COMMANDER

THE MANUAL

SA-5000   SA-1000   SA-Basic   CM-5000   CM-1000

COMMANDER

CONTENT

CONCEPT

This manual is far more extensive than the smaller versions coming with the delivery of our models. But do not get frightened by the extend, it is meant as a reference holding all substantial informations you may need using your remote control to its full degree. It is not necessary for understanding the information to read the whole book at once.

For getting started we advice to read the first chapters from basics to first steps so you will get a first impression of the functions. It is highly recommended to ready a transmitter and a receiver with power supply by then, because it is much easier to understand and learn the peculiarities of controlling a model in practice. You may read the ongoing chapters on demand. Feel free to use the manual as a lexicon for emerging questions. Check on the different chapters whenever you need information or you are searching for advice.

Shortly summarized, the further chapters apply to options and settings referring all ´Commander´ transmitter and receiver. It is likely that you will have to go back or even go ahead to the next chapter to understand your current topic.

At this point I am afraid we cannot tell you a nice little story about constructing models, but in exchange this lexica will give you any information you are searching for and even those you may have not been thinking of, yet!

The ´Commander´ series are model based. That means: all settings concerning your model (e.g. servo travel, mixer or channel assignment) are saved in your model. So the ´Commander´ transmitter does not affect your vehicles characteristics.

For changing settings and of course for driving, your model has to be connected to the transmitter.

To guarantee the ability to change between models fast via the transmitter, the ´Commander´ is identifying and connecting to a model by its number, smiliar to a telephone number. In contrast to some flight-models transmitters, which require a binding process for connecting, the ´Commander´ does not need such a process nor do you have to remember your models specific authentification number.

To comfortably select your model the ´Commander´ has an integrated address book that is automatically sorting numbers and names of your models in alphabetical order.

The ´Commander´ uses proportional and switching control elements which can be easily connected to the models servos or switching functions. That means:

A transmitter switch can also control a servo or with a proportional channel you may control switching functions. You can freely choose the relation of the receivers assignments to the control elements of the transmitter. Every control element can support various numbers of ports with data. For very complex models you may assign one control element with up to eight levels of commands.

Technically the model is structured in antenna and control module (later referred to as ´receiver´). The antenna is responsible for the radio link to the transmitter and is in addition offering the ´Commander´ bus within the model. The bus can be linked with up to eight control modules at a time. Every ´Commander´ transmitter is able to configure and control any ScaleArt and Blauzahn receiver.

STARTING

SA-1000 AND SA-5000:

The red button above (or below) the display is the main switch. To get it started, hold the button until a the loading screen appears. For switching it off, hold the main switch again until you see the good-bye screen.

The SA-1000 and SA-5000 transmitter shut down automatically after four hours of inactivity or no control function has been in use for a period of time.

SA-BASIC:

You can find the on-/off- switch to the bottom right-hand side of your transmitter. This version cannot shut down automatically. We recommend to shut down the transmitter whenever you do not need it or the battery runs low.

DISPLAY AND CONTROL

SA-1000:

On the screen you can see the status display of model and transmitter. To the bottom edge you can find the assignments of the four given buttons. For the other control elements there is no display on the screen.
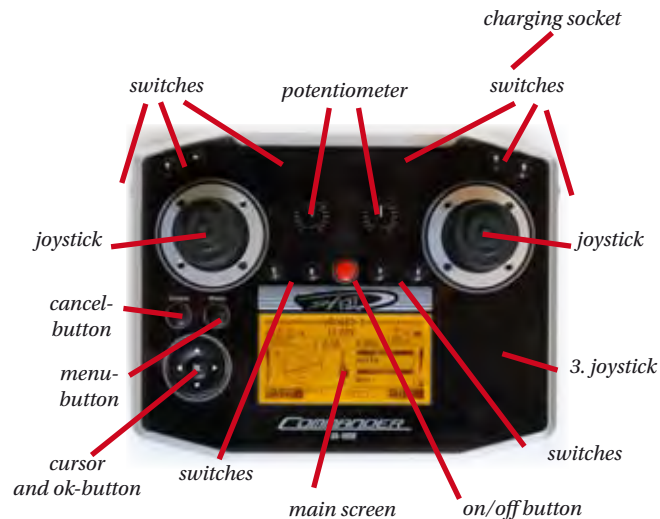
SA-5000:

The top screen is the main screen and it has the same functions as the SA-1000. The screen below shows the assignment of the buttons to its left and right, as well as the functions of the sliders and knobs.

SA-BASIC:

On the screen you can see the status display of the model and transmitter, just like it is the case for the SA-1000. The assignements for the switching channels are imprinted to the remote control, but You are free to change this in the software.

SA-1000 labels: charging socket, switches, switches, potentiometer, joystick, joystick, cancel-button, 3. joystick, menu-button, switches, cursor and ok-button, switches, main screen, on/off button

SA-5000 labels: main screen, sd-card-slot, on/off button, charging socket, switches, switches, joystick, joystick, cancel-button, menu-button, 3. joystick, cursor and ok-button, switches, switches, potentiometer, second screen, slider, potentiometer

SA-BASIC labels: menu-button, cursor and ok-button, main screen, cancel-button, potentiometer, potentiometer, switches, switches, joystick, joystick, slider, on/off switch, charging socket

BUTTONS AND CURSOR

For the moment the **cancel** button is your most important tool: by pushing the **cancel** button you can leave all menu options without permanent changes to the settings. By hitting it several times you always get back to the main screen.

The **menu** button carries you from the main screen to the main menu. While you are in the integrated address book you can open the options menu with it.

When setting values this button helps you to go in fast steps from the smallest, to the average, to the largest allowed value.

The directional buttons ⋀,⋁, ◄ and ► help you navigating through the menus and changing values. You can get to the address book from the main screen by pushing the ⋀ or ⋁ button.

While you are in the main screen and a model is connected you can switch between the different levels of control with ◄ and ►.

When you are setting values you can change them step by step by pressing the directional buttons. If you press and hold it, the numbers will change independently. After a short moment the counting speed increases.

The **ok** button applies entries and opens selected menus. If you change values and want to keep the changes you have to press and hold the button for few seconds. This shall prevent unwanted changes.

SA-1000 AND SA-5000:
ok button is centered to the cursor.

SA-BASIC:
´ok function´ is activated by pressing the joystick.

CHARGING THE TRANSMITTER

charging socket SA-1000 and SA-5000

Commander transmitter have a permanently installed battery. When delivered the battery is charged and allows several hours of operation time before you have to charge it. This way you can start testing your new product right away and may charge the battery over night. The battery performance is well calculated so you can use it for at least an entire day in continuous operation before you will have to recharge it. The display backlight draws the most power. To improve the operating time you can run your ´Commander´ in power save mode or completely deactivate the display lighting (you can check up on how to set the lighting in chapter ´display light´ on page 18).

On delivered the battery has not reached its full potential, yet. It operates only few hours when first initialized. After several charging cycles the battery then runs at its full potential.

You do not have to uninstall the battery before charging, but you do need a ScaleArt charging adapter (item nr.: 76000026) or you may use a standard Robbe/ Futaba transmitter charging-adapter. Plus is the centred pin, minus the outward one. Furthermore the frame ground lies on minus. To maintenance or replace the battery just open the rear cover.

Please use automatic charging adapters which fit to type and parameters of your battery only. Especially if you can edit settings to your adapter we advice to be cautious:

cell type:	Sanyo Eneloop:
voltage:	7,2V, (6 cells)
type:	NiMh
capacity:	2000 mAh
charging current:	max. 1000 mA

SA-1000 UND SA-5000:
The charging socket is on the rear right. You can keep the transmitter running while charging. But be aware of the fact that some charging adapters tend to deactivate too early, in case you do so. The charging socket is constantly connected to the battery via self-resetting fuse (1500 mA). In case you choose a charging current

too high for the battery the fuse will respond. If that happens you will have to wait for several minutes before you can continue the charging process with a suitable current.

SA-BASIC :
The charging socket is on the front right. In the F14 the socket is only connected to the battery when the transmitter is deactivated. Unfortunately, Futaba has not provided a fuse, yet.

When upgrading a conventional system to a Commander SA-Basic you can keep using your old battery, but you will probably have to redo your settings for the batteries warning threshold (see page 20).

charging socket SA-BASIC

DISPLAY PAGES

MAIN SCREEN

While normal operation you can see the information Referent to the state of the model, the connectivity and the status of the transmitter battery on the main screen. On the right-hand side of the display you can see the charging status of the transmitter battery. This applies to all Commander transmitters. The battery symbol below shows that the battery is going to run out of power by blinking. If the remote control is connected to a model you can check the signal strength on the left-hand side of the display. Below that symbol you find the one for the connectivity that will show a tip on its top looking like an antenna, if it is connected to a model. A simple vertical bar means that the transmitter is in stand-by (you may want to select a model using the integrated address book).

The top line of the display always shows the name of the currently connected model. To the top right-hand corner you find the indication for attached sd-cards.

If no model is connected, there will be no additional model details displayed. Instead you will see a note on the connection. The symbol for lights, turning signs, differential locks etc. are only displayed, if the corresponding functions are active. If they are not, the display will stay clear. Depending on the capabilities of the receiver and the transmitted telemetry the structure of the display changes.

E.g. if the receiver has got no battery management installed, there will be no details referring power consumption or remaining capacity.

SA-1000 AND SA-5000

Labels: current consumption, modell battery voltage, remaining capacity in modell, fog lights, difflock, work lights, SD-card, turn indicator, transmitter hours, transmitter battery, display for telemetry, rotating beacon, modell name, high beam, headlight, turn indicator, layer, signal, connection, inclinometer, gear, assignments of the surrounding switches

SA-BASIC

Labels: rotating beacon, fog lights, high beam, modell name, wiper, headlight, SD-card, turn indicator, turn indicator, difflock, work lights, signal, transmitter battery, current consumption, remaining capacity in modell, layer, gear, modell battery voltage

Without transmission control the spot displaying the transmission indication stays clear. The Inclinometer will be displayed only if the receiver is equipped with and it is enabled for the current layer. When the spot is required for telemetry data the inclinometer stays hidden.

At the SA-Basic, if telemetry data or the inclinometer is to be displayed, the symbols scaled down in size.

MODELL STATUS

Oonly applying to the SA-1000 and SA-5000 ´Commander´. In this menu the transmitter is showing triggered alerts. You can open the menu by shortly pushing the red on/off button.

Triggered alerts are highlighted with a black bar and a blinking warning sign. To leave this menu press **cancel**.
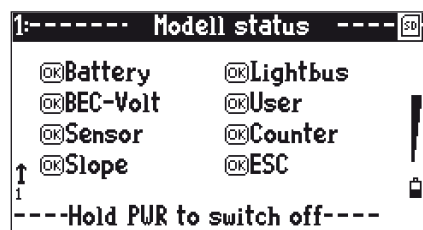
ADRESS BOOK

The address book is displaying the entry name (name of the model) in the top line with the identification number below. If the entry holds connection to more than a single model, the additional models and their mode of control are displayed below. To leave this menu press **cancel**.
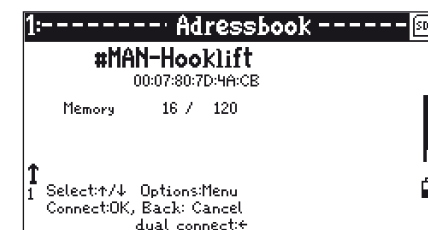
MENUE SYSTEM

D isplay the menu by pushing the **menu** button while the main screen is shown. The typical menu page shows the name of the current selection at top and the menu topics below. The number in the top left-hand corner indicates which control module (receiver) is currently selected.

To the top right-hand corner attached sd-cards will be displayed, if they could be identified by your transmitter.

MAIN MENU

The navigation is equal for all ´Commander´ transmitters:

- The buttons ◄ and ► are switching between the four main menus (SA-Basic: only three menus), select the desired entry with ▲ or ▼.
- Activate the selected menu with **ok.**
- To get back to the previous menu press **cancel.**
- Entries in brackets are leading into sub menus.

SWITCH MENUS WITH ◄ AND ►

SELECT WITH ▼ AND ▲


```
1:------+Receiver+------
Port settings
Function blocks
<Telemetry>
<Copy & Save>
Select module
Set module ID
Module name
Layer names
Module-control PIN
Module-config PIN
Modell name
Lightbus setup
Aux bus setup
Text 1
Text 2
Configruations
Confirm:OK, Cancel:CANCEL
```

Without connection this menu only holds the option: "search for models"

```
1:------+Connection+------
Search new receiver
Adressbook
Radio alarm
Use layer Modell ☑
Modell-PIN 1
Modell-PIN 2
Modell-PIN 3
Modell-PIN 4
Second link mode (1)
Confirm:OK, Cancel:CANCEL
```

(1) The entry "second link mode" is only available on SA-5000 or SA-1000

```
1:------+Sounds+------
Vibration alarm ☑
Volume  003
Keytone ☐
System sounds ☑
Battery warning ☑
Connection ☑
Turn signal ☐
Light warning ☑
Telemetry ☑
Inclinometer ☑
Confirm:OK, Cancel:CANCEL
```

(2)

(2) The menu "sounds" only comes with the SA-5000 and SA-1000

```
1:------+Basic settings+------
<File>         (3)
System info
Radio-parameter
Display light  100
Display dim  020%
Contrast  145
TX-Battery alarm
Auto PUR off  100
Joystick-Mode
Owner name
Reset transmitter
Start-PIN
Config-PIN
Confirm:OK, Cancel:CANCEL
```

(3) the entry "file" only show up if a sd-card is attached

SUB MENU

- In sub menus only ▲ and ▼ are working, ◄ and ► have no functions for this menu.
- Activate the selected menu with **ok.**
- To leave the sub menu press **cancel** .

The menus actual appearance will differ from what is illustrated here depending on the operation status, the equipment and version of your receiver.

SUB MENUES

SELECT WITH ▼ AND ▲

```
1:------<Telemetry>------
Telemetry layer
Select field
Select data
Scale/neutral
Hide field
Store:OK, Cancel:CANCEL
```

Only available if connected to a receiver.

```
1:------<Copy & Save>------
RX->Clipboard
Clipboard->RX
Clipb.->single Port
Copy Port from
Change dir        (4)
Delete file       (4)
Save clipboard    (4)
Load clipboard    (4)
Save modell entry (4)
Confirm:OK, Cancel:CANCEL
```

(4) All entries below "Change dir" will be only available if sd-card is attached

```
1:------<File>------
Change dir
Delete file
Load TX-data
Save adressbook
Save TX-config
Receiver update
Store:OK, Cancel:CANCEL
```

You will only get to this menu if a sd-card is attached

```
1:------Phonebook-options------
Connect
Connect secnd. link
Search new receiver
Edit name
Edit address
Delete entry
Store:OK, Cancel:CANCEL
```

Get to this menu by pushing the menu button while your are in the address book

COMPONENTS IN YOUR MODELL

When purchasing or installing a new receiver make sure you test it separately and assemble it after you set the basic configuration.

A CM-1000 and CM-5000 can be attached to any servo port available via battery clamp. The supply on the servo ports depends on the attached servo. With a voltage between 4,5 to 5,5 volts nothing can go wrong (technical data on page 72). You may apply voltage between 4,5 and 18,0 volts to the battery clamp. Servos and light-bus can not be supplied by the battery clamp, they require a servo port.

For your first steps it is sufficient to plug in the receiver via clamp or servo port only. Connect the antenna with the delivered cable with red plug to the receiver. It does not make a difference which of the red ports you use. The port staying clear can be used for connecting extension e.g..

CM-1000

supply from battery
find-button
supply From BEC
antenna / next control module
1-9: servo ports
notch for index pin
10: servo or lightbus port
status-LED

You may attach ten servos or nine servos and one light-bus. The BEC port can only be used for power supply, it is not transmitting any control signals.

CM-5000

IR port
lightbus
status-LED
sensor ports
find button
1 - 8: servo ports
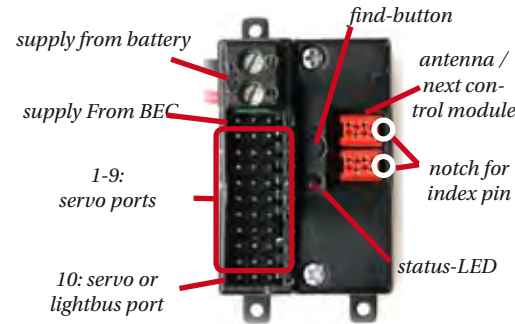output for motor
9-16: servo ports or input
supply from battery
notch for index pin
antenna / next control module
supply to other devices, eg. speed controller, soundmodule
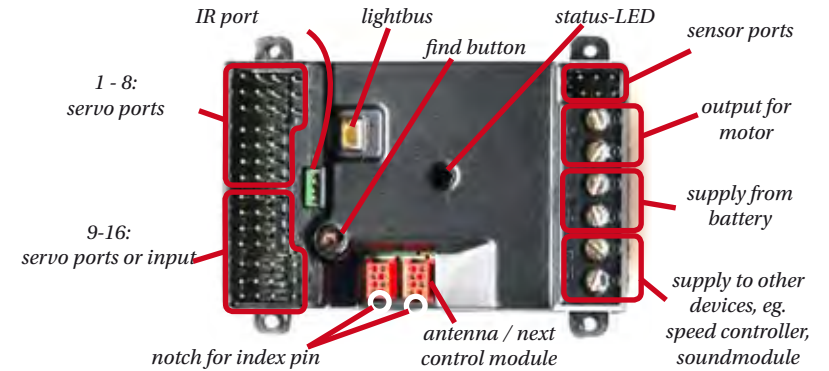
The CM-5000 can run 16 servos, one light-bus, two sensors, an infrared connection to the trailer and an motor. There is no specialized port for supplying the servos. Plug in BEC or speed controler to one of the servo ports.

CM-ANTENNA

Aussparung für Indexstift
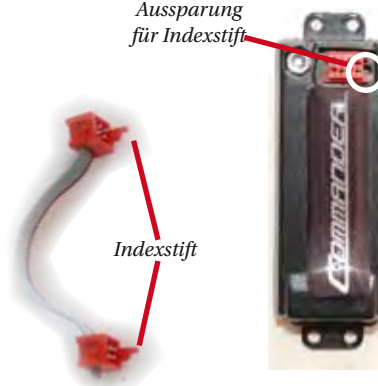
Indexstift

Plug one end of the cable to the antenna, the other end to the red port of your receiver (illustrated in the picture). The pin is always facing towards the case edge. Attach the antenna to your model and make sure it is not covered by metal.

CM-1000

CM-5000

TECHNICAL DATA (FULL DATA ON PAGE 72)

power supply receiver	
at servo port:	4,0 to 5,9 volts, 300 mA
	if lightbus used: min. 5,0 volts, 1000 mA
at battery port:	4,0 to 18 volts, 300 mA
output behaviour	
servo pulse:	1,0 ms to 2,0 ms at 100% servo travel, 0,5 ms to 2,5 ms at 200% servo travel Pulse frame: 16 ms
switching output:	max. 20 mA, internal limited on: +3,3 Volt off: below 0,1 Volt

FIRST STEPS

For getting started: the transmitter and receiver have to be connected first. The Commander systems connect to models like you are calling a friends cell-phone. Every model has its own telephone number (identification number) and every transmitter that has got the number saved can connect to the model. A single receiver can only exchange data with one transmitter at a time, for everybody else the line is busy. If not busy, the model will accept every incoming call. But this does not automatically mean that the model is talking with every transmitter. It is possible to set a PIN for your model.

You do not have to remember the models identification number: The transmitter has an address book saving names and numbers.

Enter the address book by pushing ⌃ or ⌄ while your are in the main screen. When first installing the transmitter (or after resetting it) there are no entries in the address book except "empty". On this page you learn how to add new models to your address book and how to activate them.

1. POWER UP THE RECEIVER

We are finally ready to start! Now you should prepare not just your transmitter but also provide your receiver with power supply. Actively practising what is instructed here makes it much easier to comprehend the steps.

The transmitter is operational when delivered, but you cannot use it without the most important part of the Commander system: the receiver.

For getting started we need your help: Attach the antenna to the receiver like it is explained in the previous chapter and do not forget the power supply. When you turn on the receiver its LED will light up for a second but for now nothing else will happen. Then turn on your transmitter. In general, the order of activation does not make any difference for ´Commander´ systems.

2. ADD MODELL TO YOUR ADRESSBOOK

Press the menu button to get to the main menu. If no model is connected yet, the first message you will see is the main menu item "search new receiver", which will be selected automatically. Normally you have to press ➤ until "connections" appears in the top line. Then you can go on to the "search model" menu by pressing ⌃ or ⌄ .

Press **ok**.

Now wait a second for the transmitter to search for the model and to display its name. In case you do not get a result after ten seconds, check the receivers power supply and make sure the cable connecting to the antenna is properly attached. You may leave the menu by pressing **cancel** at any time.

If any models in reach are found, they will get displayed in the list. With ⌃ and ⌄ you can select the entry of choice. Press and hold **ok** to save the model to your address book. Now you are able to enter a name for your model, but its not required to do so at this time. The entry will be saved to your address book by holding the **ok** button. You can find all saved models via your address book like it is described in the previous chapters.

Later it is recommended to enter a name for your model that you recognize/ remember easily.
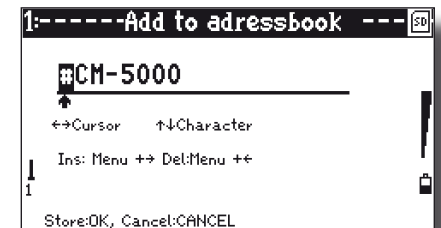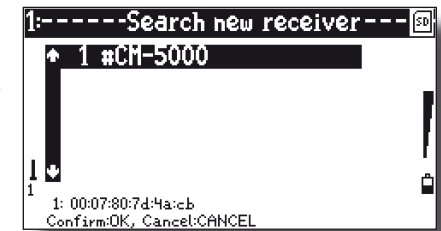
3. ESTABLISH A CONNECTION

4. NAME YOUR MODELL

Y ou always call models from your address book. To enter the address book press ⋀ or ⋁ while in the main screen. After you entered the address book the same buttons let you navigating through the different entries. The list of names is always sorted alphabetically. To start connecting to your selected entry hold ´ok´. To get out of the menu again, press ´cancel´.
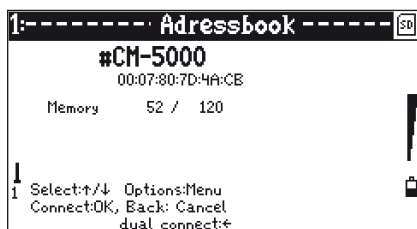
When the transmitter is started it is going to connect to the last model that has been connected.
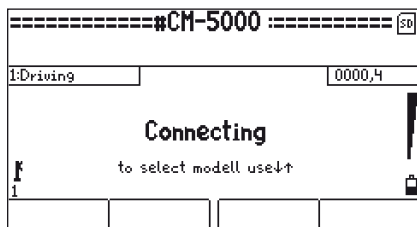
If the transmitter got properly connected to the receiver, the screen will switch from "connect with model" to the telemetric data.
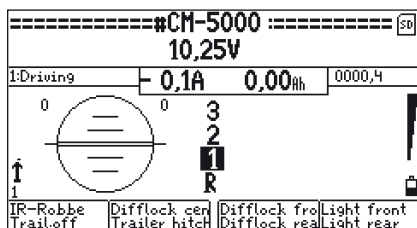
You are now able to control your model.

E very model name can be changed. If you alter the name, it will not appear as CM-1000 or CM-5000 in your list any more, instead the name you entered will be on display. Remember, the list is sorted alphabetically. Select your model and wait until it is connected.
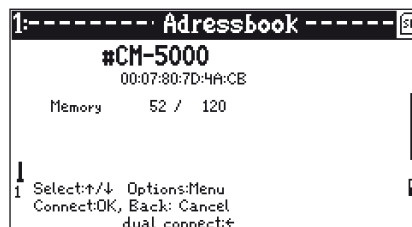
Now press the **menu** button to get directly to the "receiver menu". Navigate with ⋀ or ⋁ to the entry "model name" and accept with "ok".

The text box for editing the name should be displayed now.

With ◄ and ► you can move the cursor, ⋀ and ⋁ change the character.

If your cursor is placed behind the last sign, no further deposite is displayed. To enter a new character press ⋀ or ⋁.

If you want to delete or insert characters you have to hold the menu button and accept with ► to enter new signs or ◄ to remove/delete them.

Holding the ´ok´ button saves the entry (name) on your address book and on your model.
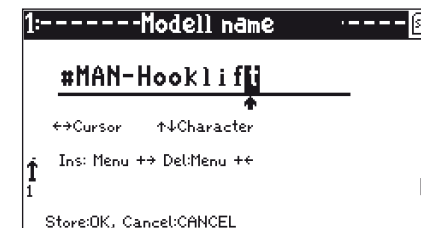
The new name will now be displayed in the list if You do another "search model".

HINT 1:
If your receivers name starts with "#", every transmitter in range can find it by browsing through the "search model" list. Without "#" the receiver is hidden. That means it will not appear on your, nor on foreign transmitters search lists.

HINT 2:
In case a receiver is not accessible at all you may press the find-button on the receiver for more than 5 seconds (the LED will do a short flash). This will reset the models name (e.g. back to #CM-1000 or #CM-5000) so it will be visible again.

HINT 3:
If you want to change the name of a model just for your address book not for the model itself (e.g. if it is the model from a friend), then change the name from there (your address book, p.14). The name there only refers to your transmitter.

5. SELECT A CONFIGURATION

6. LEFT- OR RIGHTHAND?

7. HAVE A NICE RIDE!

The ScaleArt Commander can be configured individually. In case you want to start using your new model quickly, there are predefined configurations for most common types of models saved on your transmitter.

If you decide to pick a predefined configuration, connect to the model and wait until the main screen is fully loaded. Press **menu** to go to the receiver menu. Select with ⏶ or ⏷ the menu option "configurations"

You will get a list displaying all predefined configurations saved on your receiver. Every receiver got the configuration "empty". For this standard set of configurations all output is inactive. Further predefined configurations depend on the type of receiver.
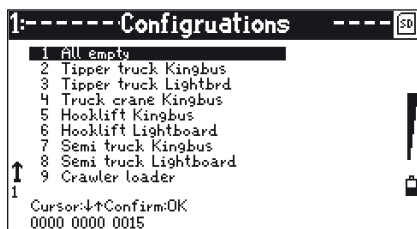
Holding **ok** for some seconds activates the selected configuration. If you want to leave the list without changing the configuration press **cancel**.

Blauzahn receivers up to (and including) version 4 do not support this function. If you have one of those receivers connected, there will be the option "reset receiver" instead.

All our receiver configurations for trucks have the steering on the right-hand and the throttle on the left-hand joystick. We are aware of the fact that this handling does not suit everybodies taste, so we came up with a handy solution:

Press **menu** while you presently are in the main screen. Select with ◄ or ► the option "basic settings". Go on with searching for the menu "joystick mode" with the buttons ⏶ and ⏷ and press **ok**.

In the following screen you can choose between four options referring to your joystick. On the left-hand is the function for the left-hand joystick and vice versa for the right-hand side. Select with ⏶ or ⏷:

Mode 1
For right-handed control. The right-hand joystick controls the functions 1 (steering) and 2 (high beam light), the left-hand joystick the functions 3 (throttle) and 4 (turning signs).
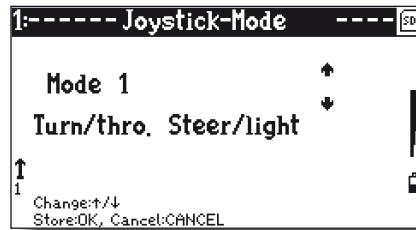
Mode 3
For left-handed control. Left and right joysticks are exchanged.

