

# MODELLBAHN DIGITAL PETER STÄRZ

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## Control Panel with 2-rowed display for Selectrix, Selectrix-2, DCC and Motorola with SX-bus-plug

SPF-PIC  
v1b-2012



**Degree of difficulty:** easy  
medium  
difficult

### Necessary skills:

- Assembly of the PCB
- Drill, countersink und saw/mill the case
- Dismantle and wiring a 5-pole cable

The Control Panel is a hand control unit with a 2-rowed display and 14 buttons to monitor and access the Selectrix-bus. In switching mode turnouts and light signals can be controlled and the state of occupancy detectors can be monitored. In programming mode switching modules (e.g. turnout decoders and occupancy detectors) can be programmed. In driving mode locomotives can be controlled.

Additionally to Selectrix also the digital formats Selectrix-2, DCC and Motorola are supported. That allows the Control Panel SPF-PIC not only to be used in combination with the professional central unit ZS1, but also with the digital central unit ZS2 or the MTTM FCC.

The scope of operation is completed with a programming mode for locomotives supporting the different digital formats.

### Special features

- Control turnouts, light signals, etc.
- Control and programme locomotives
- Especially for Selectrix-based central units
- Supports different digital formats
- Easy handling

### Table of Content:

|   |   |
|---|---|
| Special features .....                                    | 1 |
| Technical Specifications .....                            | 2 |
| Compatibility .....                                       | 2 |
| Delivery list of the kit .....                            | 2 |
| Maintenance .....   | 2 |
| Assembly instruction .....                                | 3 |
| Component layout diagram on the PCB .....                 | 3 |
| Populated PCB .....                                       | 3 |
| Description of operation .....                            | 5 |
| Commissioning .....                                       | 5 |
| Signs and symbols .....                                   | 5 |
| Control and monitor addresses of switching decoders ..... | 5 |
| Programme switching decoders .....                        | 5 |
| Controlling locomotives .....                             | 6 |
| Selection of a locomotive .....                           | 6 |
| Additional locomotive functions .....                     | 6 |
| Programming of locomotives .....                          | 7 |
| Digital formats and factor for speed steps .....          | 8 |

## Technical specifications

### Compatibility

The following table lists the digital formats and address ranges supported by the Control Panel SPF-PIC. The Control Panel SPF-PIC connects to the central unit via the SX-bus.

That makes the Control Panel SPF-PIC compatible with all Selectrix-only central units and with central units that are equipped with an SX-bus and where the support of different digital formats is based on the Selectrix frame extension.

### Supported digital formats and address ranges

The Control Panel supports the following digital formats and address ranges:

| Digital format       | Address range | Speed steps   |
|----------------------|---------------|---------------|
| Selectrix            | 0 – 103       | 0 – 31        |
| Selectrix-2          | 1 – 9999      | 0 – 127       |
| DCC, short addresses | 1 – 127       | 0 – 14/28/126 |
| DCC, long addresses  | 1 – 9999      | 0 – 14/28/126 |
| Motorola (MM new)    | 1 – 255       | 0 – 28        |

### Size

74mm x 125mm x 27mm

### Power supply

The power supply is provided by the SX-bus.

### Display

2-rowed display

### Plugging

The Control Panel SPF-PIC is delivered with an SX-bus cable. It can be hot-plugged to any of the model railway's SX-bus jacks.

**The Control Panel SPF-PIC must never be connected to the PX-bus!**

### Assembly notes

The Control Panel SPF-PIC is assembled following the instructions on the next page. For soldering the components on the PCB a soldering iron of 12 to 25 Watts or a soldering station with the temperature set to approx. 400°C is needed together with 0.5 or 1.0 mm soldering wire with rosin flux. No special tools are required. Do not use soldering flux! Pay attention to solder speedily to avoid device damage by overheating.

Be aware that the PCB mounts from the two sides. For assembly of the case a drill machine (or a portable electric drill), according drill bits (2,0 mm, 2,2 mm, 5 mm, 7 mm) and a countersink for M2 counter-sunk screws is required.

