ECoS

E S U   C O M M A N D   S T A T I O N

User Manual

2nd edition, March 2007

contents

1. Declaration of conformity

We, ESU electronic solutions ulm GmbH & Co KG, Industriestraße 5, D-89081 Ulm, declare herewith in sole responsibility compliance of the product

"ECoS ESU Command Station"

to which this declaration is related to, with the following standards:

EN 71 1-3 : 1988 / 6 : 1994 – EN 50088 : 1996 – EN 55014, part 1 + part 2 : 1993

EN 61000-3-2 : 1995 – EN 60742 : 1995 – EN 61558-2-7 : 1998

ECoS bears the CE-mark according to the guidelines as per

88 / 378 / EWG – 89 / 336 / EWG – 73 / 23 / EWG

2. WEEE-Declaration

Disposal of old electrical and electronic devices (applicable in the European Union and other European countries with separate collection system).

This mark on the product, the packaging or the relevant documentation indicates, that this product may not be treated as ordinary household garbage. Instead this product has to be delivered to a suitable disposal point for recycling of electrical or electronic equipment. By disposing of this product in the appropriate manner you help to avoid negative impact on the environment and health that could be caused by inappropriate disposal. Recycling of materials contributes to conserve our natural environment. For more information on recycling this product please contact your local administration, the rubbish disposal service or the shop where you have purchased this product.

Batteries do not belong into household trash!

Please do not dispose of discharged batteries in your household trash: take them to a collection point at your local town hall or dealer. Thus you assure an environmentally friendly way of disposal.

3. Important Remarks – Please read this section first

Welcome to ECoS!

We congratulate you to your purchase of an ESU ECoS Digital Command Station. ECoS is a modern, intelligent model train control system designed with the future in mind. In a short time you will experience how easy it is to run trains and other devices on your layout with ECoS and to discover new undreamt-of possibilities for your hobby thanks to a unique variety of functions.

This manual will guide you step by step through the multitude of possibilities of ECoS. However, we have one request:

Please read this manual carefully prior to initial operation. Although ECoS is robustly constructed there is the risk of damage due to incorrect wiring. If in doubt, avoid any "costly" experiments!

- ECoS is only intended for the use with electrical model train layouts. Never operate ECoS without paying attention and never use it for controlling devices designed for transporting persons.
- ECoS is not a toy. Make sure that children use this device only when adults are present.
- Only use the power supply provided for ECoS: Other transformers may lead to reduced output or in extreme cases to damage of the command station.
- Use the power supply provided with ECoS for the energy supply for ECoS only and not for any other household appliances.
- Never use Y-adapters in order to provide power to other devices for your model trains! An unintended connection to ground could lead to damage or destruction of your ECoS!
- Check the power supply regularly for damage on the housing or the mains cable. Damaged parts may not be used under any circumstances! Do not attempt to repair the power supply! This may be fatal!
- Assure adequate ventilation of the power supply. Do not install in furniture without sufficient air circulation since this could lead to overheating or fire!
- ECoS may only be operated with the devices described in this manual. Any other use as described here is not permitted.
- Only connect devices intended for this purpose to ECoS. Even if other devices (also from other suppliers) may have the same plugs and sockets does this not automatically indicate that such devices may be operated with ECoS.
- Adhere to the wiring diagrams shown in this manual when connecting your layout. Other circuitry could lead to damage of ECoS.
- Do not drop your ECoS command station or subject it to mechanical impact or vibrations. Such rough treatment could cause breakage of components within the device.
- Never support yourself on the touch screen or sit on your ECoS.

- The monitor with integral touch screen is a precision part. Press it only lightly with your finger or the supplied peg (stylus). Never use hard or pointed objects to avoid un-repairable damage to the touch screen.
- Never expose your ECoS to rain, humidity or direct sunlight. In case of high temperature variations (e.g. when you take your ECoS from the cold car to your comfortably heated house) please wait for a few hours until the device has adjusted to the temperature before switching it on.
- When using ECoS outside you must protect it from the elements under all circumstances! Only keep ECoS outside as long as you run trains and avoid temperatures below 8° Celsius or above 30° Celsius.
- Do not use any aggressive chemicals, cleaning solutions or solvents for cleaning ECoS. Never use liquids or spray for cleaning the monitor. Instead use a clean slightly (!) moist cloth and only when ECoS is switched off.
- Do not attempt to open ECoS. Inappropriate handling may lead to damage of the command station.

4. Introduction – What can ECoS do

ECoS is a state-of-the-art complete digital control system for model trains of all gauges. ECoS combines several devices in one unit:

- A multi-protocol digital command station. Suitable for easy mixed operation of mobile and stationary decoders suitable for Motorola®, DCC and Selectrix® protocols.
- Large seven inch FSTN LCD Display with touch screen and white illumination. It serves for displaying information in plain text and very easy menue-guided operation.
- Two ergonomic cabs with easy to grip throttle knobs, 4-way joystick and 8 function buttons each.
- An integral booster with up to 4 Ampere output for supplying "digital power" to the tracks of your layout. A feedback decoder as per the latest NMRA DCC standard ("Bi-directional Communication, RailCom®) is supplied as an integral part.
- Sockets for connecting external boosters compatible with DCC or Märklin® 6017. Simply continue to use your own boosters.
- One socket for wiring the programming track. With this you can read out and program your mobile decoders independent from the layout suitable for DCC, Selectrix® and programmable Motorola®-decoders (e.g. ESU LokPilot® mfx®, LokSound® mfx®).
- A computer interface (10 MBit Ethernet LAN, RJ45) allows you to download software updates, save and restore your configuration as well as controlling your layout with a PC (with the aid of dedicated software by several suppliers).
- ECoSlink high-speed bus. You may connect up to 128 other devices to ECoSlink. Other handheld (wireless) controllers, boosters, bus distributors or feedback decoders, they all will be detected automatically once they are plugged in: this is true "Plug & Play".

- s88-feedback bus. This popular feedback system by Märklin® enables you to control routes or to automate train movements "shuttle train (shuttle trains).
- ECoSniffer-input. The port for any DCC resp. Motorola®-capable, already available digital command stations: Continue to use your favourite handheld controllers and accessory keyboards – not a problem with ECoS.
- The ECoSlot module expansion compartment allows upgrading of ECoS with new components at a later stage.

All above mentioned parts and components enable you to run your trains with never before imagined comfort and ease. You may fully focus your attention on your trains while ECoS takes care of the details like a good co-pilot. And here are all the things you can do with ECoS:

- Run locomotives: ECoS handles up to 16.384 locomotives and stores the name, a symbol, the function buttons and their corresponding symbols, address and data format. As from now on you will call up your locomotives by their name and do not have to remember address numbers any longer!
- Control magnetic (solenoid) accessories: You may comfortably switch up to 2048 turnouts, signals and other devices with solenoid drives recognised by name and symbol with the integral keyboard with 74 pages.
- Multi-traction (consists) are a basic function for ECoS: Assemble any locomotives to a consist and control them simultaneously.
- Routes are really no problem for ECoS. Group your accessories and then switch them together; either manually or triggered by an s88-feedback contact.
- The completely new functionality of the shuttle train mode allows the definition of up to 8 track segments for shuttle trains with two s88-contacts each. This is the easiest way to run shuttle trains.
- Programming decoders: Due to the monitor programming becomes as easy as never before: All parameters are shown in plain text and avoid mistakes. Set your locomotives onto the programming track or use P.O.M. (Programming On the Main).
- In most cases you can continue to use your "old" digital system: Provided it "speaks" DCC or Motorola®, you may connect it to the ECoSniffer port and thus use all your present handheld throttles.

5. Unpacking & Set-up

5.1. Opening the package

The ECoS – command station is safely protected in two cartons when delivered. First open the brown shipping carton at one end and pull out the printed carton. This carton can be opened at either end. Now pull out the two-part blister pack and place it on a table with the monitor of ECoS facing upwards.

The upper half of the blister is secured to the lower part with several buttons. No adhesive has been used. Pull both blister halves apart at each button until you can separate the two halves.

Please keep the packaging in a safe place for later use. Only the original packaging guarantees protection from transport damage. Pack your ECoS into the blister and both cartons prior to dispatch by mail or parcel service.

5.2. Contents of package

Please check if all parts are in the package as soon as you have unpacked it:

- ECoS-command station
- Stylus for operating touch screen
- Power supply 90VA
- Separate mains cable for Euro-power outlets
- Accessory pack with two two-pole terminals for track connection
- Seven-pole terminal block for ECoSniffer-socket
- 4 batteries type AAA ("Micro")
- Manual
- Registration card (as part of the manual)
- Order form for 15V-power supply (as part of the manual)
- Guarantee card (as part of the manual)

Should any one of these parts be missing please contact your dealer immediately.

5.3. Locating the device

Place ECoS on a flat, clean and dry surface within sight of your model train layout. Assure a stable position of ECoS and an optimal distance between yourself and the command station. The monitor is tilted at 12 degrees against the support surface and is best suited for a sitting operator (easy reading of text, etc. on display).

Avoid reflections of bright walls or lighting equipment on the monitor.

Provide suitable conditions for your ECoS: ideally operate ECoS at room temperature. Avoid heat sources in the immediate surroundings. Generally it can be said that any room conditions that are comfortable for you will be good for ECoS.

5.4. Inserting the batteries

We recommend to always switch on your ECoS with batteries installed and charged. The batteries assure a proper shutdown of ECoS in case of a power failure or intended power interruption (removal of power plug at the end of the operating session). This "emergency power supply" is required to bridge the short time gap between the interruption of the power and the shutdown of the device. Batteries can be replaced without any problems whenever ECoS is switched off. Your data is safely stored in the flash memory of ECoS.

The battery compartment is located at the back of ECoS.

- Remove the cover by pressing the clip in the direction of the arrow.
- Insert four batteries in the correct polarity. The poles ("+" and "-") are imprinted in the battery compartment.
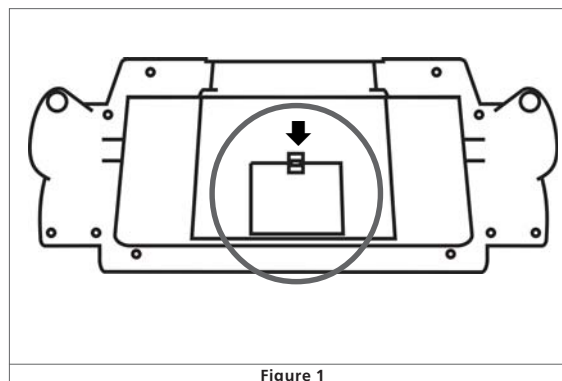
Figure 1

- Close the cover of the battery compartment.
- Only use high quality batteries or re-chargeable batteries.
- Remove batteries only when ECoS is switched off (pull mains plug).
- After longer periods without operation (e.g. after the summer vacation) please remove the batteries to avoid any leakage.
- ECoS does not contain any circuitry for re-charging batteries. Use re-chargeable batteries with an external charger. Battery chargers are available in hardware stores or electronic stores.
- Never try to charge normal batteries! There is a high risk of fire and explosion!

6. Starting up quickly

After working through this you will be able to carry out a quick test of your ECoS command station and to do the "first laps" with one locomotive.

Please read the entire manual before you wire your ECoS permanently to your layout.

6.1. Overview of possible connections

All sockets are located at the back of your ECoS command station:
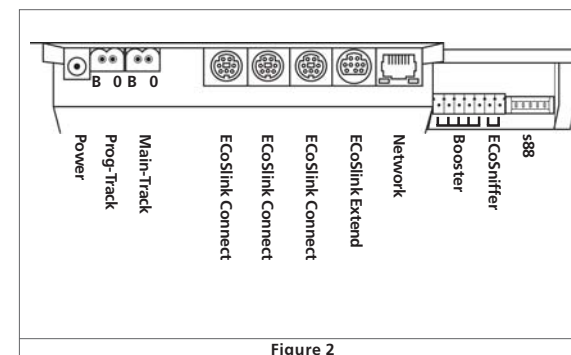
Figure 2

Power:	Socket for power supply of ECoS and your layout Connect this socket only with the power supply delivered with ECoS.
Prog-Track:	Two-way socket (5.08mm contact spacing) for programming track (optional)
Main-Track:	Two-way socket (5.08mm contact spacing) for mainline
ECoSlink:	Three seven-way Mini-DIN sockets for direct connection of external ECoSlink devices (handheld controllers, boosters, feedback decoders, etc.)
ECoSlink Extend:	Nine-way mini-sockets (DIN) for wiring bus-extension modules to ECoSlink (up to 100m total length)
Network:	10MBit Ethernet RJ45 socket for connecting ECoS to a computer network
s88:	Six-way pin-connector for wiring Märklin® s88-compatible feedback decoders (up to 32 modules)
ECoSniffer:	Two-way socket (3.5mm contact spacing) for connecting existing digital systems. Wire the track terminals of your "old" command station to this socket.
Booster:	Five-way socket (3.5mm contact spacing) for wiring external boosters compatible with DCC-standards or Märklin® 6017.

6.2. Minimal wiring for an initial test

to the power supply

B | 0

2 conductor track

B | 0
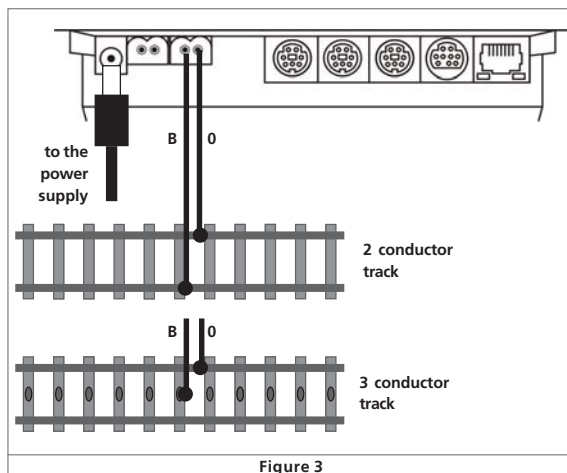
3 conductor track

Figure 3

- Connect the power supply to the appropriate socket of ECoS.
- Wire the two terminals "Main" to your test track.

ⓘ With DCC-systems polarity is not an issue. When using 3-conductor tracks polarity has to be observed; otherwise some older locomotives and accessory decoders may not function as intended.
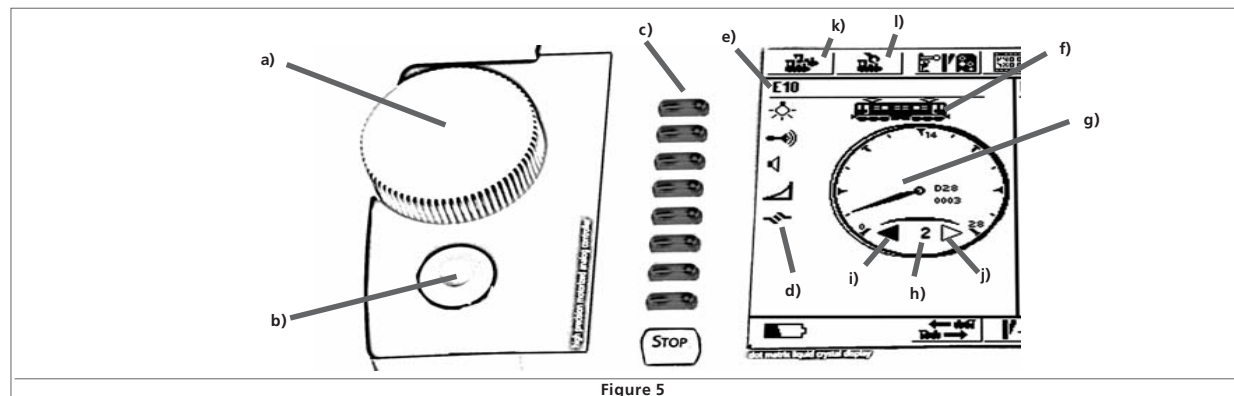
6.3. Overview of control input elements

All control input elements of ECoS are located on the top of the housing as per Figure 4 below.
a) Left Cab
b) Right Cab
c) "Stop" button: disconnects track power from mainline
d) "Go" button: switches the track power on: track voltage is present on the terminals.
e) Monitor with LCD Display and touch screen
f) "Stylus"
g) Storage space for stylus
h) Holding groove for stylus

Figure 5

6.3.1. Cabs

Each throttle consists of several components as shown in Figure 5 above:

a) Throttle knob with definitive end position and change-of-direction function. Turning the knob clockwise increases the speed while turning anti-clockwise reduces the speed. The position of the knob corresponds with the speed. Turning the throttle knob to the left beyond the "Zero"-position to a clearly audible and mechanical "click" changes the direction of travel.

b) Four-way joystick with centre-click-function serves for navigating in the menues, selecting locomotives and to trigger the whistle ("Playable Whistle") of locomotives equipped with suitable decoders.

c) Function buttons. The first 8 functions of each locomotive can be directly activated by pushing one of these buttons.

d) Function button symbols. Depending on the data format and setting you may switch on and off up to 20 functions in each locomotive by touching the appropriate symbol.

e) Name of locomotive: displays the name of the locomotive (can be made up of letters and numbers).

f) Locomotive symbol: displays the symbol of your choice (can be freely selected).

g) Speedometer display: shows the current speed.

h) Speed step indicator: displays the current speed step. The range of values depends on the data format.

i) Direction of travel "Reverse": is highlighted, if the locomotive travels forward.

j) Direction of travel "Forward": is highlighted, if the locomotive travels backwards.

k) Select locomotive: pressing this screen button opens the menue for selecting a locomotive. Press this button if you want to run another locomotive.

l) Locomotive menue: after pressing this screen button you can enter, edit or delete new locomotives or consists or assign shuttle trains.
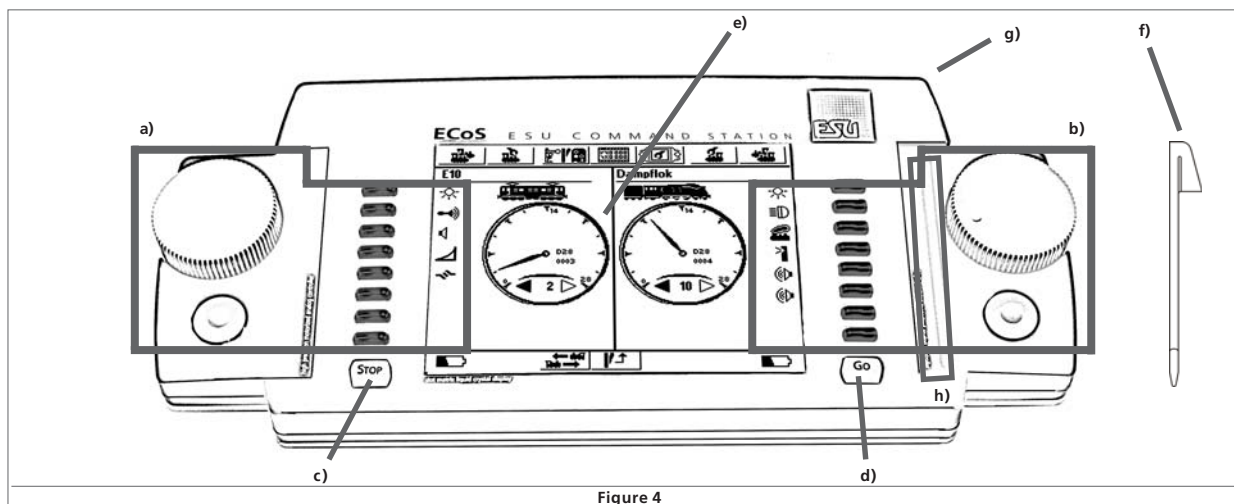
Figure 4

6.3.2. Touch screen

As the name says the touch screen responds to contact with your finger or with the stylus. Please do not use any hard or pointed objects; this could lead to permanent scratches on the surface.

The display shows information and screen buttons. Touching a screen button will result in some action.

Examples for screen buttons:

✓ Touching this screen button confirms an action.

✗ Touching this screen button cancels an action; any data entered during this particular process will not be saved.

☑ In some menues you can select or cancel certain options by touching the screen button ("ticking them off electronically").

ms ▼ Choice lists are opened by touching the right arrow on the heading of the list. Then a list of available elements appears.

◀▐█▌▶ Slider: Slide controllers enable you to comfortably set values.

BR_ Input fields are for entering text or numbers with the aid of the display keyboard.

6.4. Your first train – call up a locomotive and run it

We want to show you how easy it is to enter, call up and run a locomotive. First make sure that ECoS is connected as per the instructions and turn on the power supply.

ℹ ECoS needs one to two minutes for initialisation ("start-up"). A small square at the bottom of the monitor runs from left to right to indicate this process. As soon as ECoS is ready the "Go"-button lights up (green).

Any audible chirping from the command station is quite normal and no reason for concern.