You can save the configuration you have made with **ok** or discard the changes with **cancel**.

If you have worked through all the instruction chapters referd to as ´basics´ to this point you now have a fully operational ´Commander´ system in front of you.

For an active truck configuration plug in the steering servo to port 1, the speed controler to port 3 and enjoy your ride!

The instructions on how to set the servo travel and to reverse the direction of rotation are on page 21 in the chapter ´model menu´.

Oncoming chapters are not structured like the ´basics´. That means you do not have to work through them in a special order, because there is no benefit from it. From now on you can jump to the chapter referring to your question or problem directly.

They are structured in topics and functions for finding the desired chapter faster.
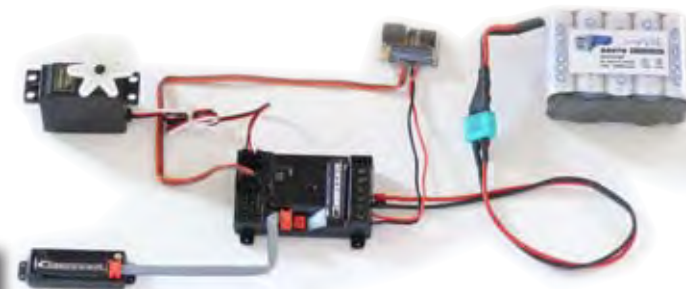
USING THE ADRESS BOOK

The address book holds the names and identification numbers of your models. You can enter the address book from the main screen with ⌃ or ⌄. Alternatively, you can find it in the "connections" menu. The different entries are sorted alphabetically by their name. You can switch through them with ⌃ and ⌄. Pressing the menu button in the address book calls up another menu for editing the currently selected entry. The following section refers to the address book functions.

Holding **ok** for a few seconds starts the connection to the selected model. If you want to go back to the main screen press **cancel** (the currently active connection will not be discarded).

> **HINT:**
> *Every time you open the address book the ´Commander´ does not suggest the current but the last model in use. This makes switching models more comfortable. Switching models: Shortly press ⌃ or ⌄ and accept with holding **ok** until the connecting screen appears.*

ADDRESS BOOK OPTION

CONNECT

When connecting to a new model every currently existing connection is cancelled. Next time you turn on your transmitter it will automatically try to connect to the same model it has been connected to in the last session.

CONNECT AS NO. 2

Connects to a second model without cancelling the currently active connection to the first model. You are able to control both models now. You cannot connect to the same model twice (more detailed information on page 59).

SEARCH NEW RECEIVER

This option leads you straight to the previously explained search function. New models are always saved as new entry independently from the entry through which you entered the menu.

The whole menu. Address book options.

```
1:------Phonebook-options----[≡]
 ↑Connect
  Connect secnd. link
  Search new receiver
  Edit name
↑ Edit address
1 ↓Delete entry
Store:OK, Cancel:CANCEL
```

EDIT NAME

Using this you can change the name of the entry in your address book, but it will not change the name saved on your model itself. Editing a new name is described on page 8.

EDIT ADDRESS

As explained on the top every model, or to be exact, every ´Commander´ antenna has its own name consisting of letters and numbers. Usually it is not necessary to enter the address manually for it should be automatically saved in your address book when the new receiver connects. If you want to enter a new address manually have a look to page 15.

DELETE MODEL

Deletes the entry from your address book. You will have to accept the order with ➤ to avoid deleting an address by mistake. The entry is deleted permanently, you are not able to connect to the model via the address book afterwards.

PREPARE SECONDARY CONNECTION

You can edit additional settings for your entries. That means you can preset options that, whenever you connect to a particular model, a specific secondary model will be selected, too.

It will appear as the first, if you enter the address book like described above. The "secondary connection" mode is configured as it has been saved.

CREATE ENTRY MANUALY

If you want to enter a new address manually, that means without the integrated search function, follow these instructions:

1. Go to the address book and select the entry "empty"

2. Press the menu button

3. Now select "edit name" and enter your name of choice

4. In addition enter the 12-character identification number of your models antenna to the "edit adress" option (you do not have to enter the separating dots, they are fixed)

Blauzahn models which have the old white antenna connector can only be added like described in point 4. You can find their address on the antenna module.

HOW TO GET THE ADDRESS

You will need the ´Commander´ models address, if you want to enter it manually like described in the blue box on this page.

E.g. if you want to connect your model to a friends transmitter, but you do not want it to be visible for others.

In case you make your models identification number (address) visible for others, they are technically able to control your vehicle. To avoid other transmitters to gain control over your model, you may want to set a password (explained in detail on page 20, chapter ´password protection´).

VISIBLE MODELS

The address of visible ´Commander´ models can be found with the search function of your transmitter. On the bottom of the screen you can see the address of the currently selected model as it is illustrated in the picture on the right-hand side.
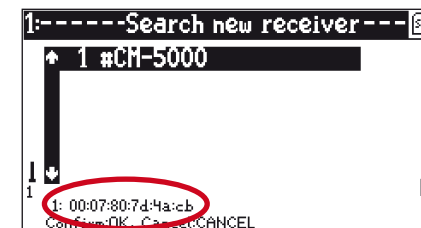
INVISIBLE MODELS

Their addresses can only be found in address books of transmitters which already have it saved. The address is displayed in the entry below the models name.
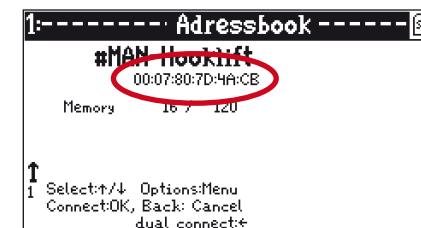
SETTING THE TRANSMITTER

This section gives detailed information about options in the "basic settings" menu.

To get there press **cancel** for as often as it is necessary to get back to the main screen. Then press **menu** and scroll with ◄ or ➤ untill you can read "basic settings" in the top line. Every adjustmen explained in this chapter refers to the transmitter only. That means changing these settings does not affect the model directly. Of course you can change the control over the vehicle by changing the "joystick mode", but you do not make any changes to the model itself.

The SA-Basic version has got two additional menus: "tare joystick" and "PPM mode" .

Their functions will be explained on the following page.

the full content of the menu "basic settings"

FILE FUNCTIONS

This option will only be available if a memory card is attached and it is compatible with the transmitter. If selecting this menu, you will get to the sub menu for the memory card. You can find a detailed chapter refering the memory card functions on page 76.

OPERATING TIME COUNTER

The values for both operation time counters are listed in the "system info". Furthermore you can find information about the transmitter hardware and installed software there, too.

In the bottom left-hand corner you can see the resetable timer behind the letters ´up´ and to your right-hand side is the total timer behind the word ´all´ .

To set the left counter to zero hold ◄ . Leave this menu with ´cancel´or ´ok´ .

CONNECTION PARAMETERS

Shows the characteristics of the connection to the model. You do not have to understand them in detail, but if you contact us reporting a problem, we might ask you for these values.

The count behind Rx-lvl is always negative and shows the signal strength. For this value suits: bigger is better!

BER is the value for the signals quality, o would be perfect.

Leave this menu with ´cancel´or ´ok´ .
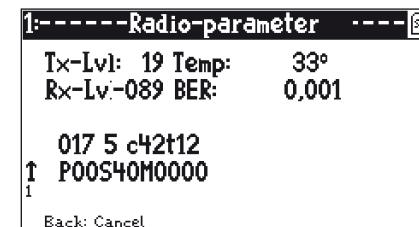
CALIBRATE JOYSTICKS

The ´Commander SA-Basic version is designed for upgrading older transmitters.

It fits perfectly to the F14, but with some craftsmanship you can extend almost all equipment with an analogue joystick. The electrical parameters of the joystick alternate from manufacturer to manufacturer and even from version to version. For this reason you will have to calibrate your joystick a single time, if it is in use for the first time.

You can find the option "stick calibration" in the "basic settings" of the ´Commander´ SA-Basic transmitter. New SA-Basics that have not been calibrated, yet, show this menu after power up.
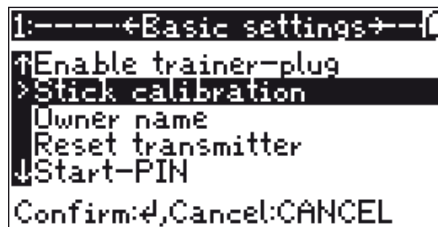
What is shown in the picture is an illustration of the transmitter:

to the bottom left- and right-hand side of the joystick, the four knobs (proportional channels) in between and on top of the illustration the display shows two adaptions with six switches and one knob for each.

NEUTRAL POSITION

Bring all controlling elements to a neutral position. That means: Place them centred and do not forget to center the trimming. Then press ▲ until all knobs and switches on your display jump to a centred position.

JOYSTICK AND POTENTIOMETER TRAVEL

The menu switches to "stick travel" and all arrows on the proportional controls facing right and up start blinking. By that you can see which direction has not been set, yet.

Now move the control elements to the far sides of the directions that the blinking arrows are facing one after another untill the end position is reached. This is necessary for ´Commander´ to recognizes in which direction the sticks and potis are attached and how big their action/ rotation angle is. Do not forget the potis of your adaptions.
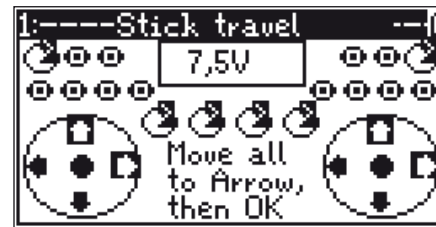
Once you reached the final position with the control element for the first direction the next arrow will start blinking. Repeat the procedure until all directions are set.

If no more arrows are blinking the calibration procedure is completed.

For slots that have not been plugged with a controlling element, the control value is set to neutral. In this case the calibration arrows will remain.

Save the settings by holding **ok** for some seconds.

You may want to leave this setup without saving the changes by pressing **cancel**.
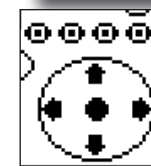
SA-1000 AND SA-5000

The larger transmitters have precalibrated controls. Normally, you do not have to set them manually. For that reason you probably will not find the corresponding entry in your options. But for service reasons there is a setup that can be entered by holding the ▲ button when you turn on your transmitter.

The procedure stays the same for the SA-5000 as it is for the SA-Basic. In case you own a SA-5000 make sure you do not forget the potentiometers on the bottom of the screen.
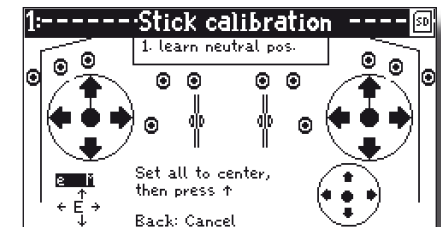
PPM-MODE

You can attach a joystick directly to the SA-Basic version. Alternatively it can read the ppm-signal from the trainer plug of the original transmitter. In the "trainer plug" menu it is possible to switch between the trainer plug (F14 mode) and a direct attachment. After changing the mode you have to redo the calibration of the controls.
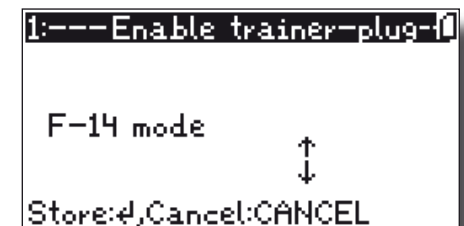
A ll display settings are available in the "basic settings" menu. Lighting and brightness can be adjusted manually, so do not hesitate to make your own settings.

```
1:-------‹Basic settings›-----
 ‹File›
 System info
 Radio-parameter
 Display light  100
 Display dim  020%
```
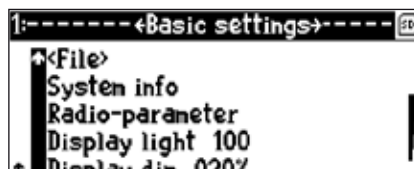
The contrast should be optimal, all displays are temperature-compensated for European climate.

LIGHTING DURATION

T he display lighting can be set to "period of lighting" , "constant lighting" or you may deactivate it entirely.
Another possibility is to set it deactivating after the cursors, sticks and menu buttons have not been in use for the editted period of time. To do so you have to go to the „basic settings" and select "lighting time" .

You can see the options "period of lighting" (in seconds), "constant lighting" and "off". ▲ and ▼ change the duration, holding "ok" saves the setting.

```
1:-------Display light -----
 125 sec.          ▲
                   ▼
 Store:OK, Cancel:CANCEL
```

You may leave the menu with cancel to discard the changes. All timers will be reset to their previous value. In case an alert is triggered, the display will automatically activate!

DIMMING THE DISPLAY

T he brightness can be steplessly dimmed at a range of 0 to 100%. You can find the "display dim" option in the "basic settings" menu.

▲ and ▼ change the brightness (values are displayed in %), holding "ok" saves the entry.

„Cancel" discards all changes and resets them to the previous

```
1:-------Display dim -----
 030%              ▲
                   ▼
 Store:OK, Cancel:CANCEL
```

values. In case of an alert the display automatically sets to full brightness for as long as the alert lasts.

Hint:
Because of the percetion of the eye, changing the first 15% of your display lighting appears most intensively. You can use this knowledge to increase the longevity of your battery: Setting it to 20% will appear as if it was at 100% brightness, but the power consumption will be reduced to a fifth.

CONTRAST

T he "basic settings" menu also contains the "contrast" setting. You can choose values between 120 and 180.

▲ and ▼ adjust the contrast, pressing the menu button changes the value from the lowest, to the average and finally to maximum value.

Holding the ok saves the setting. Cancel discards them to their previous state.

This will come very handy, if you chose to adjust the contrast to a level where you barely see anything on your display.

```
1:-------Contrast -----
 145               ▲
                   ▼
 Store:OK, Cancel:CANCEL
```

AUTOMATIC SHUTDOWN

The option to "Auto pwr off" a period of inactivity is only available for the SA-1000 and SA-5000 version. If the transmitter has not been in use for the choosen period of time (that means if no cursor, stick or button has been activated), it will automatically shut down.

∧ and ∨ change the period of time, holding **ok** accepts and saves all settings.

With **cancel** you can discard the settings and leave the menu. The previous values will be restored.

Independently from your own configuration the transmitter shuts down after a maximum of four hours continuous operation (240 min). Setting values shorter than 10 minutes always results in a 10 minute timer.
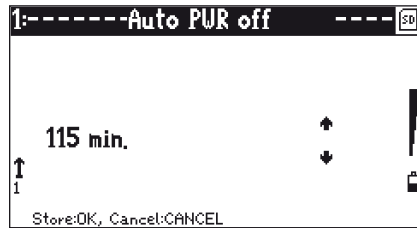
LEFT- OR RIGHT-HANDED TRANSMITTER

If a model is in use of more than a single driver, there should be a clear assignment of your transmitters control functions. Of course there is always different preferations referring the handling, but that is not a problem:

You can change the handling of the transmitter without any affects on your models configurations.

The "joystick mode" menu offers you four arrangements for assigning your joystick functions (merely automatically). ∧ and ∨ change the mode, holding **ok** saves the changes. **cancel** discards all changes and closes the menu, the previously active mode will be restored.
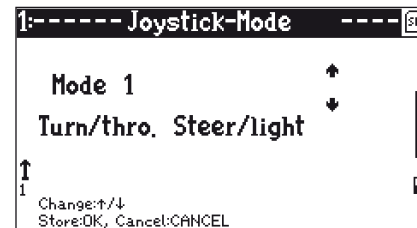
The illustration on the right-hand side shows the assignments for each joystick (left- and right-hand). If you change the mode of your transmitter, no other control element will be affected.

Mode 1
For right-handed control. The right-hand joystick controls the functions 1 (steering) and 2 (high beam light), the left-hand joystick functions 3 (throttle) and 4 (turning signals).
Mode 3
For left-handed control. All joystick functions are reversed.

Furthermore you can choose to drive and steer with the same joystick. Select mode 2 right-handed use (steering and throttle right) or mode 4 (steering and throttle left).

USERNAME

When starting your transmitter this name is displayed in the booting screen below the ScaleArt logo.

You can change the name in the "basic settings" under "owner name". It is possible to enter up to 16 characters in the same way as it is explained for changing the name of your model.

TRANSMITTER AT FACTORY STATE

Go to the "basic settings" and select "reset transmitter" option. Now you have two possibilities:
∧ deletes all entries from your address book. The following screen shows the count of the deleted addresses. The procedure takes some time.

Holding ∨ resets all configurations to factory state. You will automatically be carried to the "calibrate joystick" menu .

With **cancel** you can leave without saving the changes.

COMMANDER

ScaleART TRUCK-MODELING MANUFACTORY

TRANSMITTER BATTERY ALARM

PASSWORD PROTECTION

Commander transmitters are monitoring the battery voltage. The charge status displayed on your screen depends from the determined value.

If the supply is dropping below the adjustable threshold, the ´Commander´ will warn You: The battery symbol below the charge status starts blinking and the display lights up and down. The SA-Basic also shows a big warning sign on the screen. The more advanced transmitters SA-1000 and SA-5000 trigger vibration and acoustic alert when enabled.

For the SA-Basic version the threshold also regulates at which voltage the battery symbol will show "empty".

SET ALERT THRESHOLD
In the "battery alarm" option in the "basic settings" menu you can edit the threshold for the level of the battery voltage.
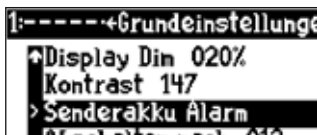
On top you can see the currently measured voltage. Below it you can find the currently active value of the threshold.

∧ and ∨ change the value, holding **ok** saves the setting. You may leave the setup with **cancel** to discard all changes. The previous threshold will be restored.
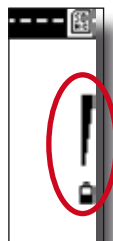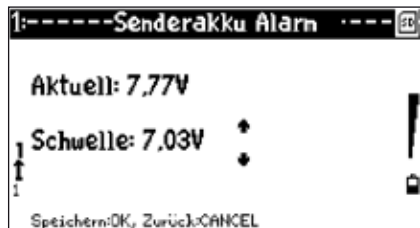
SUGGESTIONS FOR ALTER THRESHOLD
The SA-1000 and SA-5000 have a battery suiting, factory preinstalled threshold. You should not change this value without a good reason.

SA-Basic versions can optionally be supplied with 7,2v nimh, 7,4v lipo or 9,6v nimh batteries. Please set the threshold carefully, because the charge status function is fully depending on it.

nimh 7,2v (Scaleart - standard equipment): 7,05v
nimh 9,6v (Robbe - standard equipment): 9,40v
lipo 7,4v: 6,90v

Those values might look conservative, but please remember that those are not critical values set for the discharge protection, rather than threshold values for the warning signs and alerts. When the alarm sounds up You should still have plenty time to park Your truck at a suitable place.

DISCHARGE PROTECTION
The larger transmitters SA-1000 and SA-5000 shuts down automatically when the battery voltage drops below 6,0 v.

Unfortunately, this is not possible with upgraded SA-Basic versions, because of the foreign transmitter.

Whether it is for theft protection or just to avoid unauthorized usage:
It often is desirable that not anybody who is able to find the power switch, is also able to use or change every function.

Therefore ´Commander´ transmitter have a password protection to secure critical functions and to avoid unwanted changes. There are two different levels of security:

UNAUTHORIZED USAGE
You can set a "start PIN" in the "basic settings". If you enter an empty entry the, password will be reset. The PIN itself can contain all signs, space, letters and numbers available. Using the same PIN as illustrated here in the manual is no good idea.

If you did set a password, it will be required for launching your transmitter. Without entering the correct password, you are not be able to start the transmitter.

UNAUTHORIZED PROGRAMMING
If you did set a "configuration PIN" in the "basic settings", all configuration options of your transmitter and the associated models will be locked. Of course your are still able to select models from your memory and control them.

> **Attention***!*
> *If your PIN gets lost, you will have to ask your manufacturer to reset it for you. Therefore you need the proof of purchase.*

RECEIVER SETUP

This topic will grant you a closer look at the possibilities you have configuring the ´model menu´. To get there first press ´cancel´ untill you are back to the main screen, then press the menu button to go to the "model menu" .

In this menu you can find all configurations depending on your model that are saved on your receiver. If no model is connected this menu will stay clear except the option "search model" .

INTRODUCTION

Right to the very introduction of this lecture we told you that the ScaleArt ´Commanders´ are model based, which means that all configurations concerning the model are saved on its receiver. If the model is not connected to your transmitter, you cannot access the configurations saved on the receiver. You will only see all the menu points for setting the models configurations for active connections.

By the way, all operations and adjustments like the mixer and the servo path get calculated in the model not your transmitter.

The complete Receiver menu

```
1:--------- <Receiver>-------- 
 Port settings
 Function blocks
 <Telemetry>
 <Copy & Save>
 Select module
 Set module ID
 Module name
 Layer names
 Module-control PIN
 Module-config PIN
 Modell name
 Lightbus setup
 Aux bus setup
 Text 1
 Text 2
 Configruations
Confirm:OK, Cancel:CANCEL
```
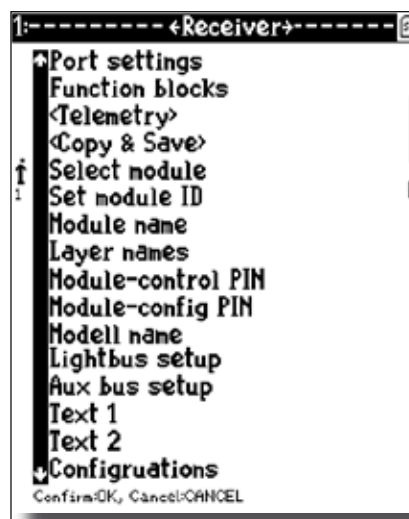
This way the receiver can still operate automated functions like lighteffects or windshield wipers without connection to the model (e.g. if the vehicle is parked)

Model based also means that if you want to change configurations of your model you always consider the device (e.g. the servo) that is connected and change the settings of the port to which its attached. For the overall configuration, the assignment of the controlling elements to the functions is just one variable option of the freely changeable settings.

Common and more easy remote controls which most model manufacturers are used to are transmitter based. But for more complex controls with wide spread functions this would just be limiting its capabilities.

So the starting point of all configurations is not the channel, but always the used port.

THE RECEIVER MENU

PORTS

The receivers have ports for e.g. servos, light-bus or the engine. Furthermore for some types there are virtual ports. Those have only importance for the software internal features like the hazard lights and for cancelling turning signals. You can find a more detailed explaination in chapter ´ports/ function elements´.

FUNKTION BLOCKS

Amongst others, function elements contain what you might know from otzer remote controls as mixer. The ´Commander´ function blocks are capable of more than simply mixing: bending light, comfort flash, limiting switch, hydraulic pump control, delaying, sequencing, various tracked vehicle mixer and much more. Described in detail in chapter ´ports function elements´.

TELEMETRY

Another ability of the ´Commander´ receiver is to send measured and calculated values back to your transmitter where they will be displayed. This is called telemetry. Besides battery info, light symbols and inclinometer, you can add four additional values to the screen. Closer description in chapter ´telemetry´.

MODULE-ID, SELECTING, SETTING AND NAME

If a single receiver is insufficient for the model functions, you can connect them to a network. You may add up to eight receivers to your model, which can then process the measured values. This is why we call them control modules. To make adjustments for a specific module you can select it by its number, the module-ID. New modules always have number 1. Usually, you do not have to worry about the module-ID for models with a single control module, because the transmitter first accesses to number 1 when initialized.

By selecting the module you decide with which of your models modules your are going to work. The ID of the currently active module is always displayed in the top left-hand corner of the menu. You may also set a specific name for the modules to keep a clear overview. Changing the name does not have any effect on the modules functions.

LAYER NAMES

ScaleArt ´Commanders´ enable you to assign up to a total of eight layers of functions to each controlling element. You may edit names for each level. The name will appear with the number on the display. The currently active level is displayed with its number and editable name. When entering the "leve text" menu, ◄ and ► change the level , ▲ and ▼ select the text from the list. You may change all eigth names in one pass. Leaving the menu by holding ´ok´saves the settings.

Hint: The eight evaluation modules and the eight levels here have nothing do to with each other.
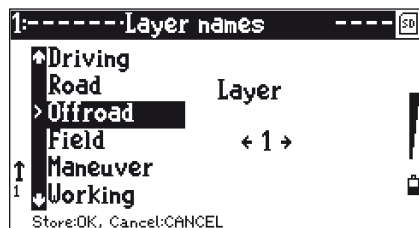
FREE TEXTS

You can give each port a name. You may select a preinstalled term or you edit your own text in the menu option "text 1" "text 2".

PIN

To protect your model from being accessed by foreign transmitters you can set a control-PIN for ´Commander´ receivers. Just transmitters holding the same PIN can access to that model.

The config-PIN prevents unauthorized persons from accessing the receiver configuration options.

Blauzahn receivers are a little different: for running a Blauzahn receiver, the menu options are displayed in the receiver port menu of the battery monitoring.

(What to say: when connected to a blauzahn-receiver, the PIN-options are not visible in the main menu. Instead, they appear in the options of the "battery-voltage" port. OS)

MODEL NAME

On the one hand the model name is the entry in your address book by which you can connect to the model, but on the other hand when changing the models name in this menu while the model is connected, the name is also changed and saved for the model itself. That means you are not be able to find your model by its standart term like #CM1000 or #CM5000 aynmore. Now the recently editted name is displayed.

Models with a name starting with ´#´ are visible to all ´Commander´ remote controls. You can find them with the integrated "search model" function.

Is the name starting with ´@´ it is visible for all ´Commander´ rc´s, but it does not offer its address. That means if you do not have the address yet, you will not be able to connect to the model.

CONFIGURATION TEMPLATES

There are several configurations for different types of models preisntalled on ´Commander´ receivers. You will find the for the currently connected receiver available settings in the "configurations" menu.

Holding ´ok´ accepts and saves the selected configuration.

Press ´cancel´ to leave the menu without changes.

Feel free to use the preinstalled configs. as a base for your own settings. After loading a presetting you can change all features independently. You may also start without any presets. by selecting the "empty model" entry.

Blauzahn receiver do not support this function. For them there is the menu option "reset receiver" .

BUS-CONFIGURATIONS

Some ports on the receiver have multiple functions: You can switch them between standard (i.e. for servos or as a on/off output) and bus-output. On CM-1000 and all blauzahn-devices the last port can be altered to support the kingbus light system (see page 54): Enter the topic "lightbus setup". There, ◄ or ► toggles between normal function and kingbus support.

CM-5000 does have a dedicated port for kingbus which is always active independent of the setting in the menu.

The topic "aux bus setup" is reserved for future extensions and belongs to port 5 on CM-5000, port 8 on CM-1000.

PORTS/ FUNCTION BLOCKS

A lways follow the same method: First select the port or function element you want to adjust, then change the required parameters.

E.g. whether a servo or LED´s are attached, which channel the port reacts to, direction of rotation, servo travel etc. If you assign several ports to the same channel, they will all be activated at the same time. The ´level release´

The steering servo is plugged to port 1 of the receiver.

selects in which level the port operates.

Suitable as control channels are: the control elements of your transmitter, the results of the function models as well as the values of the ports and sensors. Proportional control elements (joystick, potis) give a continous control value in range from -100% to +100%.