### Non-Use

When the Control Panel SPF-PIC is not used it should be stored at a dry and clean place.

### The Instruction

The full content of the instruction is important. Very important information is marked in **colours**; critical information is highlighted in **red**.

Please also visit our FAQ page at [www.firma-staerz.de](http://www.firma-staerz.de) for any question first.

## Delivery list of the kit

Please check first if all devices were delivered according to the following delivery list.

- 1x PCB
- 2x Electrolytic capacitor 47µF
- 3x Ceramic capacitor 100nF
- 1x 28-pin IC socket
- 1x PIC "SPF-PIC"
- 1x LM339N
- 1x voltage regulator 78L05
- 1x transistor BC557
- 2x resistor 10 kOhm
- 8x resistor 22 kOhm
- 6x resistor 4.7 kOhm
- 1x resistor 68 Ohm
- 2x resistor 100 Ohm
- 1x resistor 120 Ohm
- 1x potentiometer
- 14x push button
- 2x pin header and cable
- 1x cable strap
- 1x 2-rowed display
- 1x display frame
- 1x SX-bus cable (insulated at one side)
- 1x case
- 4x counter-sunk screw long
- 2x counter-sunk screw short
- 2x cylinder-head screw short
- 8x threaded stud short
- 2x threaded stud long
- 14x washer

## Maintenance and care

The Control Panel SPF-PIC should be cleaned from time to time by blowing or wiping.

The use of any kind of liquid for cleaning is prohibited explicitly.

## Assembly instruction

Assemble the kit in the order of these instructions. All components (except the push buttons) are placed on the top side of the PCB (marked "top") as close to the PCB as possible and soldered on the bottom side of the PCB (marked "Bottom"). **The Push buttons are placed on the bottom side and also soldered on that side. All push buttons have to be placed absolutely plane and equally and must not distance nor bias the PCB.** Use a bending tool (e.g. Conrad 425869 – 62) for bending. Cut the leads of components flush using a wire cutter after soldering.

**Solder cleanly and precisely!**

### 1. Resistors

Bend the resistor leads for 7.5 mm pitch before insertion. To facilitate placing components on the PCB support the edges of the board with the help of two books, for instance, to leave enough space for the leads under the board. Insert the resistors on board aligning the coloured rings of all the resistors in the same way to make it easier to verify the value of the resistors later. Place a suitable plane piece of wood or similar on top of the resistors on board. Turn the board together with the wood upside down. The underside of the board is now conveniently accessible for soldering the components.

Solder one end of each resistor first and check that they are positioned properly before soldering the other end of each resistor.

|            |          |                                      |
|------------|----------|--------------------------------------|
| R1, R2:    | 10 kOhm  | (brown, black, black, red, brown)    |
| R3:        | 120 Ohm  | (brown, red, black, black, brown)    |
| R4, R5:    | 100 Ohm  | (brown, black, black, black, brown)  |
| R6 - R11:  | 4,7 kOhm | (yellow, lilac, black, brown, brown) |
| R12 - R19: | 22 kOhm  | (red, red, black, red, brown)        |
| R20:       | 68 Ohm   | (blue, grey, black, gold, brown)     |

### 2. Potentiometer R21

Place and solder the Potentiometer accordingly.

### 3. Socket for PIC, IC3

Place and solder the PIC socket and IC3 (LM339) with the notches according to the component layout diagram on the PCB.

### 4. Capacitors

C1 - C3: 100nF (104)

### 5. Transistors and voltage regulator

The transistor and the voltage regulator can be placed simultaneously when proceeding similar to the resistors. Do not confuse the transistor BC557 with the voltage regulator 78L05!

|      |       |
|------|-------|
| Q1:  | BC557 |
| IC2: | 78L05 |

### 6. Electrolytic capacitors, watch polarity!

The positive pole of C4 must face IC2, the positive pole of C5 faces the edge of the PCB so that the negative poles of the capacitors face each other.

C4, C5: 47µF

### 7. Pin header SV2

Both pin headers (firstly without plug and cable) are placed and soldered according to the drawing. Orientate the cladding facing the PIC.