Before we can run the locomotive we must enter it in the internal list of locomotives in ECoS.

🚂 Touch the screen button "Locomotive Menue" at the top left on the display and select "New Locomotive".
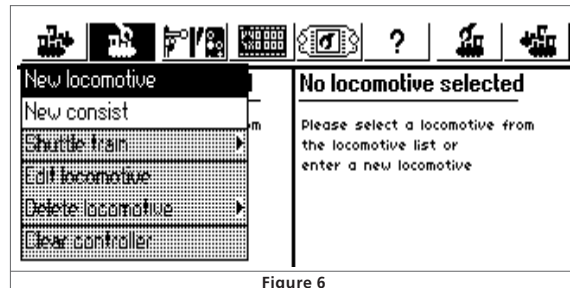
Figure 6

In our example we want to run a locomotive with the address "44". Touch the number "3" behind the text "address" with your finger. Did you notice the change? "Address" is now framed to indicate that you can enter an address.

← Push the "Delete" button of the keyboard to remove the "3" and type "44".
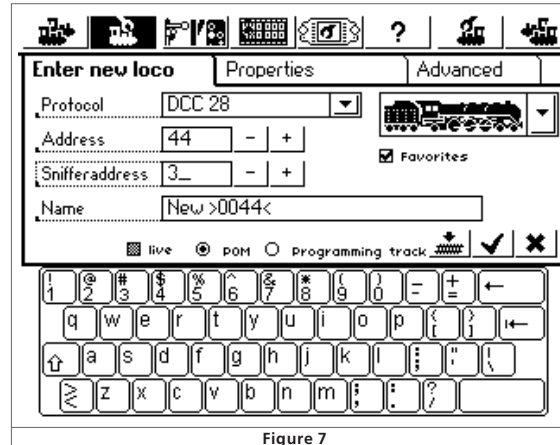
Figure 7

▼ In our example we assume that the locomotive operates in DCC-format. The DCC-mode is the default mode. Should you want to run this locomotive in Motorola® format (e.g. for Märklin® locomotives), push the arrow behind "data format" and select "Motorola 14".

✓ Confirm the entry by pushing "OK".

Now you arrive automatically in the main menu of ECoS, the newly entered locomotive is called up and ready to run.
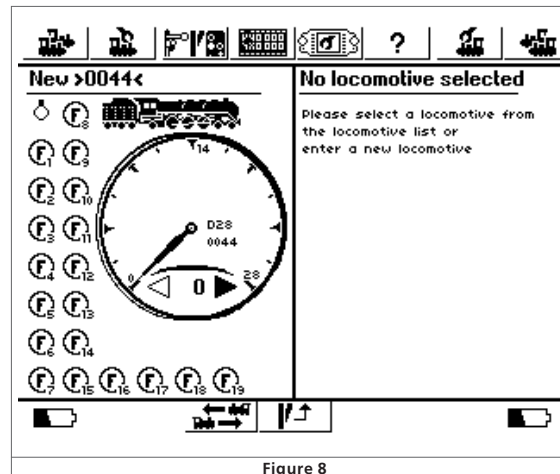
Figure 8

• Turn the throttle to the right and watch the locomotive move. The speedometer needle shows the current speed at all times; at the same time the speed step is displayed as well (refer to Figure 5 h).

• Turn the throttle to the left beyond the "zero" position until you feel and hear the "click" and you have changed direction of travel.
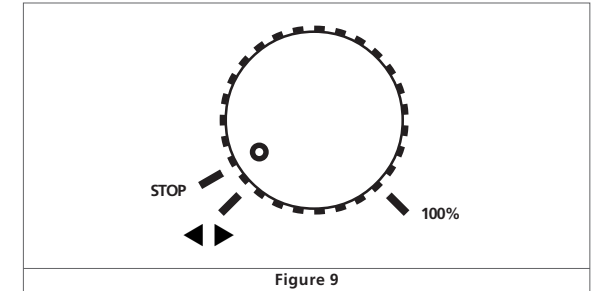
Figure 9

ℹ The throttles are supported by a motor drive. Whenever you turn the knob beyond "zero" and change direction simply release the knob and it will return to the zero position automatically.

• Any functions of the locomotive can be turned on or off by pushing the corresponding buttons or by touching the screen buttons.

With ECoS it is that easy to enter and run new locomotives.

How to proceed from here?

The following chapter 7 informs you about the characteristics of ECoS and the technical background.

In chapter 8 we describe all possible connections in detail.

Chapters 9 and 10 outline the operating philosophy and the input devices available.

The following chapter deals with individual features of ECoS and how to use them.

We recommend studying chapters 8 to 10 under all circumstances. After a short while you will understand the way ECoS works and easily master all its functions.

? Should you come to a point where you do not know how to go further simply look for advise at the online-help for ECoS on our website. If in doubt we recommend to again study this manual.

Please consider, that working with ECoS requires some time to get accustomed to it due to the manifold options available. Be patient and take your time to simply try out things. Do not hesitate - ECoS will support you like a good co-pilot.

We wish you lots of fun on your discovery tour of your ECoS!

7. Features of ECoS

ECoS is a state-of-the-art digital command control system and offers many features. We want to explain the possibilities and some technical background in greater detail. The detailed operating instructions are given in chapter 13. If you wish you may turn to these pages right now if you do not want to know the technical background at this stage.

7.1. Running locomotives

ECoS can control up to 16,384 locomotives simultaneously. Of course, this is only a theoretical number that will hardly be reached in practice. The electrical power required for so many locomotives would far exceed the maximum number of 128 boosters. The response times for each locomotive would also be unacceptably long.

As a multi-protocol-system ECoS supports several data formats for running your locomotives:

7.1.1. Data formats

7.1.1.1. Motorola-format

Motorola I ("Old" Motorola-format)
First generation Märklin® locomotives support this format in which the status of the lighting function is transmitted besides 14 speed steps. Only when changing direction a special signal will be sent to the locomotive. However, it is possible that the direction status of the locomotive and the command station status for this loco do not correspond initially. In this case you would have to change direction once more to assure a corresponding status.

Motorola® II (so called "new data format")
Besides the 14 speed steps a signal indicating direction of travel is transmitted continuously. The info regarding direction always corresponds between command station and locomotive.

The status of F1 to F4 is transmitted in a separate packet. This is only generated if the status of at least one function has changed. Advanced decoders store this information locally to assure that it corresponds with the command station even in case of a power interruption.

ECoS does not differentiate between Motorola old and new but transmits (by using a special method) data packets in both formats.

In ECoS we call this mode "Motorola14"

Märklin® built an extension into their decoder series 6090x to provide 27 speed steps: the so-called "half speed step" between the actual speed steps increases the resolution. The command station must transmit specific command sequences in order to achieve this. ECoS knows this mode as "Motorola27".

If you run a locomotive in "Motorola27" mode and you notice that functions are only activated at every second speed step, then your decoder does not support the 27 speed steps. Please switch to "Motorola14".

ESU extended all decoders to suit the Motorola®-format by an additional mode, namely "Motorola28". This operates with 28 real speed steps.

Run your mfx® decoders with "Motorola28" to allow the locomotive to respond to minute adjustments of the throttle.

In the late 1980-s Märklin® launched some models with special functions (e.g. coach with dancing figures, club coach, etc.) that have to be addressed with a special data packet. Its structure is similar to the packets for accessory decoders. We call it "Motorola Fx 14".

ESU LokSound® mfx-decoders support a second Motorola®-address. With this address it is also possible to activate function buttons F5 to F8. ECoS supports transmission of this second address in such a way that you can actually use 9 addresses.

7.1.1.2. Range of addresses - Motorola

Märklin® defined 80 addresses for its original digital system. Since this number is far too small for many applications several decoder suppliers extended the range. ESU LokSound mfx®, LokPilot mfx® and LokPilot V3.0 support 255 addresses in the Motorola-format.

7.1.1.3. DCC-format

The DCC standards published by the North American NMRA (National Model Railroad Association) is based on a development by the German company Lenz Elektronik.

In DCC-format up to 10,239 addresses, up to 21 functions and up to 128 speed steps are encoded. In practice only 126 speed steps can be used, the others are reserved for the emergency stop function. The absolute direction of travel is also encoded. How many of these addresses, functions and speed steps are actually available depends on the type of decoder and the command station. ECoS supports currently all known DCC formats.

We differentiate between 14, 28 and 128 speed steps. In the latter case 126 speed steps can actually be utilised.

Subject to the mode in which you want to run your DCC locomotive please select "DCC14", "DCC28" or "DCC128" as data format.

Please bear in mind, that the information regarding the speed steps transmitted by ECoS has to correspond with the speed step setting of the decoder. A data packet for "DCC14" is for instance identical to one for "DCC128", but will be "understood" differently by the decoder. If the settings do not correspond then the headlights of the locomotive will blink slowly while the locomotive is accelerating.

If you are not sure which DCC modes are supported by your decoder try DCC 28 first. This is the compulsory mode as stated by the NMRA. All ESU DCC decoders detect the number of speed steps automatically. You may just as well start with DCC 128.

7.1.1.4. LGB®-Format extensions

LGB® uses the DCC protocol for operating garden railways. The old Lokmaus® had only one function button "F1" besides the lighting button. But how could you switch so many functions with just one button?

The "solution" was what became know as the "sequential function status mode". The user knew if he for instance wanted to switch function F3, he had to press F1 three times in a row. The decoder counts the number of status changes and then switches the desired function. The disadvantage of this method is that functions with higher numbers (e.g. F8) take longer to respond, since several "on-off" commands have to be transmitted.

Should you have any LGB locos with such decoders and you want to run them with ECoS select the "LGB" format. It corresponds to the "DCC14" format, but the functions are activated sequentially in the background.

Modern LGB® locos or such locos with ESU LokSoundXL decoders understand alternatively "DCC28" resp. "DCC128". If in doubt, simply try it.

7.1.1.5. Selectrix®

ECoS can control all locos with Selectrix® decoders. In this mode 112 addresses, 31 speed steps and two function buttons (Light and F1) are available. ECoS calls this mode "Selectrix".

7.1.2. Multi-protocol operation

ECoS can transmit all above formats in sequence. Thus each loco can be controlled with its own data format. Mixed operation of different decoders on the same track is generally possible without any problems.

Some very old decoders may not be able to function properly if another format is transmitted to the track besides "their own". This may result in uncontrolled acceleration, blinking headlights or other abnormal behaviour.

The very first series of Märklin® signals 763xx may get confused if you run other data formats besides Motorola®.

If there is no colour mark at the underside of your Märklin® signals we recommend to get them updated. A software update makes them suitable for multi-protocol operation.

7.2. Consisting

ECoS enables you to set up and control consists of two or more locos comfortably. All locos are listed in the memory of ECoS. ECoS transmits separate signals (in the required data format) to each loco of the consist. This happens at high speed so the locos work like one. Locos with decoders that are not suitable for consisting may also be in the consist. As indicated above it is possible to run locos with different data formats and protocols in the same consist.

All locos in a consist should have similar running characteristics. Tune the locos - if necessary – by reprogramming acceleration and maximum speed settings before combining them in a consist.

You may assign a name and symbol to a consist in ECoS in the same way as for a loco. A consist is always run with 128 speed steps.

The available functions in a consist are determined by the leading loco who's functions will be displayed on the monitor. The activated functions will be signalled to all locos in the consist.

Locos of a consist can be called up on another throttle, but they cannot actually be run with that throttle.

7.3. Running shuttle trains

Many model train enthusiasts do not want to run their trains simply "in circles" but want to have real point-to-point operation. Branch lines onto mountains with terminal stations at either end, small branch lines with a connection to a main line, but also modular layouts are typical examples for such point-to-point scenarios.

In ECoS we differentiate between shuttle tracks and shuttle trains (locos) that run on these tracks (out and back). While the tracks have to be set up only once it is quite possible to have different locos on such a track. You may change the locos and easily determine which trains should serve a particular branch line.

ECoS can handle up to 8 shuttle lines and run one loco each on each of these 8 lines. ECoS slows down the trains automatically when they reach the end of the line, changes the direction and lets the loco depart after a pre-determined layover time.

To detect the stopping point we use contact inputs of the s88 bus. One s88 input is needed for each stopping point.

Such trains are stored in the virtual memory of ECoS. Thus this feature is available regardless of the decoder type.

7.4. Accessories with magnetic drives (solenoids)

One of the main features of ECoS is controlling accessories / turnouts. By magnetic accessories we mean any device that is operated by one or more solenoid drive. Amongst others these are turnouts, signals, un-couplers or relays to switch lights or motors.

ECoS can switch such devices via an accessory decoder.

Such stationary decoders are available from many manufacturers. The most popular is probably the Märklin K83 and compatible models. All such decoders can be used provided they

• are compatible to Märklin® K83 resp. to Märklin® K84 and understand the Motorola protocol or

• can process the appropriate DCC-format. DCC-accessory decoders must comply with the "DCC accessory decoder" standards.

Some accessory decoders by Roco behave like loco decoders to enable them to work with the Lokmaus2. Such decoders can only be operated with ECoS provided they can be set to a DCC compatible mode.

Wire accessory decoders as described in the manual. Some accessory decoders are suitable for an external power supply for the solenoids. We recommend a separate power supply for all larger layouts: definitely use a separate transformer. Do not use the ESU power supply for this purpose.

Please observe the correct polarity of the track power when using k83 / k84 or compatible decoders.

In ECoS accessory decoders are stored in lists similar to locos. Each accessory can have its own name and symbol. This symbol represents the function of the accessory. ECoS differentiates between two-, three- and four- aspect accessories. It is assumed that whenever three- or four-aspect accessories are used the second drive is wired to the following address of the decoder.

Example:

For a three-way turnout with the first address of 51 the second address is automatically 52. The red output of the following address (in this case: 52) cannot be used for other devices.

ECoS offers an integral control panel for turnouts with 74 levels (sub panels) with 16 each accessories. Thus you can arrange your turnouts in groups and manually call them up when necessary.

7.5. Routes

In practice it is often useful to switch groups of turnouts and signals and bring them into a pre-defined status instead of switching them individually. ECoS allows you to combine them to a so-called route. Switching a route is done in the same way as switching an individual turnout except that all devices that are part of this particular route are switched in sequence on after another to reach the required status.

Routes are also stored internally and can be displayed by a specific symbol on the accessory control panel of ECoS. ECoS can handle up to 1024 routes with 256 individual devices each.

Each accessory can be part of as many routes as desired and, of course, with different status or aspect.

ECoS transmits the appropriate signals in sequence – with an adjustable gap between the individual signals. The duration of the pulse depends on the type of accessory.

Routes can also be switched with s88 contacts: you can link any s88 contact with any route. Thus it is possible to arrange sequential processes and block protection.

7.6. Programming decoders

ECoS allows you to program your decoders. ECoS knows two principal programming modes and three different protocols: ECoS supports DCC-programming as well as Motorola- and Selectrix®-programming.

7.6.1. Programming track

The programming track must be completely (!) isolated from the rest of the layout and must be wired directly to the programming track output of ECoS.

There should always be only one loco on the programming track at any point in time. You may read out and write new values. All DCC decoders are suitable for programming on the programming track as well as programmable Motorola decoders (e.g. LokSound mfx®, LokPilot mfx®), but also Selectrix® decoders. DCC and Selectrix® decoders cannot only be completely re-programmed on the programming track; it is also possible to read the values.

7.6.2. Programming On the Main

DCC decoders can be re-programmed directly on the main (also known as "Programming On Main" or "POM"). The great advantage is that any new settings can be monitored while running the loco and without having to take it to the programming track.

7.7. Feedback with s88

ECoS offers a factory built-in galvanically isolated (!) input for the very popular s88-modules. They serve as track occupancy detectors and may be used for controlling routes and shuttle train operations.

The s88-bus consists of up to 32 s88-modules that can process either 8 or 16 feedback signals each. These modules are wired in a "chain" (bus). s88-modules are available from various manufacturers.

The number of existing s88-modules is configured in ECoS in such a way that response times are as short as possible: since the modules are checked continuously in sequence, only really existing modules should be monitored.

7.8. Continue to use your old system with ECoSniffer

ECoSniffer represents a very special feature of ECoS. It allows you to use your existing digital system even when upgrading to ECoS. Simply wire the track output of your old system to the ECoSniffer sockets. ECoSniffer then monitors the signals transmitted by your old system and "translates" them into ECoS commands.

Therefore it is possible to use any existing command station as long as it is suitable for either Motorola® or DCC since ECoSniffer is multi-protocol-capable.

It "understands" commands for locos in DCC (14, 28 or 128 speed steps, auto-detection, up to 12 function buttons), Motorola (14 speed steps, 80 addresses, Motorola old and new, up to 4 function buttons) as well as commands for accessories in DCC and Motorola. All other commands from the old system (perhaps programming commands) will be ignored.

ECoSniffer allows an easy conversion to ECoS without having to throw away your handheld throttles or keyboards for turnouts.

ⓘ You may only connect one digital command station to EcoSniffer. The number of handheld throttles connected to this command station is only determined by the old system. Thus you may for instance continue to use your Lokmaus system with up to 32 "Lok Mice" or your Loco net®-command station with all connected handheld throttles.

7.9. ECoSlink bus system

Our bus system ECoSlink allows for the extension of your ECoS command station. You may connect external handheld throttles, feedback modules, boosters and other extensions. ECoSlink is based on the CAN industrial standard, is suitable for a maximum cable length of 100 metres and provides excellent data transmission. ECoSlink operates with 250 kBit / second and is "hot-plug" and "plug&play" capable. All devices report automatically to the system and can be removed or reconnected during operation. The ECoSlink system can comprise of up to 128 devices.

7.10. ECoSlot module extension compartment

On the underside of the ECoS housing is a compartment suitable for extension modules. Thus ECoS can be extended. ESU will launch a suitable receiver module for the radio controller "mobile control" in early 2007. The mobile control will enhance ECoS with a wireless handheld throttle.

8. Wiring details

8.1. Power supply

ECoS gets its power via a 2.1mm DC-socket. In principle any power supply for DC or AC could be used provided the total output power is sufficient. The secondary voltage corresponds with the track voltage; voltage stabilising or adjustments are not required. ECoS has its own internal protective circuitry for under-voltage and overload (-current).

outside: "-"   inside: "+"
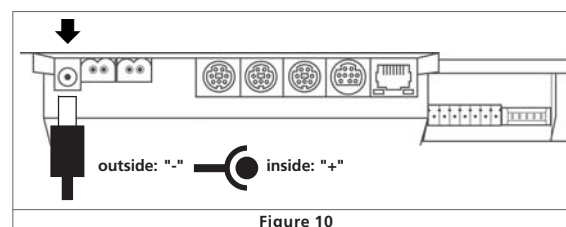
Figure 10

Supply voltage: 14V to 18V AC or DC
Supply current: max. 5A

⚠ ⚡ • The peak voltage supplied by the transformer without load may not exceed 19V. Otherwise the ECoS electronic circuitry may be irrevocably destroyed.
• Please only use the power supply by ESU or any other power unit approved by ESU. The use of other power supply units may lead to the destruction of your ECoS and, of course, makes any warranty claim null and void!

8.2. Power supply

A power supply with the following characteristics is delivered with ECoS:

Supply voltage: 100V – 240 V AC, 50 / 60 Hz
Supply current: 1.8A max.
Secondary voltage: 18V DC, stabilised
Secondary current: 5A max.
Output socket: DC-socket, 2.1mm, 1.8m cable
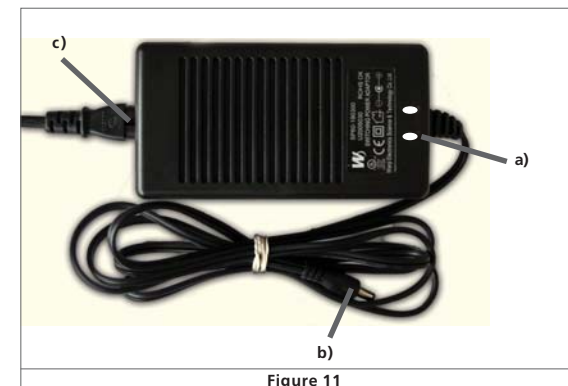
Figure 11

a) Power-LED (red)
b) Output socket (Low Voltage)
c) Mains socket

⚠ ⚡ • Please only use the power supply that comes with ECoS. The use of other transformers may lead to reduced output power or in the worst case to the destruction of your ECoS.
• Please use the power supply provided with ECoS solely for powering ECoS. Do not use it for other household appliances.
• Check the power supply regularly for any visible damage of the housing or the mains cable. Damaged parts may never be used! Do not attempt to repair the power supply! Extreme danger – risk of fatal injury!
• Make sure there is sufficient ventilation around the power supply. Mounting in furniture without air circulation may lead to overheating or even fire!

• First connect the mains cable to the appropriate socket of the power supply and insert the plug into a power outlet.

