

The DIGITAL plus LS150 turnout decoder provides cost effective turnout control for up to 6 independent turnouts.

- * Suitable for twin-coil snap action switch machines
- * Suitable for motorized switch machines
- * High current provision to support Peco and Atlas switch machines
- * The 6 turnout addresses can be sequential or up to 6 user selected addresses.
- * Control using separate push-buttons possible.
- * Configuring the LS150 does not require a separate programming track and the parameters can be changed at any time in the future even after installation.

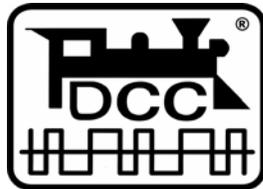
LS150

Turnout Decoder for up to 6 independent turnouts

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Digital

plus
by Lenz®



Submitted to the NMRA for
C&I testing

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Important advice, please read first!

The LS150 is a component of the *Digital plus by Lenz*[®] system and was submitted to intensive testing before delivery. Lenz Elektronik GmbH guarantees fault-free operation provided you follow the advice given below:

Any use other than that described in this operating manual is not permitted and all guarantees will become void if the LS150 is used inappropriately.

Connect the LS150 only to devices which are designated for such connection. This operating manual will inform you which devices are suitable.

Observe the technical data contained in this operating manual. Do not in any case exceed the values stated for voltage and power as this could damage the LS150.

Do not expose the LS150 to damp locations or direct sunlight.

Use of the LS150

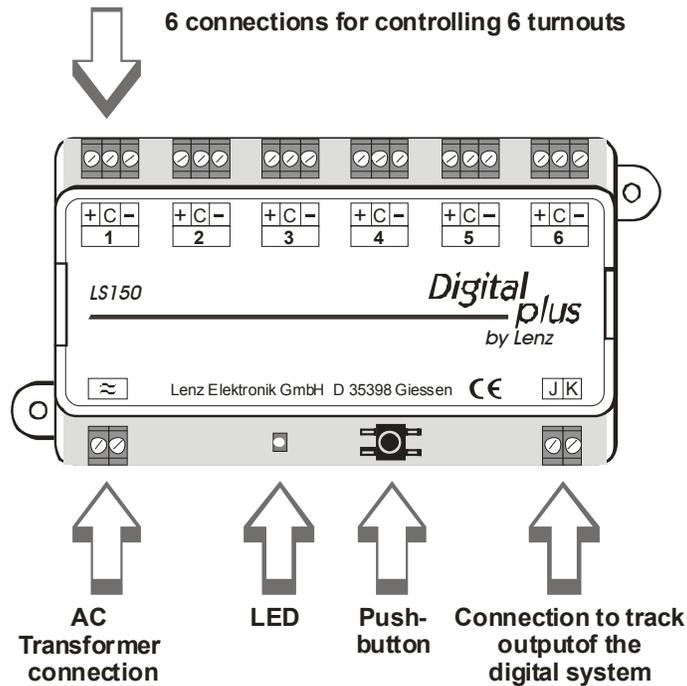
The LS150 is a turnout decoder for use in connection with the *Digital plus by Lenz*[®] or any other NMRA-DCC compliant system.

Turnout decoders are the connecting link between the digital system and the turnout switch machine. The LS150 can also be used to drive other layout devices that are driven by coils (for example switch machines, relays, uncouplers, semaphore signal drives etc.) on your model railway layout.

The LS150 was designed specifically for the connection of twin-coil machines and relays. Here, the AC output of the LS150 is particularly advantageous for switching twin-coil switch machines very reliably.

Motorized switch machines can also be connected to the LS150; this connection requires (depending on the drive used) the use of an additional 2 simple diodes per turnout.

Technical data



Range of addresses	1 - 1024
Max. voltage on AC input	16 V
Max. voltage on input J, K	24 V
Output voltage	approx. 1 V less than voltage on AC input
Max. power on outputs: up to 1 sec pulse duration more than 1 sec pulse duration	3 A 1 A
Pulse duration of outputs	settable from 0.1 to 10 sec
Minimum power consumption of output	10mA
Dimensions	120 x 60 x 20 mm

Outputs of the LS150

The LS150 has 6 outputs, which means that up to 6 devices (switch machines and/or semaphore signal drives, uncoupling

tracks etc.) can be connected to a LS150 and controlled individually.

