires** used to control the turnout motor need to be connected to the connector pins on the circuit board marked "**A**".



To do this, use the existing solder joints and solder the wires to the **same** connection points.

To ensure that the actual position of the switch rails matches the position displayed by your DCC command station, connect the

Grey wire to the **left-hand** PCB track
Orange wire to **the right-hand** PCB track

With this configuration, the turnout will be set to the straight route when the turnout status is "Closed", and to the diverging route when the turnout status is "Thrown".

(The yellow wire is used only for programming the turnout decoder and does not require a permanent connection. Route it so that it does not interfere with operation or make electrical contact with other components.)

STEP 2: Initial Function Test

An initial function test can now be carried out. **Please refer to p. 3**

STEP 3: Modifying the Housing Covers

The housing covers must now be modified to allow the wires to pass through.

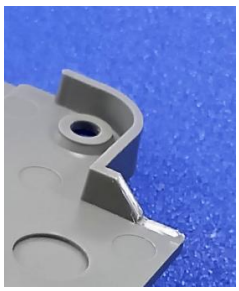
① On the cover above the connector socket, use side cutter to **remove the rib next to the pin opening**.

② Next, create an opening for the black and red wires. This is done by **trimming back the wall next to the ballast shoulder**, allowing the wires to pass between the ballast shoulder and the cover.

Using side cutters, remove approximately **2 mm** of material with two cuts.





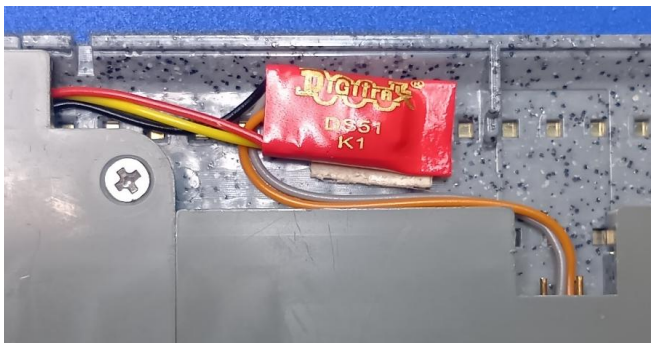


STEP 4: Reassembly

① **Refit** the housing covers and **secure** them with the screws.

Ensure that the wires are **routed** through the designated openings.

② **Secure the decoder** using a piece of double-sided adhesive tape.



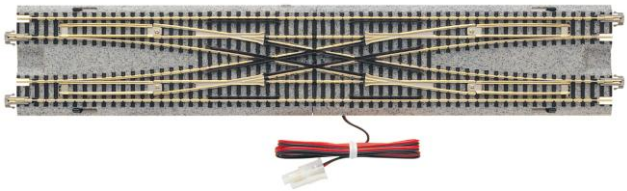
Make sure that the decoder does not protrude beyond the edge of the housing.

DCC Decoder Installation (DS52)
Double Crossover Track

The following guide explains the installation of the turnout decoder **DS52 turnout decoder (29-065)** into the **Double Crossover Track (29-065).**

The DS52 can control up to two turnouts independently. The decoder also provides sufficient power for operation of the double electric crossover, which comprises four turnouts in total.

WX310



20-210 Double Crossover Track

See the following instructions for two different procedures, considering the different requirements for **permanent** and **temporary** layouts.

Preparation

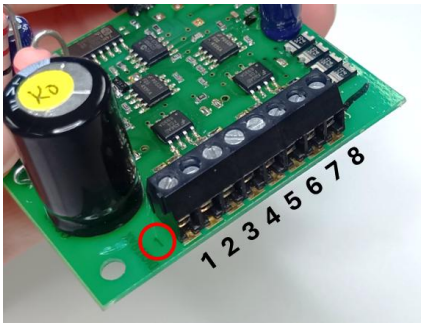
It is recommended to work on a flat surface to prevent individual parts and tools from rolling away.

Required Tools:
- Side cutters
- Slotted screwdriver (2mm)
- Wire stripper
- Soldering iron for tinning the cable ends (optional)

Installing the Decoder

The DS52 turnout decoder features screw terminals for connecting the turnout and track power. Since the double crossover track, like all KATO UNITRACK turnouts, has a connecting cable with a plug, this must first be prepared for connection.