⚠ Never use Y-adapters in order to supply power to other devices of your layout! This may cause a connection to ground that is not permitted and could destroy your ECoS!

ⓘ The power supply provides a stabilised voltage output that should only be used for your layout. For some N-gauge decoders or locos 18V may be too. We recommend a lower track voltage when using ECoS with N-gauge equipment.

• You may exchange the power supply (18V) against another with an output voltage of 15V free of charge. How to go about this you will learn in chapter 24 at the end of this manual.

8.3. Track connection

The tracks are connected via a two-way socket with a removable plug. Please make sure you use cables of adequate size for your track power. We recommend wires of at least 1.5mm² (better: 2.5mm²) cross section. In larger layouts connect track power every two meters to the tracks.

Figure 12

ECoS uses an H4-bridge (full bridge) for the track power. Therefore with ECoS – contrary to older Märklin® systems - there is no "Common" (Ground).

- Never connect another digital system or analogue transformer to the same circuit as ECoS. Your ECoS may be damaged or destroyed!
- Should your layout be split into several circuits please make sure that all sectors are completely isolated from each other. Under no circumstances may there be a Common.
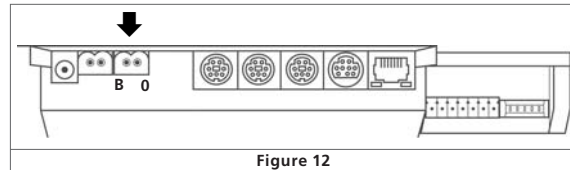- ECoS supplies up to 4A track current. Always consider if you actually need such a high output current. In case of a short circuit your locos may be damaged and there may be risk of fire! Reduce the maximum current to a sensible level. Also refer to chapter 18.1.3.

Remove all capacitors that may possibly have been wired to the track power supply cable in your layout. They would cause a strong heat build-up of ECoS and impair the power output. Almost in every connecting track in an analogue starter kit (Roco, Märklin®) are resp. were capacitors installed.

8.3.1. Wiring two-conductor tracks (standard DC)

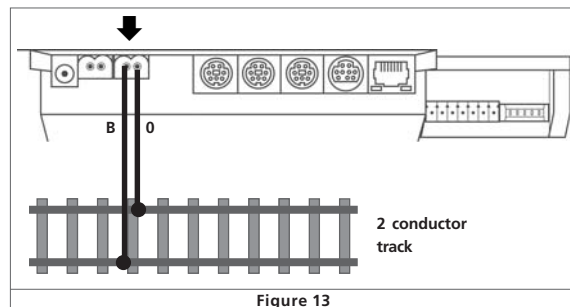Wiring takes place as shown. Polarity is not an issue for DCC or Selectrix®.

Figure 13

8.3.2. Wiring three-conductor tracks

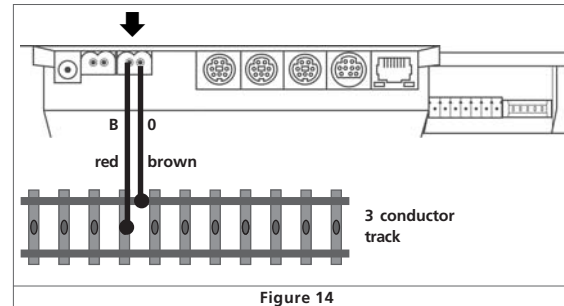Wiring takes place as shown. Polarity must be observed otherwise some older decoders may not work (e.g. k83).

Figure 14

If your new Motorola locos work but the old k83 accessory decoders and older Märklin® locos do not it is most likely that polarity has been swapped.

Märklin® offers under part number 74040 a suitable connecting track for the C-track system. For the K-track system use connecting track No. 2290.

8.4. Wiring the programming track

ECoS has a separate low power output for the programming track (max current 1A). The same type of socket is used as for the mainline connection. Wire a section of track to this output that is completely isolated from the rest of the layout, ideally some short stub track.
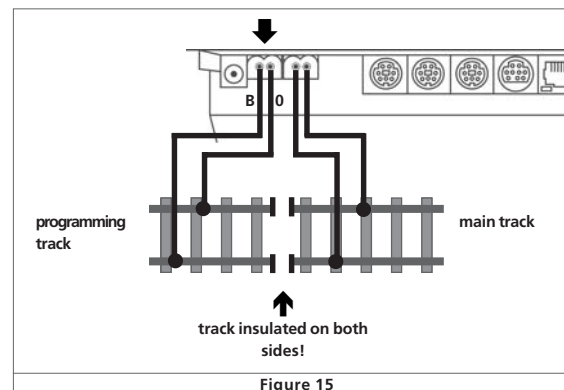
Figure 15

This track must be insulated on both sides from the layout – in case of Märklin insulate the centre conductor and both tracks! During programming the insulating gaps may not be bridged. (boogies, coaches with interior lighting, etc).

Whenever the programming track is not in use an internal relay in ECoS switches this track to the main line. Programming track and main line are synchronised. Thus you may run your locos onto the programming track and then re-program them. Only when you have started the programming procedure separate signals will be transmitted to the programming track.

There should always be only one loco or coach with decoder on the programming track to avoid unintended programming of another vehicle. After finishing the programming procedure remove the loco form the programming track. Otherwise "parked" locos could be re-programmed unintentionally.

8.5. ECoSlink

Each ECoS command station has three sockets for connecting external devices. They are called ECoSlink.
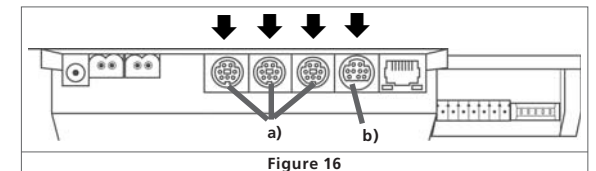
Figure 16

a) ECoSlink Connect
b) ECoSlink Extend

Should you wish to connect more than three devices you have to extend the bus with a bus-distribution-module. This device has to be wired to the ECoSlink Extend socket and thus provides further possibilities to connect other devices. Bus-distribution-modules will be available as from 2007.

8.6. Computer interface

Each ECoS has an 8-way RJ45 network socket. This is compliant with the Ethernet standard and can be connected via a long cable to your computer network. There are two LEDs integrated into the socket.
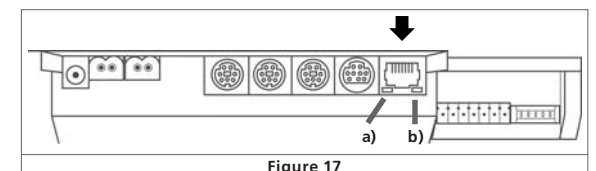
Figure 17

a) The LINK-LED lights up red continuously if ECoS is connected to a network. If this LED is not lit there is an incorrect or no connection.
b) The BUSY-LED blinks green as soon as there is a data transfer between ECoS and the network.

Connecting to a Hub or Switch

Use a commercially available network cable and insert it into a free socket of your Network Switch or Hub. The LINK-LED must then light up.

Direct coupling of a PC and ECoS

If you prefer to connect your ECoS directly to a PC without a Switch or Hub you have to use a so called "cross-over-cable". Such cables look like ordinary network cables but internally two pairs of wires are crossed. The LINK-LED lights up continuously if the connection is correct.

Connect the network output only with a computer network as per the Ethernet standard. Telephones for the ISDN standard and also other model train manufacturers use identical plug-socket-connections, but they must never be inserted into the LAN socket of ECoS.

8.7. Wiring external boosters

Should the power output of the integral booster be insufficient you may connect more external boosters. For this purpose you have to divide your layout into several individual electrical sectors.

Always insulate all conductors (tracks). There may not be any Common!

8.7.1. Suitable systems

There are two types of boosters on the market. In principle both types (compatible to DCC or the Märklin® 6017 standard) can be used since they are both capable to amplify DCC- and Motorolasignals and to supply them to the track. Please also refer to the manual of your booster.

Since most commercially available boosters have problems with Selectrix® data packets the external booster output of ECoS does not supply any Selectrix®-data. This means you cannot run any Selectrix®-locos on sectors supplied by an external booster.

The two types of boosters are different in the way they detect a short circuit and in their polarity. The correct setting can be configured in ECoS and is valid globally for all boosters. Therefore you may only use boosters of one type with ECoS at any one time.

We strongly recommend using only one type of booster by the same manufacturer. The time related behaviour of boosters varies so much that bridging gaps when travelling from one sector to another quickly leads to problems.

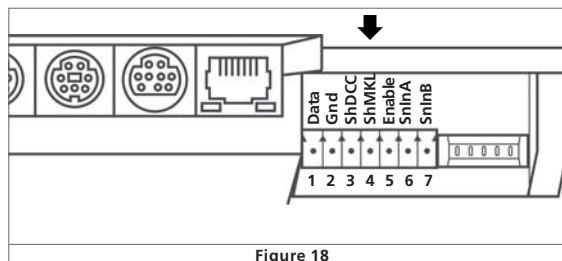There are 5 input poles for external boosters on a seven-way socket with removable screw terminals.

Figure 18

1 = Data	(Booster data cable has the signal)
2 = Gnd	(Ground)
3 = ShDCC	(Short circuit-feedback for DCC, shutdown if connected to GND)
4 = ShMKL	(Short circuit-feedback for 6017, shutdown if positive)
5 = Enable	(Booster "On/Off", for 6017-booster)
6 = SnInA	(ECoSniffer Track signal input A)
7 = SnInB	(ECoSniffer Track signal input B)

8.7.2. Connecting a DCC-booster

You must connect "Data" and "Gnd" of your DCC-booster. If you also want to transmit short circuit data you have to connect the "ShDCC" socket.

A Lenz®-Booster is wired as follows:
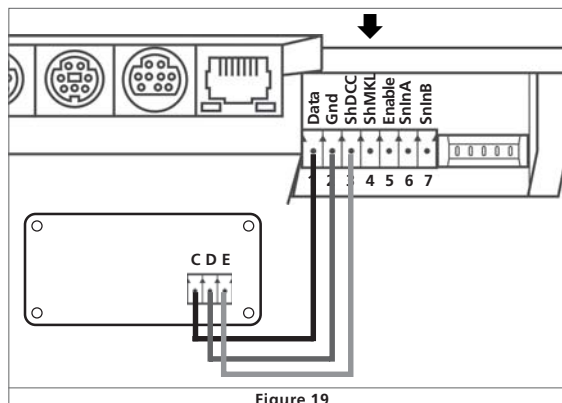
Figure 19

1 = Data	Terminal "C"
2 = Gnd	Terminal "D"
3 = ShDCC	Terminal "E"

Other DCC-boosters are wired according to the same principle. Refer to your booster manual to find out the appropriate contacts.

8.7.3. Connecting a Märklin®-booster

Each 6017-booster (and compatible boosters) are supplied with a 5-pole cable. One end is inserted into the socket of the booster the other end has to be re-wired since the ECoS sockets are not compatible.
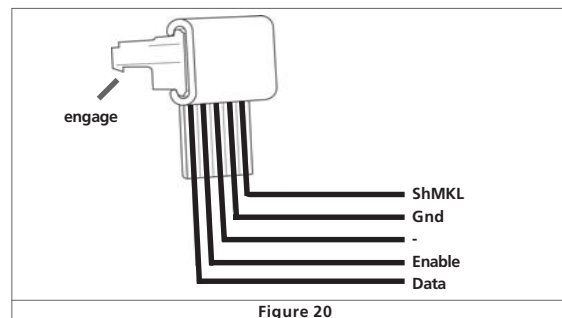
Figure 20

The contact pins are wired as follows:

1 = Data	(wire 1 of 6017-cable)
2 = Gnd	(wire 4 of 6017-cable)
4 = ShMKL	(wire 5 of 6017-cable)
5 = Enable	(wire 2 of 6017-cable)

Cut off the plug of the 6017-cable and connect the individual wires to the ECoS booster output as described above.

Make sure all wires are connected correctly to avoid damage to the booster and / or the ECoS.

8.7.4. Short circuit protection

After wiring your booster you have to configure the software in order to assure correct functionality of the short circuit protection. Chapter 18.3.1 provides more details.

8.8. ECoSniffer input

The ECoSniffer input (SnInA and SnInB of the booster / ECoSniffer socket) contacts have to be connected to the track output of your old system. Polarity is not an issue. The old system continues to get its power through the old power supply.

Make sure that the old system does not have any connection to the tracks. All tracks must be supplied with power through ECoS. The power outputs of two or more digital systems may never be connected to the tracks simultaneously.

Input voltage: 14V to 30 V

Data signals: DCC or Motorola, auto-detect

Detailed information regarding the exact function of ECoSniffer is provided in chapter 17.
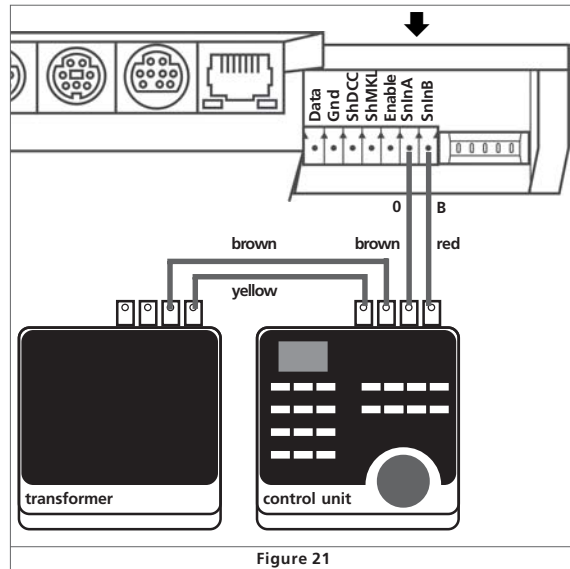
Figure 21
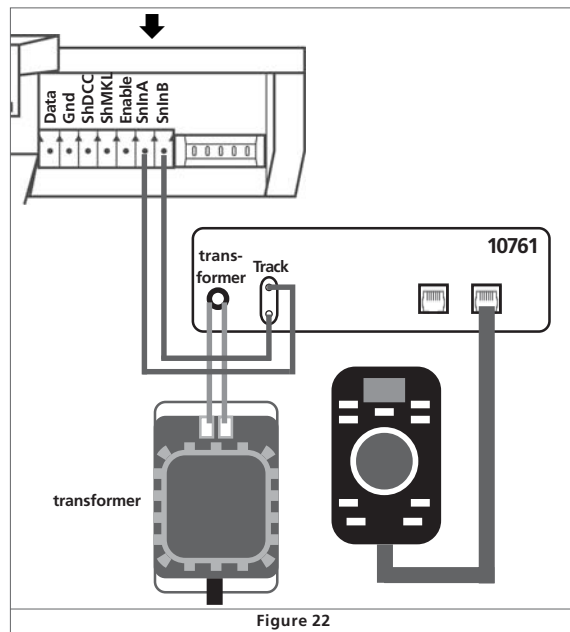
Figure 22

An s88-system consists of up to 32 s88-modules that are connected in series. The first module (module 1) is connected to the s88-socket of ECoS while module 2 is wired to module 1, etc. Thus we build up a bus system. All modules will be numbered within ECoS according to the place in the chain of connected modules.

Each s88-module is supplied with one cable. The polarity is defined since the plug only fits in one position into the socket.
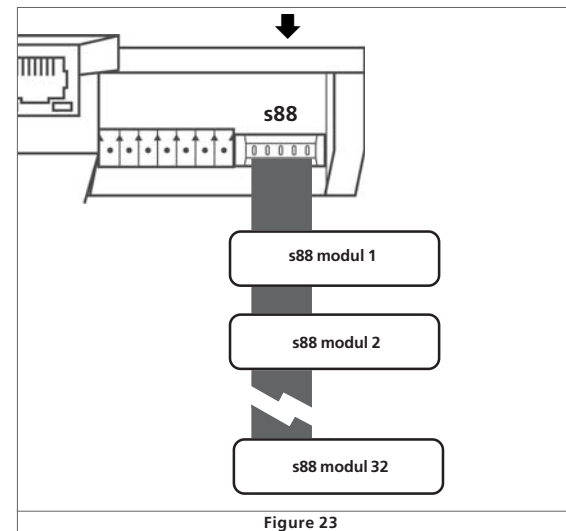
Figure 23

All s88-modules are normally supplied with power by ECoS. In total the s88-input can supply 750mA. Should this be in sufficient you may use s88-modules suitable for an external power supply. Please refer to the manual of your s88-modules.

The s88-input of ECoS is galvanically isolated from the rest of the layout and the command station. Therefore there is no direct ground connection between ECoS and the feedback decoders. If your s88-module has a direct ground connection (e.g. LDT s88-modules) this has to be wired to the track (ground).

ECoS was tested with the following s88-modules:
• Märklin® 6088
• LDT RM-DEC-88
• LDT RM-GB-8
• Viessmann 5217

Before you can use the feedback contacts you must configure the s88-bus. You will find details in chapter 19.

9. Control elements in detail

9.1. Cabs
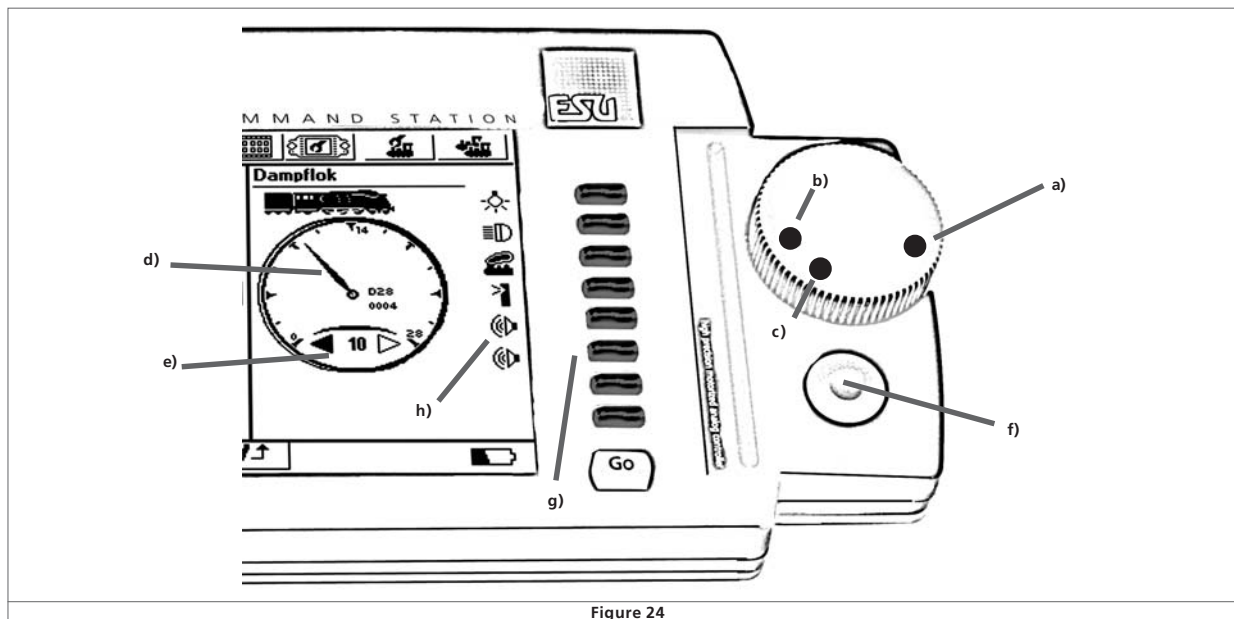
Figure 24

Each of the two cabs consists of three components namely throttle, joystick and buttons for triggering functions and part of the monitor.

a) Position maximum speed "100%"
b) Position Zero "STOP"
c) Change of direction "◄ ►"
d) Speedometer needle
e) Direction arrows
f) Joystick
g) Buttons
h) Touch screen buttons

9.1.1. Throttles

Each of the motor-driven throttles has two definite end positions at left and right. The position of the throttle knob corresponds with the speed of the loco. A small dot indicates the position of the knob.

Position b):   Loco is stopped, speed is zero.
Position a):   Loco is running at maximum speed. This corresponds with speed step 14, 28, 31 or 126 depending on the loco and the protocol.

Turn the throttle anti-clock wise to change direction beyond

position b) to position c) until you hear and feel a "click". Then please release the throttle. It will return to position "b" automatically. The arrows "e" indicate the current direction of travel.
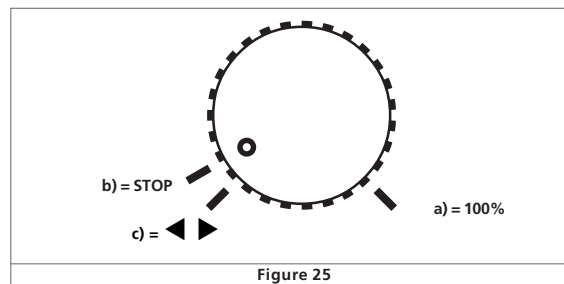
Figure 25

ℹ️ You may hold the knob even while it is turning automatically. After about one second the motor will stop. There is no risk of damage due to the sliding clutch.