Pulse Duration

Having received a turnout command for an output, this output will be switched on. It will remain so as long as the turnout command is being sent. Afterwards the output will remain switched on until the set pulse duration expires.

The pulse duration of the outputs can be set individually from 0.1 seconds to 10 seconds. This makes it possible to adjust the pulse duration to the needs of the switch machine used. A pulse of 0.1 seconds is adequate for a normal twin-coil snap action switch machine while a pulse duration of 3-4 seconds is normally needed for a slow motion switch machine.

Overload protection

The outputs have a joint protection mechanism against overload. If the permissible maximum power is exceeded, the LS150 will switch off the terminal ("+" or "-" of an output) which experienced the short-circuit. You can tell that a blocked status is existent by the fact that the LED does not shine although a command was received for this output. The corresponding terminal and all other outputs still function! The short-circuited terminal can only be reactivated by switching of the AC power supply.

Voltage on the outputs

AC voltage is applied to the outputs; this is a particularly advantageous form of voltage for the use of the LS150 with twin-coil switch machines and semaphore signal drives as well as relays.

For technical reasons, the device connected to the output must have a power consumption of at least 10mA.. This is not a problem with almost all customary switch machines used for model railroads. If in doubt, please contact the manufacturer.



Power and DCC signal Inputs of the LS150

The LS150 is supplied with power via the AC input (\approx). Use a suitable transformer – we recommend the **Atlas Generator**.

Warning: AC voltage must be used to supply power to the LS150. Do not use a DC supply as this can damage the LS150.

The power of the transformer used must not exceed 45VA in order to guarantee the proper operation of the short circuit load protection.

If you desire to use a transformer with a higher amperage you must protect the LS150s with a 10 ohm resistor (Radio shack part #271-1101)

The track outputs of a digital system (J,K for *Digital plus by Lenz*® systems) must not be used to supply the LS150 with power!



The LS150 receives its commands to activate a turnout from the NMRA-DCC digital system track outputs connected to the LS150's **J** and **K** inputs.

Connecting the LS150

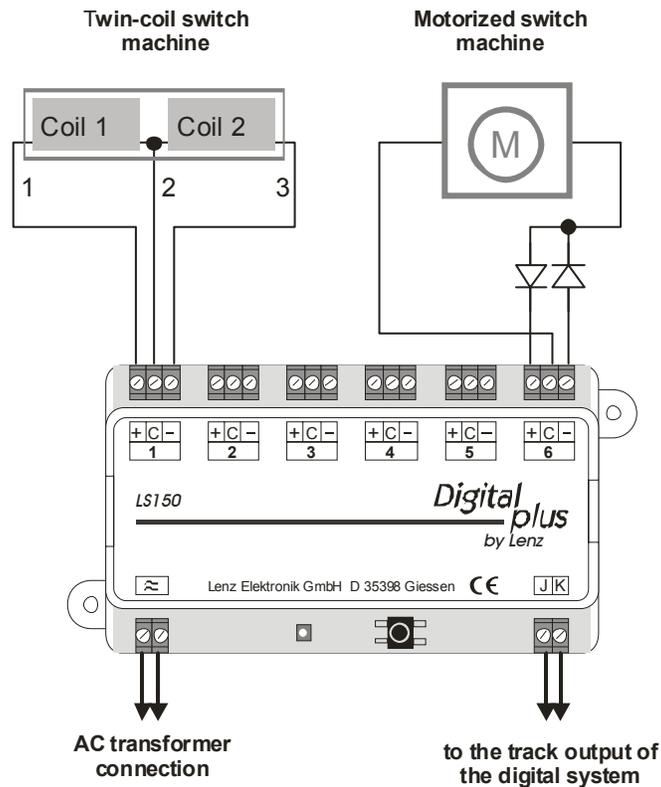


Figure 1

Connection to the AC power supply

Please see Figure 1 (Page 7), bottom left:

Connect the terminals (≈) to the terminals of an AC transformer. Observe the maximum permissible voltage (see Technical data). The power of the transformer must not exceed 45VA in order to guarantee a functioning load protection. We recommend the use of the **Atlas Generator**.