Before connecting the wires, **please pay attention to the arrangement of the connection terminals** on the turnout decoder's circuit board.



Terminal	Connection
1	Black wire from turnout 1 switch motor
2	
3	Red wire from turnout 1 switch motor
4	Rail +
5	Rail -
6	Black wire from turnout 2 switch motor
7	
8	Red wire from turnout 2 switch motor

**For more detailed information on functions and settings, please refer to the decoder's operating instructions.*

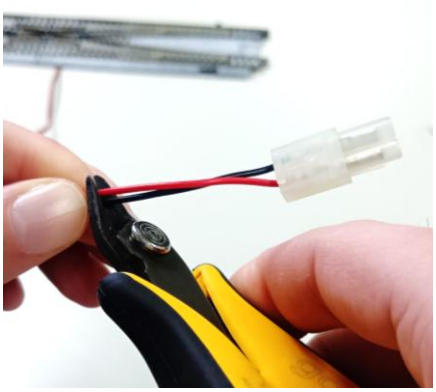
Note: Due to its size, this turnout decoder cannot be installed inside the turnout itself and is therefore connected via the switch machine's connection cable.

Permanent Layouts
For installation in a fixed layout, a permanent and reliable electrical connection is recommended. The procedure below achieves this by removing the plug from the double crossover's connection cable.

Note: Once modified, the turnout can no longer be used with KATO turnout control accessories.

STEP 1: Cutting the Turnout Cord

The turnout cord of the double crossover track must first be prepared for connection to the screw terminals of the DS52 decoder.



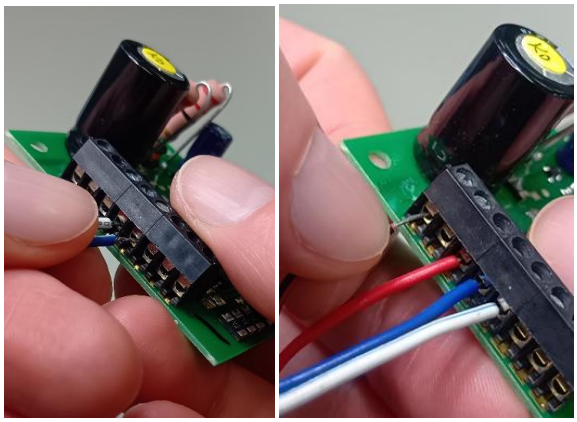
① Use side cutters to cut off the plug of the turnout cord.
If necessary, cut the cable to the required length.

② Split the end of the cable so that you have two separate strands.

③ Using the wire stripper, remove approximately 8mm (5/16”) of insulation from both wires.
Optional: Tin the wire ends to prevent stray strands.

STEP 2: Connecting the Decoder

The double crossover track can now be connected to the turnout decoder.



① For this example, the connections are as follows:
- Connect the **black** wire to screw terminal **1**.
- Connect the **red** wire to screw terminal **3**.

② Now connect the turnout decoder to the track power supply of your system:

- Connect the **blue** wire to terminal **4**.
- Connect the **white** wire to terminal **5**.

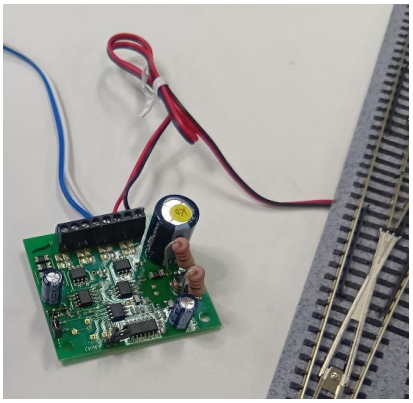
③ Close the screw terminals using the flathead screwdriver.