### 8. Push buttons

Place and solder the push buttons on the bottom side of the PCB.

### 9. Wiring the SX-bus cable

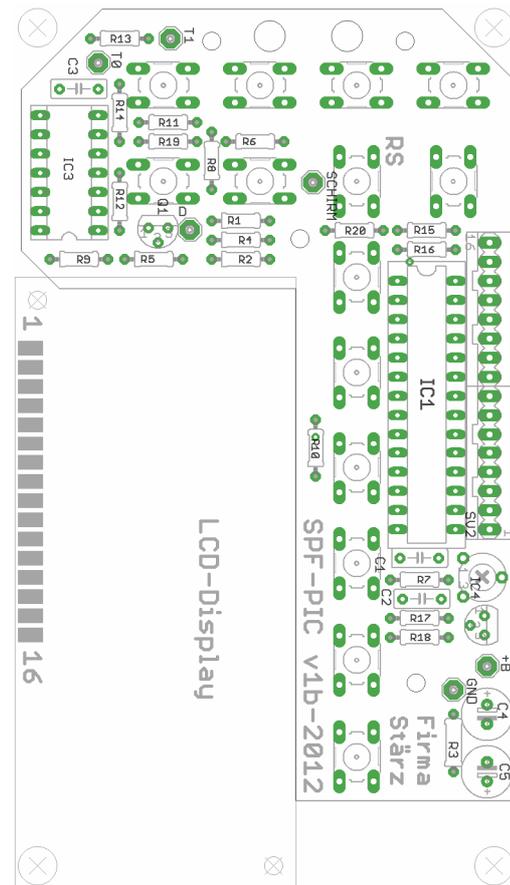
Verify that one of the pins of the SX-bus cable is shortened. The cable is soldered to the corresponding pads on the PCB. To do so dismantle and tin the single wires for about 5 mm and route them through the top side to the bottom side and solder here. Pay attention to not damage the insulations of single wires while soldering another.

|                |           |         |    |
|----------------|-----------|---------|----|
| Non-insulated: | Shielding | Yellow: | T1 |
| Black:         | D         | Orange: | +B |
| Red:           | GND       | Brown:  | T0 |

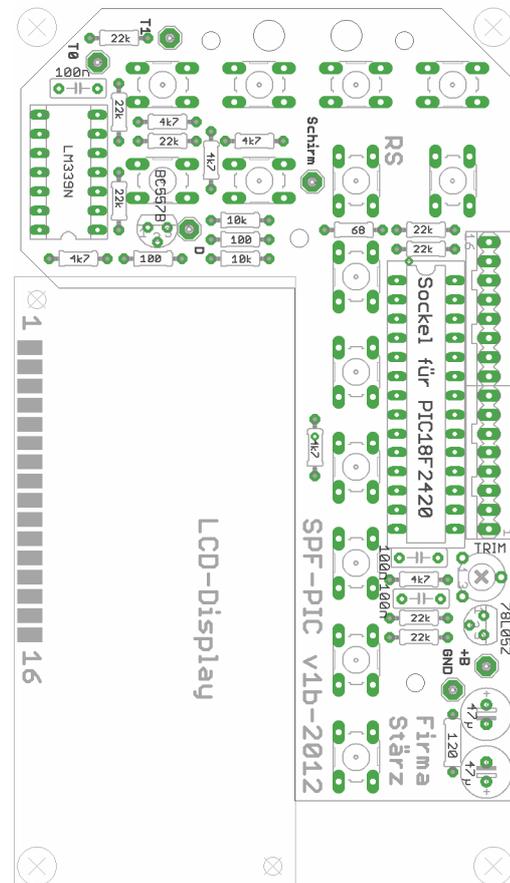
The Shield ("Schild") must never get in contact with other pins (e.g. pins of the push buttons).

Finally the cable is fixed on the PCB using the cable strap. The cable strap must be tightened in a way that a reliable strain relief is granted. The end of the cable strap must be on the top side of the PCB (see image on the following page).