The settings for channel, servo travel, neutral, reverse etc. are done at port 1 of the receiver..

Switches give 0% in centered position, +100% when activated to the top/ outside and -100% when activated to the bottom/ inside. The following illustration is an example for the ´Commander´ principle:
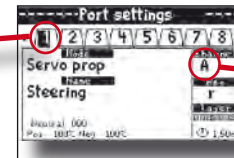
The port is currently controlled by channel A, the right joystick sideways movement.

ACCESSING PORTS/ FUNCTION BLOCKS

S tarting from the "ports" menu, press menu to open the "model menu". Then choose a port or function block. In the oncoming menu you can select which receiver pin or function block you want to make changes to.
On the display you can see the selection of ports in card files running from the left- to the right-hand. The currently active port is highlighted.

The buttons ◄ and ► move the cursor. You might recognized that the list is not fully displayed. „>" and„<" show additional content that is hidden in the further menu be-

cause depending on the receiver there can be up to 64 entries in this list. Hold ◄ or ► to go through the menu faster. Pressing the menu button sets you straight from the first, to the last and finally to the centered entry. Besides the real ports you can also select several interal functions of your receiver (the so called virtual ports). E.g. you can control the warning lights via the port with the triangle- (warning-) symbol and the steering port automatically resets turning signals.
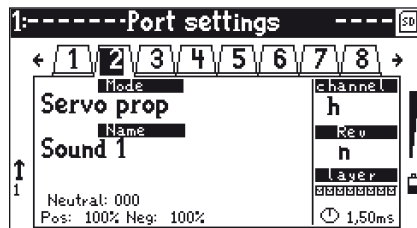
If you scroll through the card files the basic characteristics of the selected port will be displayed: name, mode (servo, switch, input), channel, servoreverse, notes, neutral position and paths as well as the level.

The knob in the bottom right-hand corner validates whether or not the port is controlled by the desired control element. In case you want to edit the setting press ´ok´, so you access to the "ports" menu where you can find the name of the selected port.

(Missing something: now we are talking about how to access function blocks. OS)

This menu is also made up in card files, but this time there are always two pages per file - left and right-hand.

The left-hand file displays the main function of the elements and is assigned with ´Fn´, the right-hand file determines the operation mode of the second port of the function element assigned with the function element specific code letter.
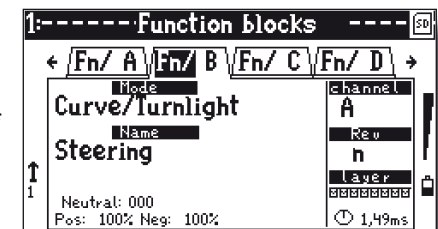
EDIT AND SAVE VALUES

I f you make any changes to the ports or function elements, the new data will be sent immediately to the model. That means the changes will be active right away. So you can instantaneously observe the changes you made (exceptions are changes to the mode and channel, for them you have to acccept the entry with ´ok´).

Even though you can test the setting it is still not saved, yet. If you shut down your model now, the old configurations will be loaded again when restarting. To finally save the changes press ´ok ´. If you wish to test the setting before saving it, you will have to leave the menu with cancel. This way you do not have to redo all the settings in case you do not like the changes.

For permanently applying the changes go to the menu of the relevant port or control element and press ´save setting´, or to discard them just restart your model, so the old values are active again.

COMMANDER

MENU STRUCTURE OF THE PORT SETTINGS

The menus´ refering the port settings are highly variable. The displayed content depends on the mode in which the selected port is active. Permanently available are: name, mode, save and - except in the ´off´ mode - port reset.

The following section explains all possible menu options for the ports. In the ongoing chapters we explain the operation modes, for that we refer to the description on this page again!

In case your are looking for specific information on the modes, feel free to jump to chapter ´port modes´ or ´function block modes´

NAME

Selects one of the 254 preinstalled description texts for the port. In general, this serves as a note on the ports function: ´lifting axle´ is easier to distinquish than ´port 14´.

For some special funtions this texts are also sort of selection criterion for assigned light-bus functions or feedback symbols (on the display of your transmitter): turning signals, travel-. full beam-, standing- and rear fog-lights, working and rotational lights, wipers, stands, brakes, trailers and
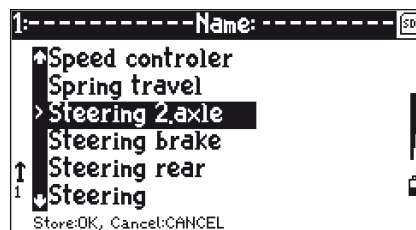
trailer couplings are linked like that. The description texts ´right brake´ and ´left brake´ are used for the selection of combined brake/turning signals. Refering to the turning signals the text ´right turning sign´and ´left turning sign´ are crucial for the bus-function and the feedback. You can find a list of all available texts in the appendix. For each model you have the option to set two separate texts that replace ´text 1´ and ´text 2´.

⋏ and ⋎ move the cursor through the list. ´Menu´ jumps to the next initial letter. To permanently save the changes to your receiver hold ´ok´ untill you get back to the "ports" menu.

NOTE

At this point you may deposit a note text. Depending on your receiver it can contain 4 to 12 characters. The text does not have any function, but it appears in the port selection with this name.
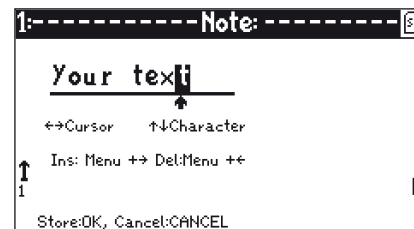
MODE

In this menu you are setting the function of a port. For operating it is crucial how the port is set. E.g. it determins whether a pulse signal for servos is generated, a simple on/ off signal for LED´s or if the port is working as an

input. Depending on the selected mode the following menu options will change: a servo does not need a frequency of blinking and a turning signal does not need servo adjustments. Which mode is available depends on the selected port and the type of your receiver.
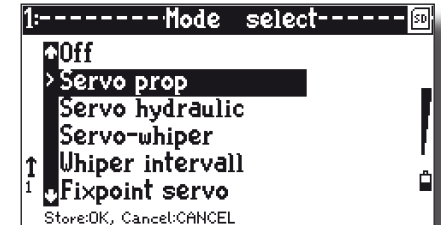
CHANNEL

The channel dertermines which of the control elements are assigned for the port. There are three groups that can be selected with ⋏ and ⋎ . Changing the channel is not immediately accepted. To activate the selection hold ´ok´.

CONTROL

The picture below illustrates the control elements of your remote control. Currently selected elements are hightlighted. Move the desired element for selection or you may use ◄ and ► to navigate.

page 25
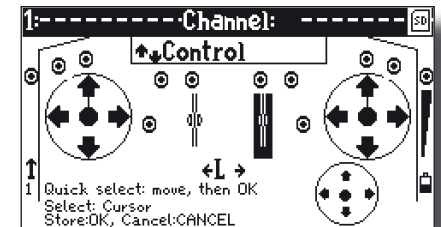
INTERNAL FUNKCTION

You can access the results of function blocks, the value of sensor ports, the inclinometer as well as stoplight-, transmission-, and reverse signals of the internal speed controller. Select with ◀ or ▶ from the list.
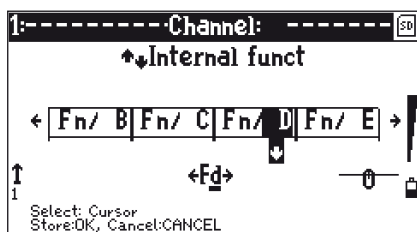
PORT

Gives you the status of the selected port, independently from their configuration (servo- or switch output, analog or button input). Select from the list navigating with ◀ and ▶.

Hint 1:
The port data will be important if you want to program dependencies. E.g. you have a tractor using a powerful servo to lift the loader. With this servo working in "hydraulic mode", You can use its position to generate a virtual electronic "parallel linkage" for the shovel.
Hint 2:
If the mode of the port is set to input, you can configure an electrical limiting switch with feedback to the transmitter (for more details go to function block "limiting switch"). You might also configure a self steering axle on a trailer.

LAYER

Layer masks are necessary to determine in which layer an active port is operating when it reacts on control functions. If the hook is set, the servo will operate in the corresponding layer, without it will stay in its last position. ◀ and ▶ select the level, ▲ and ▼ set/ delete the hook. By selecting a new level it will automatically be set active. The menu button sets/ deletes all hooks.

DIRECTION OF ROTATION

This is the standard "servo reverse", but with two additional functions! There are four options:
- "normal" and "reverse" determine the direction of rotation. The options "right only" and "left only" limit the possible direction to eigther the left or right-hand. That means, independently from the direction your joystick is turned in, the correpsonding movement of the function always results to the left or right-hand depending on your configurations. The servo then only rotates from its neutral position to the fixed direction.
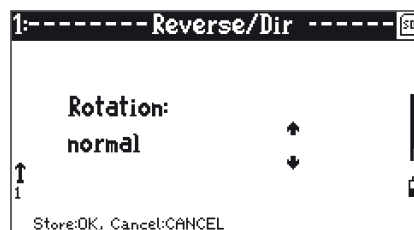
SERVO NEUTRAL

The servo neutral determines the neutral position, you may call it hidden trimm! Editable is the full servo path, but because of mechanical limits of the servos the electronical adjustment should be kept to a minimum. For larger deviations you have to offset the arm on the servo. ◀ and ▶ change the values, the menu button sets it directly to -100%, 0% and +100%.
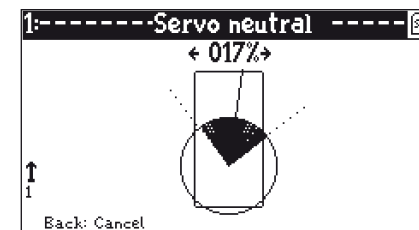
SERVO TRAVEL

In this menu you can adjust how far a servo will turn, if you fully deflect your joystick. You can set the values for both directions individually. ◀ and ▶ change the direction, ▲ and ▼ change the value. The menu button sets in fixed steps from 0%, to 198% and finally to100%.

For 100% most servos make a 90° turn (45° in each direction). You may push it to 198%, so the action radius of analog servos increases to about 180° (90° in each direction). Please make sure your settings do not interfere with the servo mechanics. If you want to test your settings before saving them, you will have to switch the menu option "sleep" to "fulltime" or "conncted/off" and steer the joystick in each direction.

Digital servos are likely to be limited internally, so most of them do not reach the same deflection ratio as analog servos do.
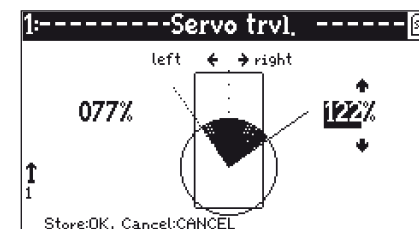
EXPO

A big exponential-factor causes the servo to be more sensitive around the neutral position. Getting closer to the end positions of the joystick the traveled path will increase, so the full servo path can be deflected. The illustration on the display (here in the picture) shows the influence the entered values have on the control:

Horizontally the joystick defelction, vertically the resulting servo position. At 0% the characteristic line is linear. ◄ and ►

select the side, ▲ and ▼ change the value. The menu button again sets the value in the following order from 0% to 100% and finally to 175%.
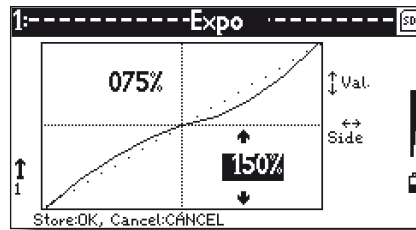
RESPONSE

I n this menu you can adjust the sensitivity of your joystick for hydraulic operations. The bigger the value, the faster the servo moves. ◄ and ► select the side, ▲ and ▼ change the value. The smallest setting is 12%, because at 0% the servo would never move.
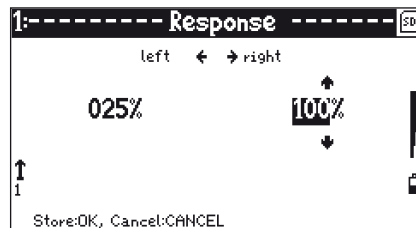
JOYSTICK ZERO

D etermines the center position of the "control valve" for hydraulic operations and should be set to 0%. ▲ and ▼ change the value. Menu sets in steps from -100% to 0% and finally to +100%.

TRIGGER

F or switching functions the "trigger" determines below which joystick defelection ratio the function is considered released. Trigger plus dead band must not be greater than 99%. Otherwise the function is not be operational. ▲ and ▼ change the value. The menu button sets in steps from -100%, to 0% and finally to +100%. Negative values have the effect that you have to pull/ push the joystick beyond the neutral position untill the function is considered as released again.
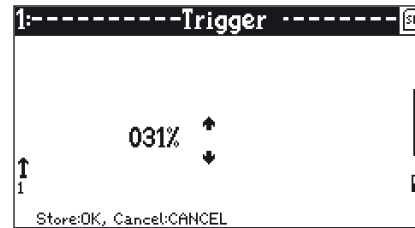
DEAD BAND

T his menu exists in two versions depending on what is operated at the port.

Servos: the dead band determines how far the joystick has to be moved before the servo wakes from the "sleep mode". In general we advice values between 1% and 5%.

Switching functions (input or output): The dead band is the hysteresis. That means it is the zone between switch-on and switch-off point.

The function will be considered as activated, if the joystick deflection is greater than switching point and dead zone together. If the deflection is smaller than the switching point, the function will be considered as released.

▲ and ▼ change the value, menu sets it in steps from 0%, to 100% and then to 150%.
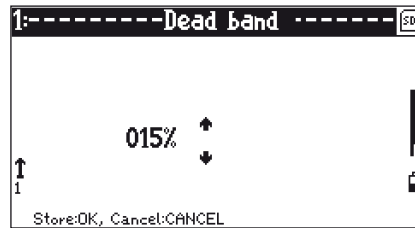
SLEEP PERIOD

Y ou may configure your servo so it ´sleeps´ when no operation is required. This helps avoiding growling servos and reduces the power consumption of resting functions. This only works for analog servos, not for their digital brothers. For switching functions the "shutdown timer" determines the maximum operation time and at which state it will change, if it is not activated for the current level.

▲ and ▼ change the value. The following settings are possible:
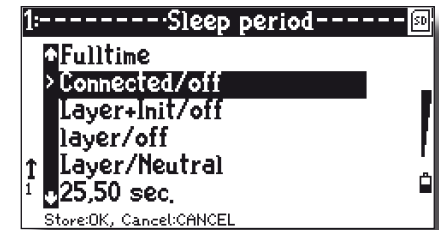
FULLTIME:
The servo constantly receives impulses.

CONNECTED/OFF:
The servo is receiving impulses for as long as it is connected to the transmitter. If not, the servo engine will not be supplied and the output stays dead: "sleep mode".

Switching functions are forcibly set to ´off´ when the connection to the transmitter gets lost.

LAYER + INIT/OFF
The servo is receiving impulses as long as it is activated for the layer. Additional, it activates for about two seconds and goes back to its initial position on power up.

LAYER/OFF:
The servo is receiving impulses as long as it is activated for the layer, but does not move untill it is connected to a transmitter and is activated for the according level. When starting the model the servo stays in "sleep mode" untill its level gets selected.

LAYER/ALL OFF

Swichting functions are set to ´off´ when they are not active for the current layer.

LAYER/PLC ONLY

Like above, but you are still able to control switching functions independently from the level with the PLC. Only the remote control function is set to ´off´.

LAYER/ON

Switching functions are set to ´on´, when they are not active for the current layer.

LAYER/NEUTRAL:

The servo is constantly receiving impulses, but if it is not active for the current layer, it will go back to its neutral position. You may use this for controls that are connected to an engine that has to stop safely whenever the user switches to a different layer.

OPERATED + N PULSES.

As long as the control is moved out of its neutral position the servo gets pulses. The threshold can be set in the "dead band" menu. After going back to the neutral position the servo receives "n" more impulses. With this configuration yan can run servo-electronical controls without the problem of the ´wandering zero´. In its neutral position the servo is not getting impulses.
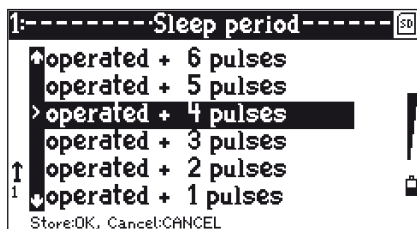
N SEC.

The servo is receiving impulses as long as the accompanying function lets expect a servo operation. The threshold can be set in the "dead band" menu. If standing still, the servo will receive impulses for few more seconds. This solves the problem of growling servos even if therefore the targeted position will not be fully reached, because of the stiff steering.

Be cautious: servos without impuls have a short holding torque.

Switching functions (even with memory) will not stay active longer than the configured timer is set. When it is running out the function automatically switches to ´off´ . To start the function again you have to activate it again.
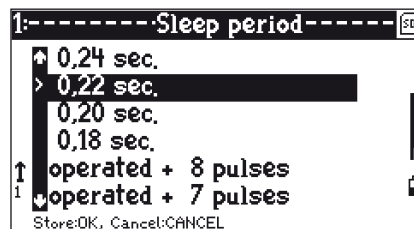
SERVOSPEED

With this setup you can artifically slow down servos for a more realistic motion sequence. The servo still has the same reaction time but it can not move faster than the preset value dictates. The displayed action time refers to 100% path. You can adjust the motion sequencing for both directions separately. Is the set servo path greater or smaller, the action time changes according to the set values. ◄ and ► select the side, ▲ and ▼ change the value. When setting the value to "min" there is no artifical delay, the servo moves as fast as possible.

DENTENTS

D entents determine at how many positions the servo stops (both resting and switching operation) between the borderlines. You can find a more detailed explaination in the chapter ´resting servo / switching servo´. ▲ and ▼ change the value.
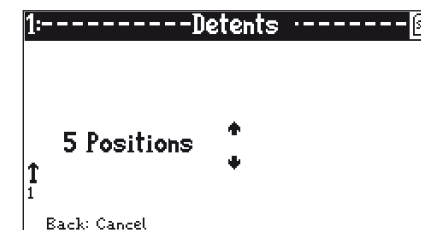
SWITCH NAMES

Y ou can add up to 32 different texts to both states of switching functions and switching inputs. If the according connection to the telemetry is set, you will see them on the display. There are two texts for each port: active (on) and inactive (off) The texts will be lost, if you change the mode of the port to one of the following: servo, turning signal, intervall or analog. ◄ and ► select the side, ▲ and ▼ change the text.

Holding ´ok´ saves both texts. An overview of all available texts is within the appendix. You can set two own texts for each model that then replace the entries "text 1" and "text 2".
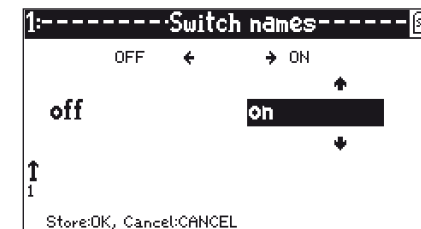
FREQUENCY/ DUTY CYCLE

For the interval mode. The left-hand value determines how many impulses per second the output should do. The value can be adjusted in 0,2 Hz steps from 0,0 to 10,0 Hz. On the right-hand you set the duty cycle. You may enter values between 1% and 99% or set it ´on/ off´.

◄ and ► select the side, ▲ and ▼ change the value. Holding ´ok´ saves both values. Find a more detailed description in section "interval mode".
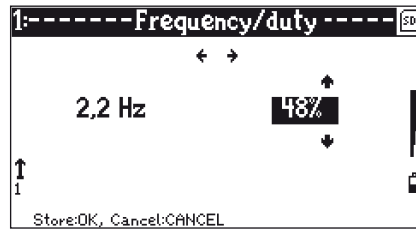
FAIL-SAFE

The fail-safe setting determines to which position the servo will move, if the connection to the transmitter gets lost. Possible are values from -100% to +100% or the entry "non".

For "non" the servo remains in its last position. A fail-safe action is only possible, when the port (to which its connected) is activated for the layer that has been selected before the connection to the transmitter got lost. ▲ and ▼ change the value, the menu button sets in steps from -100%, to 0% and then to +100%.

For switching functions (even with memory) values greater than +10% mean ´switch on´, values smaller than -10% mean ´switch off´.
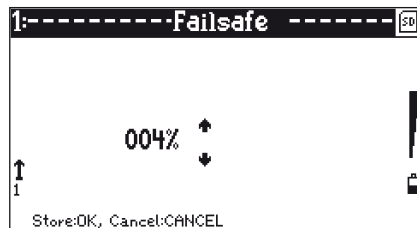
SAVE SETTINGS

Writes the currently active configuration permanently to the receivers memory.
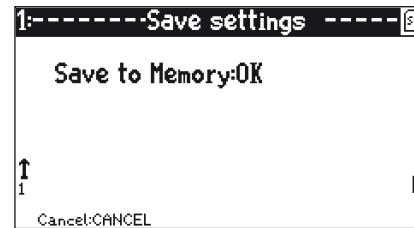
PORT RESET

Sets the configuration for the port to values matching the current mode of operation.

The settings mode, name, text, channel and layer are not affected. Hold ▲ to accept the reset.

VIEW TELEMETRY

Quick establishment of a telemetry indication box for this port. Select with ◄ and ► in which telemetry box the value shall be entered and press ´ok´ to accept. The value of the port now appears on the display.

You may deactivate the telemetry indication in the "telemetry" menu with the "hide" option. Press cancel to leave this setup without changes to the telemetry.

page 29
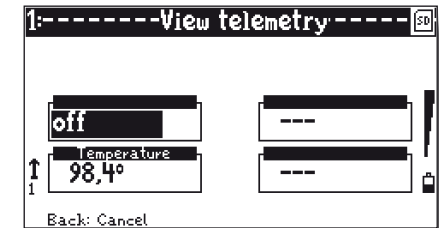
MODES FOR PORTS

The next chapters explain the characteristics of the available modes as well as their configuration. You can find an example of reasonable values for each mode. Those are the values which will be reinstated, if you reset the port.

While navigating through the menu no changes are made to the currently active mode, so feel free to scroll through the menu without expecting unwanted model operations. To ac-

cept your selection press ´ok´. A list of all available mode is in the appendix (which modes are available for a port is decided by its equipment). The list discerns simple consumers, internal controls and inputs.

Each port and every function block in receivers support the mode "off".

This ist why it is listed right at the start and is not mentioned later.

OFF

Port is inactive. The impulse connection stays fixed on 0,0v.

MODES FOR SERVOS

Following modes generate impulses for standard servos. You can operate analog and digital servos, cruise controls and all function elements which are working with conventional receivers with those modes. In case your are not sure which mode suits you start with "servo proportional". ´Commander´ receivers operate with puls lengths of 1,5 ms as neutral. At a range of 100% path the control sphere reaches from 1,0 ms to 2,0 ms. You may expand the control sphere to 0,5 ms or 2,5 ms by stretching the path.

Please note that not every servo is able to operate correctly with an expanded path. Be specially careful regarding the mechanical limits of your servos.

SERVO PROPORTIONAL

As usual, the servo is following the joystick position. This mode provides simple impulses for common servos (comparable with the performance of analog receivers).

Adjustable are: neutral position, direction of rotation, servo travel, expo, servo speed, fail-safe and sleep mode.

direction of rot. norm
servo center   0 %
servo travel   100% / 100%
servo speed   min / min
expo   0% / 0%
sleep period   fulltime
dead band   2%
fail-safe   non

SERVO HYDRAULIC

As long as the joystick is deflected, the servo moves in the corresponding direction up to the editable maximum. If you release the joystick, the servo will remain in the current position. The mode is called hydraulic, because the servo behaves like a hydraulic cylinder. So the joystick is the ´control valve´.

If initializing the model, the servo will take the position it had when you saved the configuration. The servo will start moving, if the joystick deflection is greater than the dead band. You increase the servos movement speed by raising the joystick deflection.

direction of rot. norm
joystick zero   0 %
servo travel   100% / 100%
Servo speed   min / min
response   12% / 12%
Sleep period   fulltime
Dead band   2%

The "dead band" option has special relevance to the servo function: it determines how far the joystick has to be moved out of its neutral position untill the servo activates. In general, we advice values between 5% and 25%. ⌃ and ⌄ change the value, the menu button sets in steps from 0%, to 100% and 50%.

If you selected one of the "operated..." configurations in the "sleep period" option, the servo will only receive impulses as long as the joystick, your virtual valve, is activated. The servo will ´sleep´, if the joystick stays in neutral position.

Important: This mode simulates hydraulic movement sequences. Servos which operate real oil hydraulics should be set to the "servo proportional" mode.

servo holds position

servo turns left   *servo turns right*

slow   *slow*

fast   *fast*
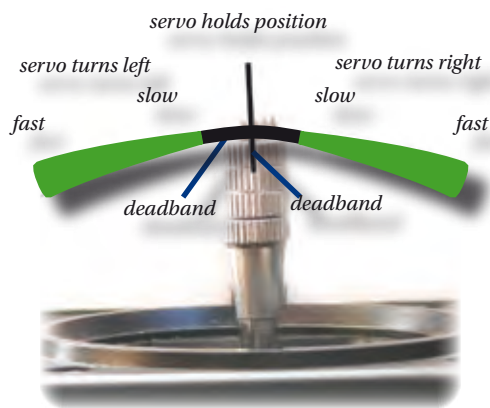
deadband   *deadband*

Hint: If you choose a switch for controlling, you will still be able to bring the servo into every possible position. The smaller the response and the greater the dead band, the more precisely the servo responds to orders.

WIPER SERVO

This is a variant of the hydraulic operation. For this configuration the servo behaves like a windshield wiper. As long as the function is active the servo runs with the preset speed from end-point to end-point. If the function is inactive the servo will remain in the end-position resulting from the direction of rotation. The control is a switching function, the wiper has only two optional states: ´on´ and ´off´.

If the joystick deflection is greater than "trigger" plus "dead band", the wiper will activate. Below the trigger the wiper is inactive. Trigger plus dead band may not be bigger than 99%, because otherwise the function cannot be activated.

direction of rot.	norm
trigger 10 %	
dead band	2%
response	12% / 12 %
servo travel	100% / 100%
servo speed	min / min
sleep period	fulltime
fail-safe	non

The "direction of rotation" menu has special function for this mode: ´normal´ and ´reverse´ determine the operating direction of the function. ´Left´ and ´right´ determine the side of the resting position.

WIPER INTERVAL

An additional interval switch is mounted: as long as the switching function is kept ´active´, the wiper is continously moving. Afterwards the interval switch is active. You may set the interval timer in the option "servo speed". The next activation of the wiper sets it ´off´. When the joystick deflection gets greater than the trigger plus dead band, the state is changing a single time. Before another change of operation is possible, you have to move the joystick below the value of the "trigger".

Trigger plus dead band must not be greater than 99%, otherwise the function is not operational.

direction of rot.	norm
trigger 10 %	
dead band	2%
response	12% / 12 %
servo travel	100% / 100%
servo speed	min / 3 sec.
sleep period	fulltime
fail-safe	non

The "direction of rotation" menu has special function for this mode: ´normal´ and ´reverse´ determine the operating direction of the function. ´Left´ and ´right´ determine the side of the resting position.

"Servo speed": the value on the right-hand provides the time the wiper needs from reaching the working position untill the next wiping operation. The value on the left-hand is meaningless.