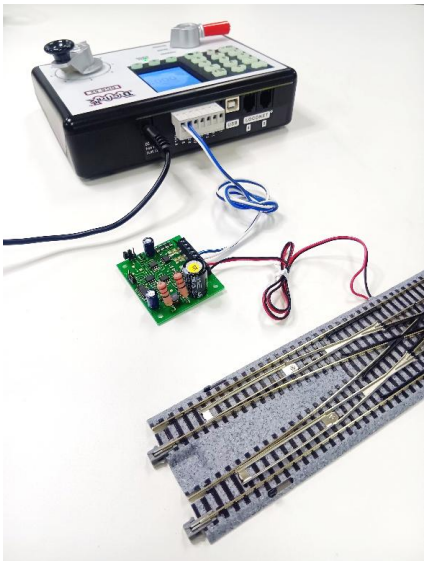
! Check for any protruding individual wires and remove them to prevent a short circuit.

STEP 3: Function Test

The decoder connection is now complete and ready for functional testing.

For instructions, **please see p. 16**





Temporary Layouts

For temporary installations, a reliable plug connection is created **using additional extension cords**, which can later be closed without tools during operation. For temporary installations, we recommend using the following:

28-930
5-Way Extension Cord 30cm (11 13/16”)

24-825
Adapter Cord 90cm (35”)

24-841
Turnout Extension Cord 90cm (35”)

STEP 1: Preparing the Accessory Cords

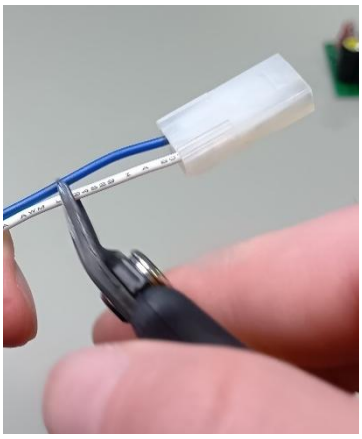
First, the two accessory cords must be prepared for connection to the screw terminals of the decoder.

① Cut the plug from the **Turnout Extension Cord** (**24-841**) and adjust to the required length if necessary.

② Cut the socket of the **Adapter Cord** (**24-825**).
Adjust to the required length.

③ Split the ends of both cables so that you have two separate strands each.

④ Using the wire stripper, remove approximately **8mm** (5/16”) of insulation from both wires.
Optional: Tin the wire ends to prevent stray strands.



STEP 2: Connecting the Decoder

Next step, the **Adapter Cord (24-825),** required for connection to the DCC base, is connected to the turnout decoder.

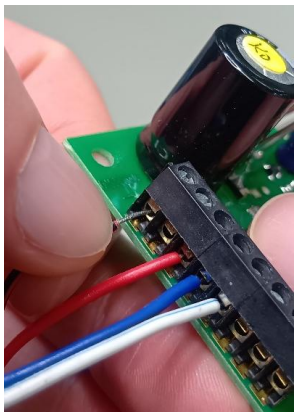
① Connect the wires of the **Adaptor Cord** (**28-825**) to the screw terminals of the decoder:

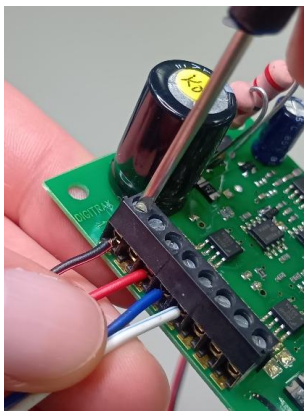
- Connect the **blue** wire to terminal **4**.
- Connect the **white** wire to terminal **5**.

② Connect the wires of the **Extension Cord** (**28-930**):

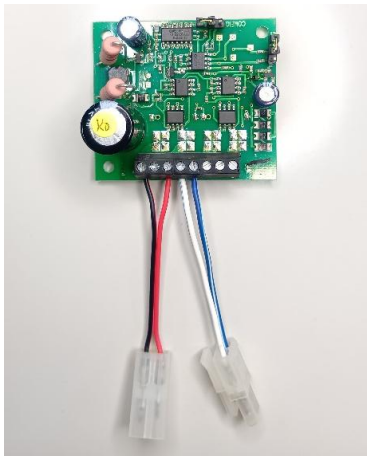
- Connect the **black** wire to terminal **1**.
- Connect the **red** wire to terminal **3**.