## Component layout diagram on the PCB



## Populated PCB



## 10. Verification and mounting the PIC

After soldering all components on the PCB verify once more that they are placed according component layout diagram and that they are oriented properly. Check that all solder points on the bottom



## Description of operation

### Commissioning

After assembling the Control Panel SPF-PIC can be hot-plugged to any of the model railway's SX-bus jacks.  
At start-up the start screen is displayed for about 2 seconds:

SPF-PIC  
Version: 2.0

At the very first start-up of the Control Panel SPF-PIC it is in switch mode at address 85.  
If nothing can be seen on the display, you first have to  set the contrast of the display correctly.

### Set the contrast of the display

**You may first have to set the contrast of the display correctly after assembling the Control Panel SPF-PIC.**

**Be very careful when proceeding!**

Use a screw driver for recessed head screws to change the potentiometer setting during operation until you achieve the desired contrast.

### Signs and symbols

In these instructions the following symbols are used:

| symbol  | name | Explanation  |
|---|------|--|
|    | ZE   | Press button ZE.<br>Turns on and off the power of the rails                                    |
|    | Lok  | Press button Lok.<br>Opens the selection menu for locomotives                                  |
|   | Adr  | Press button Adr (= address)<br>Function varies (is also arrow to the left)                    |
|  | LFk  | Press button LFk (= additional loco functions)<br>Function varies (is also arrow to the right) |
|  | Li   | Press numbered button<br>Enter the number (0 is also light function)                           |
| ...   | ...  | ...  |
|  | Fk   | Press numbered button<br>(9 is also 2 <sup>nd</sup> loco function)                             |
|  |      | Link to other section of these instructions  |

Depending on the current screen, some buttons can be pressed independently to activate certain functions (shown with tabular grid), and for some other functionality a certain procedure of pressing buttons is required (shown without tabular grid). A free procedure within a given procedure is shown by a tabular frame.

## Control and monitor addresses of switching decoders

In switching mode the state of switching decoders (e.g. turnout decoders) can be monitored and possibly be changed independently of the state (on or off) of the power on the rails.

Adr ----- ZE  
085 12345678 ein

By the following actions switching decoders can be controlled:

-  Adr      Modify address ( The Menu)
-  1       Select an address of a switching decoder
- ...
-  8      Flip bit 8 of the selected switching decoder.
-  0      B      Change the display mode:  
toggle between "-" and "/" or "0" and "1".
-  9      D      Activate decimal decoding: instead of "ZE", the decimal value of the bit sequence is displayed.

### Select an address of a switching decoder

In the given example address 90 is selected.

 Press "Adr" shortly to open address menu.

 ...  Enter the desired address with the numbered buttons.

SX0 Adresse: 0..  
Bus

---

SX0 Adresse: 090  
Bus

### Programme switching decoders

The Control Panel SPF-PIC can be used to easily programme switching decoders. The amount of addresses used depends on the specific switching decoder.  
It is advised to only plug the switching decoder to be programmed to the SX bus. During programming the power on the rails has to be turned off ("ZE aus").

**It is useful to activate decimal decoding during programming. First read the instructions of the switching decoder before starting with programming!**

**Ensure that the addresses used during programming are all set to 0 before re-powering the rails (by pressing ZE) to avoid spontaneously uncontrolled starting of locomotives.**

Generally there is no difference in handling the Control Panel SPF-PIC during programming mode or switching mode.

### Programming example

In this example the address 80 is programmed:

 Power off the rails!  
Press programming button at switching decoder.

 Select address 0 (generally this is where to enter the address of switching modules)

  Press 5 and 7 = decimal 80

 Press programming button at switching decoder.  
Re-power the rails.