Alternately you can adjust the train speed by touching on the speedometer needle d) in six steps (speed zones).

When touching one of the direction arrows e) the direction of travel will change and the loco will accelerate to the same speed in the other direction.

9.1.2. Joystick

The four-way joysticks with centre-click-function help you to navigate the menus, to select a loco and to trigger the whistle ("Playable Whistle") of locos suitably equipped.
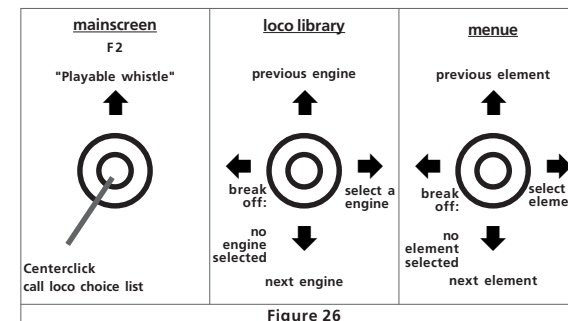
Figure 26

Never operate the joystick with force.

• You reach the loco choice list (loco library) on the mainscreen by pressing the joystick. You may move through the list by up / down movements with the joystick and select a loco by pushing the joystick once again (alternately move the joystick to the right) or to cancel the process by moving the joystick to the left.

• Within the menus you can move up and down by moving the joystick accordingly, moving right or pushing down selects an element while moving left allows you to leave the particular menue.

• In the mainscreen – without any open menus – you can trigger function F2 by moving the joystick upwards. In conjunction with a LokSound V3.5 decoder you can then vary the frequency and volume of the whistle: the further you move the joystick upwards, the louder the whistle. Finally you can blow the whistle like the engineer of a prototype railroad!

9.1.3. Function buttons
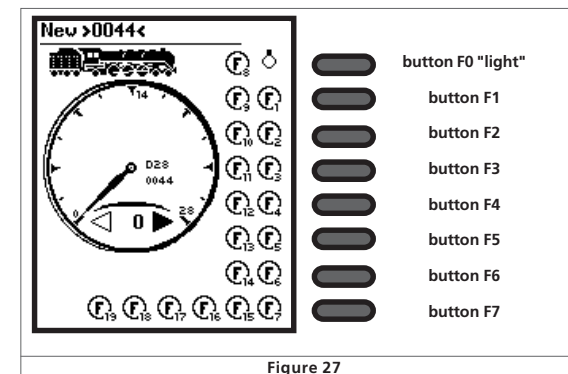
Figure 27

There are 8 function buttons assigned to each throttle that are sorted from top to bottom: At the top is the headlight button (F0), below follow F2 to F7. You can trigger any function of the currently run loco with them at any time.

9.2. Stop-button

After briefly pushing the Stop button ECoS will immediately interrupt the track current and all external boosters. The display shows "Emergency Stop", the red Stop button is lit. Use the Stop button in case of danger or when you place a loco on the tracks.

ECoS will also switch to "Emergency Stop" in case of overload or short circuit: the display will show the symbol for "Short Circuit" at both lower corners.

If you push the Stop button and keep it down the controlled shut down of ECoS will be started after 3 seconds. ECoS saves the current operating status, signals the end of operation to all boosters and external devices and shuts down safely. As soon as the following image appears on the screen you may switch off ECoS (pull the mains plug).
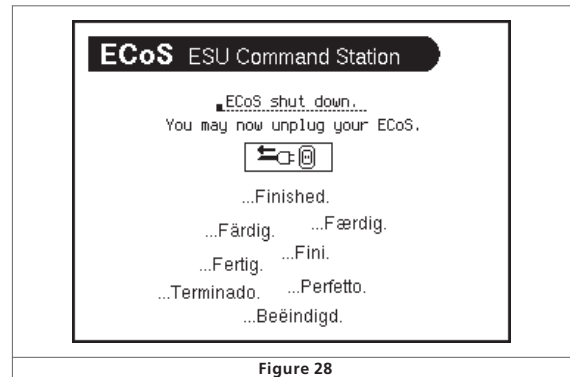
Figure 28

9.3. Go-button

The Go-button releases the Emergency Stop. The internal and the external boosters are re-activated. Operation may continue. If ECoS switches "Emergency Stop" again there is most likely a short circuit on the layout. This has to be found and removed before operations can continue.

9.4. Touch screen

The most important medium for commands is the touch screen. This makes entering any commands extremely easy: by touching a symbol, touch button or choice field on the screen the corresponding action will be triggered.

You may use your fingers or the supplied stylus for handling the

touch screen. Please do not use any hard or pointed objects since this could lead to permanent scratches on the surface.

Please observe the remarks in chapter 3 regarding the handling of the touch screen.

9.5. Storing the stylus

The supplied stylus can be placed in the holding groove on the right side of ECoS for short periods of time.

For longer-term storage we recommend to place it in the compartment at the back (right hand side).
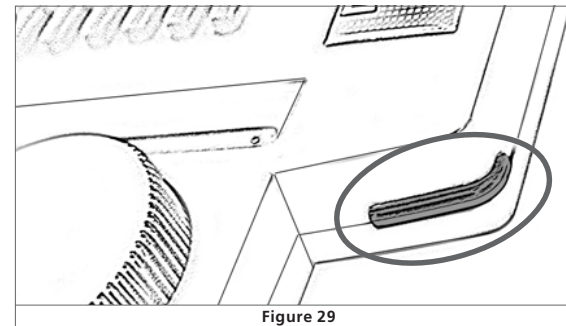
Figure 29
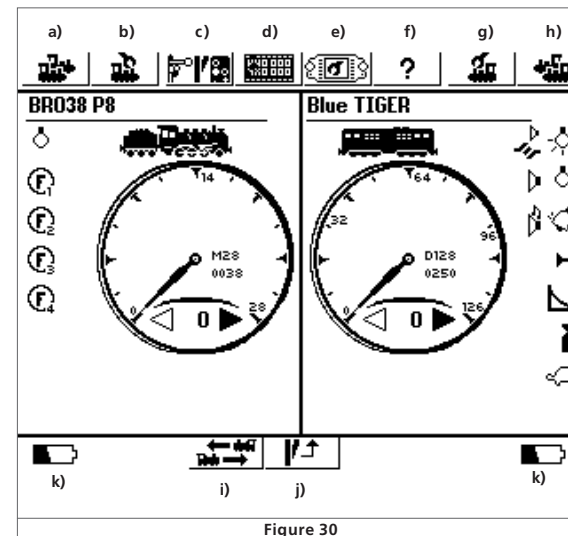
Figure 30

10. Introduction to operations

Any commands are given graphically by using the touch screen. The display on the screen changes accordingly subject to which menue is currently open. ECoS uses always the same type of control elements that are described in detail below.

10.1. Main menue

On the main screen (window) (also refer to Figure 30) there are 8 fields at the top and another two at the bottom. You can touch them directly in order to select the desired action:

a) Selecting a loco (left): opens the window for selecting a loco and assigning it to the left throttle

b) Loco menue (left): opens the menue to change any settings of the loco currently run on the left throttle.

c) Accessories menue: opens the menue for accessories

d) Link mode: after pushing this symbol ECoS changes into this mode. In this mode all buttons or symbols for function buttons and accessory symbols are displayed inverse. In the link mode you cannot switch functions or accessories, but you can assign new symbols for them. Push that symbol again and ECoS changes back to normal switching mode.

e) Set-up menue: this opens the general set-up menue of ECoS. Here you can adjust general things such as the brightness of the screen, set-up shuttle train lines, configure ECoSlink-devices and adjust the booster-current-threshold.

f) Help menue: a context related help function on the screen makes it very easy to get accustomed to the system and to find "a way out" should you have difficulties.

g) Loco menue (right): as in b), but for the right hand throttle

h) Selecting a loco (right): as in a), but for the right throttle

i) Changing throttles: you can change the locos from left to right and vice versa by pushing a button. The throttles will be adjusted to the correct position automatically.

j) Turnout control panel: pushing this symbol fades in (or out) the turnout control panel. The currently assigned locos can be run even when the turnout control panel is open. .

k) Status line: displays any errors or remarks:

Low Batt: no battery inserted or battery voltage too low. Shut down ECoS as described in 11.2 with the "Stop"-button and change the batteries.

Emergency Stop: the track voltage is switched off manually, "Stop" button lights up in red.

Short Circuit: the track voltage was switched off due to a short circuit or overload, the "Stop" button lights up red.

Update: an internal software update is under way. Operations can only begin after finishing the update. This may take up to 10 minutes.

10.2. Switch buttons

Switch buttons ("fields") serve to confirm certain actions. You may activate them with your finger or the stylus.

This button confirms an action. Changes will be accepted and saved.

This button cancels an action. Changes will not be saved.

10.3. Data entry fields

Data entry fields allow you to enter text or a number. First touch the choice field, then a cursor appears at the end of the line. Now you can enter text and / or numbers with the aid of the displayed keyboard.

Deletes the last character

Deletes all lines

If several fields exist, only the one that has been activated by touching it is active. You recognise this by the frame (interrupted line) around the text.

10.4. Choice lists

Choice lists allow you to select something out of a list of possible options.
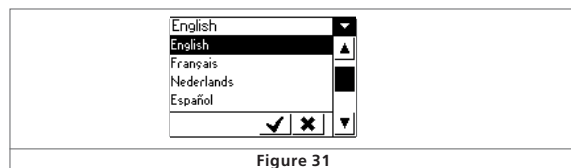
Opens a list with possible options.

Figure 31

• Move your choice by moving the joystick up or down.

• Confirm the desired option with your finger or the stylus.

10.5. Slide controller

Slide controllers make it easy to set numerical values.

Increases the current value (alternately: move joystick upwards)

Reduces the current value (alternatively: move joystick downwards)

10.6. Radio buttons and choice fields

Radio buttons enable you to make a choice out of a group of possibilities. Only one entry can be active at any given time similar to the pre-selection buttons of a radio tuner.

Choice fields serve for confirmation of options in ECoS. A tick shows an active option.

11. Run locomotives

ECoS stores a list of locos in which you have entered all locos that you want to run on your layout. Any loco without an entry in this list cannot be operated. Therefore these data have to be entered once at the beginning.

11.1. Add new locos

There are two possibilities for entering new locos: choose the one you prefer.

11.1.1. Direct entry in the list of locomotives

takes you to the loco menue.
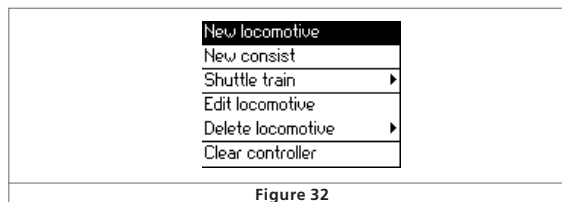
Figure 32

• Select the first entry "New Loco". A dialogue window opens in which you can change the settings of this loco.
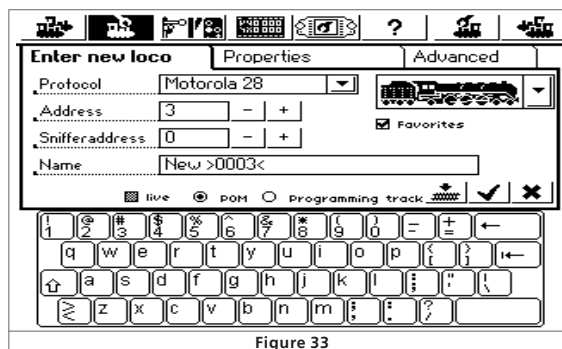
Figure 33

Saves your entry, closes the dialogue window and adds the loco to the list. The loco will be assigned to the throttle.

Cancels entries. No loco will be entered.

11.1.1.1. Data format

Via this choice list you set the data format for this particular loco. ECoS does not check if the loco understands the selected protocol. If in doubt read the decoder manual.

11.1.1.2. Address

Here you enter the current address of the loco. The accepted address range is subject to the data format and may be restricted. With this address the loco will be controlled.

11.1.1.3. Sniffer address

The address entered here is for the ECoSniffer. You can learn more about it in chapter 20. If you have not connected any old devices to the ECoSniffer you may leave address "0" unchanged.

11.1.1.4. Name

You can assign a name with up to 16 characters to any loco at any time. This name appears on the main screen whenever you have called up this loco and also in the choice list of locos. Be creative and address your locos by name only in future!

The name >xxxx< is set as the default value (xxxx corresponds with the address). Locomotive names can be assigned several times.

11.1.1.5. Symbol
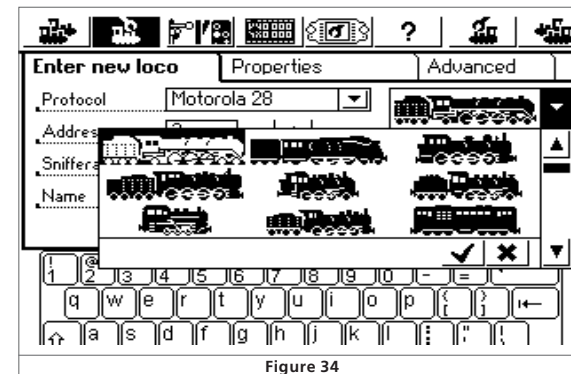
Figure 34

In this choice list you can select the suitable symbol for your loco. The symbol has no influence on operations it only serves for quick visual recognition and differentiation of your locos.

11.1.1.6. Favourites

In order to make it easier to find a certain loco out of a long list you can mark your preferred locos as "Favourites". When searching a loco you can then first list all the favourites before you scan the rest of the list.

11.1.1.7. Speed steps / max speed display

Pushing the tab "Properties" opens a dialogue window "Display". There you can select if you want to display speed steps or speed (in km/h) on the speedometer.
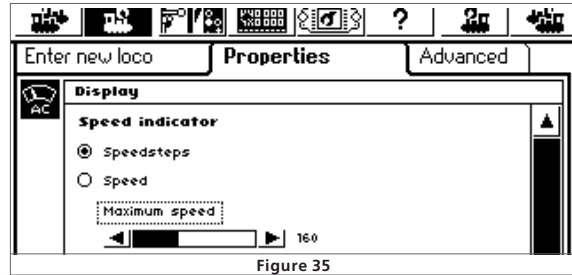
Figure 35

• In the "Speed Step"-mode ECoS shows the currently set speed step. This is represented in the following ranges: 0 – 14, 0 – 27, 0 – 31 resp. 0 – 126. This is subject to the protocol used.

• In the "Speed"-mode ECoS calculates a speed in km/h that is then displayed on the screen.

In order to be able to display the correct speed you have to enter the desired maximum speed of the particular loco in km/h. This should be the maximum speed of the prototype and not of the model.

The value that you select with the slide controller will be displayed at the highest speed step. All values in between will be interpolated accordingly.

The value entered here only serves for the display and has no influence on the actual speed of the loco. No parameters of the loco will be changed by this!

Setting the maximum speed has to be done via CVs in DCC decoders; in Märklin® locos this generally has to be adjusted within the loco.

11.1.1.8. Direct changing of address and speed step settings

Whenever you enter a new loco the data is only entered in ECoS without any changes to the decoder in the loco.

Often it happens that the address of a loco is not known. If so desired you can program the loco when entering into ECoS provided it is a DCC loco:
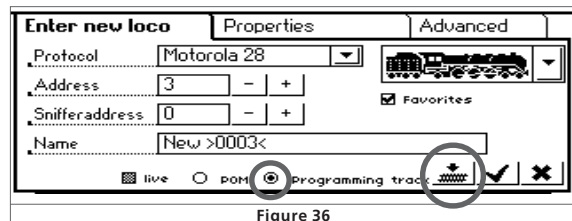
Figure 36

• Place the loco on the programming track
• Select the option "Programming on programming track" (Fig. 36).
• Push the programming icon. ECoS will now program the following parameters:
  • The address in CV1 resp. CV 17 / 18, provided a long address has been selected.
  • In CV29 the use of long or short addresses and the number of speed steps is set (14 resp. 28 / 128 speed steps).

11.1.1.9. Extended decoder settings

The function of this tab is explained later in chapter 16 "Programming Decoders".

11.1.2. Indirect entry of a locomotive

Sometimes you may want to place a loco on the tracks and run it without time-consuming data entry. Of course, this is also possible with ECoS.

• Select the loco choice button of the throttle that you want to use.

• Type in the address using the number block.

• Confirm your selection
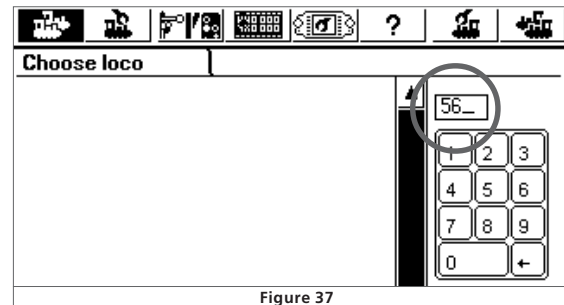
Figure 37

If there is no other loco with the same address registered ECoS will automatically enter the necessary data in the background with the given address and the name "New>xxxx<" and by setting the DCC 28-protocol.

Which protocol ECoS should use whenever you enter a loco directly can be pre-set in a menue. You find details in chapter 18.24.

11.2. Changing loco parameters

You may change the settings of any loco at any time. First assign the loco to one of the two cabs.

Open the loco menue; select "Edit Locomotive" in the menue. All further steps are shown in chapter 11.1.

The field "Edit Locomotive" is shaded if

• another user is running this loco. Only locos that are listed for the throttle can be modified. Please read chapter 11.7.2 for further information.

• that access control prevents editing locos. Read more in chapter 18.4.

• the loco is under control of the automatic shuttle train mode. Chapter 15 explains the details.

11.3. Assigning a loco to a throttle

You can assign one loco to each throttle.

Push the loco choice button of the desired throttle and a list with all available locos will open:
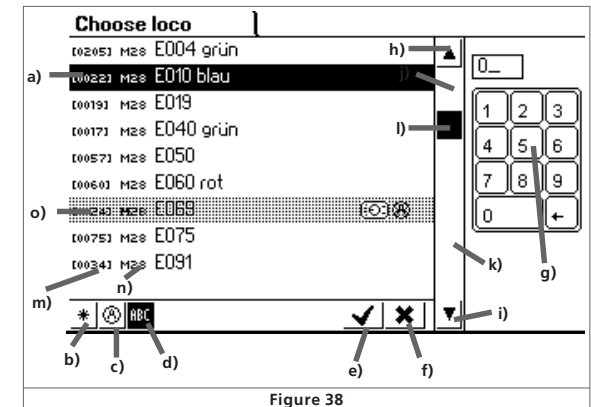
Figure 38

a) Marked loco
b) Sort list by favourites
c) Sort by active locos
d) Sort by name (activated in Fig. 36)
e) Select marked locomotive
f) Cancel without selecting a loco
g) Number block for selecting a loco by number
h) One element up
i) One element down
j) One page up
k) One page down
l) Position in inventory list (library)
m) Loco address
n) Data format of loco
o) Control not possible, loco is run from another throttle

You can fade in additional pictograms for each loco:

(A) Active loco: this loco is running

Loco is blocked: this loco is run from another throttle

* Favourite: Loco bears favourite mark

You can now navigate the list either with the joystick or with the stylus until you have found the desired loco. Alternately you can type in the loco address. ECoS scrolls automatically to the corresponding address within the list. After confirming the loco it will be called up by a throttle. The throttle moves automatically to the correct position according to the actual speed of the locomotive.

11.4. Speedometer display options

After selection the loco speed is displayed on the speedometer. Besides the information mentioned in chapter 9 the speedometer shows further important data.

Figure 39
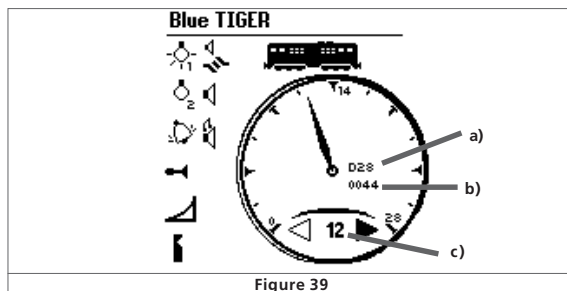
a) Data protocol of loco
b) Address of loco
c) Current speed step resp. speed of locomotive

Subject to the status of the loco the following symbols can be displayed:

Symbol "Conflict of Address"   (see chapter 11.7.1)

Symbol "Loco is blocked"   (see chapter 11.7.2)

Symbol "Shuttle Train Mode"   (see chapter 15)

Symbol "Consist"   (see chapter 14)

11.5. Deleting a locomotive

You can delete any loco at any time should you not need it any more. First select the loco and assign it to a throttle.

