Littfinski **D**aten**T**echnik (**LDT**)

Assembly Instruction

4-fold switch decoder

from the *Digital-Professional-Series* !

SA-DEC-4-MM-B Part-No.: 210311

(With possible external power supply)

>> kit <<

Suitable for the Märklin-Motorola-Format:

(e.g. **Märklin-Digital**~ [**Control Unit**, **Central Station 1** und **2**], **Intellibox**, **EasyControl**, **ECoS**, **KeyCom-MM**, **DiCoStation**, **EDiTS**, **EDiTS pro** and others)

For the digital control of:

⇒ **consumers of up to 4 Ampere on each output** (e.g. illumination, disconnection of track sections from power).

⇒ **jammed turnout- and signal drives** (drives with integrated end switch).

This product is not a toy! Not suitable for children under 14 years of age!
The kit contains small parts, which should be kept away from children under 3! Improper use will imply danger of injuring due to sharp edges and tips! Please store this instruction carefully.

CE Part-No.:
21 21 30
red point

4 038264 023066

Introduction:

You have purchased the 4 fold switch decoder kit **SA-DEC-4** for your model railway supplied within the assortment of **L**ittfinski **D**aten**T**echnik (**LDT**). The **SA-DEC-4** kit is a high quality product which is easy to assemble.

We are wishing you having a good time for assembling and application of this product.

General:

Tools required for the assembly

Please assure that the following tools are available:
- a small side cutter
- a mini soldering iron with a small tip
- solder tin (if possible 0,5mm diameter)

Safety Instructions

- All electrical and electronic components included in this kit shall be used on low voltage only by using a tested and approved voltage transducer (transformer). All components are sensitive to heat. During soldering the heat shall be applied for a very short period only.
- The soldering iron develops a heat up to 400°C. Please keep continual attention to this tool. Keep sufficient distance to combustible material. Use a heat resistant pad for this work.
- This kit consist of small parts which can possibly be swallowed from children. Children (especially under 3 years) shall not participate on the assembly without supervision.

Set-Up:

For the board assembly please follow exact the sequence of the below **assembly list**. Cross each line off as **done** after completing the insertion and the soldering of the respective part.

For the **diodes** and **zener diodes** please keep special attention to the correct polarity (marked line for the cathode).The **zener diode D4** has a **thicker connection wire** suitable for **position D4** only.

With reason to different makes of **electrolytic capacitors** you will find different markings of the polarity. Some are marked with "+" and some are marked with "-". Each capacitor has to be assembled to the board that the marking on the capacitor is in correspondence with the marking on the pc-board.

**Integrated circuits (IC`s)** are either marked with a half round notch on one end or a printed point for the correct mounting position. Push the IC`s into the socket assuring that the notch or the point is corresponding with the triangular marking on the pc-board.

Please attend to the sensitivity of the **IC`s** to **electrostatic discharge** which will cause immediate damage of the IC. Before touching those components please discharge yourself by contacting an earthed metal (for example an earthed radiator) or work with an electrostatic safety pad.

Please attend to the mark "+" of the **rectifiers.** Some manufacturers mark the "+" connections additionally with a longer connection wire. If the rectifier shows as marking a flattened side this side has to correspond with the marking on the pc-board.

The **relays** are marked with a thick line on one side. This line has to correspond to the marking on the pc-Board.

Assembly List:

Pos.	Qty.	Component	Remarks	Ref.	Done
1	1	Printed circuit board			
2	1	Z-Diode BZX ... 5V1	attend to the polarity!	D1	
3	2	Diodes 1N4148	attend to the polarity!	D2, D3	
4	1	Z-Diode BZX ... 30	attend to the polarity!	D4	
5	4	Resistors 1,5kOhm	brown-green-black-brown	R1..R4	
6	1	Resistor 18kOhm	brown-grey-black-red	R5	
7	1	Resistor 220kOhm	red-red-black-orange	R6	
8	1	Resostor 1MOhm	brown-black-black-yellow	R7	
9	1	Resistor 470Ohm	yellow-violet-black-black	R9	
10	3	Capacitors 100nF	100nF = 104	C3..C5	
11	2	IC-Sockets 18poles		IC1, IC3	
12	1	IC-Socket 8poles		IC4	
13	1	IC-Socket 6poles		IC5	
14	1	Resonator		CR1	
15	1	Electrolytic-cap. 100uF/25V	attend to the polarity!	C6	
16	1	Electrolytic-cap. 220uF/35V	attend to the polarity!	C7	
17	1	Rectifier	attend to the polarity!	GL1	
18	1	Push Button		S1	
19	4	Relays	attend to the position!	REL1..4	
20	2	Clamps 2poles		KL1, KL2	
21	4	Clamps 3poles		KL3..KL6	
22	1	IC: Z86E0412PSC	attend to the polarity!	IC1	
23	1	IC: ULN2803A	attend to the polarity!	IC3	
24	1	IC: 93C06 or 93C46	attend to the polarity!	IC4	
25	1	IC: 4N25 or CNY17	attend to the polarity!	IC5	
			Final control		