SERVO RESTING

I n general , the servo is following the joystick movement, but in this mode it snaps on a preset count of positions. Stopping in positions between those rest stops is not possible. You may add up to five rest stops (2 are minimum) which are then distributed across the path in constant intervals. You can variate with the distribution a little by setting the "expo". If the dead band is too large, the rest stops will probably not engage properly.

For two selected rest stops the servo center determines at which position the servo is switching between them.

For three or more rest stops the servo center adjusts the servo position of the centered rest-stop.

```
direction of rot.  norm
rest stops         2
servo center       0 %
servo travel       100% / 100%
expo     0% / 0%
servo speed        min / min
sleep period        fulltime
dead band          0%
fail-safe          non
```
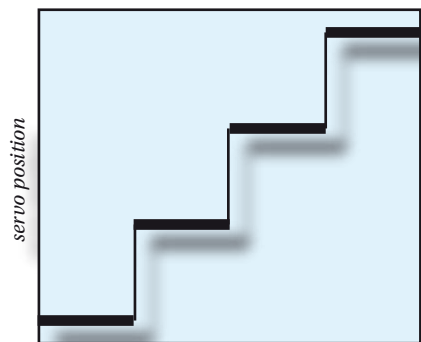

example for the relation of joystick- and servo position with 4 rest stops

servo position

joystick position

The menus "direction of rotation" and "dead band" have a special impact:

"Direction of rotation": ´normal´ and ´reverse´ determine the operating direction of the function. ´Left´ and ´right´ select on which side the servo will rest.

"Dead band": specifies how far the joystick has to be moved across the boarder to the next rest stop untill the servo moves on. ⋀ and ⋁ change the value, the menu button sets in fixed steps from 0%, to 100% and to 50%.

SWITCHING SERVO

T here are two different possible operations for this mode depending on how many rest stops the servo can engage.

TWO REST STOPS
When activating the function the servo switches to the other end position. This mode suits best for operating limits, transmissions, trailer plates or locks by a servo. You can activate the function with a simple button for the function can only operate in one direction at a time. If the joystick deflection is greater than trigger and dead band, the state will change a single time. For switching again you first have to pull/push the joystick back behind the trigger (closer details in topic ´switching funtion: "memo"´).

Trigger plus dead band must not be greater than 99%, otherwise the function is not operational. The trigger should be clearly positive, so the function responds to every tap.

THREE OR MORE REST STOPS
The control element can operate in both directions: for every activation of the control element the servo makes one step into the corresponding direction.

```
direction of rot.  norm
rest stops         2
servo center       0 %
servo travel       100% / 100%
expo     0% / 0%
servo speed        min / min
sleep period       fulltime
dead band          0%
fail-safe          non
```

The "direction of rotation" menu has special impact:

´Normal´ and ´reverse´ determine the operating direction. ´Left´ and ´right´ select the side of the servo position 1.

Most ´Commander´ receiver have ports capable of generating signals. The switching information appears at the impuls-pin. ´On´ provides a current of 3,3v, ´off´ provides 0v. The ports are equipped with internal current limiting resistors and are short circuit protected to ground (minus-pin on the port). You can connect LED´s directly without additional resistors between impuls-pin and minus-pin.

It is not recommended to connect a consumer directly to the impuls-pin of the ´Commander´ receiver and anything different from the minus-pin, because that does most likely lead to the immediate destruction of the receiver (more details in chapter "hardware")

SWITCHING FUNCTION

The output stays active as long as the function is operating. If the joystick deflection is greater than trigger plus dead band, the output will switch to ´on´. Below the trigger it switches to ´off´. Triggers plus dead band must not be greater than 99%, otherwise the function is not operational.

direction of rot.	norm
trigger	7%
dead band	7%
sleep period	fulltime
switch names	on/ off
fail-safe	non

Example: For a trigger at 50%, the joystick has to be deflected to at least half the path, so the output stays active. Is the dead band smaller than 5% the output is fluttering around that position. This can be avoided by increasing the dead band, e.g. 25%: the output is switching

switch < off
dead band, output stays unchanged
switch on >
trigger
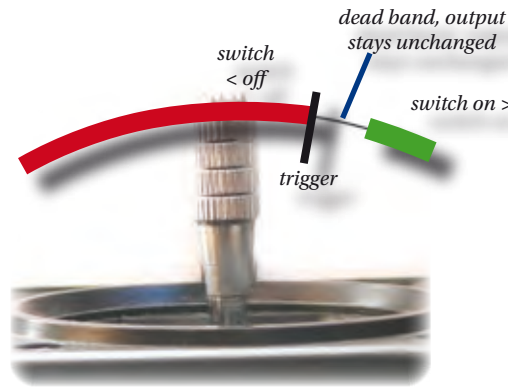
´on´ when the joystick is at about 3/4 deflection (50% plus 25%). It does switch ´off´ once the joystick is pushed back to less than half the path. You can configure what the output will respond if it is switched on/ off in the "switch texts" menu.

Hint:
You can establish a ´direction-memory´ with a simple switching function by setting a negative value for the "trigger" and about twice the value (this time positive) for the "dead band". The output switches on when the joystick is moved and stays active untill the joystick is pulled back behind the neutral position.

SWITCHING FUNCTION MEMORY

Operates like the switching function but with memory:

The first activation turns on the output, the next turns it off and so on. If the joystick deflection gets greater than trigger plus dead band, the state will change a single time. Before switching again you have to pull back the joystick behind the trigger.

Trigger plus dead band must not be greater than 99%, otherwise the function is not operational. The trigger should be far positive, so the function operates with every tap.

direction of rot.	norm
trigger	7%
dead band	7%
sleep period	fulltime
switch names	on / off
fail-safe	non

< ready for next toggle
dead band
> output toggles once
trigger
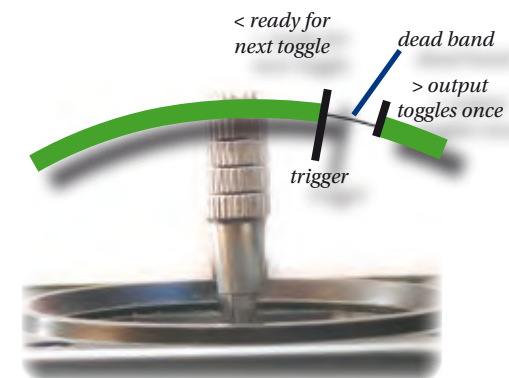
HIGH BEAM SWITCH

A combination of a switching function for the first, and a switching function with memory for the second direction. Operating like a beam-switch: when activating the first direction, the function stays active as long as the joystick is held in that postition. If the second direction is activated, the function will lock. But it will only lock, if the headlights are activated. You may deactivate the function of the second direction by moving the joystick in the same direction again (you could also deactivate the headlights). The direction of rotation determines which direction of your control element is assigned to which of the described functions. You can use the same configuration as for switching function/ switching function with memory.

Hint: If you want to turn on the headlights, you will first have to establish a "switching function memory" with the name "headlight" for the port or function element.

direction of rot.   norm
trigger   7%
dead band   7%
sleep period   fulltime
switch text   on / off
fail-safe   non

< flash function

dead band, output remains unchanged

rest stop >

trigger

output < on

> output toggles once

output off >

< ready for next toggle
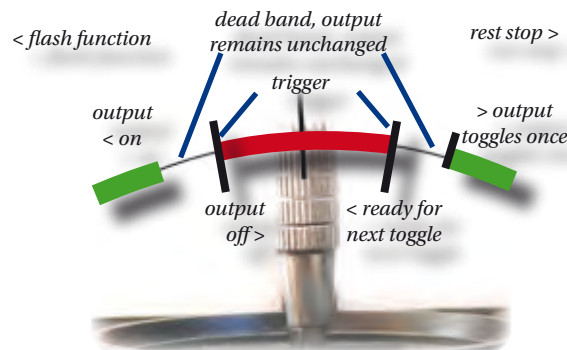
INTERVAL SWITCH

If the output is active it will be continously switched on and off. Freuquency and key ratio are adjustable. The frequency is measured in hertz (events per second) and determins how many impulses the output does every second. You can set the value in 0,2 hertz steps at a range from 0,0 to 10,0 hertz. Therefore 1,0 hertz means one blink every second, 2,0 hertz mean two blinks every second. 0,2 hertz generate one blink every 5 seconds. Setting the value to 0,0 is not recommended.

The key ratio determins how long the output is active during the cycle. Possible are values between 1% and 99%, as well as ´off´. For 50% on and off time are equal. At 10% the output is active for a short moment, at 90% it would almost be continously active.

E.g.: for warning flasher enter the values 3,0 hertz and 20%.

Hint: You may convert the interval/ blink output to a pure switching output by setting the key ratio ´on´. For setting the key ratio ´off´ the output stays on 0,0v, but the response signal is giving the correct operation status. A very low key ratio and high frequency can leat to an irregular operation.

Hint: Each interval switch is operating with its own independent timer. If you want to operate two warning flasher at the same time asynchronously, you will have to set two interval outputs to a difference in frequency of 0,2 hertz to gernerate the typical asynchronous rythm.

All interval switches provide the fixed responses ´on´ and ´off´.

For configuring the trigger and the dead band check on the switchig function.

direction of rot.   Norm
trigger   9%
dead band   9%
frequency/ratio   1,0 Hz / 50%
sleep period   fulltime
fail-safe   non

frequency

on

off

time >   duty ratio   duty ratio   duty ratio
          10%   50%   90%
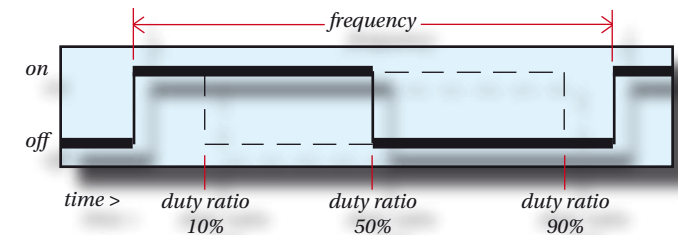
VARIANT : INTERVAL MEMORY

Same as interval but with memory: the first activation turns on the function, the next turns it off and so on.

Setting notes for trigger and dead band are explained in ´switching function memory´.

direction of rot.   norm
trigger 9%
dead band   9%
frequency/ratio   1,0 Hz / 50%
sleep period   fulltime
fail-safe   non

Double flasher/ double flasher with memory

Operates the same way the interval does, despite the fact that it is generating two consecutive flashes. The key ratio has to be set to less than 30%. The first flash depends on the key ratio, then there is a break of the same period of time and afterwards the second flash occurs depending on the key ratio again.

For setting advices go to operation mode ´interval´.
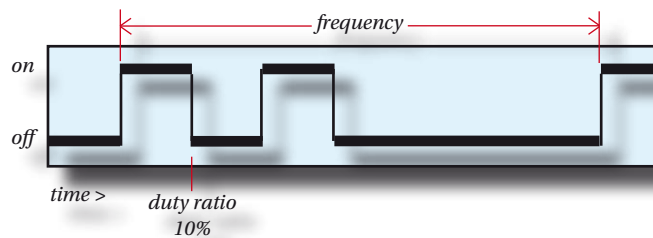
Turn signal

The function for typical vehicle turning signs. Each output that has been set as turning sign operates with the same timer, so they all operate synchronously. The internal warning flasher function activates all outputs on an evaluation module which are configured as turning sign. The configurations for frequency and key ratio are both set at the virtual warning flasher port (with the warning triangle).

Hint: for operational turning signs you have to tun the internal warning flasher port in the "interval switch" or "intervall switch memory" mode. If the joystick deflection is greater than trigger plus dead band, the switch will activate (repsonse: ´on´),. Below the trigger it deactivates (response: ´off´).

direction of rot. norm
trigger   9%
dead band   9%
sleep period   fulltime
fail-safe   non

Hint 1: turning functions will only be working, if they are operated with light-bus or if the turning signs are connected to the receiver directly. When the vehicle lighting is operated with an external light-set, the internal turning sign and flasher functions are not relevant.

Hint 2: for the automatic turning sign reset and display, the corresponding ports have to be correctly titled as ´turning sign right´ and ´turning sign left´.

turn signal comfort

Has the same function as the turning sings but with comfort function and memory: shortly tapping the control element activates the turning sign for 3 to 4 cycles. Afterwards it deactivates automatically. If you hold the control element for more than one second, the function will lock (memory) and stay activated till the next activation of the function. When activating a different turning sign the currently active ones are all shutting off. Furthermore the turning signs are supported with an automatic reset for the steering:

active turning signs are deactivated when the joystick is moved in the opposite direction. So the turning signals behave like those of real vehicles, turning back the steering wheel after turning shuts off the signal. Turning the steering wheel counterclockwise to the turning direction stops the signal, too.

The internal warning flasher activates all ports which are set as turning signals and comfort turning signals. For adjusting the response look at topic ´switching function´.

direction of rot. norm
trigger   9%
dead band   9%
sleep period   fulltime
fail-safe   non

Automatic turning sign reset

Configurate the turning sign reset via the port with the steering wheel symbol (besides the warnin flasher sign). The steering wheel port has to be operated in the ´servo proportional´ mode. Set it to the same channel the port for the steering servo is connected to. Servo travel and expo of the steering port remain at 100% and 0%. The dead band determines how far the steering

has to be pulled back to the opposite direction to deactivate the corresponding turning sign (basic setting: 50%)

> *Hint: The automatic turning sign reset is activated in the "basic settings" and responds to the right-hand joystick. If you do not want the turning signs to be reset automatically, set the steering port mode to `off´.*

Turning sign special

S ame as the turning sign comfort, but the lights are constantly flashing as marker lights (for the headlights are activated and no turning signal is active). This function will only be available, if the turning lights are connected to the receiver directly. On the light-bus, they will operate as usual. For a more details look at "turning sign comfort".

turning signal + stoplight

C ontrols the stoplights for the left- and right-hand separately and mixes them with the according turning signal, so the lights can be used as turning signs and stoplights at the same time. This is the case for US-vehicles and has been common in Europe earlier, too, especially occuring in construction vehicles and the agriculture. The ports of the front turning signs have to be set to "turning sign" , "turning sign special" or "turning sign comfort" mode with suitable names ("turnin sign right" / "turning sign left"). Those two ports additionally control the frequency of the corresponding rear turning signs. For the stoplights you have to set two seperate ports (for the left- and the right-hand) with corresponding names ("stoplight right" / "stoplight left"). Assigning the correct names to the function elements is of crucial importance, because the receiver recognizes which ports are engaged together by their names.

The stoplight is automatically controlled by the port or function element titled as "stoplight". Except mode and name there are no further adjustments to make.

Operation
turn: light blinks;
brake: constant lighting
turn and brake: the turning side blinks, the other side is constant lighting.

> *Hint: If you want to install a pure stoplight (3. stoplight), you will have to set an individual port. It has to be operated in the "switching function" mode with the title "stoplight". The port does then automatically provide the signal for the combined turning/ stop sign.*

Pwm-output

O utputs operating in the "pwm" mode generate a seemingly analog output-signal by pulse width modulation. The basic frequency is preset to 60 hertz and is fixed. You may connect an LED to the receiver output, so you can dimm it steplessly. You can also combine two pwm outputs to operate an engine with bridge output stage: both set on the same channel, the first in "norm" and the second in "reverse" mode. To avoid intersections do not operate it in the "pwm hydr." mode. The only suiting is the basic "pwm" mode.

PWM [0..max]

W hen the joystick is moved forward the pwm starts and reaches its maximum (permanent ´on´) shortly before the joystick is fully deflected. Pulling the joystick backwards does not create an output signal.

The dead band determines how far the stick has to be moved out of its neutral position before the pwm output starts. In general, we advice values between 5% and 25%. But you do have to increase the servo travel, so the pwm can reach its maximum at full deflection. You can create output signals in both joystick directions by setting the direction of rotation to "only right".

direction of rot.	norm
servo center	0 %
servo travel	100% / 100%
servo speed	min / min
expo	0% / 0%
sleep period	fulltime
dead band	2%
fail-safe	non

Variant: PWM [0..max] hydr.
Creates a signal as explained in ´pwm´, but with holding function that is matching with servos operating in "hydraulic" mode.

I n puts are used to measure values and switching states in the model. The following description suits for both sensor ports and those servo ports which are configured as inputs. Which ports can be configured as inputs depends on the receiver version. Measured is always between minus-pin (mass) and input-pin (measuring input) of the port. Depending on the operating mode you can run one sensor.

signal input (max. 5.0 V) impulse-Pin

plus-Pin

ground minus-Pin
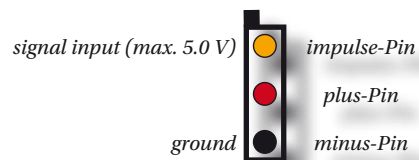
You cannot control inputs with your transmitter, but still the advanced ´Commander` remote controls have the "channel" menu available. Setting the channel determines on which control element the measurement is displayed. The ´Commander` SA-Basic does not provide this function.

Switching inputs can pass on their state directly to the light-bus and infrared, therefore you only have to set the name that corresponds to the function that shall be operated on the light-bus. This way you can take the reverse- and stop-light signals to the light-bus.

For inputs there are the following additional menus:

Scale analog inputs

T he scaling determines the value range for analog inputs. The greater the value, the greater the display for the same measurement. Editable are 0% to 199%. Standard setting is 100%. For 0% the display does not change.

Switching-/ zero point

S erves for correcting the response point of switching inputs and the zeroing for analog inputs. Normally, this value should be around 0%. The setting covers a range from -100% to +100%.

Reverse

T his function allows the logic of switching points and the result of analog inputs to be reversed. There are only two options available: ´norm´ for normal operation and ´reverse´ for reversing the operation.

Alert and threshold

A ll inputs can be assigned with thresholds. When the value exceeds or falls below the set threshold an alert is sent to the remote control. If you confirm the alert on your display by pressing any key, the alert output and display lighting will go back to sleep mode. The alert does not disappear untill the problem is solved. Surpress all alerts by setting the threshold to "-9999" for minimum and "+9999" for maximum. You can shorten the procedure by pressing menu.

Deactivate alarms

A utomatically sets the port threshold to values that never trigger alerts.

Unit

D etermines the unit in which the telemetry data is displayed on your remote control. For the temperature sensor the unit determines the measuring range, for all other input operation modes the unit only changes the display.

Format

S ets the format of the value. Optional is the number with up to four decimals and
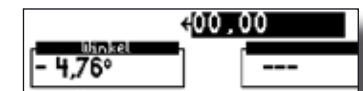
alternatively a hirzontal bar diagram with the zeroing on the right-/ left-hand or in the center.
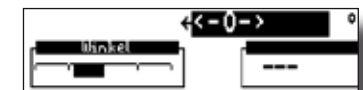
VOLTAGE

Measures the current. For sensor ports values from 0,0v to 1,0v are sufficient. The measuring range for servo ports covers values from 0,0v to 5,0v. The value is displayed in 0-100% of the measuring range.
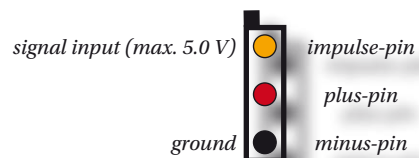
signal input (max. 5.0 V) — *impulse-pin*

plus-pin

ground — *minus-pin*

reverse	norm
switch-/ zero point	0%
scaling	100%
display format	1
unit	<space>
alert max	9999
alert min	-9999

MEASURING INPUT

This mode is only available for measuring inputs for battery voltage, total voltage, capacity, bec and light-bus voltage. Unit and displayed format are fixed matching the port configuration. Scaling and zeroing should not be customized! Alert thresholds can be set individually. The port for the battery voltage (battery symbol) has a special feature: if ´reverse´ is activated the bec voltage for servo ports will be measured instead of the battery voltage.

POTENTIOMETER

Determines the position of the potentiometer depending on the voltage. You can operate potentiometers (values between 1k and 100k) directly via servo ports. Wiper to the impuls-pin. Like this the measurement is at -100% for the position of the minus-pin, +100% for the plus-pin and 0% for the centered position.

reverse	norm
switch-/ zero point	0%
scaling	100%
display format	1
unit	<space>
alert max	9999
alert min	-9999

impulse-pin

plus-pin

minus-pin
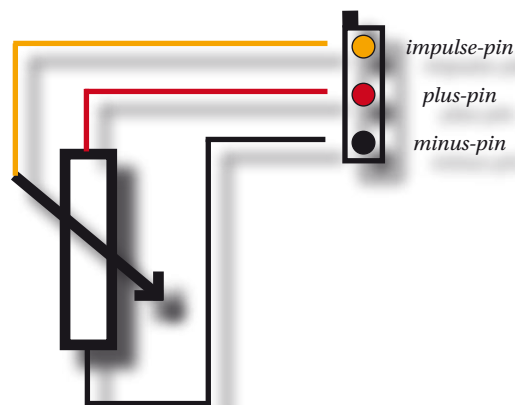
TEMPERATURE SENSOR

For operating the ScaleArt temperatur sensor (item nr.: 76000360). The measuring range covers 0-1v and gets scaled for displaying the themperature, e.g. for celsius from 0°-100°.

Alternatively, you can set the display for Fahrenheit or Kelvin. Select your unit of choice:

F or f for Fahrenheit
      (measuring range: 32-212F)
K or k for Kelvin
      (measuring range: 273 - 373C)
Everything else sets the scaling to Celsius.

Reverse	norm
Switch-/ zero point	0%
scaling	100%
display format	1
unit	°
alert max	9999
alert min	-9999

impulse-pin

plus-pin

minus-pin
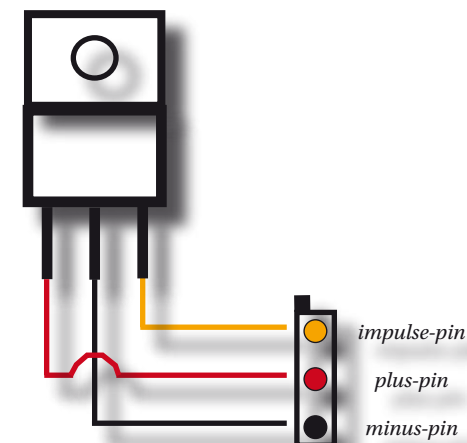
Switch < o >

S witch with three positions: plus, free and mass. The input provides the following results: the switch text for ´on´ ("switching point" menu) when connected to plus, switch text ´off´ for connection with minus and the text "center" for an open input (switch in centered position). The responsivity is set in the option "switching point" : for a standard value of 0% it is switching at a result of 2,2v upwards and 0,8v downwards. The greater the switching point, the greater the range in which the result "center" does appear. You only have to adjust the switching point for special features. Normally, if indeed switch contacs are connected, 0% is accurate.

Set ´reverse´ to invert the logik. When using the switch as control data source the centered position provides the control value neutrally (0%), the operating positions provide 100% for the corresponding direction.

For a defined ´free´ position the CM-5000 keeps the port at about 1,5v.

reverse	norm
switch-/ zero point	0%
switch text	on/ off
alert max	9999
alert min	-9999
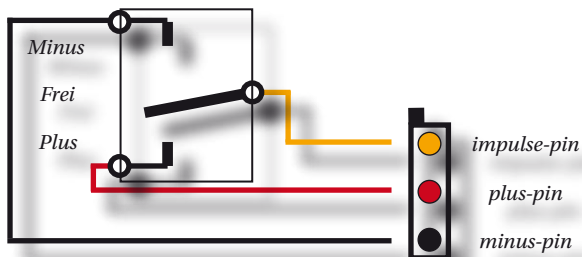
Switch simple

S imple switching contacts can be plugged directly (without additional construction parts) between minus-pin and impuls-pin.

When the contact is closed, the switch text for ´on´ appears, if it is open the text for ´off´ will be on the screen (go to section "switch texts" for more details). You can configure the responsivity in the "switching point" menu: for the standardized value 0% it switches at about 1,5v. For special applications you have to adjust the value, but for switch contacts 0% is optimal.

With this input mode you can easily request external control signals which are working together with a contact (or transistor) towards minus. Therefore, the control output of the external device is exclusively connected to the receiver input. No further consumers must be plugged!

reverse	norm
switch-/ zero point	0%
switch text	on/ off
alert max	9999
alert min	-9999
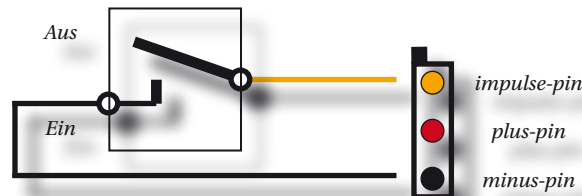
2 switches - 1 port

You can request the switches for two end positions on the receiver, e.g. up and down, with only one port. To do so, you require a so called change-over switch (most micro switches are change-over switches) Additionally, the port has to operate in switch mode <o>. Install the switches so that they will activate if you reach their end position. The upper switch will set the input on plus if activated, otherwise the signal continus on the lower switch. On the other hand the lower switch will set the signal input on mass if activated. If not, it will stay clear. Keep the labels in mind when wiring: for and active switching contact ´c´ is connected to ´no´, otherwise to ´nc´.
The port provides the following values:
for no switch is active - 0% and the text "center"
when activating the upper switch - 100% and the text "on"
when activating the lower switch - -100% and the text "off".

C

switch top

NC　　　　NO

C

switch bottom

NC　　　　NO

impulse-pin
plus-pin
minus-pin

Minus
Frei
Plus

impulse-pin
plus-pin
minus-pin

Aus
Ein

impulse-pin
plus-pin
minus-pin
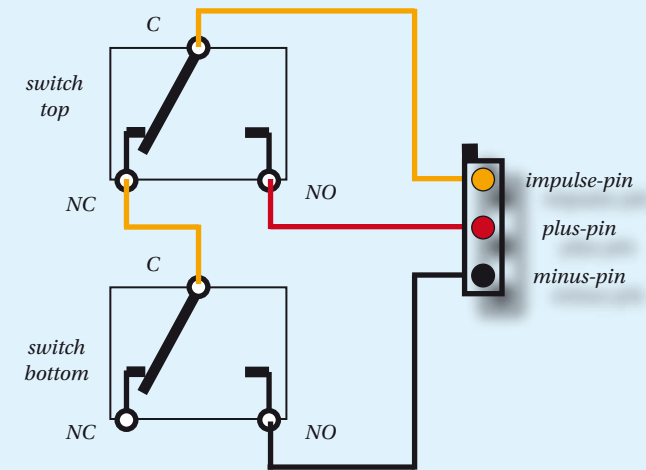
Hint: both switch modes do first measure the current on the input and then compare it to the threshold configured in the "switching point" menu. That means you may connect a potentiometer as sensor to the switch input, so it will respond with texts, if the value exceeds or falls below the set threshold.

FUNCTION BLOCKS

So far each port is controlled by a single control element, but often that is not enough. E.g. when driving tracked vehicles with throttle- and steering joysticks:

You have to combine two control elements in a way the model will be maneuverable, even if the drives themselves cause completely different motions. You probably know the term ´mixer´ from flight-model remote controls. And most likely you have already experienced that flight-models do not require half the capabilities that are provided and necessary for complex ground operations. This is different now:

The ´Commander´ contains everything that is required for vehicles and machines on the ground and in the water. And of course the ´Commander´ got the classic mixing ability.

Because there is more to it than just mixing, we call them function elements. You can find e.g.: limit switch, function switch, dynamic path limits, hydraulic pump control, sequential transmission switch, attenuation and differential elements, multi-switch control, freely programmable path defaults and much more.

Consider those function elements a box with two outputs for servos, two inputs for control elements and a switch on top of it to determine the function. Instead of plugging the control elements directly to the servos you now add the box in between. For complex functions - or in case more than two signals have to be processed - you can also connect several boxes in a row.