Adr ----- ZE  
090 12345678 aus

---

SX0 Adresse: 000

---

Adr 00001010=080  
000 12345678 aus

---

Adr 00000000=000  
000 12345678 ein

## Controlling locomotives

In driving mode locomotives can be controlled. In this mode the screen displays the information (see following table for explanation) of the currently selected locomotive and the state of the central unit (on or off).

```
Lok  Fs  Li  F  ZE
005  00>   ein
```

By the following actions locomotives can be controlled:

- ZE** ZE Switch on or off the power on the rails
- Lok** Lok Change to another locomotive address  
☐ Selection of a locomotive
- LFk** LFk Switch to additional locomotive functions
- 1** . Speed step pawl: Effect changes of speed only by pushing buttons separately (no by hold)
- 2** Halt Set speed to 0
- 3** < > Change direction of travel
- 4** < 0 > Set speed to 0 and change direction of travel
- 5 6** - FS + Change speed by pushing separately or by keeping pushed
- 7** Li Turn light on and off („\*” = on)
- 8** F Turn on and off second loco function („\*” = on)  
(☐ Additional locomotive functions)

The direction of travel is indicated by the symbols “<” left or by “>” right of the speed step.

If the selected locomotive is controlled by another participant of the SX bus (e.g. by a hand controller), an exclamation mark appears on the display next to “Lok”:

```
Lok! Fs  Li  F  ZE
001  08> *   ein
```

## Selection of a locomotive

When switching to the locomotive selection menu, the format and the address of the locomotive are chosen.

**Only those formats provided by the central unit are available and are displayed.**

- Lok** Short pressing opens locomotive selection menu. 

```
SX1 Lok: ...
```
  - Lok** Repeated pressing changes the format of the locomotive. 

```
DCC Lok: ...
k Fs14
```
  - LFk** For DCC: Choice between long and short addresses and 14, 28 or 126 speed steps. 

```
DCC Lok: ....
L Fs126
```
  - 0 9** Entering the address of the locomotive by the numbered buttons. 

```
SX1 Lok: 035
```
- After entering the last digit the display switches automatically to driving mode.
- ```
SX1  Fs  Li  F  ZE
035  00>   ein
```

## Additional locomotive functions

When a Selectrix locomotive is selected in driving mode, both light and second function are displayed. For other formats, only the light is indicated.

Additional locomotive functions (e.g. sound for Selectrix locos) or the functions 1 to 16 respectively are selected in driving mode by pressing LFk:

- LFk** Change to additional loco functions (for SX1: the loco's following address is selected) 

```
LFk ----- ZE
036 12345678 ein
```
- LFk** Repeated pressing changes back to normal driving mode or to further additional functions respectively. 

```
Fk2 ----- ZE
-16 12345678 ein
```
- Lok** Change back to driving mode 

```
SX2  Fs  Li  ZE
1234 000>   ein
```

## Double traction

The Control Panel SPF-PIC can handle one Selectrix double traction.

A double traction means to control two locomotive addresses, a first and a second, simultaneously. Both locomotives receive the same SX bus information but only the first locomotive is displayed on the screen. “Lok” is replaced by “DTr” on the screen to indicate the active double traction.

- 0** Add a second loco. A first Selectrix loco must be active in driving mode. 

```
2.Lok: v...
```

- Adr** Flips the direction of travel of the second locomotive. 

```
2.Lok: r...
```

- Lok** Cancel the operation. 

```
SX1  Fs  Li  F  ZE
035  00>   ein
```

- 0 ... 9** Enter the address of the second locomotive. 

```
2.Lok: v036
```

- After entering the last digit the display switches automatically to driving mode. 

```
DTr  Fs  Li  F  ZE
035  00>   ein
```

Depending on the properties of the locomotive, the locomotive decoder and the velocity profile it can occur that both locomotives drive with different speed although information on the SX bus is the same. You should choose locomotives for double traction that are most equal in velocity profile. Alternatively you could leave away the traction tires of one of the locomotives or by ☐ Programming of locomotives you could modify locomotive settings.

**The control of a double traction can also be taken by another controlling unit, e.g. a hand controller. To do so the first address has to be selected there.**

If the double traction is controlled by another controlling unit, an exclamation mark is displayed next to “DTr”:

```
DTr! Fs  Li  F  ZE
035  00>   ein
```

## Programming of locomotives

In programming mode for locomotives Selectrix- (standard settings as well as extended decoder settings), Selectrix-2- and DCC-locomotive decoders can be programmed. To do so the central unit must be off („ZE aus“), this can be done by pressing the button “ZE“.