• Select the loco menue of the appropriate throttle and select "Delete Locomotive" in the menue. Then another menue opens.
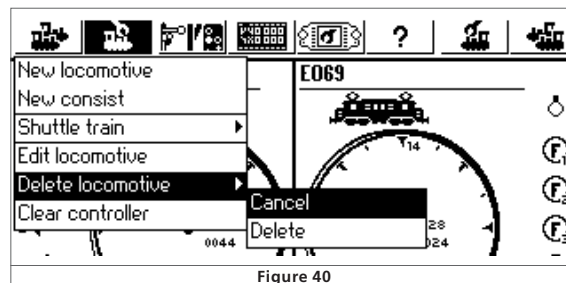
Figure 40

• Select "Delete" and the loco will be deleted.

11.6. Assign function symboles – Link mode

ECoS permits free assignment of symbols for each function button. In other words not only can you assign a symbol for each function of each loco but also determine if this particular function should be active continuously or only as long as the corresponding button is pressed.

• Push the screen button in the main screen. Then the symbols will be displayed inverse (white on black).

This symbol appears for function buttons that were hidden until now.

Push the symbol of the function you want to change and a list of many symbols will open. Each symbol is displayed twice:
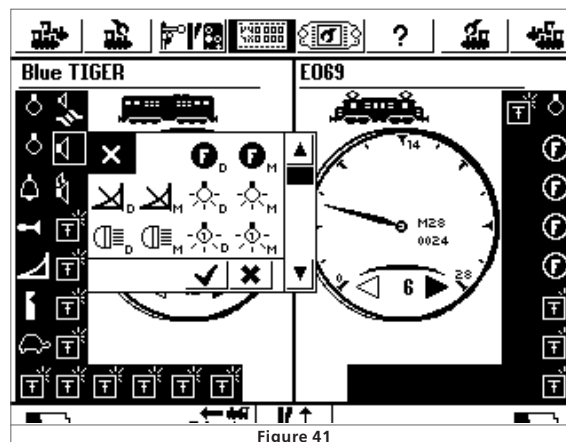
Figure 41

A small "D" next to the symbol means continuous operation. It is switched by touching the screen and remains active until you touch it again.

A small "M" next to the symbol means "Momentary Action". It remains only active as long as you touch the button.

ECoS does not check if any particular symbol matches the actual function of the locomotive. The pictogram only serves for graphic representation.

Select the symbol at the top right if you do not want to assign a symbol for the function button.

Once you have changed all function symbols the way you want them touch the symbol again and thus leave the "Link Mode".

(i) DCC locos can switch up to 20 functions, Selectrix®-decoders only two. Locos running under "Motorola14" NS 2Mototrola"8" offer up to 9 functions. ECoS sets functions 5 to 8 automatically to the second Motorola address that is supported by all LokSound decoders. This second address first has to be activated. Refer to the decoder manual for instructions.

11.7. Interesting information on how to run a loco

11.7.1. Conflict of addresses

A conflict of addresses occurs if you want to run a loco but another loco with the same address is already running.

Each locomotive should have its own unique address. That way there will be no problems during operation. In practice it happens frequently that two or more locos are listed in ECoS and have the same address: collectors often own several locos of the same class and to whom they have assigned the same address; e.g. class 44 with address"44". Of course, normally only one of the models will be put on the layout while the others remain in a display case. However, the owner of these models wants to list all of them in the list of locomotives in ECoS.

At first this can easily be achieved. ECoS permits you to enter as many locos with the same address as you wish.

However, it is not possible to run them at the same time on your layout. The first loco can be run in the normal way. When the second loco with the same address is selected the symbol shown on the left will be displayed and this loco cannot be operated. In reality this would make no sense at all. As soon as a command is transmitted to the first loco both locos would respond – after all, they have the same address!

The same occurs if you enter the following locos:

• Loco1: Address: 03, DCC 28 speed steps, "E 103"

• Loco2: Address: 03, Motorola 14 speed steps, "BR 03"

In this case the display would also show a conflict of addresses since both locos have the address "03". The differing data format does not have any impact, because ECoS cannot know if a modern multi-protocol-decoder (e.g. LokSound) will respond to both formats.

11.7.2. "Locking" - Exclusive access to locomotives

ECoS only permits one throttle to run a certain locomotive at any point in time. As soon as a cab runs a loco or consist the same loco can be selected on another controller but it cannot actually be operated. The inferior controller indicates this with the symbol shown here.

This setting is ideal for club layouts or display layouts where it is intended to give control to individual controllers over certain objects. "Taking Over" a loco from another controller is not wanted.

When you often run your trains alone but have located several handheld throttles around your layout it is useful to "hand over" a loco form one throttle to the next. ECoS offers a setting for this that we call "Taking Over Locomotives". Chapter 18.2 explains how it works.

If you permit that other operators may take over a loco you should not select the same loco on both throttles. Since both throttles would have "equal rights" the needle of the speedometer may start vibrating because both potentiometers may vary by one speed step due to tolerances.

11.7.3. Address ranges – recommendations

If you want to run vehicles in multi-protocol-operation with Märklin®, ESU LokPilot, ESU mfx® and DCC-decoders simultaneously we recommend to arrange for a split of addresses as follows:

Märklin®-decoders: Addresses 01 – 80

DCC-decoders: short addresses: Addresses 81 - 99

ESU mfx®-decoders: Addresses 100 – 255

DCC-decoders: long addresses: Addresses > 256

12. Operating consists

Consists also get an address in ECoS like locos. They are listed and run in the same way as single locomotives.

12.1. Add a new consist

Select the loco menue of the left or right hand throttle and
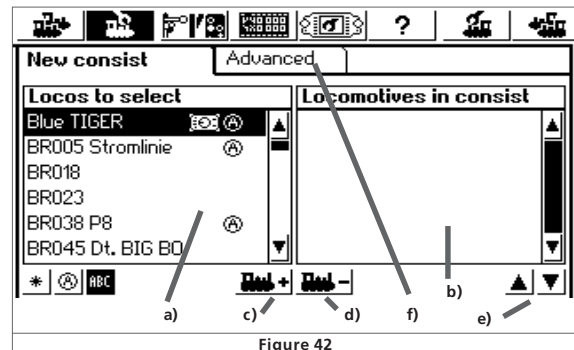
Figure 42

select "New consist".

a) List of all locos

b) List of locos in this consist

c) Adds another loco to a consist

d) Deletes a loco from a consist

e) Moves the currently marked loco at the right up or down

f) Extended settings for consists

- Select the first loco to be added to the consist from the list on the left.

- Touch the icon in order to add this loco.

- Repeat this process with the other locos you want to add to the consist.

In the menue "Extended" you can select a symbol for the
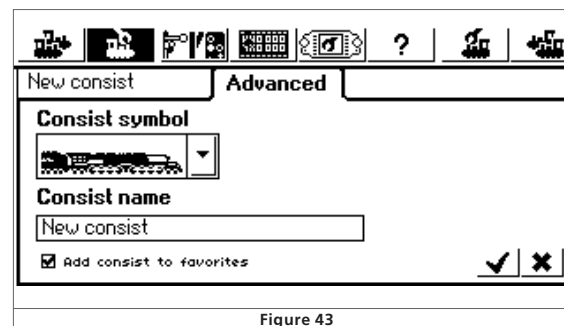
Figure 43

consist and assign a name under which you will find it in the list of locomotives.

- By touching this screen button the consist is established and assigned to the throttle.

Consists are always run with 128 speed steps on the throttle. Internally ECoS will convert these speed steps to the appropriate value for each decoder.

- Locos can only be assigned to one consist.
- Consists cannot be added to other consists.
- Locos assigned to a consist cannot be run individually any more.

12.2. Assigning a consist to a throttle

Selecting a consist is done the same way as selecting a locomotive. Refer to chapter 11.3. Consists are marked as "Multi" in the locomotive list.

12.3. Change parameters of consists

You can change any settings in a consist just as easily as with individual locos, refer to chapter 11.2.

12.4. Deleting a consist

You can delete a consist just as easily as with individual locos, refer to chapter 11.5.

Any locos that were part of the deleted consist will of course not be deleted as well. They remain as individual locos in the list of locos.

12.5. Hints for running consists

- It is recommended only to add locos to a consist that process the information regarding direction (e.g.: Motorola 2-format; DCC-format).
- The characteristics of the locos in a consist should be similar (maximum speed, acceleration and deceleration). There should not be any big deviations. If necessary reprogram such locos before adding them to a consist. Also refer to chapter 18.
- Do not couple lightweight vehicles between locos in consists because of risk of derailment!
- Please make sure that any isolated sections ahead of signals are sufficiently long when running consists (at least 36cm to 54cm longer than the length of consist).

13. Switching accessories

Accessories are listed in a library within ECoS similar to locomotives. Thus all accessories have to be entered once before they can be switched. Before switching the accessories will be assigned to one or several control panels.

13.1. Enter new accessories

- Touch this symbol and select "Enter New Accessory" in the menue. The following configuration dialogue will be opened:
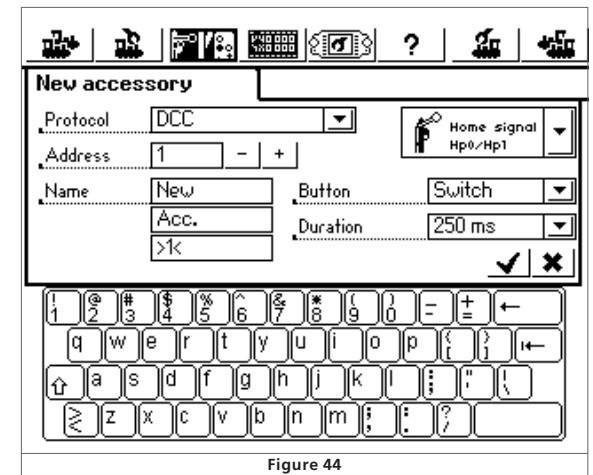
Figure 44

13.1.1. Data format

Here you can select the suitable data format to operate your accessory. Both DCC and Motorola are available.

13.1.2. Address

Here you enter the digital address of the accessory. This value has to be entered as a number. If you use Märklin® accessory decoders and you are used to the process of entering the address by typing the decoder number (1 to 64) followed by the position on the decoder (1 to 4), please read up in chapter 21.2 on how to enter the address in the table.

Please make sure that you enter an address (that matches the decoder) since ECoS does not check if an address is correct or not.

13.1.3. Name

For a precise representation on the screen you may give your accessory a name of up to 3 lines with 9 characters each.

13.1.4. Symbol

You should choose the symbol for your accessories as precisely as possible: ECoS recognises two-, three- and four-aspect symbols and controls through the symbol the outputs of the accessories accordingly; also refer to chapter 7.4.

ECoS offers a large number of German and international symbols in a choice list.

13.1.5. Permanent versus momentary action buttons

Here you determine if the accessory should be switched for a pre-determined time (=change over) or only as long as the button is pressed (=pulse).

Normally you would use the "change over" mode for turnouts. ECoS transmits a defined, time controlled pulse to the solenoid. Thus any burnout of solenoid coils is prevented.

The "Pulse" function is best suited for un-couplers, which should be active as long as the function is activated (until your finger leaves the screen button).

The function mode cannot be changed later unless you delete the accessory and re-enter it.

13.1.6. Switching time

The switching time can be adjusted in five steps from 0.25 seconds to 2.5 seconds in "Change Over" mode.

Should the default value of 250msec not be sufficient for reliable switching increase the switching time step by step.

Once you have set this parameter touch the corresponding screen button and ECoS stores the setting and completes the configuration dialogue.

Should the dialogue not close as desired and instead an exclamation mark "!" appears just behind the three lines with the name, then the text is too long. ECoS checks the length of the text entry dynamically when it is saved. In that case please shorten the name of the accessory.

13.2. Setting accessory parameters

You may reset the parameters of an accessory at any time:

• Push the screen button and select "Edit Accessory" in the menue. A list with all accessories appears.

• Select the desired accessory. All further steps are the same as in chapter 13.1
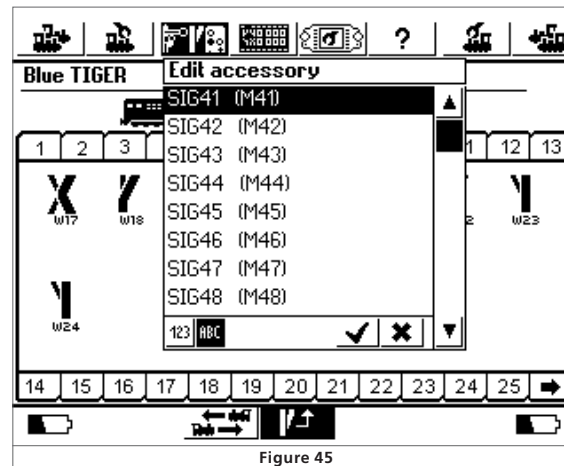
Figure 45

13.3. Assign accessories to the turnout control panel

After entering accessories they must be assigned to one or more turnout control panels in ECoS. Only once they have been assigned can they actually be switched. The control panels always show the current status.

ECoS saves the status of each accessory internally. Manual change of the status cannot be detected by ECoS. Therefore make sure that the status on the system corresponds with the physical status of the accessory.

In total the turnout control panel of ECoS offers up to 74 individual panels each of which can switch up to 16 accessories or routes.

Fade in the turnout control panel.
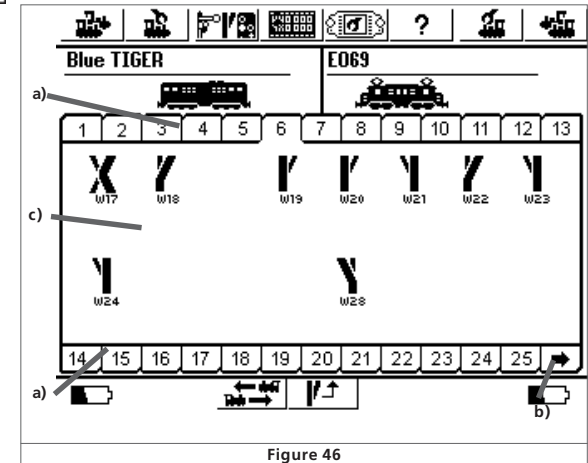
Figure 46

a) Choice buttons for the individual panels.
b) Display of the next 25 panels.
c) Display field for 2 x 8 accessories.

Each panel can handle 16 accessories. Pushing the corresponding panel number activates a panel.

13.3.1. New link

• Change to the link mode while the turnout panel is open. All 16 symbols will be displayed inverse.

An unused position on the panel will also be displayed.

• Select the position to be linked and touch it. A menue called "New Link" will open.

Figure 47

- Select "Select from List".
- Select the accessory that you want to place here and confirm.
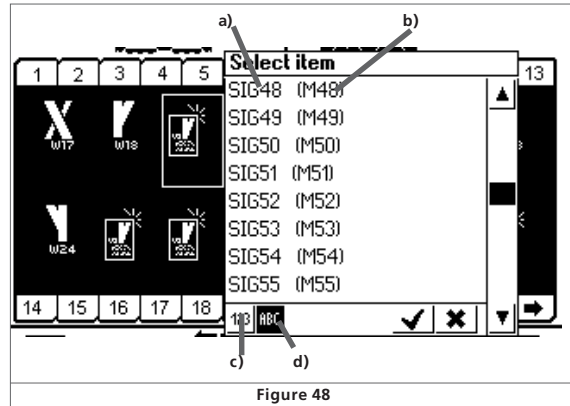
Figure 48

a) Name of accessory
b) Data format and address of accessory
c) Sort accessories by address
d) Sort accessories alphabetically

- Repeat the process with the remaining other accessories.

You may link accessories several times and on different panels.

ℹ️ If you select "Create New Accessory" you will arrive directly at this menue for entering new accessories as outlined in chapter 13.1. After entering an accessory successfully it will be linked to the desired location automatically.

13.3.2. Delete a link

If you wish to delete a link touch the link you want to delete while you are in the active link mode (all fields are displayed inverse). The menue "Edit Link?" appears:
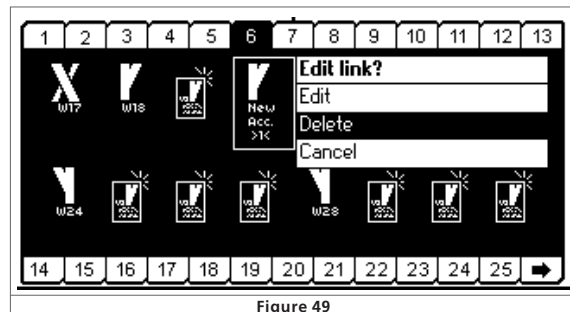
Figure 49

ℹ️ - Select "Delete" and the link disappears.
  This deletes only the link but not the accessory.

13.4. Switch an accessory

An accessory can be switched very easily.

- Fade in the turnout control panel and select the desired panel.
- Push the pictogram of the desired article.
- Accessories with two definite positions: the alternate aspect or status will be switched on.
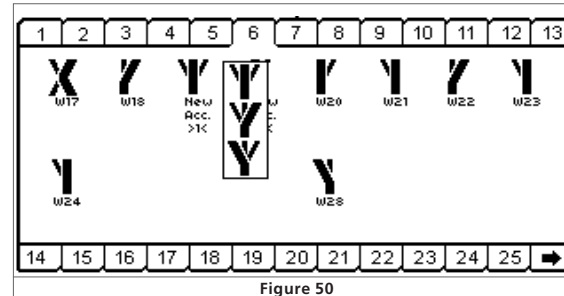
Figure 50

- Three- or four-aspect accessories: A window showing all possible aspects opens. Select the desired aspect. The window closes and the aspect will be switched on.

13.5. Delete an accessory

An accessory can easily be deleted:

- Push the screen button and select "Delete solenoid Accessory" from the menue.
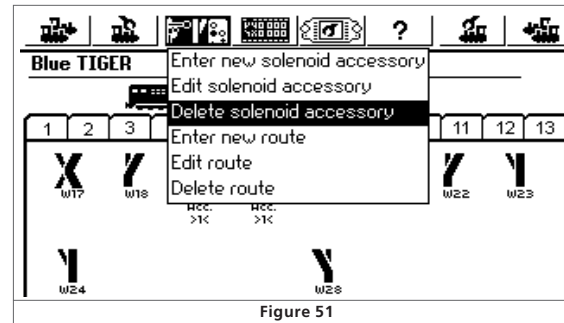
Figure 51

Select the desired accessory and confirm your choice.

ℹ️ When an accessory is deleted it will be removed from all routes and links in the turnout control panel.

14. Routes

Routes are also registered in lists analogue to locos and accessories. Routes therefore have to be defined first before they can be linked on a control panel and before they can be activated. Definition means, which accessories belong to the route and which aspect or status should they have.

⚠️ Only linked accessories can be added to a route. Therefore you should link all accessories before defining routes.

14.1. Enter new route

Push this symbol and select "Enter New Route" from the menue.
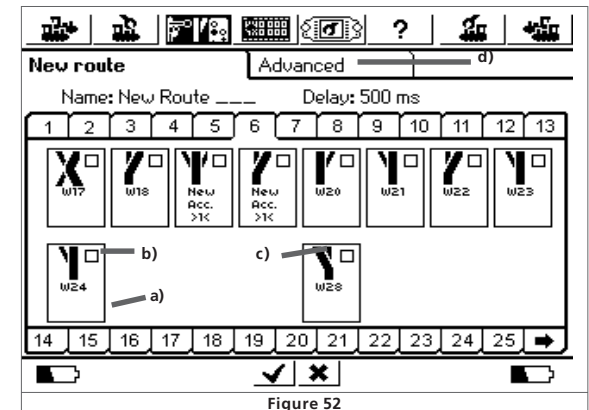
Figure 52

a) Selection frame around all accessories
b) Selection box active for each accessory within the route.
c) Desired aspect or status of the accessory in the route.
d) Tab "Advanced"

A selection frame is located around each accessory a). Other routes are faded out since a route may only contain accessories but not other routes. As always you may change between panels in order to see all linked accessories.

- Select the first accessory to be included in the route and mark it in the selection box at the top right with a tick.
- Push the accessory symbol and select the desired aspect or status.
- Select all other elements of the route and their desired aspect step by step.

ECoS triggers the commands in the same sequence as you have entered them. Keep that in mind when entering routes.

14.1.1. Advanced settings

Once you have added all accessories to a route please change to "Advanced". There you can set other important parameters.
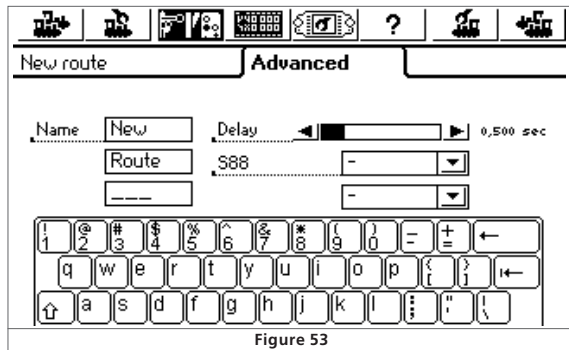
Figure 53

14.1.1.1. Name

For an unmistakeable recognition you may give each route a name on the screen. Three lines with 9 characters each are available.