We integrated the function elements to the receivers, so they do not waste space in the model. The connection between port, function and control element can be comfortably configured via the menu without cable clutter.

Indeed, there are multiple of those elements provided in each receiver: a CM-5000 has got 16 of them, the CM-100 got 6.

ACCESS TO FUNCTION BLOCKS

For configuring the function elements go to the "receiver" menu and select the "function blocks" option.
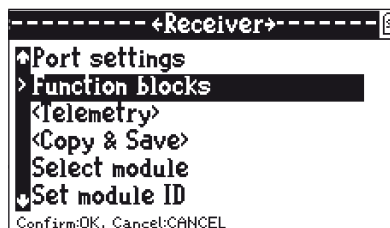
The ´Commander´ function blocks have letters as their name (Fn/ A to Fn/ X) and they are used like virtual ports (function described in the previous chapter).

Because each function element has two parts, they got two sided card files (left/right-hand) - that means each function block consists of two (virtual) ports.
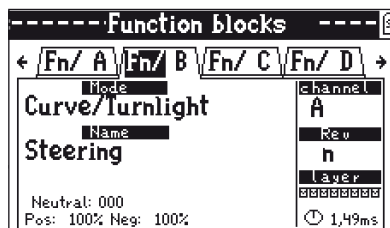
Depending on which side of the card file you are editing the left- or right-hand of the file is highlighted. For the operation mode configurations are always set for the left-hand.

This side also selects and configures the first input signal. The setting on the right-hand port determines the parameter of the second signal.
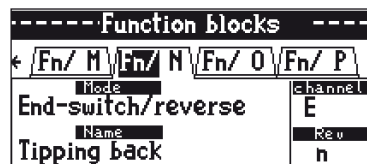
Not every function block requires both inputs.
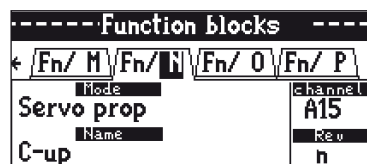
To process the result of the function element for example with a servo, select the channel for the corresponding port, then navigate with ᴧ and ᴠ to the group called function data. You can see a list of function element outputs titled as Fn/ A´ to ´Fn/ X´.

For the left-hand ´Fn´ is highlighted, for the right-hand its the letter. Select with ◄ and ►. With pressing ´ok´ you activate the selection of the function element output as control data source for the port.

To permanently save the setting hold ´ok ´ untill the screen changes.

In case you want to test your settings without saving them permanently, leave with ´cancel´.
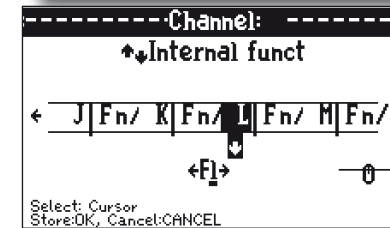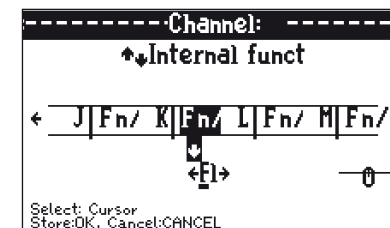
For comfortably controlling a tracked vehicle throttle and steering are mixed. A function element (here Fn/ A) is operating as steering transmission. It calculates the signal for the engine corresponding to the joystick deflection.

The ports (10 and 11) to which the controls for the chain-engine are connected, receive their control data from the outputs of this function element.

Pay attention to the different hightlightings of ´Fl´ on the port in the channel option. The function element itself receives its control data from the positions of throttle- (left-hand input, channel c) and steering-joystick (right-hand input, channel a).

Each function element provides values in a range of +/- 100%. If the calculation leads to values exceeding or falling below that range, they will be automatically limited. In case you require greater swings, set them at the servo port which processes the results. On the other hand the output should be kept fully occupied, because small swings will reduce the resolution.

For configuring we advice the following procedure: start with the port and set the neutral position, direction of rotation and paths for the servos or controls. To directly control the port set the channel temporarily on the joystick.

Afterwards configure the required function elements. When you think that the operation suits roughly, go back to the port and set the channel on the function element output.

The operation mode of the function elements right-hand input is eigther fixed by the function (e.g. multi-switch, operation time counter or PLC) or there are different servo and switch modes available. At first glance, not every combination makes sense, but we do not want to spoil your creativity with "logical" limits!

the control for the left- and right-hand track are linked to the servo ports 10 and 11

the ports 10 and 11 receive their control data from both ports of the function element L

Function Block L in mode *X-type-mixer*

the function element L receives its information from the throttle and the steering joysticks and calculates the value for the left- and right-hand drive by it. The value is provided on the left- and right-hand output of the function element.

joystick for throttle

joystick for steering

FUNCTION BLOCKS WITH PROPORTIONAL OPERATION

X-TYPE-MIXER

The dual mixer is a conventional mixer, it adds two inputs ´crosswise´: the right-hand input moves both outputs equally. The left-hand input moves them in opposite directions. The mixing ratio is configured for both inputs (for each of them in both directions) separately.

Left output	Right output
Left input + right input	Left input - right input

Reverse/dir	norm
Servo neutral	0 %
Servo travel	100% / 100%
Servospeed	min / min
Expo	0% / 0%
Sleep period	continuous
Dead band	2%
Failsafe	none

E.g. the dual mixer can be used to adjust a plane shield (dozer blade?), which is controlled by two servos, in height and tilt. It can also be used for steering tracked vehicles which originally are steered by a superposition gear with steplessly adjustable drive (oil-engine). Turning without throttle is possible, just as turning the tracks in opposite directions.

VARIANT: X-TYPE-MIXER HYDR.

As usual, but the left-hand input operates in ´hydraulic´mode. The right-hand input can always be set to hydraulic or proportional.

LIMIT / SPLIT

Limiting the path of the left-hand input to the value on the right-hand input. You could say that it is an electronical stop which can be adjusted while operating.

The second output operates contrary. That means, if the left-hand output stops, because of the limiting, the right-hand output then copes the input signal. So the original path gets split amongst the servos.

Criterion	Left output	Right output
left input > right input	right input	left input
default	left input	right input

VARIANT: LIMIT / SPLITT HYDR.

Like before, but the left-hand output operates in ´hydraulic´ mode. This would be a comfortable version of increasing/ decreasing the height of a snow-plough with your joystick regarding the example on the right-hand side.

	left	right
direc. of rot.	norm	norm
servo neutral	0 %	0%
servo travel	100% / 100%	100%/100%
servo speed	min / min	min/min
expo	0% / 0%	0%/0%
sleep period	fulltime	fulltime
dead band	2%	80%
fail-safe	non	non

Example:
Communal trucks for street cleaning:
the servo moving the snow-plough is controlled by the joystick. With ´limiting/ split´ you can preset the working depth of the lowered plough by the second channel.

> *Hint:*
> *If the stop is operated in ´hydraulic´ mode (right-hand input) you can chnage it with a button. For a sensitive controle select a great dead band (ca 80%). .*

two different examples for control values on the right-hand input

position of the righ-hand input

red zone: left-hand output follows the joystick

green zone: right-hand output follows the joystick

joystick on the left-hand input

position of the righ-hand input

red zone: left-hand output follows the joystick

green zone: right-hand output follows the joystick

joystick on the left-hand input

SLOW/DIFF.

T he left-hand output follows the left-hand input with limited speed. Maximum speed is determined for both turning directions separately by the servo speed. The right-hand output provides the difference between left-hand input and output. The right-hand input of the function does not influence the results.

direction of rot.	norm
servo neutral	0 %
servo travel	100% / 100%
servo speed	turn left/ right
expo	0% / 0%
sleep period	fulltime
dead band	2%
fail-safe	non

ATTENUATION/DIFF.

T he left-hand out put follows the left-hand input with attenuation. Set the attenuation time for both turning directions separately via servo speed.

CONTROL SELECT

S witches both outputs alternatively on a single controlling element: the control information from the left-hand input is eigther transmitted to the left- or right-hand output. The respective output remains neutral. Criterion for switching is the signal on the right-hand input. Greater than neutral means left-hand control. Smaller than neutral means right-hand control. The dead band determines the area in which both outputs remain neutral. You may use this function depending on a control function, a servo position or a measured value, to switch between different functions.

criterion	left output	right output
right input > neutral + dead band	left input	neutral
right input < neutral -dead band	neutral	left input
others	neutral	neutral

	left:	right
direction of rot.	norm	norm
servo neutral	0 %	trigger
servo travel	100% / 100%	100% / 100%
servo speed	min / min	min / min
expo	0% / 0%	0% / 0%
sleep period	cont. operation	cont. operation
dead band	2%	neutral
fail-safe	non	non

Example:
sweeper front attachment: for a lowered sweep the control operates the drive, for a raised sweep the same control element switches the turning signs.

SLOW OR ATTENUATION?

In general, the difference between the preset servo speed (slow) and attenuation is the response to small swings: by setting the timer the response happens almost instantaneous, just major adjustements are noticeable deplayed.
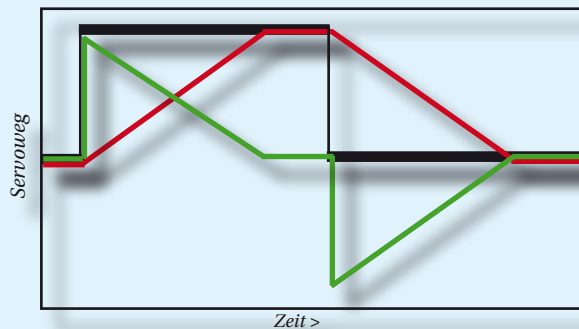
For attenuation the turning speed depends on the difference between default (joystick defelction) and current servo position. Furthermore, the turning starts smoothly, so small adjustments happen very slow.

slow response on a sudden joystick deflection (impuls response):
black: joystick; red: left-hand output; green: right-hand output
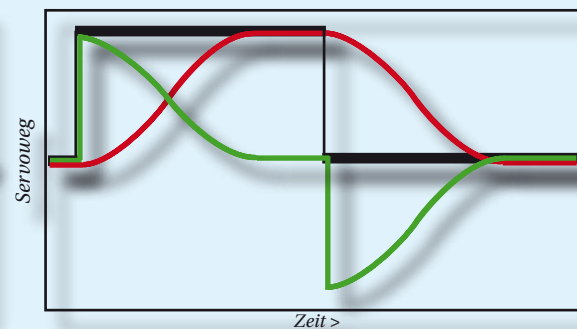
attenuation-response on a sudden joystick deflection (impuls response):
black: joystick; red: left-hand output; green: right-hand output

This function block can be used for two types of operations. Always both version are calculated, depending on what you need you can take the result from the left- or right-hand output. The actual signal is on the left-hand input, the limiting signal on the right-hand input.

END SWITCH

The function is assigned to the left-hand output and limits the swings towards plus or minus depending on the right-hand value. As long as the right-hand input is in a centered position (or rather within the thresholds). The left-hand input follows the left-hand output limitless.

If the right-hand input is activated towards plus (or rather is moved above the set threshold), the left-hand output will only operate from neutral to -100%. In contrast, if the right-hand input is activated towards minus (or rather moved below the set threshold), the left-hand output will only operate from neutral to +100%. On the right-hand input the signal can be generated eigther by a switch input (two end switches) or by a potentiometer input (poti for determining the position).

REVERSING SWITCH:

The right-hand output receives the control signal from the left-hand input, but depending on the right-hand input it is reversed in direction (reversing function). The triggers mentioned in the text above suit here, too.

The response values for limiting or rather switching are specified for both operations in the "servo travel" menu for the right-hand input. Be careful, if there is a value exceeding 100% the corresponding direction will be permanently active, because the input value cannot exceed a maximum of 100%.

	left:	right:
direct. of rot.	norm	/norm
servo neutral	0 %	0%
servo travel	100% / 100%	threshold
servo speed	min / min	no meaning
expo	0% / 0%	no meaning
sleep period	fulltime	no meaning
dead band	2%	no meaning
fail-safe	non	no meaning

EXAMPLES:

Crane jib with spindle drive: the jib gets a potentiometer on the axle which is assigned to a port running in potentiometer mode. It provides a continous response to the current position of the jib. The end/ reversing switch receives the control signal for the jib drive on the left-hand and the signal from the poti port on the right-hand side. The signal for the spindle drive controller is on the left-hand output of the function block. Now you may set the shutdown point of the jib for the right-hand function block via the "servo travel" menu.

Bi-directional vehicle: most modern tractors can be operated in two directions. For that the driver seat, the steering column and the pedals are turned by 180°. You have the same function for your model:

To switch to the onward direction while operating, use a separate reversing switch for each of the following functions: steering, throttle and lights. Assign the right-hand input of the reversing switch to the turning potentiometer and set equal thresholds. You can turn the seat with the same poti.

criterion	left-hand output	right-hand output
the right-hand input value exceeds the path for turning left	output remains neutral / output following the joystick only right / joystick on left hand input	output follows the joystick in opposite turning direction
right-hand input value lays between both value specifications	output follows the joystick in both directions	output remains neutral
right-hand input exceeds the path for turning right	out following the joystick only to the left / output remains neutral	output follows the joystick in the same turning direction

GET CONTROL

Depending on the level the output is assigned to different control elements. As long as the left-hand input is unlocked for the current level, this value is used for the left- and right-hand output. If it is not unlocked, the right-hand output will be controlled by the right-hand input.

criterion	left-hand output	right-hand output
level unlocked	left-hand input	left-hand input
level locked	right-hand input	neutral

	left:
level	selected control element left or right
direction of rot.	norm
servo neutral	0 %
servo travel	100% / 100%
servo speed	min / min
expo	0% / 0%
sleep period	fulltime
dead band	2%
fail-safe	non

Example:

Operating a winch with two control elements: the winch can be controlled in the main level with a joystick, but it should still be possible to address it with any other switch in other levels. Then connect the switch to the right-hand input and unlock it for its level. The joystick is assigned to the left-hand input and afterwards you have to select the level in which it shall operate the winch. Finally, you have to configure the servo output so that is receives its data from the left-hand output of the function block.

TRACKED VEHICLE STEER

Simulates the handling of tracked vehicles which originally are operated with steering brakes/ clutch. Also works for single wheel brakes which are common for tractor vehicles. The vehicle will only move if you activate the throttle. For steering the inner curve track gets slowed down and the outter track gets accelerated. You can turn on a spot by a vertical chain. Contrarotating tracks are not possible for this kind of steering, so we did not carry that into our models, aswell. The input on the left side is the steering, the right-hand input throttle. When driving in a straight line both engines operate at the same performance. If you want to turn your vehicle while both engines are operating at full throttle only the inner curve track will be slowed down. Responsivity and the maximum deflection of the steering are set in the "servo travel" and "expo" option for the left-hand card of the function block. If the selected paths are smaller than 100% the inner curve track will never be braked to standstill.

left-hand output	right-hand output
right-hand input * (1 - left-hand input)	right-hand input * (1 + left-hand input)

TRACKED STEER 2

Simulates the handling of tracked vehicles such as groomers (snow cat). The vehicle will only move, if throttle is activated. For steering the inner curve track gets slowed down, the outter curve track gets accelerated. Turning on a spot is possible in two ways: with a vertical chain or contrarotating tracks. The right-hand input is throttle, the left-hand input steering. When driving in a straight line both engines operate at the same performance. If you want to turn while both engines are operating at full throttle, only the inner curve track gets slowed down, no acceleration for the outter curve track.

For turning with contrarotating tracks you first have to slow down the model untill it is standing, then deflect the joystick to its end position in the direction of choice and activate the throttle again. For safety reasons, it is not possible to operate the tracks contrarotating while driving.

Responsivity and the maximum deflection of the steering are set in the "servo travel" and "expo" option of the left-hand card of the function block. If the selected paths are smaller than 100%, the inner curve track will never be braked to standstill and contrarotating tracks will not be available, too.

steering mode	left-hand output	right-hand output
drive	right-hand input * (1 - left-hand input)	right-hand input * (1 + left-hand input))
turn right	right-hand input	- right-hand input
turn left	- right-hand input	right-hand input

LIFTING MECHANISM (EHR)

Controls the for agricultural vehicle common lifting mechanism with ´working depth preset´ and ´quick lift´. The main control element is selected for the left-hand input (in most cases a joystick is adviced). The right-hand input is the control element for the working depth preset, you may choose a potentiometer or a simple button. The left-hand output transmitts the signal for the servo operating the lifting mechanism. Tapping the joystick onward switches between the states ´lifted´ and ´lowered´. For ´lifted´ the servo turns to its upper end position , for ´lowered´ the servo turns to the for the right-hand input preset position.

Pulling back the joystick lifts the device directly and proportional to the joystick position as long as the function is kept activated.

If you are operating a potentiometer for presetting the working depth, you will have to run the right-hand card of the function block in the "servo proportional" mode.

To operate the working depth via button, set the right-hand card to "servo hydraulic" mode, adjust the response to the lowest editable value and dead band to at least 50%, so you have a sensitive control function.

OIL-PUMP CONTROL

Creates a control signal for the hydraulic pumps depending on the valve position by summing up all input values. The right-hand card file of the function block is set to "pump control" mode automatically. You can monitor more than two functions by setting additional function blocks to "pump control" mode. They are internally cascaded then.

Each function block can monitor two control elements: the summation takes place in the shown order of funtion elements from the left- to the right-hand side (from a to x). Subtotals are available on the corresponding outputs. The total signal appears on the rightmost function block branch (example on next page). The result will never exceed 100%, even if multiple functions are active.

If the direction of rotation is set to "reverse", the value of this function block branch will not be added, but substracted from the result.

Attention! Make sure to set the fail-safe of the port to which the pump control is plugged, so that the pump stops operating when the connection gets lost.

function block	left-hand output	right-hand output
first	left-hand input value	right-hand input value + left-hand input value
others	current sum + left-hand input value	current sum + right-hand input value + left-hand input value

STARTING ENGINGE SPEED

For brushless engines you may scip the area of small numbers of revolutions. With the "starting engine speed" preset you can configure how much "throttle" the pump receives when the function gets activated. The preset only affects the output of the function block branch on which it is set and it is not included to the summation.

Functionallity of the starting engine speed:
- if no joystick is deflected, the pump stands still
- as soon as oil is requested the pump starts with the preset number of revolutions. If more oil is required, the number of revolutions increases proportional to the requirement.

direction of rot *add/ substract*
servo neutral   0 %
servo travel   100% / 100%
servo speed   min / min
expo   0% / 0%
sleep period   *maximum operation time*
dead band   2%
start rpm 0%
fail-safe   non

SELECTING THE CONTROL SOURCE
The oil-pump control can operate depending on the valve servo deflection, but we advice to rather assign the joystick deflection as data source. Otherwise, adjustments of the servo port ("neutral position"/ "servo travel") can have undesireable effects on the pump control.

CONFIGURATION-HINTS

The dead band determines for every function, regarding the valve, at which joystick deflection the pump starts. The pump should already be turning when the valve opens, because otherwise this can cause sagging of the cylinders.
How high the pump performance will be for a maximum deflection is determined by the "servo travel" menu separately for each direction. With "expo" you may define the characteristics in detail. The servo speed can be set for each pump separately and determines how long the pump runs on after the function has been deactivated: The right-hand value concerns the running up of the pump and should be set to minimum, the left-hand value determines the running down of the rotational speed. The displayed value shows the time needed from full throttle to full stop. The maximum operation time of the pump can be limited for every monitored function separately via sleep period.

EXAMPLE: HYDRAULIC EXCAVATOR ARM WITH THREE CYLINDERS

The three valve servos for spoon, arm and shaft are directly controlled by the joysticks (channel assigned to the joystick). The pump control uses function block A and B. Those depend on the joysticks, too: the channel from the left-hand card of Fn/A is assigned to the control element which is controlling the valve servo for the spoon. The channel from the right-hand card of Fn/A is assigned to the element controlling the arm and the channel from the left-hand card of Fn/B to the element controlling the shaft. Some model manufactur-

res in addition like to control the pump manually. Therefor the right-hand Fn/B card gets a preset from a turning poti: so the right-hand card of Fn/B is the lastly used function block branch. It got the pump signal on its output. The port to which the pump control is plugged, in example 14, is receiving its control data from that element branch (channel from 14 is assigned to the right-hand card of Fn/B). You can set the stopping position and control range of the pump control on that port.

the three valve servos receive their control data directly from the joysticks

the hydraulic pump receives its control data from the pump control-function block which was last in use

valve servo for spoon

valve servo for boom

valve servo for arm

speed controller for oil pump

moving sideways

moving up/ down

moving up/ down

Poti for manually setting the rotational speed

joystick for spoon and arm

joystick for shaft

the result is automatically passed on to the next block

function block B
oil-pump control mode

function block C
oil-pump control mode

the function blocks used for pump control receive their control data, as it is the case for the according valve servos, directly from the joysticks

in the last function block a manual engine speed preset is added to the calculation

MOTOR-LOADDETECT

This function calculates a virtual engine-load. This way you can operate smoke generators at a realistic ratio. Assign the left-hand input to the throttle joystick, rhe right-hand input serves as main switch: a control value smaller than 0% sets the output to neutral.

The signal on the left-hand output consists of the by the receiver measured power consumption an the throttle-signal. Left-hand input: the influence of the voltage can be adjusted with the value on the right-hand input: neutral for the starting position and servo travel for the influence. The right-hand output has no function for this operation (right-hand value).

This function block is only available in receivers which provide a device for measuring the voltage (example: CM5000)

criterion	left-hand output	right-hand output
right input below neutral position	neutral	no function
voltage smaller threshold	value from left-hand input	no function
default	value from left-hand input + measured current	no function

	left:	right:
direct. of rot.	norm	control direction main switch
servo neutral	0 %	threshold for voltage
servo travel	100% / 100%	0% / influence of voltage
servo speed	min / min	no meaning
expo	0% / 0%	no meaning
sleep period	cont. operation	no meaning
dead band	2%	threshold for main switch
fail-safe	non	no meaning

CURRENT LIMITER

With this you may limit the entire power consumption of your model by reducing the control value of controllers. The current limiter has got two channels, you may set two independant functions with separat thresholds on the right- and left-hand branch of the function block. The deflection of the output follows the control value, but if the measured power consumption exceeds the threshold set for the dead band, you cannot deflect any further.

If the voltage keeps increasing, the deflection will be reduced in steps. The right-hand card of the function block is automatically set to "current limiter" mode.

This function block is only available in receivers which provide a device for measuring the voltage (example: CM5000).

direction of rot.	norm
servo neutral	0 %
servo travel	100% / 100%
servo speed	min / min
expo	0% / 0%
sleep period	fulltime
dead band	threshold for voltage
Fail-safe	none

UNDERVOLTAGE STOP

Serves as emergency shutdown for the different functions in case of the battery running low. The function block set both outputs to neutral, if the alert function for the measurement input is triggered. If no alert is triggered, both outputs follow their control value without changes.

The right side of the function block will be automatically set to "undervoltage protection" mode, too.

Example: if the battery voltage drops below its minimum, the model shall stop.

First, set the "alert min" value of the battery voltage port (the one with the battery symbol) to the desired minimum voltage. Afterwards assign the channel of this function block to the throttle joystick. Then assign the channel of the cruise control port to the output of the function block. In practice, the model does not finally stop in the midst of the parcour, if the battery voltage runs low. You will be able to drive your model off the parcour before every operation becomes impossible due to undervoltage.

Reason: shutting down large consumers will restore the battery voltage a little. Cautiously starting the model does not immediately trigger new alerts.

> *Hint:*
> *the "undervoltage protection" perhaps triggers false alerts, if the battery voltage collapses, because of inadequate cable cross-sections or insufficient battery performancet.*

> **Attention**:
> *the "undervoltage protection" does not work in combination with cruise controls!*
> *If activated the, function will provide the value ´neutral´ with which the cruise control would drive on with constant speed and could not be stopped again..*

Servo curve

With servo curve you can program any servo motion you can imagine. Operating a servo in this mode means that it does not simply follow your joystick position, but it will take the preset path. You may say it is following the pattern. The curve is diagrammatically build by 9 bases, the values between those bases get linearly interpolated. Right and left side of the function block operate independently. In general, the path pattern operates independently from the level, but you have to unlock the level for the ports which process the output signal of the path pattern. You can check on the grapic illustration of the path in the "path pattern" menu. Horizontally, the value of the joystick path (corresponding to the input signal of the function block) and vertically the assigned path of the function blocks output. The solid line is the currently set pattern. The diagonal, dotted line is a ledger line and equals a proportional servo motion. With ◄ and ➤ you can

move the cursor - the closely dotted vertical line. ⋀ and ⋁ move the base on which the cursor is currently resting. Pressing ´menu´ sets the value in steps from -100%, to 0% and to +100%.
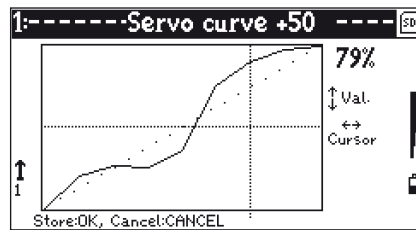
Hint: Combinating several path patterns opens the possibility to coordinate servo and switching function patterns to motion sequences.

Transmission control

The following elements serve for controlling servos which themselves control manual transmissions. The left-hand input is controlled with a switching function, so that the result is a sequential transmission control. Activating the switch upwards upshifts a gear, activating it downwards downshifts a gear.

You may surpress the ability to shift gears while throttle by assigning the right-hand input to the throttle joystick. The dead band indicates at how much throttle you are still able to shift gears.

The left-hand output operates the servo for the transmission control (gear), the right-hand output provides a signal for driving backwards (for modes including reverse gears). E.g. you may use it for operating a pole reversal relay.

Basically, there are two versions: the modes titled with "12" to "r123" (illustrated on the right side) illustrate the currently engaged gear under fixed circumstances. There is a maximum total of three forward gears and one reverse gear. In case a reverse gear is provided you will always have to engage transmission 1. for it.

The modes "f/ b" and "f/ n/ b" provide up to nine forward gears and five reverse gears with or without no-load (n). The display shows the engaged gear and + if you can shift up to another gear, or - if you can shift down to another gear.

A higher reverse gear is thereby selected by downshifting. The switching servo on the left-hand output engages the same transmission gear for forward as for reverse. The triggers are evenly distributed to the servo travel. The direction reversing (as well as no-load) is done by the right-hand output of the servo.