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Internet: http://www.**ldt-infocenter**.com

Soldering instruction

Provided you have no special experience in soldering electronic components please read first this soldering instruction before starting the job. Soldering has to be trained!

1. Never use additional fluxes for soldering electronic circuits which contain acids (e.g. zinc chloride or ammonium chloride). Those can destroy components and printed circuits when not washed off completely.
2. As soldering material only lead free soldering tin with a rosin core for fluxing should be used.
3. Use a small soldering iron with max 30 Watt heating power. The solder tip shall be free from scale to assure an excellent heat transfer to the area to be soldered.
4. The soldering shall be performed on a speedy way because a long heat transfer can destroy the components. To much or to long heating can take off the copper pads and copper tracks from the board.
5. For a good soldering a well tinned solder-tip has to be brought in contact to the copper-pad and the component wire at the same time. Simultaneous a little solder-tin shall be applied for heating up. As soon as the solder-tin starts melting the tin wire has to be taken away. Just wait until the tin has well wetted the pad and the wire and take the soldering iron away from the soldering area.
6. Make sure not to move the just soldered component for about 5 seconds after removing the soldering iron. This should create a silver shining faultless soldering joint.
7. For a faultless soldering joint and well done soldering is a clean non-oxidized soldering-tip absolutely required. It is not possible to perform a sufficient soldering joint with a dirty soldering tip. Therefore please clean the soldering tip from excessive solder-tin and dirt by using a wet sponge or a silicone cleaning pad after each soldering process.
8. After completion of the soldering all connection wires have to be cutted off directly above the soldering joint by using a side cutter.
9. By soldering semiconductors (transistors, diodes), LED`s and IC`s is it very important never to exceed the soldering time of 5 seconds to prevent the destruction of the component. It is absolutely required to attend to the correct polarity of the component before starting the soldering process.
10. After the board assembly carefully control the pc-board about correct insertion of the components and the correct polarity. Please check if no connections or copper tracks are accidentally short circuited by soldering tin. This can not only result to malfunction of the module but also result to a destruction of expensive components.
11. Please take into account that improper soldering joints, wrong connections, faulty operation or wrong board assembly is not a matter within our sphere of influence.

General installation information

The contact-wires of resistors and diodes to be assembled in a lying position shall be bended in accordance to the raster distance into a right angular position and assembled into the specified bores (in accordance to the board assembly plan or the assembly markings). To prevent that the components will not fall out by turn-over the pc-board please bend the connection wires about 45° apart and solder them carefully to the copper pads on the rear side of the board. Finally the excessive wires shall be cutted off with a small side cutter.

The resistors in the supplied kits are metal-foil resistors. Those have a tolerance of 1% and are marked with a brown “tolerance-ring”. The tolerance ring can be identified by the larger margin distance respectively the larger distance to the other four marking rings. Normally there are five color rings on the metal-foil resistors. To read the color code you have to locate the resistor that way that the brown tolerance ring will be on the right side. The color rings will be red now from left to right!

Please take care to assemble diodes with the correct polarity (position of the cathode marking). Take care about a very short soldering time! The same will apply to the transistors and the integrated circuits (IC`s). The flat side of the transistors has to correspond with the marking on the pc-board.

The transistor legs should never be assembled in a crossed position. Further those components should have a distance of about 5mm to the board. Attend to the short soldering time to prevent the damage of the component by excessive heat.