14.1.1.2. Delay

When switching a route ECoS transmits individual pulses to the corresponding accessories. The time interval between two individual commands can be adjusted. This may be necessary if accessories with particularly high current draw are part of the route. They high current could lead to a voltage drop and the pause between commands assures reliable operation.

14.1.1.3. Trigger a route with an s88-contact

A mighty function is represented by the possibility to trigger a route not only by pushing a screen button but also by an s88-conctact.

This function can be used to realise block control: A train entering a block is detected by an s88 and the previous block is cleared.

• Enter the desired s88-module and the port number of the input that should switch the route.

The s88-bus must be configured prior to this procedure (refer to chapter 19).

Of course, it is also possible to trigger the same route manually on the turnout control panel.

• Confirm your entries to save the new route. The data entry dialogue will be closed and the new route is registered.

If the dialogue window does not close und an "!" is displayed instead then the text is too long. ECoS checks the length of the text when saving it. In that case simply shorten the name of the route.

14.2. Edit a route

Should you wish to rename or edit a route this is easily possible at any time:

• Push the corresponding screen button and select "Edit Route" in the menue. A library with all routes appears.
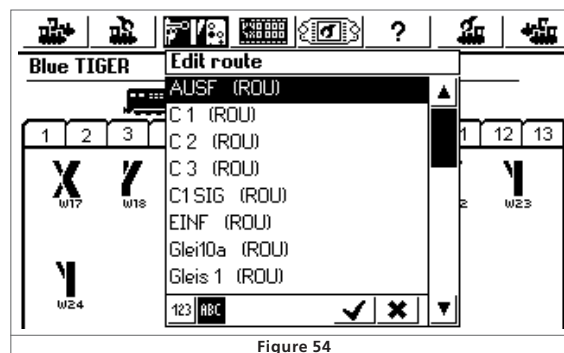
Figure 54

• Select the desired route and proceed as described in chapter 14.1.

14.3. Assign a route to the turnout control panel

After configuring the routes you can link them to one or several control panels of the turnout control panel. Only routes that are linked to any panel can be switched manually: routes linked to s88-conatcts do not have to be linked to a control panel.

Linking routes happens in the same way as linking accessories. Chapter 13.3 explains how. Routes are marked with "ROU" behind the name in the accessory library.
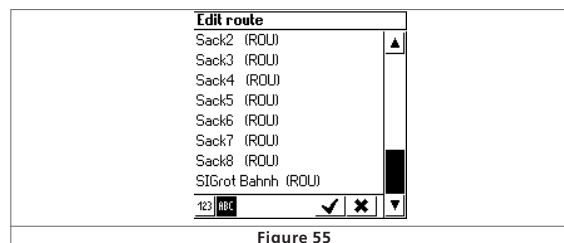
Figure 55

14.4. Switching a route

In principle a route is switched in the same way as an individual accessory as described in chapter 13.4. However, there are two differences:

This pictogram indicates that the route is currently not completed. At least one accessory did not switch as it was supposed to.

The route is completed; all accessories are switched to the desired status.

Routes can only be switched. Switching another route that contains at least one accessory of the previous route does releasing routes.

It is always possible to switch an accessory belonging to a route individually, for instance through another link to a screen button in a control panel. As soon as the status of at least one accessory does not correspond to the appropriate status of this route the displayed symbol changes. Thus you keep control at any time and have certainty that all accessories of one route are switched correctly.

14.5. Deleting a route

Deleting a route is just as simple as deleting an accessory:

• Open the accessory menue and select "Deleting Route".
• Select the desired route and confirm your choice.

15. Running trains in "shuttle train" mode

The shuttle train mode represents another fascinating function of ECoS.

ECoS differentiates between two terms:

• Shuttle train line: the track section on which the loco should travel forward and backwards
• Loco in shuttle train mode: loco that is dynamically assigned to a shuttle train line and travels "out and back".
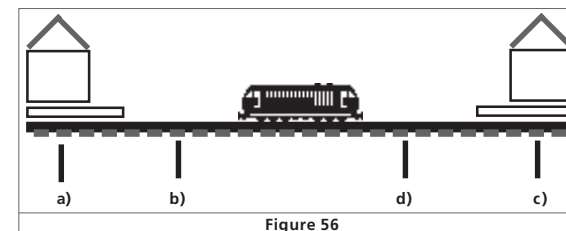
Figure 56

A shuttle train line must comprise of the following:
a) Station1
b) Brake point for station1
c) Station 2
d) Brake point for station 2

The train stops at each station for a pre-determined layover time before it travels back to the other station. The sequence happens as follows:

- As soon as the train from station 1 reaches the brake point for station 2, ECoS transmits a "Stop" command (speed step "0") to the train. At the same time a timer is started inside ECoS.
- The train slows down with the set deceleration and stops. Deceleration has to be set in such a way that the train definitely stops in station 2. You may have to experiment a little.
- Once the pre-set layover time is past (T1), the timer gives the signal and the train receives a command to change direction. The train is still stopped in station 2; it is now ready for departure and the headlights are switched correctly for the return trip.
- Once the timer signals departure time (T2) the train accelerates and moves towards station 1. Thus the procedure begins once again.
- The periods T1 and T2 are of equal duration. The time the train takes from brake point 1 plus the time the train is stopped while still set to the original direction is the same as the time the train waits in the station after having changed the direction setting.
- These periods are identical for both stations. The distance from the brake points to the station must be the same in both stations since the braking distance is subject to the set deceleration of the locomotive.

For detecting the brake points you have to install and assign two s88-contacts.

15.1. Configuring a shuttle train line
A shuttle train line can easily be configured:
- Select the set-up symbol from the top tool bar. A window with several pictograms located on the left opens.
- Select the sixth pictogram from the top and the window "Shuttle Train" opens.
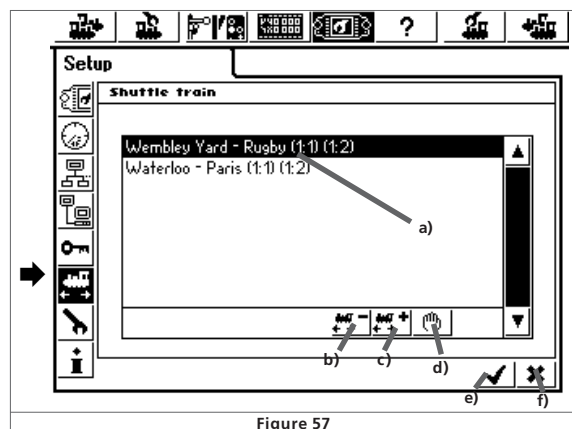
Figure 57

a) Shuttle train routes that are already configured
b) Add a shuttle trian route
c) Delete a shuttle route
d) Edit a shuttle train line
e) Leave the set-up menue and save changes
f) Leave the set-up menue and cancel changes.

Pushing this screen button opens the sub-window "Shuttle Train Route".
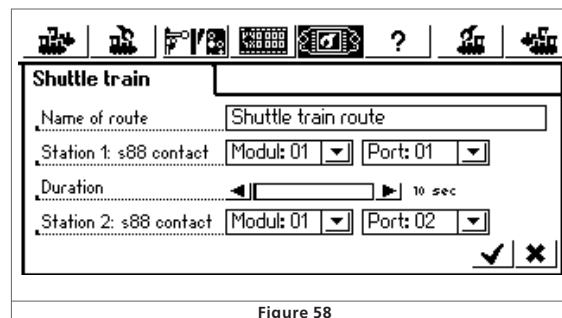
Figure 58

Name of the (shuttle train) route
Assign explicit names to your shuttle train lines. This name is required later for assigning the line.

Station1: s88-contact and station2: s88-contact
Here you select the two s88-contacts for the brake points of the shuttle train line. The s88-bus must be correctly configured prior to this action. See also chapter 19.

Use two separate s88-contacts. ECoS does not check if these contacts are used for any other action.

Duration time in the stations
Here you enter the time T1+T2 (in total). This may be up to 300 seconds.

✓ Finish your data entry, the window closes and the new shuttle train line is displayed on the screen. Enter other shuttle train lines in a similar fashion.

ECoS can handle up to 8 shuttle train lines.

Pushing this symbol for the marked shuttle train line deletes it

Open and edit the marked shuttle train line with this symbol.

15.2. Locos travel "out-and-back"
Once you have configured your "shuttle train lines" you may dispatch a train.
- Call up the loco onto one of the two cabs.
- Move the loco into the shuttle train mode.
- Set the throttle to the desired speed.
- Select "Shuttle Train" from the menue.
- Choose the desired Shuttle Train Line from the sub menue.
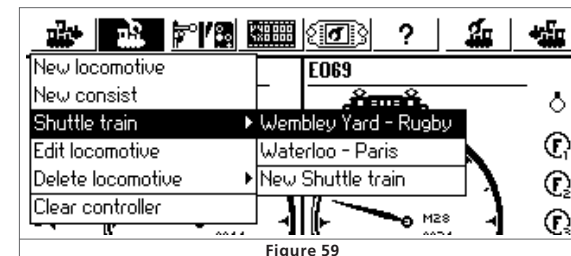
Figure 59

- Now the locomotive will be controlled by the Shuttle Train Line control function and cannot be controlled manually any longer. An icon on the speedometer indicates this.

15.3. Cancel shuttle train mode
If you wish to run this loco manually again proceed as follows:
- Call up the loco on the same throttle that you used to set up the shuttle train mode.
- Select "Shuttle Train Line" in the locomotive menue.
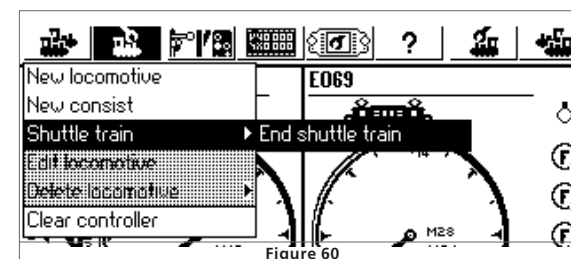
Figure 60

- Select "Cancel Shuttle Train Mode"
- Now the loco can be controlled manually.

16. Programming Decoders

By programming we mean the method of electronically changing certain parameters of decoders. This applies to all types of decoders such as mobile decoders, accessory decoders and feedback decoders. Decoders with manual switches (DIP-switches) such as older models from Märklin® cannot be programmed with ECoS.

Unfortunately there is no standardised method to access all parameters; this varies subject to the manufacturer and decoder type.

Generally it can be said that all parameters of a decoder are stored in an internal memory space. Each memory space can contain a number. The memory spaces are numbered in sequence. Since the value of each memory space can be changed at any time they are also known as variables. With these variables the properties of the decoder are defined ("configured") and thus the term "Configuration Variable" (CV) was introduced.

The values stored in each CV determine the behaviour of the decoder to a great deal. Values that are not permitted or wrong may cause havoc to the point that the decoder does not work properly or not at all any more.

⚠️ Change decoder settings only if you are certain about the consequences. Otherwise you may experience all sorts of unexplainable behaviour.

In the DCC standards the properties resp. characteristics of most CVs are defined. The most important ones are:

CV	Name	Description	Range	Value
1	Address	Address of loco	1 - 127	3
2	Starting voltage	sets the minimum speed	1 - 64	3
3	Acceleration	Multiply this value with 0.869 to calculate the time from 0 to Vmax	0 - 64	8
4	Braking time	Multiply this value with 0.869 to calculate the time from Vmax to 0.	0 - 64	6
5	Maximum speed	maximum speed of loco	0 - 64	64
8	Manufacturer's ID	ID of ESU		151
17 / 18	Extended address	Long address CV 17 contains the higher value byte (Bit 6 and Bit 7 must always be active), CV18 the lower value byte. Only active if function in CV 29 is set.		
29	Configuration register		-	6
		Function		Value
		Bit 0: change direction		
		normal direction of travel		0
		reversed direction of travel		1
		Bit 1: speed step mode		
		14 speed steps		0
		28 or 128 speed steps		2
		Bit 2: Analogue mode		
		Switch off analogue mode		0
		Permit analogue mode		4
		Bit 4: select speed curve		
		Speed curve through CV 2, 5, 6		0
		Speed curve through CV 67 - 96		16
		Bit 5:Select short or long address		
		Short addresses (CV 1)		0
		Long addresses (CV 17+18)		32

ℹ️ A complete list of all CVs and further information to the DCC standards is available at http://www.nmra.org/standards/DCC/. Please also refer to your decoder manual.

16.1. DCC-Programming

The range of possibilities in programming DCC decoders has continuously improved over the years. Therefore there are different methods that are incompatible to each other:

Register Mode: Here you can only access CVs 1 to 8.

Paged Mode: On the programming track CVs 1 to1024 can be reached

Direct Mode: On the programming track CVs1 to1024 can be reached. Reading out decoder data is about 8-times faster than in Paged Mode.

POM Mode: Here programming is done on the main line ("Programming On Main"). All CVs from 2 to 1024 can be overwritten. The base address CV1 cannot be accessed.

Unfortunately there is no rule regarding the fact which decoder supports which programming method. For new decoders the Direct Mode is compulsory. All ESU decoders support Direct Mode as well as the other methods.

Refer to the manual of your decoder to find out which programming methods are supported.

⚠️ From Veriosn 1.0.1. ECoS supports all programming modes. Version 1.0.0 only supports DCC Direct Mode and POM mode.

16.1.1. Direct Mode (CV-Mode)

For programming in DCC Direct Mode (also known as CV-mode) the loco has to be located on the programming track. No other loco may be on the programming track at that time otherwise they will also be programmed simultaneously. In Direct Mode you can read and write CVs.

16.1.2. Programming on the Main (POM)

In the POM mode the loco may remain on the layout and is re-programmed while running on the layout. Thus you may observe and correct any changes directly.

ℹ️ Some decoders can only be programmed on the main if they are set to speed step "0". ESU decoders can also be adjusted while running.

ℹ️ In order to program a loco on the main ECoS must transmit specific commands to this loco. Therefore the current address of the loco must be known, otherwise it cannot be programmed.

Should you not know the address of a loco place it on the programming track. There you can read out the address.

16.2. Introduction to Motorola-programming

With the LokPilot ESU has introduced a method to program Motorola-decoders despite the fact that the original Märklin® digital system did not cater for this option. Every ESU decoder (except for pure DCC decoders) contains a specific so-called 6021-programming mode that allows access to all or at least to the most important CVs of a decoder. They can be written but not read.

Meanwhile Märklin® has also started to equip many locos with decoders that support this special mode developed by ESU. These could be locos with mfx®-decoders or locos without "DIP switches".

ℹ️ The ECoS Motorola programming mode can be used for all ESU decoders and most Märklin® decoders but not necessarily for decoders by other manufacturers. .

The address search mode represents a very special feature. It can be used to determine the address of older decoders that are not suitable for the Motorola programming mode: ECoS tests all possible addresses and stops as soon as the loco responds. Thus you never have to open your locos again in order to check DIP switches!

16.3. Overview of programming options with ECoS

		Main track	Prog-track
DCC-Decoder (ESU)	Write in DCC Direct Mode	No	Yes
	Write in DCC Paged Mode	No	Yes*
	Write in DCC Register Mode	No	Yes*
	Write in DCC "POM mode"	Yes	Yes
	Read in DCC Direct Mode	No	Yes
	Read in DCC Paged Mode	No	Yes*
	Read in DCC Register Mode	No	Yes*
	Read of values on graphic interface	No	Yes
Motorola-Decoder (ESU)	Search Motorola address	No	Yes
	Write in ESU Motorola programming mode	No	Yes
	Read all values on graphic interface	No	No
Motorola®-Decoder (DIP-switch)	Search Motorola address	No	Yes
	Read all values on graphic interface	No n	No
Selectrix®-decoder	Write base values in Selectrix®	No	Yes
	Read base values in Selectrix®	No	Yes
	Read base values of Selectrix® on graphic interface	No	Yes
mfx®-decoder	Write in ESU Motorola programming mode	No	Yes
	Search Motorola-addresses	No	Yes
	Read of all values on graphic interface	Nein	No

* from Version 1.0.1.

16.4. Manual programming (DCC & Motorola)

Always place only one loco on the programming track. Make sure there is good electrical contact. There must be a motor connected to the decoder otherwise ECoS cannot receive the confirmation pulses and will erroneously report an error.

All described programming modes can be used with a universal programming window.

• Open the set-up menue.

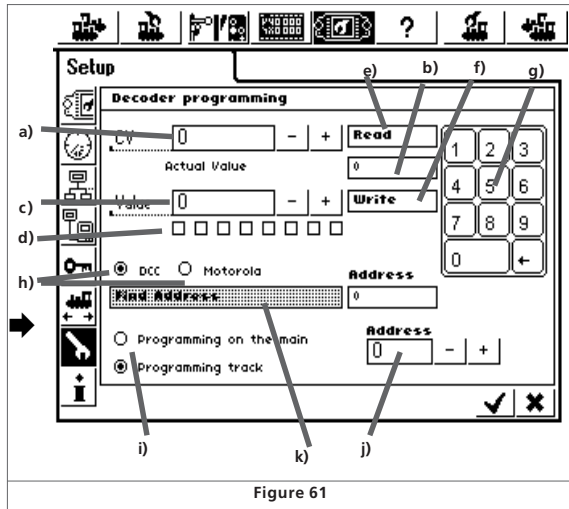• Select this pictogram on the left to open the programming window. The following figure appears:

Figure 61

a) CV-number that should be read or programmed

b) Currently read value / error reports

c) New value, that you want to write (input in decimal numbers)

d) Binary display of the current value entered in c)

e) "Read" screen button

f) "Write" screen button

g) Number block for data entry

h) Choice of DCC- or Motorola-programming mode

i) Choice between POM and programming track mode

j) Current loco address (is needed for POM)

k) Search address (only for Motorola)

• First select if you want to use POM or programming on the programming track. Remember: you can only read decoder data on the programming track.

16.4.1. Read CVs

Only possible on the programming track and only in DCC.

• Enter the CV number in field a), that you want to read.

• Push the screen button e) "Read"

• After a short while the current value will be displayed in field b).

• If you were not successful "Error" or "No Loco" will be displayed.

"No Loco" means that no loco was found on the programming track or that the current draw was below 4mA. Check the electrical contacts.

ECoS tries first to read a CV in Direct Mode. If this does not work ECoS attempts to read the CV in Paged resp. Register Mode. This may take up to 30 seconds.

16.4.2. Write CVs

• Enter the CV number in field a), that you want to write.

• Enter the new value of the CV in field c). It may be entered in decimal format or with the 8-bit blocks in binary format. Bit 0 is far right, bit 7 far left.

Lenz calls the bits of a CV sometimes switches and counts from 1 to 8. ECoS counts as per the DCC standards from 0 to 7.

• Push the screen button f) "Write"

• If successful the word "OK" will be displayed after a short while in field b)

• If not successful then "Error" or "No Loco" will be displayed.

"No Loco" means that no loco was found on the programming track or that the current draw was below 4mA. Check the electrical contacts.

In very rare cases it may happen that "Error" is displayed even though writing the CV was successful. ECoS always waits for confirmation from the decoder and in some cases this may not happen or may not be recognised by ECoS!

16.4.3. Programming on the Main (POM)

Only for DCC. When you select this mode you must enter the current address in field j). Reading is not permitted in this mode.

16.4.4. Searching the address

A useful function particularly for finding the Motorola address of older decoders. ECoS tests all 255 possible addresses and checks if the loco responds.

This search mode only works if the acceleration has been set to a low value. The loco will move for a moment. Make sure it cannot fall off the layout.

16.5. Graphic programming

Besides the sometimes-cumbersome method of direct CV programming – after all, who knows all CV numbers by memory – ECoS offers a comfortable alternative method:

All ESU decoders and many others can be programmed easily without having to know CV numbers. This is possible due to decoder profiles.

16.5.1. Decoder profiles

A decoder profile is a description of the parameters of a decoder. All CV numbers, their value ranges and their purpose, as well as the layout of the elements on the ECoS monitor are summarised here. Every decoder that has a graphic profile can be programmed by this method.

ECoS knows profiles for all ESU decoders and also has two generic profile decoders from other manufacturers.

16.5.2. Manual configuration of decoder profiles

You may assign to each loco a decoder profile as follows:

• Call up the loco on a throttle

• Open the loco menue and select "Edit Loco"".