Gear 1-2 to gear R-1-2-3

12		1	2	
left outp.	-	-100	+100	-
123		1	2	3
left outp.	-	-100	0	+100
R12	R	1	2	
left outp.	-100	-100	+100	-
Right outp:	-100	+100	+100	
R123	R	1	2	3
left outp.	-100	-100	0	+100
Right outp:	-100	+100	+100	+100

Universal gear control v/r (examples)

1R, 5V				R1	N	1	2	3	4	5		
left outp.		-	-	-100	-100	-100	-50	0	+50	+100		
Right out.:		-	-	-100	0	+100	+100	+100	+100	+100		
4R, 4V	R4	R3	R2	R1	N	1	2	3	4			
left outp.	+100	+33	-33	-100	-100	-100	-33	+33	+100			
Right out.:	-100	-100	-100	-100	0	+100	+100	+100	+100			
3R, 7V		R3	R2	R1	N	1	2	3	4	5	6	7
left outp.		-33	-66	-100	-100	-100	-66	-33	0	+33	+66	+100
Right out.:		-100	-100	-100	-0	+100	+100	+100	+100	+100	+100	+100
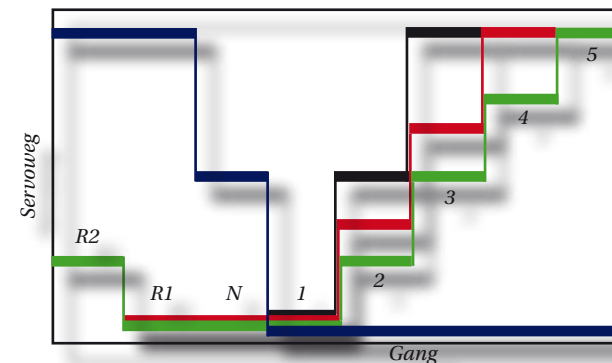
connection between gear and switching servo position (left-hand output) for
3 gears: black
4v + 1r gear: red
5v + 2r gear: green

travel-directionServo (right-hand output): blue

FUNCTION BLOCKS WITH SWITCHING OPERATION

SWITCH

This mode operates as a simple switching function. On the left-hand output appears the value +100% for ´on´ and -100% for ´off´. The right-hand input is taken to the right-hand output just as the currently active mode specifies. There is no mutual interference between them.

You may use this mode to trigger switching functions which have been assigned to the light-bus or infrared. Therefore set the name of the function for the desired bus function. You can find a list of all function names on page 56.

If the joystick deflection is greater than dead band plus trigger, the output switches to ´on ´. Below the trigger the output switches to ´off ´.

direction of rot.	norm
trigger	7%
dead band	7%
sleep period	fulltime
switch texts	on / off
fail-safe	non
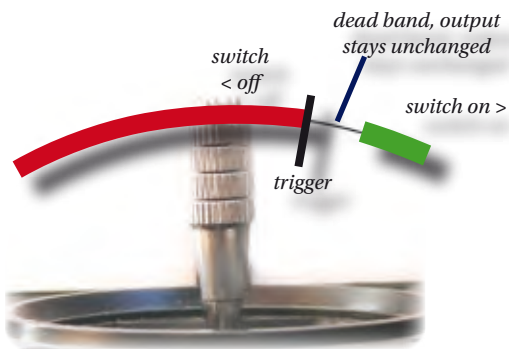
SWITCH MEMORY

Operates as switching fucntion with memory. On the left-hand output appears the values +100% for ´on´ and -100% for ´off´.

Effect of the memory function: first activation switches ´on´ the output, second activation switches it ´off´ again and so on. The right-hand input is taken to the right-hand output just as its mode specifies. There is no mutual interference between them.

If the joystick deflection is greater than trigger plus dead band, the state changes a single time. Before switching again you have to take back the joystick behind the trigger first. Triggers should have posotive values.

Influencing light-bus and infrared functions takes place as described on the left side.
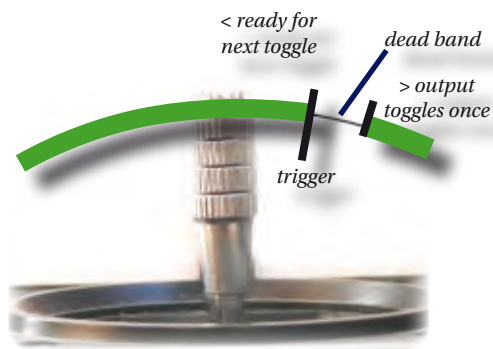
SWITCH MEM. COMBI

Here the switching function with memory (described on the left side) is additionally connected to the right-hand branch of the function block: if the switching function in the left-hand branch is set to ´off´, then the for the right-hand branch configured switching function will be set to ´off ´, too.

In case there is a proportional function set for the right-hand branch, its output will be set to neutral. The chart below illustrates the relation.

On the left-hand output appears the value +100% for ´on´ and -100% for ´off´. Trigger and dead band operate as described for "trigger memory".

OPERATION

left-hand output	right-hand output	
switching func.. mem. combi.	switching mode	proportional mode
on (+100%)	as controlled	as controlled
off (-100%)	off (-100%)	neutral

switch < off — *dead band, output stays unchanged* — *switch on >* — *trigger*

< ready for next toggle — *dead band* — *> output toggles once* — *trigger*

Hint:
concerning all switching functions:
trigger plus dead band together
must not be greater than 99%. Other-
wise the function is not operational..

Creates a signal for operating multiswitch light- or nautic-modules from Robbe, ScaleArt or Graupner. Further contruction parts or extensions are not required for your transmitter. You can control the function with the given buttons and sticks as usual.

The right-hand branch of the function block is automatically set to "multiswitch" mode - the created signal is a composition of both branches of the element.

The according decoders are plugged to the receiver with a single servo cable and usually are capable of activating up to 16 switching functions. Depending on type and version you may operate servos instead, those will then replace two switching functions. For common transmitters you need to attach a special module to your transmitter which got eight switches (each three positions) or potentiometers and creates the signal for the decoder in the model.

The ´Commander´systems operate little different: the signal for the decoder is provided by the receiver and not your transmitter, because the positions of your control elements are continously transmitted anyway. The left-hand output of the function block provides the Robbe-format (signal), on the right side the Graupe-format is provided. The ScaleArt light-set can operate both signals.

The schematic below illustrates the structur of the signal. It consists of a short (Robbe) or two long (Graupner) sync pulses and 8 variable impulses.

Set the control elements for the multiswitch buttons 1- 4 on the left-hand branch of the function block and repeat the procedure for the switches 5 -8 on the right-hand branch. Each switch is, depending on the activation direction, controlling two decoder outputs at a time.

The number refers to the order of transmission - the print on the decoder is not standardized - what means, that in most cases the labeling of the decoder depends on the manufacturer and type. The configuration for the multiswitch differs from what has been described so far:

Each side has four channels instead of a single one. Mode, note and level apply to all four switches (channels) of the corresponding multiswitch side. Followed by four groups with the starting numbers 1 -4 for the four switches. Each group contains the configuration menus "name", "channel", "reverse" and "memory" to set
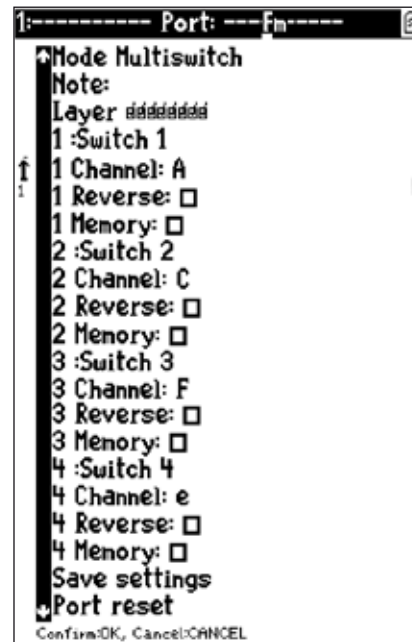
the characteristics. The "name" menu is not fully spelled on the display, for a better overview only the selected switch text is shown. The "channel" menu selects the control element. You do not have to select a switch, depending on the decoder you may assign a joystick or potentiometer instead. The control data can even be provided by a different function block or port.

"Reverse" changes the effect of the switch to the opposite. "Memory" provides the possibility to fix the state of the function with every activation. That means, the first activation turns on the function, the next activation deactivates it again and so on. Activating the switch or stick to the opposite direction, will activate the holding function for the other direction/ function. Due to the structur of the multiswitch it is not possible to hold several functions for different directions at a time. This memory function is provided by the receiver and should not be confused with the (possible) decoder internal memory function.

Attention:
The multiswitch system was modulated for analog remote controls decades ago! It is pretty slow and even the Commander system cannot speed it up. Thereby the decoder responds about 20 times slower than common Commander channels.

Hint:
You can use function blocks of the multiswitch type to operate up to 8 switching functions on the light-bus. Simply assign the name of the corresponding light-bus function to the switch of choice. Only one activation direction gets evaluated, standardized thats ´up´. The opposite direction will activate "reverse". Memory functions operate as usual. .
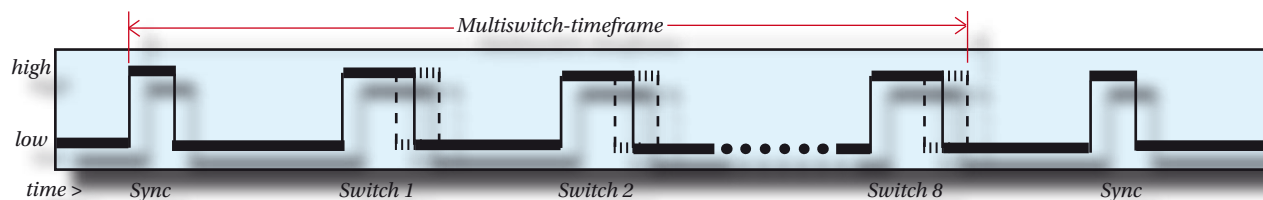
This element creates control signals for operating the left- and right bending light. The bending light is switched on for the respective direction, if you activate the turning sign (while the headlight is active). The cornering light activates when the headlight is active and the steering is sufficiently deflected. On the left-hand input you can assign the joystick via "channel" menu. The dead band determines at which deflection ratio the cornerning light activates. The states of the headlight and turning signs are automatically adopted. For an active warning sign the bending light stays inactive.

The function block provides the signal for left and right light, furthermore the related signals for the light-bus are created.

criterion	left-hand output	right-hand output
headlight off	off	off
headlight on and turning signal left or steering deflected to the left-hand side	on	off
headlight on and turning signal right or steering deflected to the right-hand side	off	on
headlight on and hazard lights	off	off

Dead band

left corner-ing light

right corner-ing light
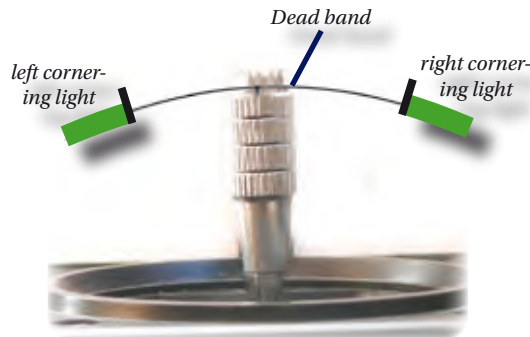
Counting the operation time of a function (only active periods). You may monitor the following: the state of a port, a function block output or a control element.

The operation time counter operates like switching functions, but fully independant from the level. As long as the function is active, it is counting the operation time of the assigned function. The total operation is displayed and saved in tenths of hours. Internally the resolution is selected so that even the shortest activation time (0,016 sec) can be detected. The maximum possible count is 6553 hours.

The right side of the function block is automatically set to "operation time counter", too, but they are both operating independently.

DISPLAY OF THE COUNTER IN THE TELEMETRY

The telemetry is only displaying counter readings up to 400,0 hours, when exceeding this limit the counter starts at 0 again. Even though, you can find the complete/ correct counter reading in the "operation time" menu.

If the selected function and the operation time counter are active, the telemetry screen displays ´ * ´ in front of the counter. The display unit is always provided in hours (h).

SERVICE INTERVAL

In the "service interval" menu you can preset a counter reading (in hours) at which the display shows a maintenance hint. That means as soon as a counter exceeds the set operation time threshold an ´attention´ sign is displayed on the screen.

This happens independently from the configuration of the counter in the telemetry.

ADDITIONAL MENUS

"Engine hours": shows the current counter reading and the next maintencance date. You can reset the counter by holding ▲ .

"Service hours": shows the current counter reading and the next maintenance date. The maintenance date can be adjusted with ▲ and ▼ . If you set the maintenance date to 0h (hours) no maintenance hint will be displayed.
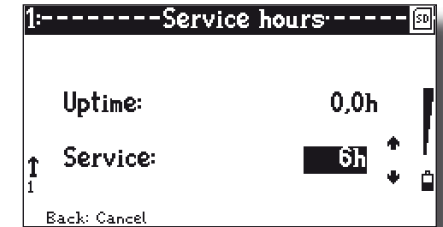
Here is a quick telemetry setup:

direction of rot. norm
trigger   7%
dead band   7%
operation time   0,0h
service inerval   *for the maintenance instruction*

TURN SIGNAL COMF.

Same function as "turning sign comfort". The right-hand branch is automatically set to the same mode, too.

TURNING SIGNS + SWITCH

There are controls with integrated lighting system for which one and the same control function serves for switching directions as for controlling the lights. This is comfortably solved for the S20 from Servonaut: moving the joystick sideways while driving activates the turning sign, but if the same operation is done while standing a full deflection of the joystick in the corresponding direction will select the resulting driving direction.

For models with light-bus the lighting system of the control can only be partially used. Even though, you can configure the combined control for this function block: while the throttle joystick is in a driving or centered position, the side signal is transmitted to the left-hand output, for a braking position the signal is transmitted to the right-hand output.

To be exact, you could have already realized the function with an output switch, but for this one the triggers are already appropriately set.

BRAKELIGHT GEN.

Creates a signal for controlling the stop lights and the light-bus from the joystick deflection. The right-hand side of the function block os not influenced by the function and can be independently configured. Assign the the channel to the throttle joystick.

By setting the dead band and servo speed you can adjust the response of the stop-lights. The stop-light generator operates with mass simulation: for great changes in speed the stop lights stay longer active than they do for lesser speed changes. The draq torque of the virtual diesel-engine causes short delays without brake activation.

Even though, the stop-light generator only has the joystick deflection provided but it does not have the actual acceleration or delay of the model. This is a simulation which does not always and in every situation behave realisitc.

direct. of rot.	only right
servo neutral	0 %
servo travel	100% / 100%
servo speed	influence delay / acceleration
expo	0% / 0%
sleep period	fulltime
dead band	joystick clearance without stop-light
fail-safe	non

MFC-SIGNAL SWITCHING AND PROPORTIONAL

Combines a switching and a proportional function so that you can comfortably operate a Tamiya-MFC-unit without adjusting the trims.

The left-hand port is assigned with the control element of the basic function, the right-hand one with the element which shall trigger the superimposed secondary function of the MFC. The only options of interest are: "channel" and "direction of rotation". Everything else is implemented and fixed internally. "Servo reverse", "level" and "fail-safe" are configured on the port which processes the signal of the function block.

The proportional function creats a maximum deflection of 80% on the left-hand output. The MFC interprets this as: "only joystick moved, trim neutral". The switching function creates 100% on the output, the MFC interprets here: "joystick and trim moved".

Attention: when setting the joystick path for the MFC only move the control elements assigned to the basic function, the elements controlling the secondary function stay resting.

criterion	left-hand output	right-hand output
left-hand input further back than 50%	right-hand input	neutral
others	neutral	right-hand input

CONFIGURATION HINTS:

The servo speed for turning right should be as small as possible, because it determines how fast the stop-lights deactivate when accelerating again. For turning left the servo speed influences how long the stop-light stays active after delaying. The dead band determines the deflection that is required for the stop-lights to respond.

LIGHTBUS AND INFRARED

Commander-receiver can be provided with light-bus and infrared output. The here issued control data gets generated automatically - special settings for configuring the function are not required. The information transmitted in both directions are closely related, because naturally vehicle and trailer lights operate synchronously. Thats why we explain both systems in the same chapter.

The CM-5000 has a separat output for the light-bus to which the cable of the bipolar bus-connection can be attached.

The CM-1000 does not provide a light-bus signal in its standard version, but we do provide an alternative firmware to solve this problem: with the light-bus firmware installed the servo port 10 is dropped, therefor the output then provides the light-bus data. For connecting the bus-cable an additional, exclusive light-bus adapter (item nr.: 76000368) is required.

Switching between standard and light-bus firmware is possible by the receiver-menu-item "Lightbus-setup".

LIGHT-BUS

The light-bus is compatible with ScaleArt and Pistenking. It is a two wire system which transmits the supply voltage as well as the control information. By using the bus system effort and space required for wiring of the vehicle is greatly reduced. All lights are connected to the continous bipolar cable.

The switching commands are sent on this wire , tiny microprocessors within the lights evaluate the signal and process the command. For new models we provide light boards which fit directly behind the lights and in general (depending on the vehicle) cover all lights: turning signs, sidelights, dimmed headlights, bending lights, full beam and fog lights. We also offer rear lights with integrated evaluation module including the LED´s for: turning signs, side lights, read fog and stop-lights.

So the wiring is reduced to simply plugging the cables. The entire system is safe against reverse polarity and short circuits, confusing the ports is not significant for the function.

For upgrading older models with conventional wiring or for vehicles for which there are no suitable light-boards avail-able, we provide a solution: universal modules for front and rear provide light functions for the corresponding vehicle part on the screw clamp. So you do not need a multipolar harness anymore.

Furthermore, we offer universal boards for installion on a suitable position with outputs for special lights like: work light, rotating light and additional lights.

The light-bus operates at a voltage of 5,5v and may be loaded with a maximum of 1 ampere. Typical truck lightings normally require less than 0,3 ampere. The receiver is supplied by the external BEC. The ScaleArt BEC-elements are preset to 5,5v and are designed for this charging. For foreign products you have to check on the voltage and the capacity yourself.

For voltages smaller than 5,0v we cannot ensure a secure function.
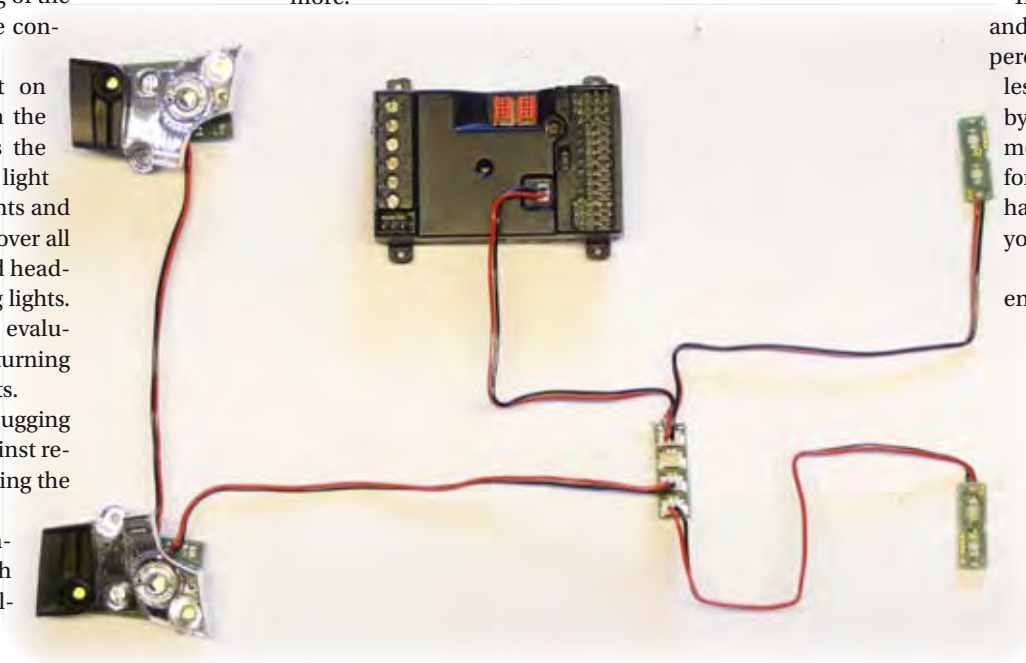
The CM-5000 has a separate output for the light-bus suiting for the small white plug of the bipolar bus cable. The power supply of the light-bus and the servos is provided by the external BEC (cruise control). So the voltage displayed for the servo is the same as for the light-bus. In the "BEC" card file you can monitor the value and set thresholds (for more details go to chapter "battery monitoring")

Port for lightbus

LIGHT-BUS POWER SUPPLY

The CM-5000 is monitoring the power consumption of the light-bus and can temporarily switch it of in case of an overload. For configuration of the monitoring there is a card file "bus" (lamp symbol) in the "port" option in the "model menu". The port is internally connected with the voltage sensor of the light-bus output and therefor operates in "measurement input" mode.

You can display the value via telemetry screen by selecting the position of the display where the value shall appear in the "show telemetry" menu. "Alert max" determines the shutdown threshold for the overload protection. It is not recommended to alter zero point,
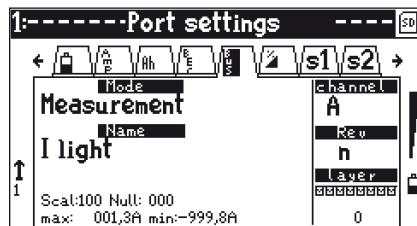
scaling or reverse, otherwise there are wrong values displayed on the screen and probably the overload protection is not operational. "Alert min" should not be set at all.
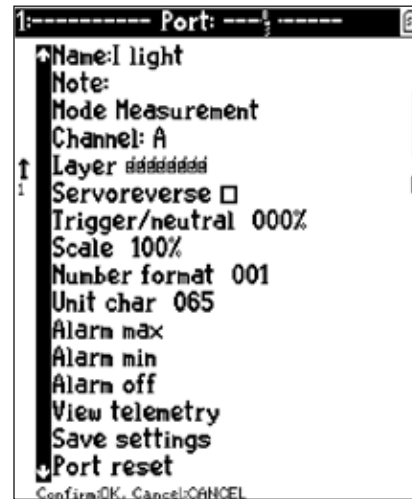
OPERATION OF THE OVERLOAD PROTECTION

If the measured power consumption in the light-bus exceeds the in "alert max" set threshold, the light-bus is temporarily disabled. After about 0,2 seconds the receiver automatically tries to reconnect to the bus. If the power consumption exceeds the threshold again, the bus deactivates deactivated and so on.

TURNING OFF THE LIGHT-BUS

You may entirely deactivate the light-bus: to do so set the assigned mode to "off", then the light-bus is not supplied with power.

For the CM-1000 there is a special firmware that provides light-bus data on the 10th servo port, but you need an additional, exclusive light-bus adapter (item nr.: 76000368), if you want to upgrade your CM-1000.

The light-bus is consuming its power, just as the servos, from the external BEC (crusie control). The light-bus voltage is the same as displayed for the servos (for closer details go to chapter "battery monitoring").

The CM-1000 does not monitor the light-bus. The voltage on the bus is only limited by the performance of the servo power supply.

Ther servo port 10 connot be used for operating a servo when the light-bus firmware is active.

Port for lightsbus-interface

page 55

CONTROLLING LIGHT-BUS AND INFRARED

PRINCIPLE

As mentioned in the introduction at the very beginning of this lecture the Commander system can operate without explicit configuration menus for light-bus or infrared. Accessing these functions can be imagined like that: the receiver has got a dashboard with virtual control elements. Each of the elements has its own name depending on its function. If you insert the same name for the port as for the element, they will be automatically connected with each other. This port then controls the corresponding light-bus and infrared functions.

So now, to access on the switch for toggling the sidelights proceed as following: look for a free port or free function element and set it to "switching function" mode (optionally with memory function). Then set the name of the port coping the name of the desired bus function - in this example its "sidelights". So the receiver recognizes that the state of the switching function is also crucial for the sidelights in the light-bus and infrared. Now configure the ports as usual: set channel, level, switching points, dead zone and fail-safe.

This kind of assignement works for all switchable functions in bus and infrared, as for all switching modes of the ports. That means that like the switching functions, the interval switch, double flasher and turning signs work, too.

Turning signs on the light-bus have a special status: to make sure they do blink and are not continously shining you have to operate them in "turning sign" mode. Special trailer functions for servo and engine can be operated by ports in switching and proportional mode.

The following chart shows all available functions with their names as well as the symbols which might be displayed.

NAME OF THE BUS FUNCTIONS

name	display-symbol	bus-function
trailer hitch		coupling servo
right turning sign		right turning sign
left turning sign		left turning sign
brake		trailer brake
brake light		brake light
driving light		driving light
full beam		full beam
1. function		ir-trailer servo 1
2. function		ir-trailer servo 2
horn 1		horn
ir-Robbe		select protocol
light		
front light		front working light
rear light		rear working light
right light		right cornering light
left light		left cornering light
siren		siren
engine start		engine start
rear fog-light		rear fog-light
Rampen		Rampen auf/ab
reversing light		reversing light

name	display-symbol	bus-function
1.rot.warn.sign		rot. warn.sign
saddle-plate		saddle-plate servo
switch 1		add. function 1
switch 2		add. function 2
switch 3		add. function 3
switch 4		add. function 4
front light		fog light
sound brake		sound brake
sound air		sound air
sound fanfare		sound fanfare
sound switching		sound switching
front lock		front lock
rear lock		rear lock
center lock		center lock
sidelight		sidelight
stands		stands up/ down
trailer off		ir on/ off
wiper 1		wiper servo
wiper 2		wiper servo
warn. sign		warn. sign
add. light		add. light

INFRARED

The light-bus currently ends at the rear bumper. Transmitting data for operating the lightings and additional features of trailers is done wireless by the infrared light. This technology is harmless for humans and animals!

The towed vehicle has to be fitted with a *trailer board pro* from ScaleArt (ScaleArt item no. 76000164) or with a Superlicht set from Robbe. Receiver of type CM-5000 support the ir-protocols from Robbe and ScaleArt. For this is a transmission into a single direction, e.g. from vehicle to trailer, the receiver cannot recognize what electronic has been fitted in the trailer on its own. So you have to switch manually (for further instructions look below).

IR-OUTPUT FOR THE CM-5000

CM-5000 devices provide a port for a infrared-diode. With that you can operate ir-devices in trailers or semitrailers without fitting additional hardware. The infrared transmitting LED (item nr.: 76000382) can be purchased as additional equipment for the CM-5000. It is plugged to the bipolar "ir" port with the red cable on plus (+). For wrong wiring (wrong polarity) the ir-transmission does not grant, but you do not cause any damage to the equipment eighter. Hints for assemly of the ir-diode in the model can be found in the corresponding construction manual.

port for ir-diode

For switching between Robbe and ScaleArt configure a "switching function memory" with the name "IR-Robbe". If the function is deactivated or does not exist the CM-5000 transmits according to the ScaleArt-protocol. If the function is active, the CM-5000 provides the data in Robbe-format. Activating the assigned button in the opposite direction triggers the shutdown signal for the trailer.

TRAILER FUNCTIONS

trailer electronic	light functions	additional functions
Superlichtset (Robbe)	turning signals, rear-, stop- and rear fog-light, reversing light, additional output - rotating light	One servo
Trailer main board (ScaleArt)		One servo, one motor, with limit switches
Trailer board pro (ScaleArt)		One motor, one servo or second motor, limit switches, oil-pump-control, rear-axle-steering via servo. Servo travel adjustable

PASSWORD PROTECTION - RECEIVER

To ensure that it is not possible for everybody to drive your model you may set the password protection for your receiver which then regulates the access on particular functions. There are two levels of security which can be set independently:

UNAUTHORIZED OPERATION

To avoid unauthorized acces on the model you can set the "control-pin". An empty pin deactivates the proctection. The pin can contain any characters including space.

Everybody knowing the pin can indeed connect to the model, but will not be able to control it - the model remains in fail-safe state.
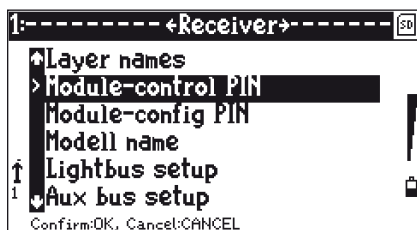
UNAUTHORIZED PROGRAMMING

Setting the "config-pin" in the "model menu" protects your model from unauthorized modifications. Everybody can control the model, but to change any of the programming you have to know the config-pin.