Capacitors shall be assembled into the respective marked bores, the wires to be bent a little apart and careful soldered to the copper pad. By the assembly of electrolytic capacitors (electrolytic cap) it has to be attended to the correct polarity (+,-)! **Wrong-way soldered electrolytic capacitors can explode during the application!** Therefore is it very important to check the correct polarity two- or even better three-times. In addition it has to be attended to the correct capacitor values, e.g. n10 = 100pF (not 10nF!).

A careful and clean assembly will drastically reduce the possibility that anything will not be in correct function. Check every step and every soldering joint two times before carrying on! Attend closely to the assembly list! Perform the described step not different and do not skip any step! Mark each step as done at the foreseen column after assembly and careful check.

Take your time. Private work is no piece-work because the time for careful assembly work is much less than an extensive fault diagnosis.

Final assembly

Sockets and integrated circuits (IC´s) of the kits will be supplied on a piece of foam to assure safe transport.
This foam shall never be used below or between components as this foam is electrical conductive.

In case the kit will be taken into operation the conductive foam can produce a short circuitry and destroy the complete kit. Anyhow the function of the module will not be as expected.

Warranty

As we have no influence to the proper and correct assembly we have to limit our warranty to the complete supply and the faultless quality of the components.

We guarantee the function of the components in accordance to the identified values within a non-assembled condition of the parts and the compliance of the technical data of the circuit by attending to the respective soldering instruction and the specified start of operation of the module including connection and operation.

Further demands are not accepted.

We are not taking over any warranty nor any liability for any harm or sequential damage connected to this product.

We reserve our right for a repair, rework, supply of replacement or refund of the purchase price.

The following criteria will result to a non-repair respectively to a lost of right to claim under guarantee:

- if acid-containing soldering tin or fluxes with corrosive content and others have been used
- if the kit has been improper soldered or assembled
- by alterations or repair-trials on the device
- by own circuit amendments
- by construction of non-intended improper displacement of components, free wiring of components etc.
- application of other non-original kit-components
- by damaging of copper tracks or soldering copper pads on the board
- by wrong assembly and the sub sequential damages
- overloading the module
- by damages caused by intervention of foreign persons
- by damages caused by disregarding the operation manual respectively the connection plan
- by connecting a wrong voltage respectively a wrong current
- by wrong polarity connection of the module
- by wrong operation or damages caused by negligent usage or abuse
- by defects caused by bridged or wrong fuses.

All such cases will result to a return of the kit to your expenses.

Littfinski **D**aten**T**echnik (**LDT**)

Operating Instruction

4-fold switch decoder

from the *Digital-Professional-Series* !

SA-DEC-4-MM-F Part-No.: 210312

(With possible external power supply)

>> finished module <<

Compatible to Märklin-Motorola-Format:

(e.g. **Märklin-Digital**~ [**Control Unit**, **Central Station 1** und **2**], **Intellibox**, **EasyControl**, **ECoS**, **KeyCom-MM**, **DiCoStation**, **EDiTS**, **EDiTS pro** and others)

For digital control of:

⇒ **consumers up to 4 Ampere on each output**
(e.g. illumination, disconnection of track sections from power).

⇒ **jammed turnout- and signal drives**
(drives with integrated end switch).

This product is not a toy! Not suitable for children under 14 years of age!
The kit contains small parts, which should be kept away from children under 3! Improper use will imply danger of injuring due to sharp edges and tips! Please store this instruction carefully.

CE Part-No.:
21 21 48
red point

4 038264 023073

Introduction/Safety instruction:

You have purchased the 4-fold switch decoder **SA-DEC-4** for your model railway as a kit or as finished module.
The **SA-DEC-4** is a high quality product that is supplied within assortment of **L**ittfinski **D**aten**T**echnik (**LDT**).

We wish you having a good time using this product.

The switch decoder **SA-DEC-4** of the ***Digital-Professional-Series*** can be easily installed and used on your digital railway.

The **colored point** on the **receiver device** indicates to which digital system the decoder can be adapted.

In case the **receiver device** is marked **red** the decoder is suitable for **Märklin-Digital~** respectively for **Märklin-Motorola** layouts.