If you desire to use a transformer with a amperage that is greater then 45VA, you must protect the LS150s with a 10 ohm resistor current limiting resistor. (Radio shack part #271-1101).



Connection to the NMRA DCC digital system

Please see Figure 1 (Page 7), bottom right:

Connect the terminals **J, K** with the track output of the digital system. In the *Digital plus by Lenz*® system the track output is also marked with J and K.

Connecting twin-coil switch machines

Please see Figure 1 (Page 7), top left:

Twin-coil switch machines have three connections. The common connection of the two coils (2) is connected to terminal 'C'. The cable of coil 1 (1) is connected to terminal '+'; the cable of coil 2 (3) to terminal '-'.

Depending on the switch machine used, when the output '+' is activated this results in the switch is set to the 'branch' or for "straight". If the action is opposite to what you desire, simply swap the connections at the terminals '+' and '-'.

The following table contains common colour coding of some manufacturers, with reference to the numbering of the cables in Figure 1. Please use the operating manual of the drive used to verify whether cable colours have been changed!

Cable no.:	1	2	3
ROCO	red	black	green
Arnold	blue	grey	purple
Fleischmann	beige	black	brown
Trix	yellow	black	green
Märklin	blue	yellow	blue
Viessmann semaphore signal	green	brown	red

When using twin-coil switch machines without auto-shutoff, extending the pulse duration (see Section "Setting individual addresses and pulse duration") beyond the factory default setting is only necessary if the drive does not throw the turnout completely despite functioning properly. Keep in mind that an extension of the pulse duration can lead to the switch machine warming up and is set excessively long, a twin-coil switch machine can be damaged.

Connecting motorized switch machines

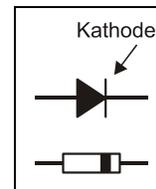
Please see Figure 1 (Page 7), top right:

Motorized drives (such as Kato Unitrak, and Circuitron Tortoise) normally require DC voltage for operation. By reversing this DC voltage, the direction of rotation of the motor is changed and thus the turnout is set to a different position.

In order to be able to turnout drives like those described with the LS150, you need to add 2 simple rectifier diodes. Connect the switch machine as shown in Figure 1 (Page 7).

The type of diodes you can use depends on the power consumption of the switch machine. Normally diodes of the type 1N4001 should be sufficient. (Radio Shack part # 276-1101)

The position of the cathode can be seen by the ring on the diode.



You may have to extend the pulse duration of the output used for motorized switch machines to fully move the points to the respective end position, For more detailed information, please refer to the Section "Setting individual addresses and pulse duration".

The use of the LA010 adapter is not required for the operation of motorized drives. Moreover, this adapter must not be connected to the LS150!



The motorized point drive from the company Pilz is connected exactly like a double-coil point drive; no additional diodes are required:

Connection to LS150:	+	C	-
Cable colours Pilz drive:	pink	red	yellow

Connecting a separate push-button to the LS150

It is possible to control the turnouts connected to the LS150 via separate push-buttons (or REED contacts). The point or signal drive used should have auto-shutoff to avoid damage to the switch machine should the push button be held down for too long a time. Wire the push-buttons and/or Reed contacts in accordance with Figure 2:

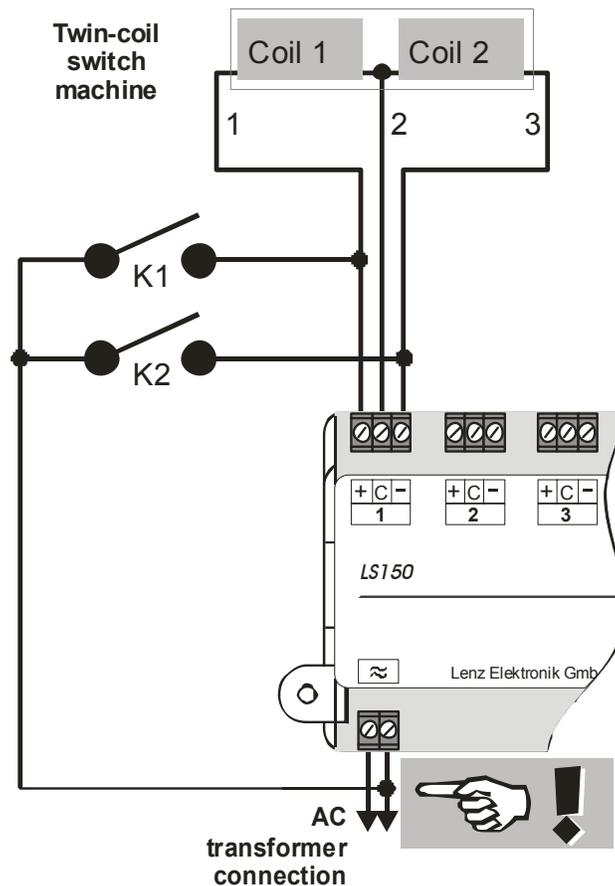


Figure 2

The figure shows a typical twin-coil switch machine. The two coils are connected to the terminals + and - of an output of the LS150.

Two push-buttons K1 and K2 are connected as shown. When connecting the push-buttons, make sure that the common connection of the push-buttons is connected to the AC terminal on

the *right* (marked with  in Figure 2) otherwise the turnout will not function properly!

Press push-button K1 to activate coil 1 and press push-button K2 to activate coil 2. This way you can control the turnout both digitally with the LS150 or manually with the push-buttons K1 and K2.

Only use voltage-free contacts for this procedure, e.g. Reed contacts! The ROCO track 42518 is also suitable.

Note: The C terminals of different LS150s may not be connected to each another!



Controlling the outputs

The LS150 will only activate one output at a time. Incoming turnout commands are stored until they can be processed. If the same LS150 receives several turnout commands in a row, which cannot be processed simultaneously due to the pulse duration set, the corresponding outputs are activated in the order received. This feature is ideal for setting routes.

Setting the address

The LS150 decoder is set at the factory for control of turnout addresses 1 through 6.

There are two different ways of setting the addresses of the outputs:

1. Set output 1 to the desired address; the remaining outputs are automatically set to the 5 following addresses.
2. Set each output to an individual address; the addresses of the outputs need not be sequential.

In order to be able to set addresses, the LS150 must be connected to a power supply (AC voltage input \approx) and to the DCC track signal (inputs J,K). You do not need switch machines connected to the LS150 to set its addresses. You can also set the addresses of the LS150 when the installation is completed. This is helpful if you wish to change addresses later or wish to reuse the LS150 on a different model railway.

Setting outputs with sequential addresses

Connect the LS150 to both the AC voltage supply and track output as described in the Section "Connecting the LS150" (Page 7). Then turnout on your DCC system (such as your *Digital plus by Lenz*® system.)

1. Choose the turnout address which you wish to set the first output of the LS150 to.
2. Press the push-button on the LS150 and keep it down until the LED shines continuously (this will take approx. 3 sec.). Release the push-button. The LED remains turned on and the LS150 changes from the normal operating mode into the setting mode. Output 1 of the LS150 will now assume the address of the first turnout command it receives.
3. Proceed as if you wanted to activate the switch machine of the selected turnout address by pressing the necessary keys on your NMRA DCC system. It does not matter whether you press the key to switch the turnout for "divergent" or "straight", e.g. when using the LH100, use the keys '+' or '-'.
4. The point address received with the turnout command is now allocated to output 1 of the LS150. Outputs 2 to 6 are automatically set to the following turnout addresses.

You can tell that the setting was effected when the LED turns off and the turnout command is carried out, i.e. the corresponding

switch machine (if connected) is activated. The LS150 now returns to the normal operating mode.

Setting individual addresses and pulse durations of outputs

Use the following procedure to set individual outputs to unique addresses. The address of each output does not necessarily have to be sequential. You can also set a unique pulse duration for each output.

Connect the LS150 to both the AC voltage supply and track output as described in the Section "Connecting the LS150" (Page 7). Then turnout on your *Digital plus by Lenz*® system.