STORE PASSWORD

In order to access a protected receiver the corresponding password has to be stored in the transmitter in the "connections" menu in one of the entries "model-pin1" to "model-pin4".

The control pin is in the first three characters of the entry, the config-pin in the last two characters. Four different pins can be stored. When switching the model the remote control automatically transmits the pin from the corret entry to the model. In models with several evaluation modules each module can be differently protected and can have different pins.

CAUTION:
If the receiver-pin gets lost, only the manufacturer will be able to reset the receiver. Any programming will be lost!

DUAL CONNECTION

Mit den großen Commander-Sendern, SA-1000 und SA-5000, können Sie zwei Modelle gleichzeitig verbinden. Sie haben dann die Möglichkeit diese entweder synchron oder wechselweise zu steuern. Das ist nützlich bei Ladearbeiten oder bei Modellen die aus mehreren Einheiten ohne elektrische Verbindung bestehen.

Beispielsweise können sie einen Radlader und einen LKW verbinden und diese Wechselweise steuern: das Umschalten zwischen diesen beiden Modellen erfolgt dann einfach mit einer kurzen Betätigung der **Cancel**-Taste. Sie haben sofort die Kontrolle über das andere Modell, ohne den Weg über das Adressbuch und neuen Verbindungsaufbau.

Bei Modellen aus mehreren teilbaren Elementen (bsp. Großraumtransport), kann das Zugfahrzeug und der Anhang jeweils eine eigene Empfangsanlage besitzen. Im Simultan-Modus bekommen beide gleichzeitig dieselben Steuerinformationen. So arbeiten beispielsweise Beleuchtung und Lenkung bei beiden Modellteilen synchron.

Für Kombinationen die Sie öfter gemeinsam benutzen können Sie im Adressbuch einen Eintrag erzeugen der bereits den Hinweis auf das passende zweite Modell enthält (Menüpunkt „Zweitverbindung vorbereiten" in den Adressbuch-Optionen).

EINRICHTIEN / AUFLÖSEN

Um ein zweites Modell zu verbinden gehen Sie zunächst ins Adressbuch und blättern auf den gewünschten Eintrag. Dann drücken sie **Menue**, es erscheint das Menü „Adressbuch-Optionen".

Nun wählen sie „Als Nr.2 verbinden" und bestätigen mit **OK**.

Der Bildschirm wechselt in die Hauptanzeige, eine neue Verbindung wird aufgebaut. Die bisherige Verbindung bleibt bestehen.

Im Menü „Verbindung" gibt es den Punkt „Zweitverb. Modus". Damit stellen Sie ein ob beide Modelle gleichzeitig steuerdaten bekommen (Modus „simultan"). Oder ob Sie manuell auswählen wollen wer gerade dran ist (Modus „wechselnd").

Sobald Sie ein neues Modell aus dem Adressbuch aufrufen oder die „Modelle Suchen" benutzen werden alle bestehenden Verbindungen aufgelöst.
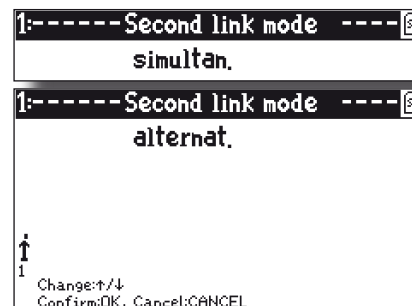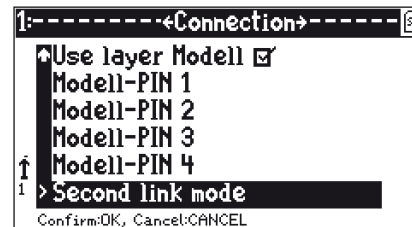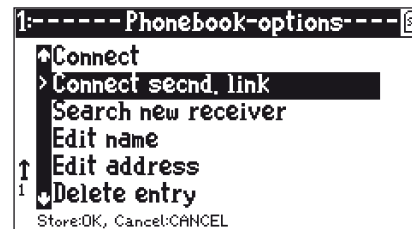
BETRIEB VON 2 MODELLEN

Mit der **Cancel**-Taste wechseln sie im Hauptbildschirm zwischen den beiden Verbindungen. Die Anzeigen im Bildschirm beziehen sich immer auf das gerade aktive Modell.

Wenn der Modus „wechselnd" gewählt wurde bekommt auch nur das angezeigte Modell Steuerdaten, das andere geht in den Failsafe-Zustand. Falls die Verbindung zum inaktiven Modell abbricht können Sie mit dem aktiven uneingeschränkt weiter arbeiten.

Im Simultan-Modus bekommen stets beide Modelle Steuerdaten, mit der **Cancel**-Taste schalten Sie lediglich die Anzeige zwischen den beiden um. Falls hier eine Verbindung abbricht werden immer beide unterbrochen.

Damit im Simultanbetrieb die Beleuchtung an beiden Fahrzeugteilen synchron arbeitet müssen die Lichtfunktionen auf beiden Empfängern mit den gleichen Parametern (Kanal, Schaltpunkt, Modus) eingerichtet sein. Am Warnblinker-Anschluss muss für beide die gleiche Blinkfrequenz vorgegeben sein. Brems- und Rückfahrlicht müssen im Anhang genau so Konfiguriert sein wie auf dem Empfänger des Zugfahrzeugs.

TIPP:
Wenn Sie Einstellungen am Empfänger verändern möchten sollte keine Zweitverbindung bestehen. Zwar kann die Commander die beiden Empfänger gezielt separat ansprechen. Es passiert aber leicht dass der Modellbauer dabei durcheinander gerät.

To ease up your start we prepared configurations. You may also use them as a bacis setting for your own configuration. Those prepared configs are always provided by the receivers and differ depending on the receiver type and in the future even on the installed firmware version.

In order to load a prepared config first connect your remote control to the receiver (further details in chapter 2). In case you are not in the main screen of your remote control, first press cancel untill you are back to it. Then press ´menu´ to get to the "receiver menu".

Navigate with ▲ and ▼ all the way down through the menu untill you find the option "configs" at the very bottom.

Then press ´ok´ to access the option.

Now, the display is showing you a list of all configurations which are available in the currently connected receiver. With ▲ and ▼ you can scroll through the list - depending on the receiver the list does not end with the bottom of the screen! So do not hesitate to scroll all through the list to get a first impression/ overview before going on.

Holding ´ok´ accepts and saves the selected configuration. The previous/ current config. of the receiver will be overwritten, so be cautious when loading a new config., if you already made individual adjustments, because they will be lost. With ´cancel´ you can leave the menu without saving the changes.

The following pages give you an overview on what we prepared for you!

There are configurations for several trucks, excavators, wheel loaders and groomers. For trucks you discern between the equipment with light-bus system, truck-light-board (multiswitch based light-set) or MFC.

For the assignement of the control elements all transportation vehicles follow an uniform pattern. The standardized assignements for the different transmitters can be found on the next page.

Feel free to use the prepared configurations as base for own adjustments. After loading a preset all options can be adjusted freely. But remember, when loading a preset that currently assigned control elements are probably reset.

If you do not want to start with a preset but from the very beginning, select the entry "all empy". For this option all outputs are deactivated for the start, so there will be no unwanted operation of the model.

ASSIGNEMENT AND CONNECTION

Normally, the assignements of joysticks, potis and buttons for all configurations are set in an uniform mannor. The following three pages show the standardized assignements for all three Commanders.

Afterwards the assignements of the receiver ports for the different configurations are explained. Furthermore the explanatory notes describe important functions.

For a detailed description for wiring the different models take a look into the wiring plan coming within the delivery of your model. In case you need a plan as pattern for own models give us a request.

COMMANDER

CONTROLS ON SA-BASIC

DRIVING OPERATION (ALL TRUCKS)

trailer off/ select protocol

transmission

dispenser: tilt
SZM: additional function 1

rotating lights/ left turning sign

difflock center/ clutch

difflock front/ rear

trailer function 1

trailer function 2

additional lights

start engine/ horn

dispenser: ejector
SZM: additional function 2

warning sign/ right turning sign

fog-light front/ rear
(light-set: fog-light/RWL)

side-/driv-ing-light

⬆⬇ driving
(⬅ light-set: turning sign ➡)

⬅ steering ➡

⬆⬇ full beam/headlight flasher
(light-set: full beam/warning sign)

The illustrated assignements suit for vehicles with light-bus. For trucks with light-set the light functions in brackets are assigned.

CRANE OPERATION (ACTIVE IN LAYER „CRANE")

trailer off/ select protocol

transmission

stands deploy/ retract

rotating lights/ left turning sign

difflock center/ clutch

difflock front/ rear

trailer function 1

◄ layer ►

trailer function 2

additional lights

start engine/ horn

stands up/ down

warning sign/ right turning sign

fog-light front / rear
(light-set: fog-light/rot.warn.sign)

side-/driv-ing-light

⬆⬇ lift/ lower arm
⬅ swivel crane ➡

telescope

rotate gripper

⬅ open/ close gripper ➡
⬆⬇ lift/ lower boom

The "truck crane" model operates with two levels, driving- and crane opera-tion. You can switch between them with the small joystick on the left side of the dis-play. In the bottom line of the screen the currently active level is displayed.

GROOMER / WHEEL LOADER

tramsmission

open/ close gripper

rotating light/ left turning sign

difflock

additional lights

start engine/ horn

ripper up/ down

warning sign/ right turning sign

side-/driv-ing-light

⬆⬇ driving
⬅ steering ➡

⬅ Sengage/ dump bucket ➡
⬆⬇ lift/ lower wing

Depending on the vehicle not all illustrated functions are provided (trans-mission, difflock, ripper, turning signs, driving-/ sidelights).

EXCAVATOR

pump speed limiter on/ off

pump idle speed

pump clearance

additional lights

start engine/ horn

additional valve 1

side-/driv-ing-light

⬆⬇ shaft off/ on
⬅ swivel ➡

additional valve 2

⬅ open/ close spoon ➡
⬆⬇ lift/ lower arm
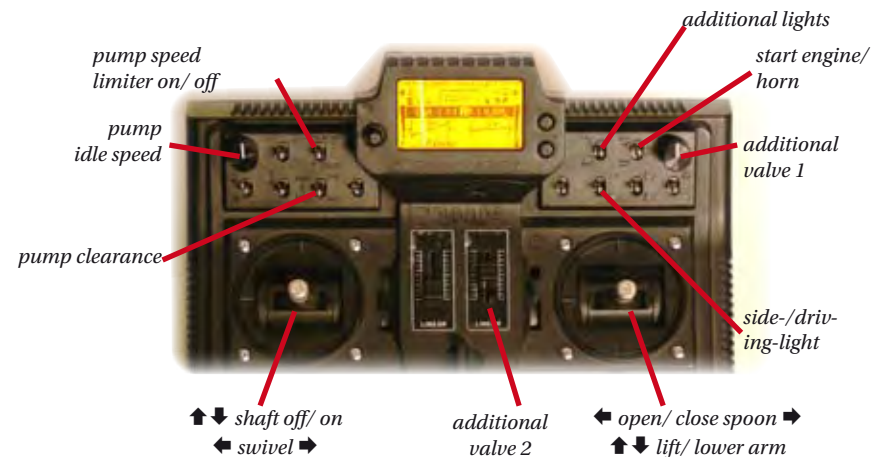
For operating the throttle at the same time you require two additional propor-tional function elements on ports 7 and 8 (not illustrated in the picture above).

DRIVING OPERATION (ALL TRUCKS)

- trailer function 1
- hooklift: lift / semi truck: function 1
- hooklift: telescope / semi truck: function 2
- trailer function 2
- fog-light front/ rear (light-set: fog-light/ rotating beacon)
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ↑↓ driving (← light-set: turning signs →)
- ← steering →
- ↑↓ full beam/headlight flasher (light-set: full beam/ hazard fl.)
- trailer off / select protocol
- difflock center/ trailer hitch
- difflock front / rear
- auxiliary lights

The illustrated assignments suit for vehicles with light-bus. For trucks with light-set the light functions in brackets are assigned.

CRANE OPERATION (ACTIVE IN LAYER „CRANE")

- outrigger in/out
- outrigger up/down
- trailer function 1
- trailer function 2
- fog-light front/ rear (light-set: fog-light/ rotating beacon)
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ← swivel crane →
- ↑↓ lift/ lower arm ↻ telescope ↻
- ← open/ close gripper →
- ↓↑ boom up/down ↻ rotate gripper ↻
- ◄ layer ►
- trailer off / select protocol
- difflock center/ trailer hitch
- difflock front / rear
- auxiliary lights

The "truck crane" model supports two layers, driving and crane. You can switch between them with the cursor on the left-hand side of the display. In top left-corner of the screen the currently active layer is displayed.

TRACKED / WHEELED LOADER

- clamshell open/close
- ripper up/down
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ↑↓ driving
- ← steering →
- ← bucket in/out →
- ↓↑ boom up/down
- difflock
- auxiliary lights

Depending on the vehicle not all functions are provided (transmission, lock, ripper, lights).

EXCAVATOR

- pump idle speed
- aux. valve 1
- position light/ low beam
- start engine/ horn
- ← slew left/right →
- ↑↓ arm out/in
- ← bucket in/out →
- ↓↑ boom up/down ↻ aux. valve 2 ↻
- ↑↓ driving
- ← steering →
- pump speed limit er on/off
- pump main switch on/off

Driving the tracks drive is granted by the small joystick on the lower right-hand side.

Controls on SA-5000

Driving operation (all trucks)

- trailer off / select protocol
- difflock center/ trailer hitch
- difflock front / rear
- auxiliary lights
- fog-light front/ rear (light-set: fog-light/ rotating beacon)
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ⬆⬇ driving (⬅ light-set: turning signs ➡)
- ⬅ steering ➡
- ⬆⬇ full beam/headlight flasher (light-set: full beam/ hazard fl.)
- trailer function 1
- trailer function 2
- hooklift: lift semi truck: function 1
- hooklift: telescope semi truck: function 2

The illustrated assignments suit for vehicles with light-bus. For trucks with light-set the light functions in brackets are assigned.

Crane operation (active in layer „Crane")

- trailer off / select protocol
- difflock center/ trailer hitch
- difflock front / rear
- auxiliary lights
- fog-light front/ rear (light-set: fog-light/ rotating beacon)
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ⬅ swivel crane ➡
- ⬆⬇ lift/ lower arm
- ↻ telescope ↻
- ⬅ open/ close gripper ➡
- ⬇⬆ boom up/down
- ↻ rotate gripper ↻
- trailer function 1
- trailer function 2
- ◄ layer ►
- outrigger in/out
- outrigger up/down

The "truck crane" model supports two layers, driving and crane. You can switch between them with the cursor on the left-hand side of the display. In top left-corner of the screen the currently active layer is displayed.

Tracked / wheeled loader

- difflock
- auxiliary lights
- position light/ low beam
- transmission
- start engine/ horn
- rotating beacon/ left turn signal
- Hazard flasher/ right turn signal
- ⬆⬇ driving
- ⬅ steering ➡
- ⬅ bucket in/out ➡
- ⬇⬆ boom up/down
- clamshell open/close
- ripper up/down

Depending on the vehicle not all functions are provided (transmission, lock, ripper, lights).

Excavator

- pump speed limit er on/off
- pump main switch on/off
- position light/ low beam
- tracks left/right
- start engine/ horn
- ⬅ slew left/right ➡
- ⬆⬇ arm out/in
- ⬅ bucket in/out ➡
- ⬇⬆ boom up/down
- ↻ aux. valve 2 ↻
- ⬆⬇ driving
- ⬅ steering ➡
- pump idle speed
- aux. valve 1

Driving the tracks drive is granted by the small joystick on the right-hand side or the centred drive controls.

The following charts show in the first (left-hand) column the ports of the receiver. Right next to it you can find the channels with their different configurations which control the port and which servo, control or switching function is activated. The upper half of the chart lists the configurations of the ports, the lower part shows those of the function elements.

The channel column shows the control element (joystick/ button) which operates the function followed by an arrow displaying the activation direction. When the function receives its control data from a function element and not directly from a joystick or button, there is the entry "Fn" with the identification letter and an arrow pointing out the corresponding side of the function element.

	truck light-bus		truck ight-set		truck MFC	
port	channel	function	channel	function	channel	function
1	right joystick ↔	steering	right joystick ↔	steering	right joystick ↔	steering
2	button H ↕	sound	button ↕	sound	Fn/C ⬅	MFC-light ↕
3	left joystick ↕	control	left joystick ↕	control	left joystick ↕	MFC-control ↕
4	button D ▼	AHK	button D ▼	AHK	Fn/D ⬅	MFC-Schaltung ↔
5	Fn/F ⬅	transmission	Fn/F ⬅	transmission	Fn/F ⬅	transmission
6	button E ▼	rear lock	button E ▼	rear lock	Taster E ▼	rear lock
7	button E ▲	front lock	button E ▲	front lock	Taster E ▲	front lock
8	button D ▲	center lock	button D ▲	center lock	Taster D ▲	cente rlock.
9	left poti	hydraulic pump ext.	left poti	hydraulic pump ext.	left poti	hydraulic pump ext.
10	-	light-bus output	Fn/B ⬅	light-set	Fn/B ⬅	MFC-steer (turn s.) ↔
warning sign	right button ▲	warning sign	-	(not in use)	-	(not in use)
turning sign reset	right joystick ↔	turning sign reset	-	(not in use)	right joystick ↔	turning sign reset
function elements	channel	function	channel	function	channel	function
Fn/A ⬅	left joystick ↕	stop-light-gen.		- frei -	left button ▼	turning sign comfort
➡	right joystick ↕	full beam/headlight fl.		- frei -	right button ▼	turning sign comfort
Fn/ B ⬅	right joystick ↔	cornering light-gen.	look page 65	multiswitch 1-4	Fn/A ⬅	mixer, turning sign l.
➡	button links ▲	rot. warn. light (bus)		multiswitch 5-8	Fn/A ➡	and r. for MFC
Fn/ C ⬅	button links ▼	turning sign comfort		- free -	right joystick ↕	horn MFC
➡	button rechts ▼	turning sign comfort		- free -	button F ▲	light MFC
Fn/ D ⬅	button B ▼	rear fog-light		- free -	left joystick ↔	switching MFC
➡	button B ▲	fog-light		- free -	button C ↕	add. function MFC
Fn/ E ⬅	button G ▲	Standlicht		- free -	-	- free -
➡	button G ▼	driving-light		- free -	-	- free -
Fn/ F ⬅	button A ↕	transmission 123	button A ↕	transmission 123	button A ↕	transmission 123
➡	-		-		-	

TRUCK LIGHT-BUS

Steering, controls, sound, trailer-coupling, locks and the hydraulic pump for the dump truck are directly operated by the control elements of the transmitter.

The transmission operates via function element F, that means there will be a response for the engaged gear on the display. A light-bus adapter is plugged to port 10, so it is occupied and can now only be used for virtual switching functions. For operating functions in the light-bus, e.g. stop-lights, cornering light, turning signs and the light switches, signals are generated by the function elements. The light-bus firmware has to be installed for operating these configurations (look in chapter software update for closer details).

TRUCK LIGHT-SET

The driving function operates as previously described. The control port of the light-set is plugged to port 10. Function element B generates the multi-switch signal for the light-set (look at page 69). Please keep in mind that for the ScaleArt truck-light-board even the signals for controls (here port 3) and steering servo (port1) are processed by the board. Otherwise all lights are continously blinking and no light or trailer function can be switched. To make sure this configuration is operative, the standard firmware has to be loaded in the receiver. You may alternatively guide the light-set signal to another port.

Truck MFC

On this page we prepared the comfort-control for the Tamiya-MFC.

Steering and transmission servos are plugged to the receiver and not the MFC. The former steering port of the MFC is connected to port 10, the MFC-light/ horn channel to 2, the MFC throttle channel to 3 and MFC switch channel to 4. When setting the responsivity for the MFC horn, throttle and switch-joystick proceed as usual. Instead of the steering joystick activate the Commander turning sign button. For triggering special features of the MFC you do not have to adjust trims anymore, everything is granted by separate buttons.

In the future the turning sign system will operate independently from the turning direction of the vehicle, but with all Commander-comfort features: automatic turning sign reset after changing the direction, short blinking for tapping the button and continous blinking for holding the control element for some seconds. Aktive turning signs appear on the display.

Toggle the side-, driving- and fog-light in the MFC typical order via F button to the upside. For starting and shutting down the engine press C and F together. How does that work?! Function element C combines the on-/backwards movement of the right-hand joystick and the F button, so that the MFC on port 2 activates the horn with the stick and switches the light with the button. Function element D does the same with the side-wise deflection of the left-hand stick and button C. Left- and right-hand turning sign operate on function element A. B combines both signals, so that the former steering-channel of the MFC (port 10) does receive the correct direction-signal. For this special operation the responsivity of the Commander turning signs (on the warning sign input) is set to 99%. The blink-frequency is given by the MFC, the Commander warning sign function does not work for the MFC.

Wheel loader

Control for a machine with oil-hydraulic and hydraulic articulated steering. Function elements A and B monitor the control elements operating the valves and provides the value of the current oil-requirement. Using the left potentiometer C considers in addition a manually specified idle speed. On port 1 the signal for the hydraulic pump controler is provided. According to the basic setting port 1 generates the neutral position for inactive pumps and depending on the oil-requirement a positive result.

In case you are operating a flight-controller you will probably have to make necessary adjustments to the configurations on port 1:

1. Set the servo center (neutral position) to -100%, therefor the controller receives the signal "joystick fully down" for inactive pumps.

2. Set the right-hand servo path to 198%, so that you reach ´full throttle´ for the maximum pump performance.

The pump control is configured in a mannor it runs at lower rotational speed when driving. Thereby the oil-pressure can be provided immediately ,if required for steering corrections.

If your vehicle is steered by a servo- or transmission engine, this provident oil-delivery is not necessary. In this case set the mode of both side of the function element B to ´off´.

Groomer

This configuration only differs in some points from the wheel loader config. - they are both charging vehicles.

Steer and drive by a chain-drive electrically, so that this function is not considered by the pump control. But in compensation the groomer has valves for a combi-bucket and rear-ripper. In general, presetting an idle rotational speed is not required for such models.

For both, the wheel loader and the groomer, the pump-output is configured, so that the pump-speed rises fast but drops slowly. This is how we avoid frequent toggling of the pumps for small motions. For toggling the lighting an external switching element is required, the rotating warning sign is prepared for the Pistenking model.

port	Wheel loader channel	Wheel loader function	Groomer channel	Groomer function
1	FB/C ←	hydraulic pump ext.	FB/B →	hydraulic pump ext.
2	right joystick ↕	wing valve	right joystick ↕	wing valve
3	right joystick ↔	bucket valve	right joystick ↔	bucket valve
4	left joystick ↔	steer valve	left joystick ↔	control steer
5	left joystick ↕	control throttle	left joystick ↕	control throttle
6	button C ↕	transmission	left poti	gripper valve
7	button E ▲	lock	right poti	ripper valve
8	button G ↕	light ext. CTI.	button G ↕	light ext. CTI.
9	left button ▲	rot. warn. light ext.	left button ▲	rot. warn. light. ext.
10	-	- free -	-	- free -
warning sign	-	(not in use)	-	(not in use)
turning sign reset	-	(not in use)	-	(not in use)
function elements	channel	function	channel	function
Fn/A ←	right joystick ↕	pump (Schwinge)	right joystick ↕	pump (wing)
→	right joystick ↔	pump (bucket)	right joystick ↔	pump (bucket)
Fn/ B ←	left joystick ↔	pump (steer)	left poti	pump (open/close)
→	left joystick ↕	pump (drive - rot. speed)	right poti	pump (ripper)
Fn/ C ←	left poti	pump (rot. speed preset)	-	- free -
→	-	- free -	-	- free -
Fn/ D ←	-	- free-	-	- free -
→	-	- free -	-	- free -
Fn/ E ←	-	- free -	-	- free -
→	-	- free -	-	- free -
Fn/ F ←	-	- free -	-	- free -
→	-	- free -	-	- free -

CONFIGURATIONS CM-5000

TRUCKS WITH LIGHTBUS SYSTEM

For the CM-5000 the chart is divided in ports and function elements. In the left-hand column you find the ports of the receiver, next to it the different configurations with the corresponding channel that is controlling the port and the respective servo, controller or switching function that is activated. Fn refers to the function element.

DUMPER

Steering, controller, sound, trailer-coupling and locks are directly operated by the control elements of the transmitter. The transmission control is operated by function element G. There is a response displayed for the currently engaged gear on the remote control. Port 9 is prepared for a controller for operating a hydraulic pump. You can alternatively use the internal controller aswell. Bus functions like stop-light, cornering-light, turning signals and light switches are generated by the function elements. Ports 15 and 16 are prepared for limitting switches to avoid that the pump keeps running while the contacts are open.

DISPENSER

Similar to the dumper, but instead of limit switching the pump a hydraulic pump control for monitoring both valves is installed. For this suits aswell: alternatively to the integrated controller, port 9 provides a control signal for the controller of an external hydraulic pump.

TRACTOR UNIT

This type of model gets along without extraordinary features. But for most street trucks are driven with cruise control, we prepared an alternative control for stop- and reversing-light: port 15 and 16 can request the corresponding signal from the external cruise control and transmit it to the light-bus. If you do so, you have to set the function elements A (stop-light) and I (reversing-light) to the mode ´off´.