**To programme locomotive decoders the SX-bus addresses 104 to 111 of the SX0-bus are used. Pay attention not to have connected any components to the bus using those addresses while programming.**

**Read the instructions of the locomotive decoders first before programming!**

Only one locomotive may be on the (programming) track when entering the programming mode for locomotives!

In all modes of programming the cursor can be moved using the buttons “Adr” and “LFk”:

-  Adr Move cursor to the left.
-  LFk Move cursor to the right.

### Programming Selectrix locomotive decoders

Selectrix locomotive decoders have the following parameters to be programmed in this order (see instructions of the locomotive decoder for detailed information):

- Address of the loco (“Lokadr“), (3 digits)
- Signal-stopping section (“Halteab“)
- Maximum velocity (“V-Max“)
- Acceleration and deceleration delay (“Verzög.“)
- Impulse width (“Impuls“)

 Press long to open programming menu. SX1 Lokprog “1“→  
SX2 Lokprog “2“←

 Power off the rails first! ZE ist ein!

 Select the Selectrix programming mode. Prog  
Lokadr ...-...

|                                                                                     |                                                                                        |                                                                                                 |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|  | Cursor on the very left:<br>Read decoder values (button “Adr” = arrow to the left).    | <span style="border: 1px solid black; padding: 2px;">Prog -lesen-<br/>Lokadr ...-...</span>     |
|  | Enter the new decoder values.                                                          | <span style="border: 1px solid black; padding: 2px;">Prog<br/>Verzög. 018-633</span>            |
|  | Cursor on the very right:<br>Write decoder values (button “LFk” = arrow to the right). | <span style="border: 1px solid black; padding: 2px;">Prog -schreiben-<br/>Impuls 018-633</span> |

 Leave programming mode. SX1 Fs Li F ZE  
035 00> aus

## Programming Selectrix-2-parameters

The general procedure is like in  Programming Selectrix locomotive decoders.

However you first have to pre-select a Selectrix-2-parameter, read it and then overwrite it with a new value.

 Press long to open programming menu. SX1 Lokprog “1“→  
SX2 Lokprog “2“←

 Power off the rails first! ZE ist ein!

 Select the Selectrix-2 programming mode. Prog  
SX2 Par 0001·...

|                                                                                   |                                                   |                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------|
|  | Pre-select the Selectrix-2-parameter.             | <span style="border: 1px solid black; padding: 2px;">Prog<br/>SX2 Par 0012·...</span>             |
|  | Read the decoder values at cursor position .      | <span style="border: 1px solid black; padding: 2px;">Prog<br/>SX2 Par 0012·...</span>             |
|  | Enter the new decoder values.                     | <span style="border: 1px solid black; padding: 2px;">Prog<br/>SX2 Par 0012·047</span>             |
|  | Write decoder values at the last cursor position. | <span style="border: 1px solid black; padding: 2px;">Prog -schreiben-<br/>SX2 Par 0012·047</span> |

 Leave programming mode. SX1 Fs Li F ZE  
035 00> aus

### Programming of DCC Configuration Values (CVs)

The general procedure is like in  Programming Selectrix-2-parameters.

Instead of the Selectrix-2-parameter the DCC CV is pre-selected, read and then overwritten with a new value.

 Browse to page 2 of the menu first. DCC CV “3“→  
DCC-Adr. “4“←

 Select the DCC CV programming mode. Prog  
DCC CV 0001·...

**Simplified DCC-programming**

The Control Panel allows using a simplified DCC-programming mode to programme the following setting without CVs:

- Pre-selection of long or short loco address
- Locomotive address
- Number of speed steps

The general procedure is like in Programming Selectrix locomotive decoders.

|          |                                                                       |                               |
|----------|-----------------------------------------------------------------------|-------------------------------|
| <b>4</b> | Select DCC addresses programming mode. The decoder is read instantly. | Prog<br>DCC ? . . . . .Fs . . |
| <b>0</b> | Change long vs. short address at cursor position k or L respectively. | Prog<br>DCC k 004 ·Fs28       |
| <b>9</b> | Change from 14 speed steps to 28 (or 126) at cursor position Fs.      | Prog<br>DCC L 1234 ·Fs14      |

**Digital formats and factor for speed steps**

**Factor for speed steps**

**Selectrix-2 and DCC support up to 128 speed steps.** To change speed more rapidly a factor between 1 and 4 can be selected. Depending on this setting the speed steps are increased by 1 up to 4 when changing speed.