In case the **receiver device** is marked **yellow** the **SA-DEC-4** will be suitable for the **DCC Data format,** used for instance at the systems of **Lenz-Digital Plus, Arnold-, Märklin-Digital=, Intellibox, TWIN-CENTER, Roco-Digital, EasyControl, ECoS, KeyCom-DC, Digitrax, DiCoStation** and **Zimo**.

The decoder **SA-DEC-4** is **multi digital** and can be installed to the **Intellibox** without any problems.

The finished module comes with **24 month warranty**.

- Please read the following instructions carefully. Warranty will expire due to damages caused by disregarding the operating instructions. **LDT** will also be not liable for any consequential damages caused by improper use or installation.

Connecting the decoder to your digital model railway layout:

- **Attention: Before starting the installation switch off the drive voltage by pushing the stop button from the command station or disconnect the main supply.**

The decoder receives the **digital information** via the clamp **KL2**. Connect the clamp with a rail or even better connect the clamp directly to the command station or to a booster assuring supply of digital information free from any interference.

Pay attention to the mark at clamp **KL2.** The color markings '**Black/Schwarz**' and **'Red/Rot'** next to the clamp are used for **Arnold-Digital (old)** and **Märklin-Digital= .**

Other systems are using the letters '**J**' and '**K**'.

If you use the decoder for a **Märklin-Digital~** respectively **Märklin-Motorola** installation please attend to the colors marks **'red/rot'** and **'brown/braun'**.

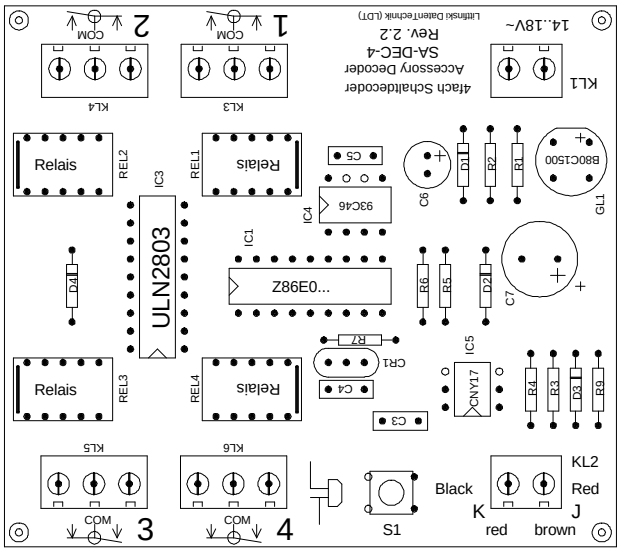
The decoder receives the **power supply** via clamp **KL1.** Voltage in the range of 14 to 18V~ is acceptable (alternate current output of a model railway transformer).

If you **do not** want to supply power to the decoder **SA-DEC-4** from an **external transformer** you can connect the clamp **KL1 to KL2 with two wires**. In this case the decoder will get the power supply **complete** from the **digital system**.

Now connect the consumers (e.g. illumination, motors or turnout- and signal coils) to the outputs 1 to 4. The contact marked **'COM'** is the common connection for the bistable relay.

Programming the decoder address:

For programming the decoder address you have to connect a consumer to the output 1. As it is possible to hear the switching of the bistable relay the connection of a consumer is not mandatory.



- Switch on the power supply of your model rail way.
- Depress the programming key S1. Do not touch the integrated circuits of the pc-board because any electrostatic discharge can destroy the IC`s.
- The relay connected to output 1 will now switch automatically every 1,5 seconds. This indicates that the decoder is in the programming mode.

- Depress now one key of the group which you want to assign to the decoder. For programming the decoder address you can also release a turnout switch signal via a personal computer.

  Remarks: The decoder addresses for magnet accessories are combined in groups of four. The address 1 to 4 build the first group. The address 5 to 8 build the second group etc. Each **SA-DEC-4** decoder can be assigned to any of these groups. Which of the 4 turnouts of a group will be activated for the addressing does not matter.
- If the decoder has recognized the assignment correctly the relay will move a little faster. Afterwards the movement slows down to the initial 1,5 seconds interval again.
- In case the decoder will not recognize the address it could be that the two digital information connections (clamp 2) are wrong connected. For testing this, switch off the system exchange the connection on KL2 and start the programming again.
- Leave the programming mode by depressing the programming key S1 again. The decoder address is now permanently stored but can be changed at any time by repeating the programming as described above.
- If you depress the first key of the programmed group of keys or you send a switch signal for this turnout from a PC the addressed bistable relay should now switch the connected consumer on or off.