• Change to the third tab called "Advanced" and a window opens.
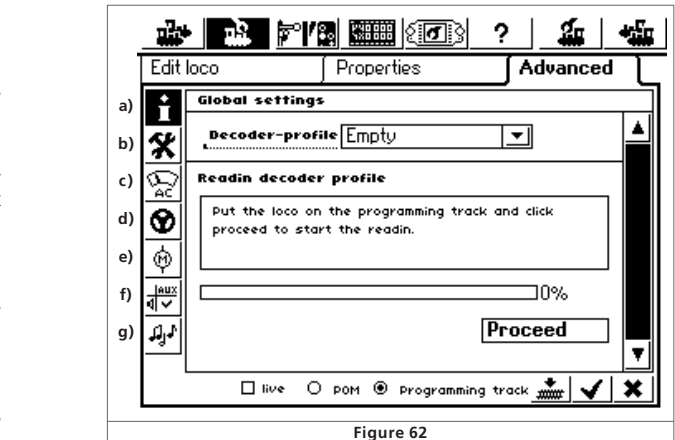
Figure 62

a) Global settings

b) Address settings

c) Analogue settings

d) Running characteristics

e) Motor settings

f) Function mapping

g) Sound settings

The content of the individual sub-dialogues depends on the available decoder options resp. the assigned profile. For instance sound settings will only be available in a LokSound decoder.

• Select the matching decoder profile in the choice list "Decoder Profile". If the decoder is not in the list choose "Empty".

As soon as you have selected a decoder profile the sections b) to g) will be loaded with the settings of the corresponding decoder. Now you can comfortably modify any settings on the graphic display.

ECoS transfers standard values according to a manual profile selection. They do not necessarily match the actual values of your loco. Therefore we recommend using the automatic assignment of profiles.

16.5.3. Automatic assignment of profiles

During the automatic assignment of the decoder profile the decoder data is read out and then the matching profile is assigned. All CV values of the decoder are read simultaneously and displayed on the graphic interface. That way it can be assured that the displayed settings correspond with the ones saved in ECoS. This is how you proceed in detail:

• Place the loco on the programming track.
• Call up the loco on one of the two cabs
• Open the loco menue and select "Edit Loco".
• Change to the third tab called "Advanced" and a window as shown in figure 62 opens.
• Touch the screen button "Proceed" to start the read out.
• First ECoS finds out which decoder type is used and then selects the matching profile.
• ECoS reads out all CV values from the decoder. This may take a while.
• Finish the process by pushing "Finish".

• Should ECoS not be able to read the loco in DCC mode it will check if it could be a Selectrix® decoder.
• If this is not the case either ECoS will try to find a Motorola address. In this case ECoS assumes that this is an unreadable Motorola decoder.

16.5.4. Editing decoder settings

After assigning a decoder profile you can edit any decoder parameters comfortably on the graphic display. Initially all changes are set in ECoS only and not transferred to the decoder. Of course, you can transfer (program) the data set locally on ECoS to the decoder at any time.
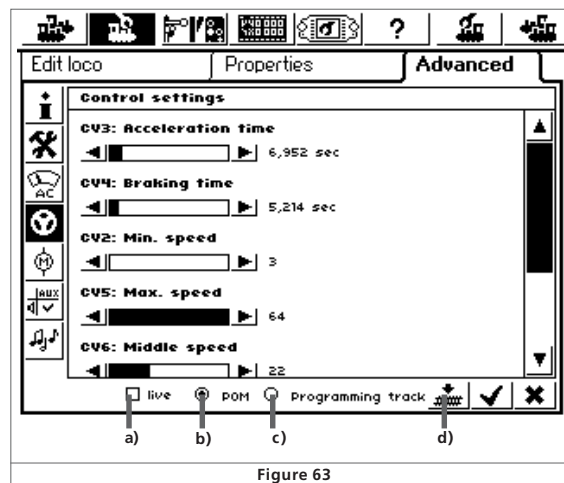

Figure 63

a) Choice field "Live"
b) Radio button "POM" (=Programming On the Main)
c) Radio button "Programming track"
d) Screen button "Write data on decoder"

• First use radio buttons b) and c) to select the programming mode (POM or programming track).

If you want to program on the main (POM) then no address change is permitted. As you already know address changes can only be done on the programming track.

16.5.4.1. Download mode

• Transfer the complete set of data to the loco by pushing the screen button d).

All CV data of the decoder will be overwritten with the data displayed on the screen. Please check if you actually want to proceed before pushing this button!

16.5.4.2. Live mode

In POM mode you can observe all changes "live" during the programming process: ECoS transmits all changes to the (running) loco immediately. Thus programming becomes far easier than previously.

• Activate the screen button a) "Live" while in POM mode.
• As soon as you now change any value with the slide controller (e.g. CV5, maximum speed) the new value is transmitted to the loco and you see the effect immediately.

• Live mode is not suitable for
  • setting addresses
  • function mapping
• The live mode only works in DCC mode!

16.5.5. More info on profile

• There is a matching profile for every ESU decoder. However, a profile does not necessarily contain all decoder parameters. Some rarely used settings should be adjusted manually as described in chapter 18.4. Alternately you could use our LokProgrammer with its software.

• For DCC decoders by other suppliers it is best to use the generic NMRA profile. For extended settings we recommend to use manual programming of CVs.

17. ECoSniffer

The ECoSniffer enables you to continue to use your old digital system and it thus protects your investment. .

As already mentioned in chapter 7.8 all DCC- and Motorola-systems can be used with ECoSniffer. ECoSniffer behaves like a digital decoder and translates all track signals into information that can be processed by ECoS.

While all previously launched digital systems are based on addresses ECoS establishes a library (loco list) with names. Since there could be several locos with the same address the loco address of the old system must be linked to the appropriate name of the loco in ECoS.

ECoS handles this with great flexibility. For each entry in the loco library you can assign a so-called "Sniffer Address" besides the real decoder address. This Sniffer address is independent of the real address and only serves to link the address received from the old digital system to the locos in the ECoS loco library.

17.1. Sniffer addresses

Sniffer addresses are stored as additional parameter in each loco and in the loco library.

Since they are independent of each other some fascinating sequences can be realised:

Example 1:

You have connected a Lokmaus 2-system to ECoSniffer as per Figure 22. The Lokmaus 2 can only work with addresses from 01 to 99.

Let's assume you have a "Blue Tiger Class 250" with address "250" and want to run it with the Lokmaus 2. You want to use address "25" on the Lokmaus. Simply enter "25" as the Sniffer address for the Blue Tiger.

From now on the Blue Tiger will respond to the address 25 on your Lokmaus. ECoS links the address "25" by the Lokmaus to the Blue Tiger, detects that it is actually run with the decoder address "250" and runs the loco accordingly.
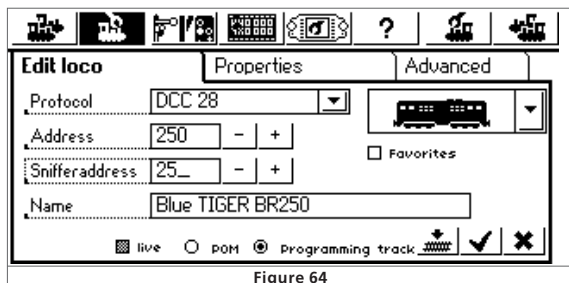
Figure 64

Example 2:

You have connected a 6021 to ECoSniffer as per Figure 21. The 6021 can only handle addresses from 01 to 80 in Motorola format. .

Let's assume you have a "Blue Tiger Class 250" with address "250" in DCC format and now want to run it with the 6021. You want to use address "50" on the 6021. Simply enter "50" as the Sniffer address for the Blue Tiger.

From now on the Blue Tiger will respond to the address 50 on your 6021. ECoS links the address "50" by the 6021 to the Blue Tiger, detects that it is actually run with the decoder address "250"(in DCC mode!) and runs the loco with this address in DCC mode. In other words it is no problem to use a Motorola command to run a DCC loco.
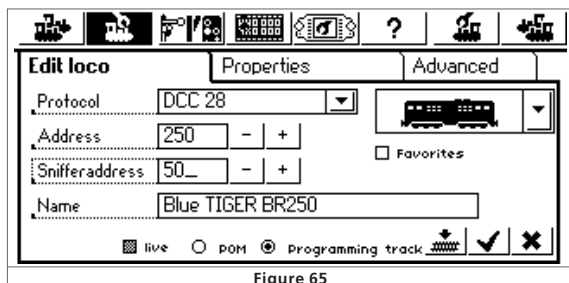

Figure 65

- Assign each Sniffer address to one loco only. ECoS does not check if the address has been assigned previously during data entry.
- Assign the Sniffer address "0" to locos that you do not want to run with the old system.
- Of course you cannot extend the address range of your old system: A 6021 can only handle addresses from 01 to 80. If you for instance enter Sniffer address "85" then you will not be able to run this loco with your 6021.
- In DCC format ECoSniffer detects only function buttons F0 to F12 of your old system.
- In Motorola format ECoSniffer detects only function buttons F0 to F4. ECoS cannot detect extended function buttons (F5 to F8) via the following address.

17.2. Hints for using ECoSniffer

Of course, there are some limits to what ECoSniffer can do. Since communication only takes place in one direction it is not possible to transmit signals to the old system: If you for instance run a loco with your old system on speed step "10" and subsequently reduce this to speed step "2" with one of the two cabs on ECoS, the old system will still show speed step "10".

- Do not call up a loco on your old system and on an ECoS throttle at the same time. This could lead to problems.
- Run your DCC locos always with 28 or 128 speed steps in your old system since ECoSniffer cannot differentiate reliably between 14 and 28 speed steps.
- If you do not wish to run a loco with your old system anymore stop the loco with your old system and turn off all functions. After some time ECoSniffer will delete this loco from its internal check list (purging).
- ECoSniffer will accept accessory addresses directly and switch them immediately. There are no Sniffer addresses for accessories.

18. Configuration menue

Basic operational parameters are edited via the set-up menue.

After touching the pictogram for the set-up menue at the top of the monitor the set-up dialogue is opened. This is structured over several pages (windows).

18.1. General settings

18.1.1. Setting the language

Select the desired language from the choice list. Any adjustments will be accepted immediately.
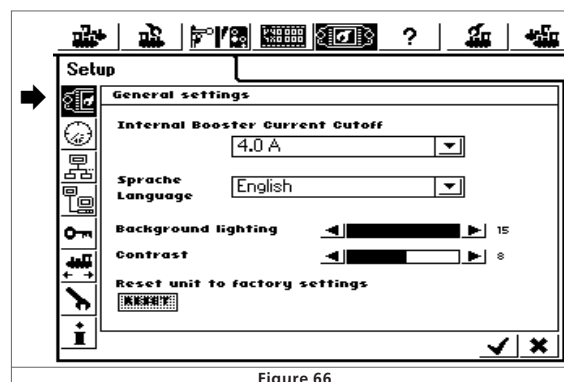
Figure 66

18.1.2. LCD contrast and brightness

With the slide controllers for brightness and contrast you can adapt the screen to the surroundings and your personal preference.

18.1.3. Current threshold of the internal booster

The choice list "Maximum current of the internal booster" allows you to adjust this value. Never set the current threshold higher than necessary to avoid damage or "welding" of tracks in case of a short circuit.

18.1.4. Reset

Push "Reset" to trigger a reset to default values. This deletes all data in ECoS including all loco and accessory libraries.

This reset is carried out immediately.

For safety reasons the button "Reset" is normally shaded grey. Before activating a reset you have to permit access to this function as described in chapter 18.4.

18.2. Display for train operations

18.2.1. Taking over loco

When you tick the field in front of "Transfer locomotive control" then any other player may take (pinch) this loco (parallel operation).
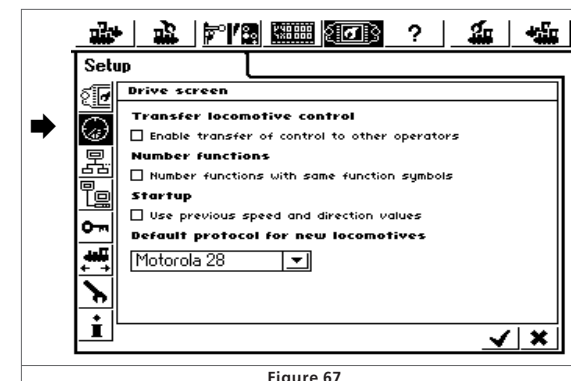
Figure 67

18.2.2. Numbering functions

If this function is active all function buttons are counted so you can keep them apart easier. You recognise this by the small numbers at the bottom right of the function symbols.

18.2.3. Starting mode

This setting determines if you want to send the commands that were active most recently (speed, functions, direction) to your models. This function enables you to continue operations exactly at the point where you stopped during your last operating session.

18.2.4. Pre-determined protocol for new locos

When you select a loco via the loco library then the data format as stored in the library will be used. Also refer to chapter 11.12

### 18.3. Components in the system

In this menue all devices that are currently connected to the ECoSlink bus. Each device reports automatically to ECoS (Plug & Play) and generally can be configured further if required.
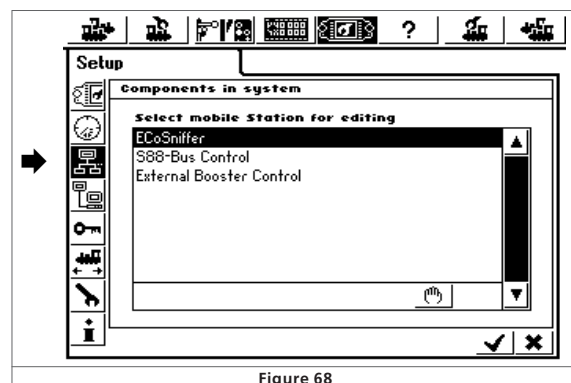

Figure 68

The devices "ECoSniffer" "s88-Bus Control" and "External Booster Control" will always be displayed even if there are no external devices connected. These three devices are integrated into ECoS but are displayed as if they were external.

18.3.1. Booster configuration

As mentioned in chapter 8.7 different booster types use different methods for detecting a short circuit. The time it takes from detecting a short circuit until ECoS turns off the track power must be adjusted to the type of booster to assure safe operations and to avoid erroneous switch-offs.

These settings are adjusted in the sub-menue "Booster Configuration".

You find this menue via the set-up menue "Configuring Devices" as per Figure 68: Select "External Booster Control" from the list of devices and press "Edit".
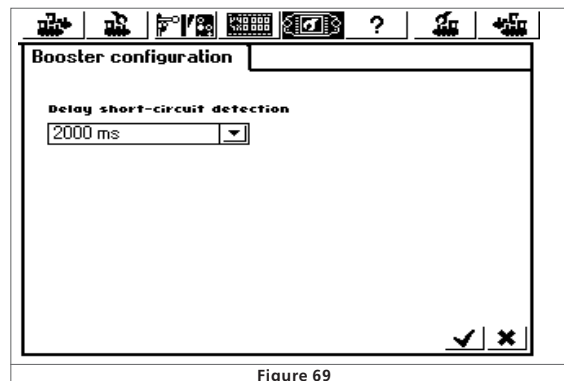

Figure 69

Then enter the delay time directly in "Delaying Short Circuit Detection":

- Select "0 ms" for DCC compatible boosters (e.g. Lenz)
- Select "1500 ms" for LDT boosters
- Select "2000 ms" for Märklin® 6017-boosters

Start with "0 ms" for all other makes and test it. Make sure that both a Motorola- and a DCC-loco are active. Some boosters cannot handle DCC packets very well. Should ECoS switch off immediately (STOP button is illuminated red) then the time must be increased.

18.4. Access control

Here you can set various options that reduce or prevent unauthorised access, e.g. visitors cannot edit or delete loco data or – even worse – trigger a reset.
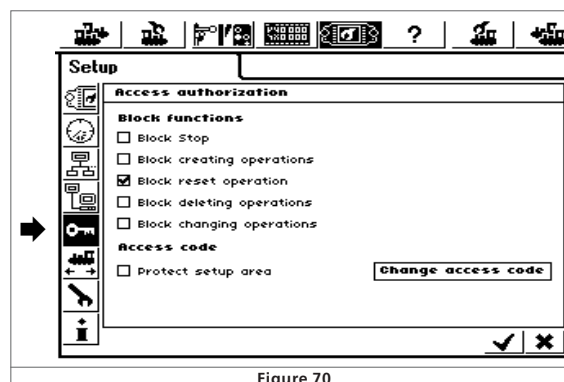
Figure 70

18.4.1. Lock functions

- "Block Stop" prevents the emergency stop when pressing the STOP button. This affects the internal STOP button and all STOP buttons of devices connected to ECoS via ECoSlink and ECoSniffer.
- "Block creating poerations" prevents adding new locos, turnouts, routes etc. This is useful for public layouts that should be operated but not changed in its settings.
- "Block reset operations" deactivates the reset to default values (refer to chapter 18.1.4)
- "Block deleting operations" prevents deletion of locos, turnouts, etc.
- "Block changing operations" prevents editing of locos, turnouts, etc.

18.4.2. Access code

You can protect access to the sub-menue "Access Authorised" with a code. This helps you to prevent any unauthorised modifications to the settings of the system.

First you have to define a 5-digit number code. This has then to be entered whenever anyone wants to open this menue.
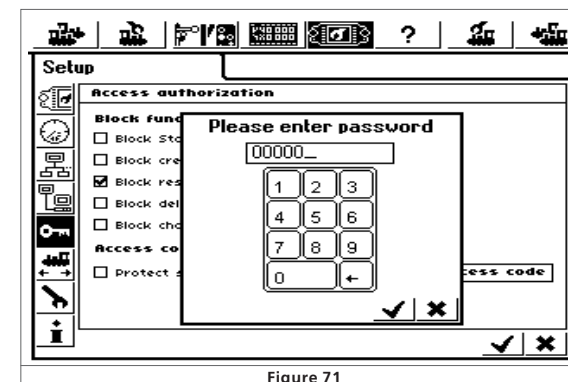
Figure 71

18.4.2.1. Changing the code

- Press the screen button "Change access Code" and another dialogue window opens where you can enter the new code.
- Delete the old code and enter the new one.
- Confirm this entry

Make sure you remember your access code. Should you forget it the only way to reset it is via the computer interface (refer to chapter 22.2.4).

A reset of the code at the factory will cost money!

18.4.2.2. Activating the code

• Set a tick at "Protect".
• Whenever you call up the menue "setup area" you have to enter the code that you entered as described in 18.4.2.1.

18.5. Global information

Here you find some important info about your ECoS.

Figure 72

18.5.1. Software version

The software version relates to the internal software. Important: Whenever you contact ESU to ask questions relating to your ECoS you must know the software number.
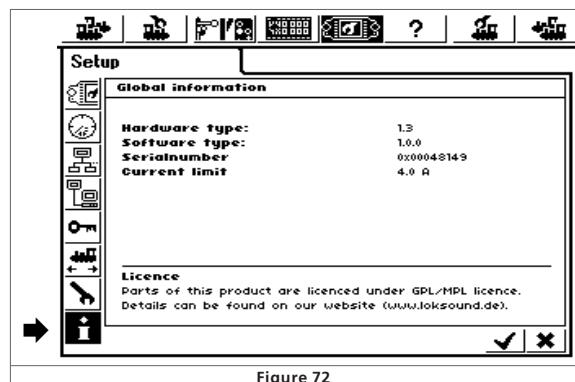
18.5.2. Serial number

The internal serial number is valid for your ECOS only. You need this number when you register your ECoS with ESU. We also need to know this number in order to help you whenever you ask for support.

19. s88-bus-configuration

As mentioned in chapter 8.9 the individual s88 modules are linked like a chain. ECoS needs to know how many of these modules are connected and if they have 8 or 16 ports. This is done in the set-up menue:

• Open the set-up menue.

• Select "Devices in the System" in the sub menue.

• Select "s88-Bus-Control" from the list in "Devices on ECoSlink" (also see Figure 68).

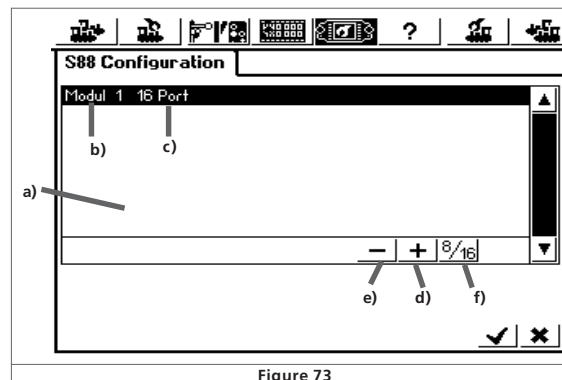• Push "Edit" and a dialogue window called "s88 Configuration" will open:

Figure 73

a) List of all currently known s88-modules
b) Name of module
c) 8- or 16-port indicator
d) Screen button "Add Accessory Module"
e) Screen button "Delete Accessory Module"
f) Screen button "Shift between 8 and 16 Ports"

You have to enter each s88-module in ECoS:

• Press the screen button "Add Accessory Module"

• Touching this screen button shifts between the 8-port and the 16-port module.