Changing speed steps of locos in Selectrix mode is not affected.

|            |                                    |                                      |
|------------|------------------------------------|--------------------------------------|
| <b>Lok</b> | Press long to open the menu.       | SX1 Lokprog "1"→<br>SX2 Lokprog "2"← |
| <b>LFk</b> | Browse to page 3 of the menu.      | SX2-Fs-Fa:1 "5"→<br>F: nur SX1 "6"←  |
| <b>5</b>   | Modify the factor for speed steps. | SX2-Fs-Fa:2 "5"→<br>F: nur SX1 "6"←  |

**Digital formats**

The support of different digital formats depends on the central unit used. Only if the central unit supports the digital format, it can be selected using the Control Panel.

The Control Panel supports the following digital formats on the rails:

- No. Format
- 1) Selectrix only ("nur SX1")
  - 2) Selectrix and Selectrix-2
  - 3) Selectrix, Selectrix-2 and DCC
  - 4) DCC only ("nur DCC")
  - 5) Selectrix, Selectrix-2 and Motorola
  - 6) Motorola only
  - 7) Selectrix, Selectrix-2, DCC and Motorola

Switching the different digital formats on the rails is done via page 3 of the menu.

|            |                                         |                                       |
|------------|-----------------------------------------|---------------------------------------|
| <b>Lok</b> | Press long to open the menu.            | SX1 Lokprog "1"→<br>SX2 Lokprog "2"←  |
| <b>LFk</b> | Browse to page 3 of the menu.           | SX2-Fs-Fa:1 "5"→<br>F: SX+DCC+MM "6"← |
| <b>6</b>   | Switch the digital format on the rails. | SX2-Fs-Fa:1 "5"→<br>F: nur SX1 "6"←   |

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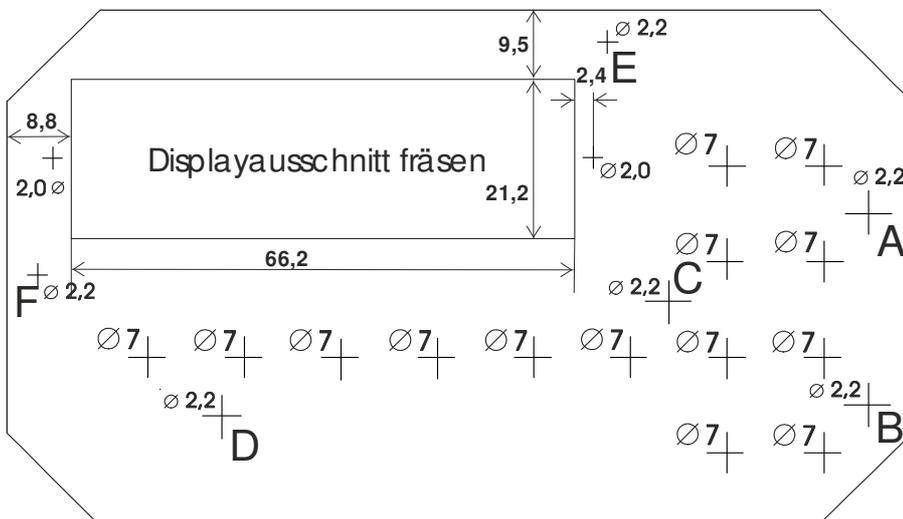
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Illustrations and technical data are subject to change. We are not responsible for printing or typographical errors.

Printable version of 23.03.2017

**Drilling template**

Please cut this drilling template carefully and use it for the case according to the assembly instruction point 12



Respect the following remark if you print this document yourself:

You may only use this drilling template if you printed this document in original size!

To do so, select "Page adjustments: None" in your printer settings.

The template has to have a width of 119.2 mm.