③ Close the screw terminals with the flathead screwdriver.





! Check for any protruding individual wires and remove them to prevent a short circuit.



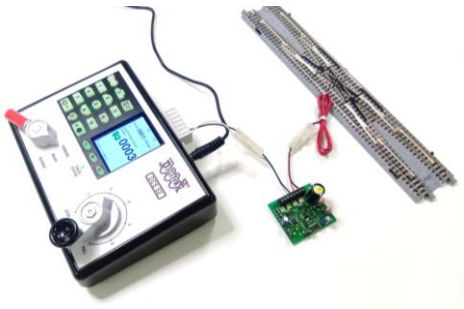
⑤ 9) Now connect the turnout decoder and the double crossover track by plugging together the connecting cable of the switch machine and the red-black cable of the turnout decoder.

⑥ Connect the turnout decoder to your DCC base by plugging the blue and white cable into the socket marked “RAIL”.

Function Test

You can now perform a functional test.
① Turn on the track power and change to the turnout control mode on your DCC base unit. By default, the left terminal of the decoder has **address 1**.

② Set address 1 and try to set the turnout. In the “closed” state, the turnout should now be set to straight ahead, and in the “thrown” state, it should be set to diverging.

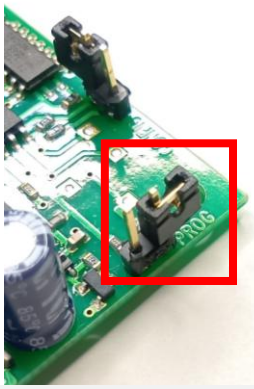


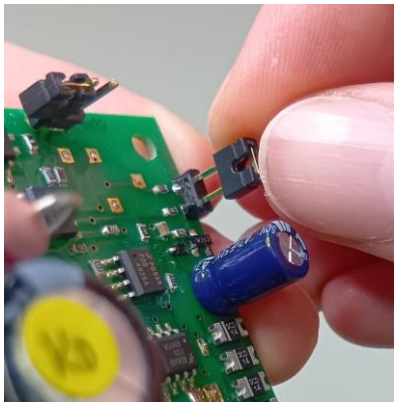
Changing the Decoder’s Address

To change the address, the decoder must first be put into programming mode.

① To do this, close the jumper labeled “PROG”.

② Now send two commands with the desired addresses for turnout terminals 1 and 2.





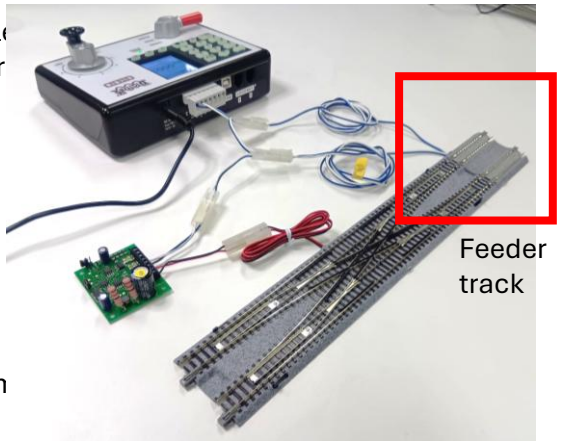
Note: The command for the second terminal must be sent within 16 seconds; otherwise, the decoder will select the next higher address for that terminal.
Opening the jumper exits programming mode.

Installing into the layout

After the functional test and assignment of the desired address, the double crossover track can be installed in the layout. When mounting the decoder avoid short circuits between the underside of the decoder and the mounting surface.

For DCC operation in permanent and temporary layouts, we recommend installing feeder tracks before and after the double crossover track, as otherwise the power routing function of the turnout would interrupt the track power.

For a temporary layout, we recommend using the 5-way splitter cable 30cn (28-930) to connect the turnout decoder to your DCC base. Use the remaining free sockets on the splitter cable to connect the additional feeder tracks.



The following configuration can be achieved using additional extension cables and feeder tracks. Since the crossover's "Power Routing" function cannot be disabled, the additional feeder tracks are required to ensure a continuous supply of track power to all sections of track.