Complete the following steps to set the address and pulse duration of an output.

1. Press the push-button on the LS150 and keep it down until the LED shines continuously (this will take approx. 3 sec.). Release the key. **The LED remains turned on.**
2. Press the key again for a short moment. **The LED starts to blink:**
 - 1 blink, break: output 1 is selected,
 - 2 blinks, break: output 2 is selected etc.If you only want to set the pulse duration of an output and not its address, press the key again and proceed with step 4.
3. Select the switch machine address of the digital system to which you want to set the selected output. Proceed as if you wanted to activate the turnout and press the corresponding key of the digital system¹. The selected output will take this address as its new address.
4. **The LED starts to flash.**
5. You can now set the pulse duration of the output. If you do not want to do this, press the key again for a short moment and proceed with step 6.

Select a switch machine address between 1 and 100 on the digital system, depending on the desired pulse duration. Address 1 stands for 0.1 sec, address 100 for 10 sec. Proceed as if you wanted to activate the turnout at that address. The LS150 will use the switch machine address received as the pulse duration.
6. **The LED will start to blink again as described in step 2.**

You can now set the address and pulse duration of the

¹ For more information about controlling turnouts using your digital system, refer to the corresponding operating manuals of your NMRA DCC system.

second output. To set this output, go back to step 3.

Repeat this procedure for all outputs of the LS150.

To complete the setting process at any time, press and hold the push-button until the LED turns off.

If you want to skip a certain setting, simply press the key again and the LS150 will proceed to the next step. This also makes it possible to set a single output separately.

If you want to stop the setting procedure at any given time, press the push-button until the LED turns off.

Note: If the address of an output is reset, the pulse duration set during a previous setting procedure will remain unchanged.



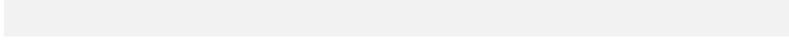
Resetting the decoder

To reset the decoder to its factory defaults setting, proceed as follows:

1. Interrupt the AC voltage supply to the LS150 (You can turn off the transformer to accomplish this step).
2. Press the push-button on the LS150 and keep it pressed down.
3. Turn on the AC voltage that is connected to the LS150s terminals.
4. Proceed as if you wanted to activate a turnout controlled by the LS150 and press the corresponding key of the digital system to activate one of the LS150s outputs.
5. Release the push-button.

The LS150 is now reset to the point addresses 1 – 6 and the shortest pulse duration (100ms). After being reset, the LS150 decoder will complete a test during where each output is activated one after another. If switch machines are connected to the LS150, these will be each be activated briefly one after the other.

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North American Warranty

Lenz GmbH does everything it can do to ensure that its products are free from defects and will operate for the life of your model railroad equipment. From time to time even the best engineered products fail either due to a faulty part or from accidental mistakes in installation. To protect your investment in Digital plus products, Lenz GmbH offers a very aggressive 10 year Limited Warranty.

This warranty is not valid if the user has altered, intentionally misused the Digital Plus product, or removed the product's protection, for example the heat shrink from decoders and other devices. In this case a service charge will be applied for all repairs or replacements. Should the user desire to alter a Digital Plus Product, they should contact Lenz GmbH for prior authorization.

Year One: A full repair or replacement will be provided to the original purchaser for any item that that has failed due to manufacturer defects or failures caused by accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay for shipping to an authorized Lenz GmbH warranty center.

Year 2 and 3: A full replacement for any item will be provided that has failed due to manufacturer defects. If the failure was caused by accidental user installation or use, a minimal service charge may be imposed. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

Year 4-10: A minimal service charge will be placed on each item that has failed due to manufacturer defects and/or accidental user installation problems. Should the item no longer be produced and the item is not repairable, a similar item will be substituted at the manufacturer's discretion. The user must pay shipping to and from the authorized Lenz GmbH warranty center during this portion of the warranty period.

Please contact your dealer or authorized Lenz GmbH warranty center for specific instructions and current service charges prior to returning any equipment for repair.

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This equipment complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE Please save this manual for future reference!

Warning: This product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm

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