• Confirm your entry.

20. Computer interface

This enables you to connect your ECoS with your PC. ECoS works with several operating systems such as MS-Windows®, Apple® or Linux®. ECoS is based on open standards for data transfer and does not require any software installation on your PC. All you need to have installed and configured is an Internet browser (e.g. Mozilla Firefox®, MS Internet Explorer® or similar).

The computer interface enables you to download updates, to save and recall all ECoS data on your PC.

Communication between ECoS and your PC runs over a so-called IP-connection. In such IP-networks it is important that each device resp. participant has a unique IP-address. With the aid of these IP-addresses all connected devices can find each other.

Therefore you must configure a correct IP-address in your ECoS and also on your computer. Otherwise data transfer cannot be facilitated.

20.1. IP Set-up

If you have connected your PC with a broad band internet (e.g. DSL) provider or if you even have a wireless router or operate a small home network it is likely that you have a so called DHCP server in your network: This assigns automatically IP-addresses to all devices. Most Internet routers function as DHCP-servers: if this is the case please read on in chapter 20.1.2.

If you do not have a DHCP-server or you want to connect ECoS with a PC that is not connected to a network or works with a static (manually assigned) IP-address continue reading below.

20.1.1. Manually assigning IP-Addresses in Windows

If you use a static IP-address and your PC is already configured you do not have to change anything in your PC. Continue reading in chapter 20.1.2.

If you use a PC that has not been connected to a network until now you have to check the IP-settings first. We present this as an example for MS Windows® XP. Should you have another operating system consult your system administrator or the manual?

We assume that you will establish a network with your PC and your ECoS only (without any other devices). This example is only valid for this particular case. If in doubt consult a computer specialist.

• Make sure that your PC and ECoS have connected to the network as per figure 8.6
• Click on "Start" in Windows, Select "Settings" and then "System Control".
• Find the pictogram "Network Connections" and open it.
• Now a window similar to the one shown in Figure 74 should open.
• Search for the used network connection. In most cases this is called "LAN-Connection".
• Double click with the mouse on your connection. The following dialogue window will open (see figure 75).
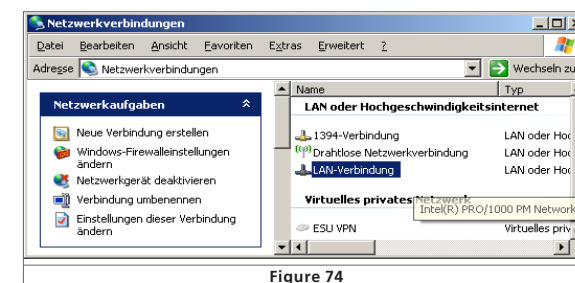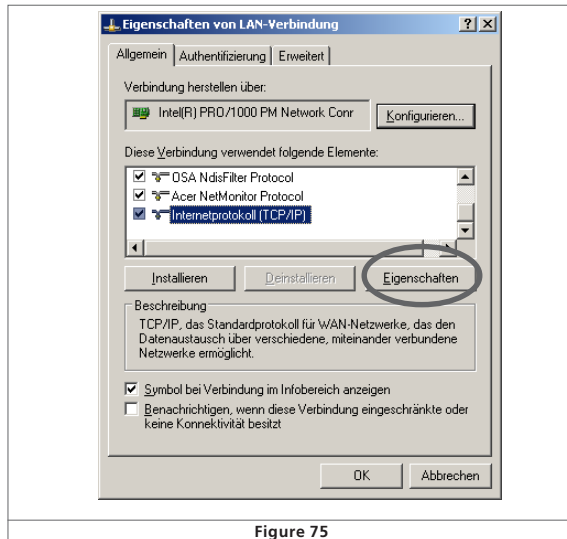

Figure 74

Computer interface

Figure 75

• Mark "Internet-Protocol" in the list and click on "Properties".
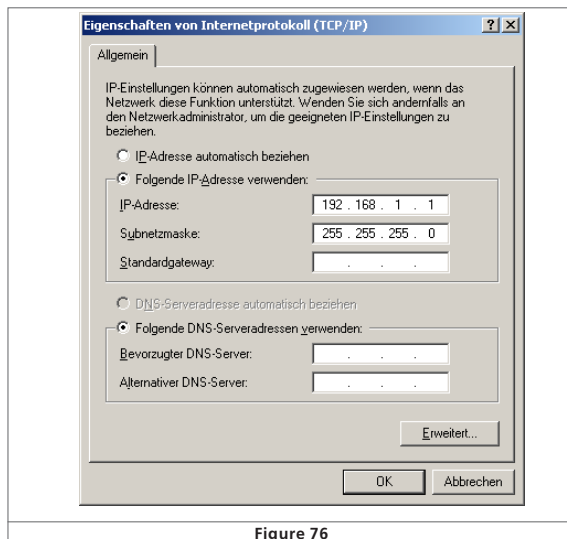

Figure 76

• Select "Use the following IP-address" and enter the value exactly as shown in Figure 76.
• Confirm your entry with "OK".
• Confirm again with "OK" to close the window "Properties".

20.1.2. Assigning an IP-address on ECoS
Now you have to assign an IP-address to ECoS.
• Open the set-up menue.
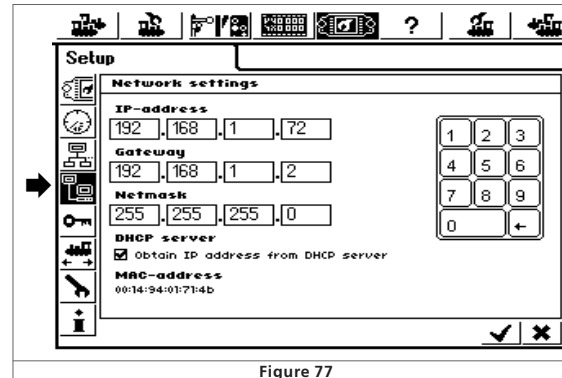• Select "Network Settings" from the list.

Figure 77

• Enter suitable values for your home network in the fields "IP-Address" and "Net Mask". Should you put the above example into practice enter the values precisely as shown.
• Make sure the tick at "Obtain IP-Address via DHCP-Server" is NOT set.
• Confirm your entry and leave the set-up menue.

Restart your ECoS (shut down completely and then restart).

Continue in chapter 20.2.

20.1.3. DHCP-Server in the net
A DHCP-server in the net automatically assigns IP-addresses to all devices in the network. ECoS checks by default during each start up procedure if such a server is available and requests a valid IP-address. All you have to do is read out the assigned IP-address and enter it in the address line of the internet browser.
• Open the set-up menue of ECoS.
• Open the network set-up as per Figure 77.
• Make sure the tick at "Obtain IP-Address via DHCP-Server" is set.
• Read and remember the "IP-Address"

20.2. Web interface
• To establish a connection with ECoS start your Internet browser.
• Type in the upper command line: http://IP-Address. IP-Address means in this case the address assigned to ECoS. Confirm with "Enter".

• In our example from chapter 20.1.1 you enter:

  http://192.168.1.2

  and press the return key.
• After a short while the start display of ECoS will have been established. It must look like the following:
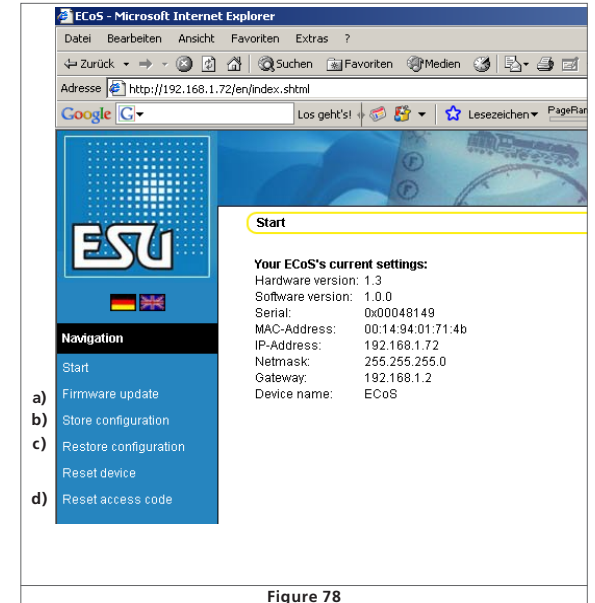
Figure 78

a) Menue "Firmware Update"
b) Menue "Save Configuration"
c) Menue "Store Configuration"
d) Menue "Reset Access Code"

20.2.1. Firmware update
First save your data as per chapter 20.2.2 before you start a firmware update.

This enables you to update the operating software of your ECoS. First you must download new firmware packets from our website and save it locally on your PC. You will find the latest version of our software at: http://www.loksound.de. Follow the link "Download", then "ECoS Software".

Update your firmware only if you want to upgrade relevant errors or new functions that you absolutely need. Never change the configuration of a system that is stable and works without problems.

• Select "Firmware Update", and then enter the desired firmware file with the aid of the "Browse"-button.

• Start the update by pushing the "Download"-button.

• Now the download will be started. It may take up to 10 minutes before the new firmware has been downloaded. After that ECoS will start again at least once and unzip and install the new data. Therefore this start up procedure takes much longer than usual.

⚠ • Please be patient: an update may take even up to 15 minutes. Do not switch off ECoS during this process! This could result in n complete non-operable software.

⚡ • Also make sure that the power supply to your PC and your ECoS is not interrupted during this process. An incomplete update may render your ECoS useless. A factory reset that will be charged is then unavoidable.

• After a successful update ECoS should start with the standard display.

20.2.2. Backup configuration

You should make it a habit to save your loco libraries on your PC. Should you delete the lists by mistake then you have a backup available thus avoiding having to go through the process of entering all data individually once more.

• Select "Store Configuration" from the menue.

• Click on the screen button "Save Settings".

• Select "Save File" and save your file on your PC.

20.2.3. Restore configuration

ⓘ When restoring the configuration all current settings of ECoS will be replaced by the ones saved in the configuration file.

• Select "Restore Configuration" from the menue.

• Select the desired file that you wish to restore with the aid of the "Browse" button.

• Start the download by pushing the "Send" button

• The configuration files of ECoS will be deleted and replaced by the new ones. After that ECoS will re-start.

20.2.4. Resetting the access code

Here you can reset the access code back to the default value "00000" in case you have forgotten the code. Follow the instructions on the screen.

20.3. Train control software on your computer

ECoS has a communication protocol to hook up to external train control programmes run on your PC. Ask your software supplier if and when his software will support the ECoS communication protocol.

ⓘ This communication protocol is due to the many possibilities incompatible to any existing interfaces. A software update of your train control program on your PC is therefore essential.

Goods Return Note

1. Customer data   (please enter in block letters)

Name: ....
Street: ....
Postal Code / Town:
Country: ....
E-Mail: ....
Telephone ....
Date:
Signature: **X**

2. Serial number of device

iD-code 0x

3. Type of fault

☐ Faulty display	☐	Short circuit
☐ Software	☐	Output programming track
☐ Throttle	☐	Output main
☐ Joystick / keyboard	☐	No figure (no response)

4. Description of fault (use extra page if necessary)

5. Receipt of purchase

Please return the receipt with the shipment!

6. Details of dealer / hobby shop

Stamp or address of hobby shop

---

22. Warranty Certificate

24 months warranty from date of purchase

Dear customer,

congratulations to your purchase of this ESU product. This high tech product has been manufactured according to the latest production processes and has passed stringent quality checks and tests.

Therefore ESU electronic solutions ulm GmbH & Co KG offers you in addition to the national warranty rights as governed by law a special

manufacturers warranty of 24 months from date of purchase

Warranty conditions:
• This warranty is valid for all ESU products, purchased at an ESU dealer.
• Any repair or replacement under this warranty is subject to proof of purchase. The warranty certificate completed by your ESU dealer together with the receipt serves as the proof of purchase. We recommend to keep the receipt together with the certificate.
• Please fill in the goods return note on the left accurately and send it in as well.

Content of warranty / exemptions
The warranty of ESU electronic solutions ulm GmbH & Co KG comprises the free of charge disposal or replacement of any faulty part due to faulty design, manufacturing or material or transport damage. Any further claims are excluded.

This warranty expires:
1. in case of failure due to wear and tear
2. if ESU products have been modified with parts not approved by ESU
3. if parts have been altered, especially missing shrink sleeves, or wires soldered directly to the decoder
4. if the product is used for a different purpose than the one intended by the manufacturer
5. if recommendations issued by ESU electronic solutions ulm GmbH & Co KG are not adhered to.

For reasons of liability no examination or repairs can be carried out on parts built into locos or coaches. The warranty period will not be extended due to repairs or replacement.

You may submit your claim by either returning the faulty product to your dealer or by shipping it directly to ESU electronic solutions ulm GmbH & Co KG together with the warranty certificate, the receipt and a detailed description of the fault.

ESU electronic solutions ulm GmbH & Co KG
warranty department
Industriestrasse 5
D-89081 Ulm

23. Registration card

23.1. Introduction

Thank you for purchasing the ESU ECoS. We spent much time and patience in developing this product and hope that you will like it. To enable us to further develop ECoS in future we rely on your help. We kindly ask you to register your ECoS with us and to answer the following questions. You will help us to improve ECoS even further!

Registered user will be informed about product updates when available.

Thank you for your assistance.

23.2. Address   (Please fill out in capital letters)

Name: ....

Street: ....

Postal Code / Town:

Country: ....

E-Mail: ....

Telephone ....

Date: ....

Signature: ....

23.2. Serial number of your ECoS

ID-Code 0x-

23.3. Information regarding the system environment

☐ H0 3-conductors   ☐ Number of locomotives MOT:
☐ H0 2-conductors   ☐ Number of locomotives DCC:
☐ N-gauge   ☐ Number of locomotives SX:
☐ TT-gauge   ☐ Club layout
☐ Gauge 1   ☐ Home layout
☐ G-gauge   Previously used digital system:

23.4. Hobby shop or dealer

23.5. Confidentiality guarantee

ESU pledges to use the data provided solely for the purpose as indicated above ands will not provide this information to others. You may have your entry deleted from our database at any time. Surface mail or Email suffices.

24. Exchange Voucher for 15V Power Supply

24.1 Introduction

As outlined in chapter 8.2 the standard ECoS power supply provides a secondary voltage of 18V. Since this is too high for many N-gauge layouts we offer the possibility to exchange the 18V power supply against one with 15V secondary voltage.

Fill out this Exchange Voucher completely and clearly readable and send it together with your 18V power supply to the following address:

ESU GmbH & Co KG.
- Exchange of power supply -
Industriestraße 5
D-89081 Ulm

(Please fill out in capital letters)

24.2. Address

Name: ....

Street: ....

Postal Code / Town:

Country: ....

E-Mail: ....

Telephone ....

I herewith declare that the 18V power supply is in perfect technical condition and request a free-of-charge exchange against a 15V power supply. I have carefully packed the 18V unit and applied the appropriate postal stamps. ESU will cover the cost for shipping the 15V unit.

Date: ....

Signature: ....

24.3. Delivery Address

Please ship the 15V-power supply to the following address:

Name: ....

Street: ....

Postal Code / Town:

Country: ....

21. Annex

21.1. Technical data

H4-booster with 4.0 A continuous output

H4-programming track output with 0.6A

NMRA DCC BiDi Feedback with integral cut-out-device

7 inch QVGA FSTN LCD Display with touch panel and 6-fold LED Backlight (white)

32-Bit ARM 720T Controller, 64 Mbytes Flash ROM, 32 Mbytes RAM, Linux® Operating system

16 Bit Real time Co-processor

2 x motor driven potentiometer-cabs with definitive end position

2 x Two-way-analogue-joysticks

2 x 8 Function buttons as well as Stop- and Go-buttons

3 Sockets for ECoSlink devices

Socket for ECoSlink bus extension

Galvanically separated booster socket for DCC-conform and 6017-compatible boosters

Galvanically separated ECoSniffer input for connecting old systems

Galvanically separated s88-bus input for feedback decoder

10/100 Mbit Ethernet-socket (RJ45)

1 ECoSlot-module to accommodate a radio receiver

Power supply 90VA

21.2. Code table for accessory decoder

The table contains the link between the status of the DIP-switches and the turnout address as well as to the Märklin® keyboards.

Keyboard No.	Keyboard Button	Turnout-address	Turnout decoder DIP-switch ON
1	1..4	1-4	- 2 3 - 5 - 7 -
1	5..8	5-8	- - 3 - 5 - 7 -
1	9..12	9-12	1 - - 4 5 - 7 -
1	13..16	13-16	- 2 - 4 5 - 7 -
2	1..4	17-20	- - - 4 5 - 7 -
2	5..8	21-24	1 - - - 5 - 7 -
2	9..12	25-28	- 2 - - 5 - 7 -
2	13..16	29-32	- - - - 5 - 7 -
3	1..4	33-36	1 - 3 - - 6 7 -
3	5..8	37-40	- 2 3 - - 6 7 -
3	9..12	41-44	- - 3 - - 6 7 -
3	13..16	45-48	1 - - 4 - 6 7 -
4	1..4	49-52	- 2 - 4 - 6 7 -
4	5..8	53-56	- - - 4 - 6 7 -
4	9..12	57-60	1 - - - - 6 7 -
4	13..16	61-64	- 2 - - - 6 7 -
5	1..4	65-68	- - - - - 6 7 -
5	5..8	69-72	1 - 3 - - - 7 -
5	9..12	73-76	- 2 3 - - - 7 -
5	13..16	77-80	- - 3 - - - 7 -
6	1..4	81-84	1 - - 4 - - 7 -
6	5..8	85-88	- 2 - 4 - - 7 -
6	9..12	89-92	- - - 4 - - 7 -
6	13..16	93-96	1 - - - - - 7 -
7	1..4	97-100	- 2 - - - - 7 -
7	5..8	101-104	- - - - - - 7 -
7	9..12	105-108	1 - 3 - 5 - - 8
7	13..16	109-112	- 2 3 - 5 - - 8
8	1..4	113-116	- - 3 - 5 - - 8
8	5..8	117-120	1 - - 4 5 - - 8
8	9..12	121-124	- 2 - 4 5 - - 8
8	13..16	125-128	- - - 4 5 - - 8
9	1..4	129-132	1 - - - 5 - - 8
9	5..8	133-136	- 2 - - 5 - - 8
9	9..12	137-140	- - - - 5 - - 8
9	13..16	141-144	1 - 3 - - 6 - 8
10	1..4	145-148	- 2 3 - - 6 - 8
10	5..8	149-152	- - 3 - - 6 - 8
10	9..12	153-156	1 - - 4 - 6 - 8
10	13..16	157-160	- 2 - 4 - 6 - 8
11	1..4	161-164	- - - 4 - 6 - 8
11	5..8	165-168	1 - - - - 6 - 8
11	9..12	169-172	- 2 - - - 6 - 8
11	13..16	173-176	- - - - - 6 - 8
12	1..4	177-180	1 - 3 - - - - 8
12	5..8	181-184	- 2 3 - - - - 8
12	9..12	185-188	- - 3 - - - - 8
12	13..16	189-192	1 - - 4 - - - 8
13	1..4	193-196	- 2 - 4 - - - 8
13	5..8	197-200	- - - 4 - - - 8
13	9..12	201-204	1 - - - - - - 8
13	13..16	205-208	- 2 - - - - - 8
14	1..4	209-212	- - - - - - - 8
14	5..8	213-216	1 - 3 - 5 - - -
14	9..12	217-220	- 2 3 - 5 - - -
14	13..16	221-224	- - 3 - 5 - - -
15	1..4	225-228	1 - - 4 5 - - -
15	5..8	229-232	- 2 - 4 5 - - -
15	9..12	233-236	- - - 4 5 - - -
15	13..16	237-240	1 - - - 5 - - -
16	1..4	241-244	- 2 - - 5 - - -
16	5..8	245-248	- - - - 5 - - -
16	9..12	249-252	1 - 3 - - 6 - -
16	13..16	253-256	- 2 3 - - 6 - -
-	-	257-260	- - 3 - - 6 - -
-	-	261-264	1 - - 4 - 6 - -
-	-	265-268	- 2 - 4 - 6 - -
-	-	269-272	- - - 4 - 6 - -
-	-	273-276	1 - - - - 6 - -
-	-	277-280	- 2 - - - 6 - -
-	-	281-284	- - - - - 6 - -
-	-	285-288	1 - 3 - - - - -
-	-	289-292	- 2 3 - - - - -
-	-	293-296	- - 3 - - - - -
-	-	297-300	1 - - 4 - - - -
-	-	301-304	- 2 - 4 - - - -
-	-	305-308	- - - 4 - - - -
-	-	309-312	1 - - - - - - -
-	-	313-316	- 2 - - - - - -
-	-	317-320	1 - 3 - 5 - 7 -