Please attend to the following:

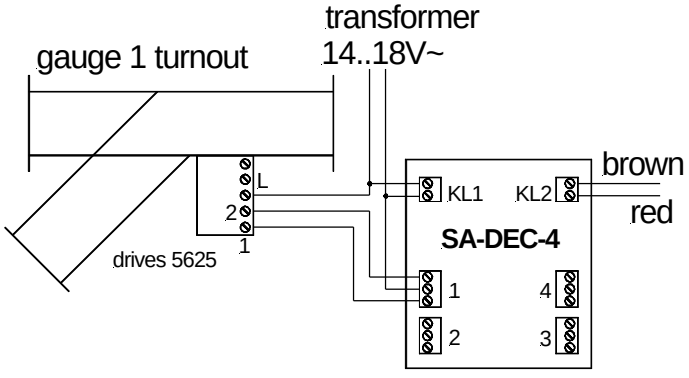
- All 4 **outputs** can switch consumers with up to **4 Ampere**.

Decoder application:

Besides the switching of illumination and motors there is an excellent application for the decoder **SA-DEC-4** of digital switching the **Märklin gauge 1** drives (e.g. 5625).

As an advantage large current consuming drives will not unnecessary overload the expensive digital power supply.

The following draft shows the wiring.



Feed the **SA-DEC-4** via **KL1** witch **AC** from the **model railway transformer**. Further connect one cable of the transformer with clamp **'L'** at the turnout drive. Connect the second cable of the transformer with the clamp marked with **'COM'** on the respective decoder output.

Now, connect the two remaining clamps of the decoder output with the outputs **1** and **2** of the turnout drive.

Further examples can be found on the **web-Site** (www.**ldt-infocenter**.com) in the **download** section.

A solid **low cost housing** is available for the decoder **SA-DEC-4**. Please consult our Web-Site for further details.

Trouble shooting:

What to do if something is not working as described above?

If you have purchased the decoder as a kit, please carefully check all parts and soldered joints.

Here some possible functional errors and possible solutions:

1. During **programming of the decoder addresses** the relay on output moves within 1,5 seconds, but does not **confirm** the programming with **faster movement** by **depressing any key**.
- **Change cable** connections at **KL2**.
- **Interfered digital information** at **KL2** respectively **lost of voltage** at the **tracks!** Connect the decoder directly with cables to the digital control unit or to the booster instead to the tracks.
- Eventually the **clamps** have been **tightened to strong** and therefore the clamps got **loose at the soldering** to the pc board. **Check** the **soldering connection of the clamps** at the lower side of the pc-board and re-solder them if required.
- **For kits:** Is IC5 correct inserted into the socket? Value of R6 actually 220kOhm or mixed up with R5 18kOhm?

2. The **programming of the decoder address** functions as described, nevertheless the **connected consumers** will **not be activated.**
- **Interfered digital information** on **KL2** respectively larger **lost of voltage** at the **tracks** result to unsafe data transfer! Connect the decoder directly with cables to the command station or the booster.
- **For kits:** Is IC4 correct inserted into the socket?

Further products within the ***Digital-Professional-Series*:**

S-DEC-4
4-fold turnout decoder for 4 magnet accessories with free programmable decoder addresses and possible external power supply.

M-DEC
4-fold decoder for motor driven turnouts. For motors up to 1A. With free programmable decoder addresses. Drives can be connected directly with the decoder output.

LS-DEC
Light signal decoder for up to 4 LED train signals. Signal aspects will be originally dimmed up and down and directly positioned via the decoder address.

RM-88-N / RM-88-N-O
16-fold feedback modules (also with integrated opto-couplings) for the s88-feedback bus and the connection to **Memory** and **Interface (Märklin / Arnold)**, Central Station 1 and 2, ECoS, **Intellibox** respectively **TWIN-CENTER, EasyControl, DiCoStation** and **HSI-88**.

RM-GB-8-N
8-fold feedback module with integrated **track occupancy detectors** for the s88-feedback bus.

All components can be purchased as easy to **assemble complete kits**, as **finished modules** or as ready **finished modules in a case**.

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