CRANE

This model is configured in two levels, because besides driving you also need the cursor for operating the crane. While active in the ´driving´ level the configuration equals standardized truck configs. for the light-bus. In `crane´ level the driving functions are deactivated, only the lights and the sound can be switched. Instead of the previous assignement, the control elements now operate the valves of the crane topping. The hydraulic control is structured in the function elements K to N. The cranes main function is correpsonding to industrial standards assigned to the cursor. Deploying the telescope is done by the turning -function of the left-hand joystick.

port	channel	Dumper bus function	Dispenser bus function	Tractor unit bus function	channel	Crane busus function
1	right joystick ↔	steering	steering	steering	right joystick ↔	steering
2	button H ↕	sound	sound	sound	button H ↕	sound
3	left joystick ↕	controler	controler	controler	left joystick ↕	controler
4	button D ▼	AHK	AHK	AHK	button D ▼	AHK/trailer
5	Fn/G ←	transmission	transmission	transmission	Fn/G ←	transmission
6	button E ▼	rear lock	rear lock	rear lock	button E ▼	rear lock
7	button E ▲	front lock	front lock	front lock	button E ▲	front lock
8	button D ▲	transmission lock.	transmission lock	transmission lock	button D ▲	transmission lock
9	Fn/O →	hydraulic pump ext.	hydraulic pump ext.	trailer/plate	left joystick ↕	valve arm
10	turn left	- free -	lift valve	special func.. 1 tractor	right joystick ↕	valve jib
11	turn right	- free -	valve telescope	special func. 2 tractor	turn left	valve telescope
12	left joystick ↕	sound rpm	sound rpm	sound rpm	right joystick ↔	valve gripper
13		- free -	- free -	- free -	turn right	turn valve gripper
14		- free -	- free -	- free -	left poti	valve stands off
15	-	lower limiting switch	- free -	reversing light input	right poti	valve stands on
16	-	upper limiting switch	- free -	stop-light input	left joystick ↔	swivel/drive
engine	Fn/O →	pump	pump	- free -	FB/N i	pump
warning sign	right button ▲	warning sign	warning sign	warning sign	right button ▲	warning sign
sensor 1						
sensor 2						temperatur

function elements	channel	Dumper bus function	Dispenser bus	Tractor unit bus	channel	Crane busus function
Fn/A ←	left joystick ↕	stop-light gen.	stop-light gen.	stop-light gen.	left joystick ↕	stop-light gen.
→	button F ▲	front work light	- free -	- free -	button F ▲	front work light
Fn/ B ←	right joystick ↔	cornering light gen.	cornering light gen.	cornering light gen.	right joystick ↔	cornering light gen.
→		- free -	- free -	- free -		- free -
Fn/ C ←	button links ▼	turning sign gen.	turning sign gen.	turning sign gen.	button links ▼	turning sign gen.
→	button rechts ▼				button rechts ▼	
Fn/ D ←	button M ↕	trailer servo	trailer servo	trailer servo	button M ↕	trailer servo
→	button N ↕	engine servo	engine servo	engine servo	button N ↕	engine servo
Fn/ E ←	button C ↕	protocol/trailer off	protocol/trailer off	protocol/trailer off	button C ↕	protocol/trailer off
→	button F ▼	rear work light	- free -	- free -	button F ▼	rear work light
Fn/ F ←	button G ▼	side-lights	side-lights	side-lights	button G ▼	side-lights
→	button G ▲	driving-light	driving-light	driving-light	button G ▲	driving-light
Fn/G ←	button A ↕	transmission	transmission	transmission	button A ↕	transmission
→						
Fn/ H ←	button B ▼	rear fog-light	rear fog-light	rear fog-light	button B ▼	rear fog-light
→	button B ▲	fog-light	fog-light	fog-light	button B ▲	fog-light
Fn/ I ←	left joystick ↕	reversing-light	reversing-light	reversing-light	left joystick ↕	reversing-light
→	button links ▲	rot. warning si. in Bus	rot. warning si. in Bus	rot. warning si. in Bus	button links ▲	rot. warning si. in Bus
Fn/ J ←	right joystick ↕	f. beam/ headl. fl.	f. beam/ headl. fl.	f. beam/ headl. fl.	right joystick ↕	f. beam/ headl. fl.
→		- free -	- free -	- free -		- free -
Fn/ K ←	turn left	- free -	pump (lift)	- free -	right joystick ↔	pump (gripper)
→	turn right	- free -	pump (telescope)	- free -	right joystick ↕	pump (arm)
Fn/ L ←		- free -	- free -	- free -	left joystick ↕	pump (jib)
→		- free -	- free -	- free -	turn left	pump (telescope)
Fn/M ←		- free -	- free -	- free -	turn right	pump (turn gripper)
→		- free -	- free -	- free -	left poti	pump (dep. stands)
Fn/ N ←	left poti	limiting switch control	- free -	- free -	right poti	pump (stands down)
→	Port 15	low. threshold switch	- free -	- free -	-	pump (idle)
Fn/ O ←	Fn/N ←	limiting switch control	- free -	- free -		- free -
→	Port 16	up. threshold switch	- free -	- free -		- free -
Fn/ P ←		- free -	- free -	- free -		- free -
→		- free -	- free -	- free -		- free -

Activate the additional function by turning the right-hand joystick this time. Deploy the stands by the left-hand turning poti, lower them with the right-hand potentiometer.

An additional special feature is the measurement of the oil-temperature via ScaleArt temperatur sensor (item nr.: 76000360) as well as the displaying of the the measured value in the telemetry.

On Sa-Basic transmitter screens this value, due to a lack of space, will only be displayed, if the inclinometer is deactivated for the telemetry.

TRUCKS WITH LIGHT-SET

Configuration of the driving and hydraulic functions for using a lift-set (truck-light-board) equals the config. for the light-bus.

Controlling the light and trailer functions via light-set is a littel different , though.

To generate the signal for operating the light-set, there is a multiswitch configured for function element B. Please take the assignements of the 8 control elements from the chart to the right side. Th chart suits for all vehicles with CM-1000 or CM-5000.

port	channel	function	Dumper light-set	Dispenser light-set	Tractor u. lightset
1	right joystick ↔	steering	steering	steering	steering
2	button H ↕	sound	sound	sound	sound
3	left joystick ↕	controler	controler	controler	controler
4	button D ▼	AHK	AHK	AHK	AHK
5	Fn/G ⬅	transmission	transmission	transmission	transmission
6	button E ↕	combi lock	combi lock	combi lock	combi lock
7	Fn/B ⬅	light-set	light-set	light-set	light-set
8	button D ▲	transmission lock	transmission lock	transmission lock	transmission lock
9	Fn/O ➡	hydraulic pump ext.	hydraulic pump ext.	hydraulic pump ext.	trailer plate
10	turn left	- free -	- free -	lift valve	add. func. 1 trac.
11	turn right	- free -	- free -	telescope valve	add.func. 2 trac.
12	left joystick ↕	sound rpm	sound rpm	sound rpm	sound rpm
13		- free -	- free -	- free -	- free -
14		- free -	- free -	- free -	- free -
15	-	lower limiting switch	lower limiting switch	- free -	- free -
16	-	upper limiting switch	upper limiting switch	- free -	- free -
engine	Fn/O ➡	pump	pump	pump	- free -
warning sign		(not in use)	(not in use)	(not in use)	(not in use)
sensor 1					
sensor 2					

function elements		Dumper light-set	Dispenser light-set	Tractor u. lightset
Fn/A ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ B ⬅	look right	multiswitch 1-4	multiswitch 1-4	multiswitch 1-4
➡		multiswitch 5-8	multiswitch 5-8	multiswitch 5-8
Fn/ C ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ D ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ E ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ F ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/G ⬅	button A ↕	transmission	transmission	transmission
➡				
Fn/ H ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ I ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ J ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ K ⬅	turn left	- free -	pump (lift)	- free -
➡	turn right	- free -	pump (telescope)	- free -
Fn/ L ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/M ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -
Fn/ N ⬅	left poti	limiting switch control	- free -	- free -
➡	port 15	low. threshold switch	- free -	- free -
Fn/ O ⬅	Fn/N ⬅	limiting switch control	- free -	- free -
➡	port 16	up. threshold switch	- free -	- free -
Fn/ P ⬅		- free -	- free -	- free -
➡		- free -	- free -	- free -

Multiswitch assignement in Fn/B

control	fcuntion
left joystick ↔	turning sign
button O ↕	add. servo
button M ↕	trailer servo
button N ↕	trailer engine
right joystick ▲	full beam
right joystick ▼	warning sign
button G ▲	driving light
button G ▼	side-light
button B ▲	add. function
button B ▼	fog-light
button C ↕	protocoll/ trailer-off

CONTRUCTION VEHICLES

Charts for contruction vehicles can be found starting from page 70. The left-hand column: receiver ports, right next to it the different configs. with the corresponding channel/port (by which it is controlled) and the operating servo, controller or switching function.

GROOMER LOADER

Control for a machine with oil-hydraulic. Function elements A and B monitor the control element operating the valves and providing the value for the current oil-requirement of the pump. Steering and throttle is granted by the chain drive electrically, so that the function is not considered by the pump control. Element C does still use the throttle stick, this information is used here for the sound module. The hydraulic pump is plugged to the internal control which receives its control data from function element B, for that it is depending on the valve openings.

The groomer loader has valves for a combi-bucket and rear-ripper. Normally, there is no rotational idle speed preset necessary for this vehicle.

The pump output is set so the pump speed increases fast but drops slow, this way we avoid constant toggling of the pump for small motions. For switching the lights you need an external switching element on port 4 or a ScaleArt switching-step on ports 13 to 15. The rotating warning light is prepared for the Pistenking model.

Throttle and steering are mixed in the cruise control, so there is no special function prepared for the Commander receiver.

GROOMER TRANSPORTER

Similar to the groomer loader: driving and light functions are identically. The hydraulic system consists of three valves operating the functions for: tilt, tailgate and bulldozer plate. For this is the case the pump control only considers these three functions. As for the groomer loader, function element C adds the throttle stick to the oil-requirement to generate a signal for the sound module depending on the throttle-stick and the pump state.

TRACKED EXCAVATOR

This configuration is prepared for fully hydraulic excavators made by Damnitz, but with few adjustments you can use it for almost any hydraulically driven excavator model. In general, for operating vehicles which are only partly hydraulic you have to set the paths for the non-hydraulic functions in the hydraulic pump menu to zero (in the function element, not on the port). The controllers for electrical funtions are plugged to the corresponding valve servo ports. Usually, at least arm, shaft and spoon are operated hydraulical, thats why they are assigned to the first hydraulic pump elements.

On port 14 the control signal for the hydraulic pump controller is provided depending on the oil-requirement. Port 15 generates the same signal, but this time with switchable path limitation for reducing the feed rate - the maximumworking speed - for delicated operations.

With the left-hand poti you can set a continous idle speed for the pump.

Another special feature of Damnitz excavators is an additional main switch for the pump control power supply that can be controlled by port12, button E. In case you do not need it, simply ignore this port.

The steering of the vehicle is somehow extravagant: with the small joystick you can drive and steer (when using a SA-5000 transmitter you can operate both tracks individually via driving levers).

In the basic settings the pump control ports are configured in a mannor you may use a flight-controller for oprating the pumps: for resting pumps the port provides the signal for "joystick fully back" and depending on the oil-requirement the signal for upward deflections.

We prepared the following configurations:
1. servo center (neutral position) at -100%; like that the controller receives the signal "joystick fully back" for resting pumps.

2. servo path (right-hand) at 198%, so for the maximum pump performance the controller reads "full throttle".

3. fail-safe at -100%, so the controller switches to "stop" when the connection gets lost.

If you do make any changes to this setup, please remember to adjust the fail-safe postion according to the controller. Futhermore, you should always activate the function "save setting" for the controller port while the pumps are resting to define the initial position, whenever you adjusted the configuration.

port	control	groomer loader	groomer transporter		hydraulic functions control		tracked excavator control
1	left joystick ↕	control driving	control driving		- free -		- free -
2	left joystick ↔	control steering	control steering		- free -	right joystick ↔	valve (spoon)
3	button H ↕	sound	sound		- free -	right joystick ↕	valve (arm)
4	button F ↕	ext. light cti.	ext. light cti.		- free -	left joystick ↕	valve (shaft)
5	right joystick ↕	wing valve	tilt valve		- free -	button H ↕	sound
6	right joystick ↔	bucket valve	shield		- free -	left joystick ↔	valve (swivel)
7	turn left	valve open/close	valve open/close		- free -	right poti	valve function 1
8	turn right	ripper valve	- free -		- free -	turn right	valve function 2
9		- free -	- free -	right joystick ↕	valve (arm)	Fn/F ➡	left chain valve
10		- free -	- free -	left joystick ↕	valve (jib)	Fn/G ➡	right chain valve
11		- free -	- free -	Drehen links	valve telescop		- free -
12	Fn/C ⬅	sound rpm	sound rpm	right joystick ↔	valve gripper	button E ↕	pump clearance
13	button F ▲	light SA-board	light SA-board	turn right	valve turn gripper		- free -
14	button F ▼	rot.warn.lig. SA-board	rot.warn.lig. SA-board	left poti	valve stands dep.	Fn/H ➡	pump controler (a)
15	button E ▲	light reserve	light reserve	right poti	valve stands down	Fn/J ➡	pump controler (b)
16	button F ▼	- free -	- free -	left joystick ↔	swivel drive		- free -
engine	Fn/B ➡	pump	pump	Fn/C ➡	pump	Fn/J ➡	pump
warning sign		(not in use)	(not in use)		(not in use)		(not in use)
sensor 1							
sensor 2		temperatur	temperatur		temperatur		temperatur

function element	groomer loader	groomer transporter	hydraulic functions	tracked excavator
Fn/A ←	right joystick ↕ pump (luft)	pump (tilt)	- free -	right joystick ↔ pump (spoon)
→	right joystick ↔ pump (tilt)	pump (shield)	- free -	right joystick ↕ pump (arm)
Fn/ B ←	turn left pump (open/close)	pump (open/close)	- free -	left joystick ↔ pump (swivel)
→	turn right pump (ripper)		- free -	left joystick ↕ pump (shaft)
Fn/ C ←	left joystick ↕ drive (trottle)	- free -	- free -	right poti pump (function 1)
→	- free -	- free -	- free -	turn right pump (function 2)
Fn/ D ←	- free -	- free -	- free -	Fn/F ➡ pump (left track)
→	- free -	- free -	- free -	Fn/G ➡ pump (right track)
Fn/ E ←	- free -	- free -	- free -	right joystick ↔ mixer steering
→	- free -	- free -	- free -	right joystick ↕ mixer driving
Fn/ F ←	- free -	- free -	- free -	Hebel links mixer left lever
→	- free -	- free -	- free -	Fn/E ← mixer joystick
Fn/G ←	- free -	- free -	- free -	right lever mixer right lever
→	- free -	- free -	- free -	Fn/E ➡ mixer joystick
Fn/ H ←	- free -	- free -	- free -	left poti pump (idle)
→	- free -	- free -	- free -	
Fn/ I ←	- free -	- free -	- free -	- free -
→	- free -	- free -	- free -	button C ↕ rot. speed limiter
Fn/ J ←	- free -	- free -	- free -	Fn/H ➡ pump requirement
→	- free -	- free -	- free -	Fn/I ➡ threshold on/ off
Fn/ K ←	- free -	- free -	right joystick ↔ pump (gripper)	- free -
→	- free -	- free -	right joystick ↕ pump (arm)	- free -
Fn/ L ←	- free -	- free -	left joystick ↕ pump (jib)	- free -
→	- free -	- free -	turn left pump (telescope)	- free -
Fn/M ←	- free -	- free -	turn right pump (turn gripper)	- free -
→	- free -	- free -	left poti pump (depl.stands)	- free -
Fn/ N ←	- free -	- free -	right poti pump (low. stands)	- free -
→	- free -	- free -	- pump (idle)	- free -
Fn/ O ←	- free -	- free -	- free -	- free -
→	- free -	- free -	- free -	- free -
Fn/ P ←	- free -	- free -	- free -	- free -
→	- free -	- free -	- free -	- free -

SCHEMATIC WIRING DIAGRAMS

I n this section you learn everything about the electronical characteristics of the receivers:

Connecting the power supply, servos, sensors, engines, simple consumers, the concept of wiring and of cause schematic wiring diagrams.

POWER SUPPLY

Basically, Commander receivers can be supplied with power by two different sources. They can (or even should) be operated at the same time: the source is the BEC - for servos - and the vehicle battery.

Internally, the two positive poles are divided. The minus poles are connected as common for cruise controls (principle of common ground).

There is no power supply provided for the servos by the receiver. You have to configure the power supply via external BEC or cruise control with integrated BEC. For feeding the BEC the CM-1000 provides a special port (on the left side of nr 1.). For the CM-5000 you can simply plug an external BEC to one of the clear servo ports.

BATTERY MONITORING

All Commander receivers have the ability to monitor the battery voltage. To do so the vehicle battery has to be plugged to the battery clamps. If those clamps stay clear, the receiver will report 0 volts. Standardized this will trigger an alert, which can be deactivated in the menu of the port with the battery symbol.

VOLTAGE MEASUREMENT

The CM-5000 can, including the battery voltage, also monitor the current consumption of the battery. Therefor the battery has to be plugged to the ´battery´ titled clamps. Any consumer within the model is then connected to the ESC clamp of the receiver, instead of directly attaching it to

the battery. This way the entire current is linked through the measurement of the CM-5000.

Current that is drained from between battery and receiver cannot be measured, though. Additionally, the CM-5000 got an apere-hour counter. It totalizes the measured current consumption since the start of the model.

On the port illustrated with the ah-symbol you can configure the initial capacity and set an threshold.

BEC-MONITORING

Both receivers can measure the voltage on the servo ports (BEC-voltage).

INTEGRATED CONTROLLER

The CM-5000 contains an electrical cruise control for engines with up to three ampere continous current consumption. This might be the auxiliary drive (hydraulic pump, swinging spindle) or even the main drive.

The controller operates in both directions electronically and it can limit the engine on demand. All outputs are short circuit protected and the controller is protected against excessing temperatures and voltage. Power supply is provided by the battery clamp of the CM-5000.

SENSOR PORTS

There are two ports for ScaleArt sensor modules provided by the CM-5000. They are not suitable for operating servos. Power supply is granted by an internal resistor with battery voltage.
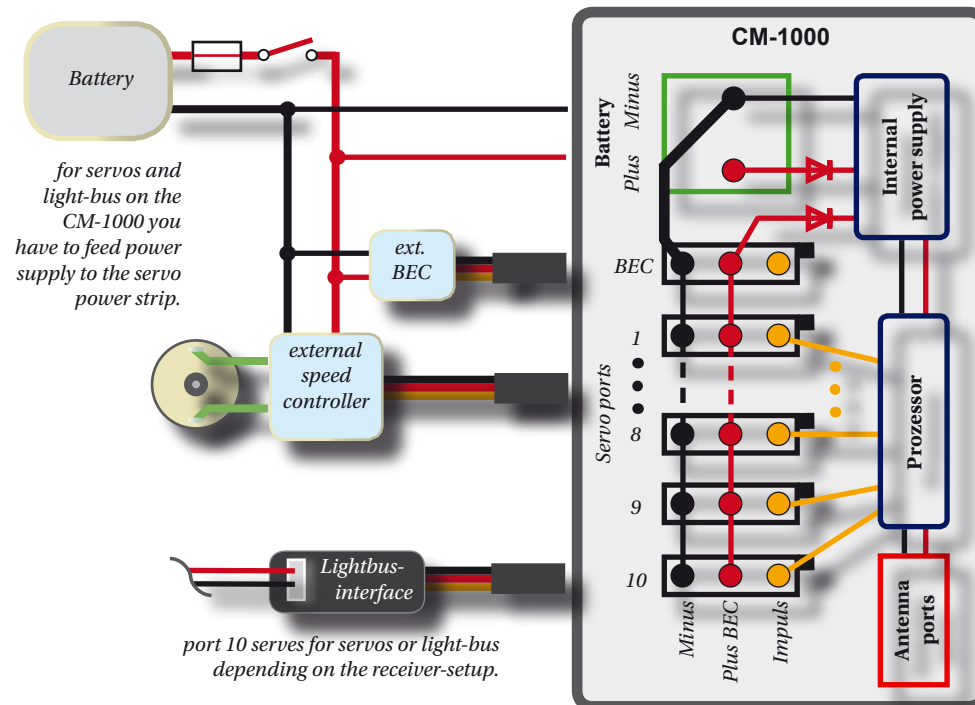
LIGHT-BUS

The light-bus is supplied by the BEC-system in both receivers. The current input of the light-bus has to be covered.

For the CM-1000 the light-bus signal is provided

CONNECTING CM-1000

the electronic of the CM-1000 is suplied by both, the battery clamp as well as the servo port strip.
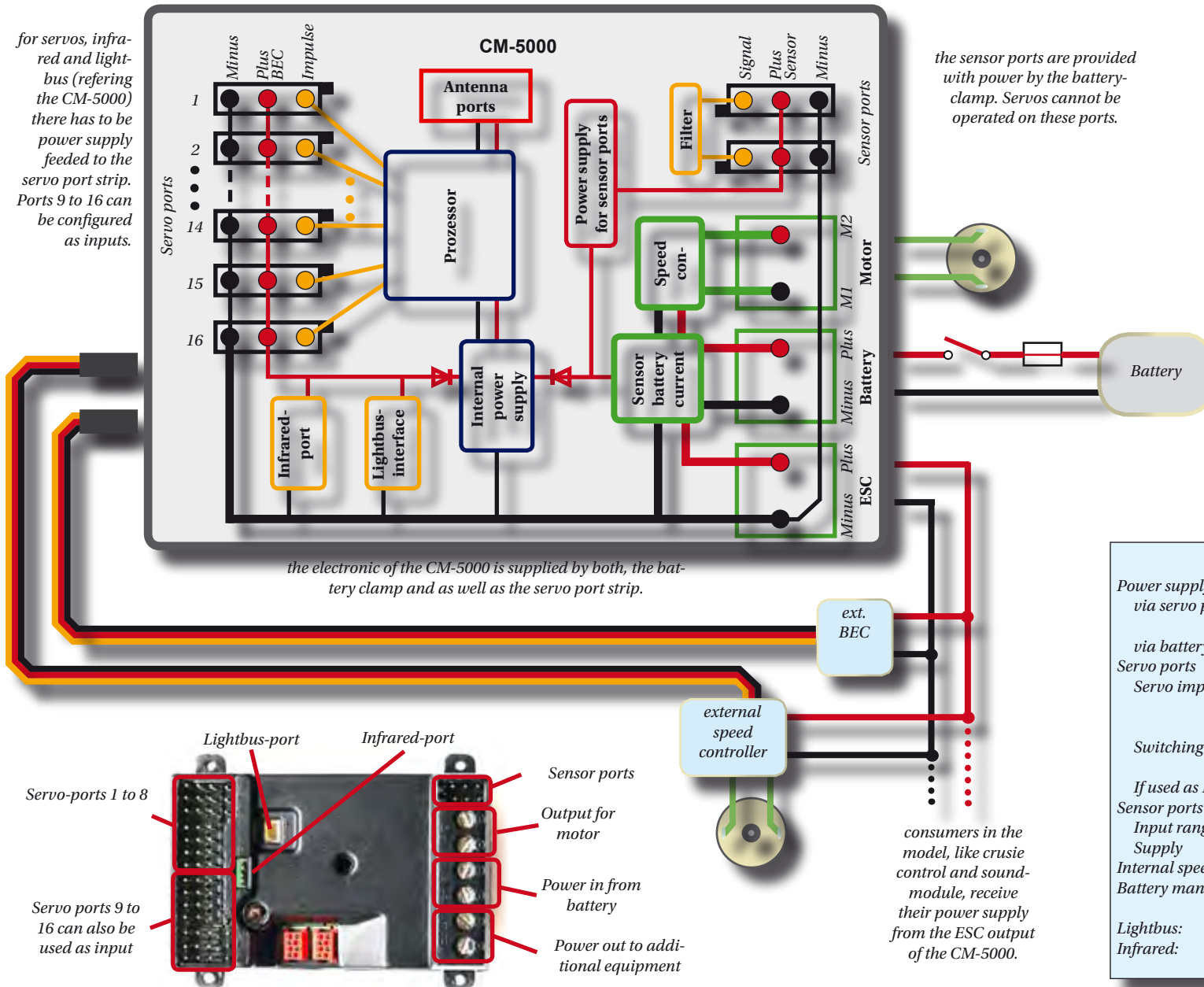

for servos and light-bus on the CM-1000 you have to feed power supply to the servo power strip.

port 10 serves for servos or light-bus depending on the receiver-setup.

TECHNICAL DATA (CM-1000)

Power supply receiverer	
via servo port:	4,0 to 6,0 V, 300 mA
	(5,0 to 5,5 V, 1000 mA if lightbus used)
via battery port:	4,0 to 18 V, 300 mA
Ports	
Servo impulse format:	1,0 ms to 2,0 ms at 100% servo travel,
	0,5 ms to 2,5 ms at 200% servo travel
	impulse-frame-time: 21 ms
Switching signal:	max. 20 mA, internally limited
	on: +3,3 Volt off: below 0,1 Volt
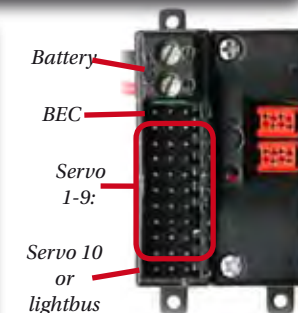
CONNECTING CM-5000

for servos, infrared and light-bus (refering the CM-5000) there has to be power supply feeded to the servo port strip. Ports 9 to 16 can be configured as inputs.

CM-5000

Minus | Plus BEC | Impulse

Servo ports

1
2
14
15
16

Antenna ports

Prozessor

Infrared-port

Lightbus-interface

Internal power supply

Power supply for sensor ports

Signal | Plus Sensor | Minus

Filter

Sensor ports

the sensor ports are provided with power by the battery-clamp. Servos cannot be operated on these ports.

Speed con-

Sensor battery current

M2 | M1 Motor

Plus | Minus Battery

Plus | Minus ESC

Battery

the electronic of the CM-5000 is supplied by both, the battery clamp and as well as the servo port strip.

ext. BEC

external speed controller

Lightbus-port

Infrared-port

Servo-ports 1 to 8

Sensor ports

Output for motor

Power in from battery

Power out to additional equipment

Servo ports 9 to 16 can also be used as input

consumers in the model, like crusie control and sound-module, receive their power supply from the ESC output of the CM-5000.

by port 10. For connecting you need an additional adapter (item nr.: 76000368).

The CM-5000 has an integrated light-bus interface. It has a port to which the bipolar cable of the light-module can be plugged directly.

INFRARED

Only the CM-5000 is provided with an infrared ouput. It is only operational when the BEC current is available. You may add an infrared transmitter diode without any further requirements. The CM-5000 automatically provides the required voltage.

TECHNICAL DATA (CM-5000)

Power supply receiverer	
via servo port:	4,0 to 6,0 V, 300 mA
	(5,0 to 5,5 V, 1000 mA if lightbus used)
via battery port:	4,0 to 18 V, 300 mA
Servo ports	
Servo impulse format:	1,0 ms to 2,0 ms at 100% servo travel,
	0,5 ms to 2,5 ms at 200% servo travel
	impulse-frame-time: 16 ms
Switching signal:	max. 20 mA, internally limited
	on: +3,3 Volt off: below 0,1 Volt
If used as Input:	range 0 - 5 Volt
Sensor ports	
Input range:	0 - 1 Volt
Supply	from plus battery, imited to 100 mA
Internal speed controller:	max. 3,5 Amp.
Battery management:	max. 15 Amp., 18 Volt;
	Amp-count up to 99 Ah, resolution 0,1 Ah
Lightbus:	max. 1,3 Amp., supply from ext. BEC
Infrared:	supports **Robbe** and **Scaleart** data format

W ith the SA-Basic set you may upgrade any common remote control to a Commander transmitter. The Futaba F14 plugs suit perfectly to the SA-Basic equipment. In the following we explain how to upgrade other devices to a SA-Basic by setting the port assignement and electrical parameters.

The power supply is granted by the quadripolar power strip. Furthermore there is an input for ppm-signals, for exmaple the trainer-bush. The eight tripolar ports serve for directly connecting joysticks, potis, sliders or switches.

For attaching the control elements you may use the ppm-inputs or the ports.

POWER SUPPLY

The SA-Basic operates batteries with nominal voltage of 7,2v. You may use six nimh- or two lithium-cells. The upper limit for the voltage is 12v: so if your remote control still uses a for analog controls common 9,6v battery, you may want to keep it. For emergencies even a car battery suits:

On average the transmitter requires 100 ma, but even though you should prepare and protect it for about 500 ma. The on/ off switch has to be added externally, because the SA-Basic does not provide a power switch it self.

Port assignement: directed from the board-edge to the center comes minus, then plus. The board is protected against reversing the polarity.

JOYSTICK PORTS

You may plug the joystick of almost any kind of analog remote control to this tripolar port. The polarity does not matter here - it determines the direction of rotation but when setting the joystick paths the software will automatically recognize the direction and reverse it, if necessary.

The pin in the center is the control signal (the wiper of the joystick poti), the two pins to both sides are the supply (leading to the outward ports of the joystick). The SA-Basic provides 3,3v for the potis.

You can also plug switches with three positions to these ports: in centered position the port is open, the SA-Basic interprets this as neutral. On the pin strip (socket board) there are the Commander channels A to D and G to J. Channels E and F are always provided for the two potis of the expansion module.
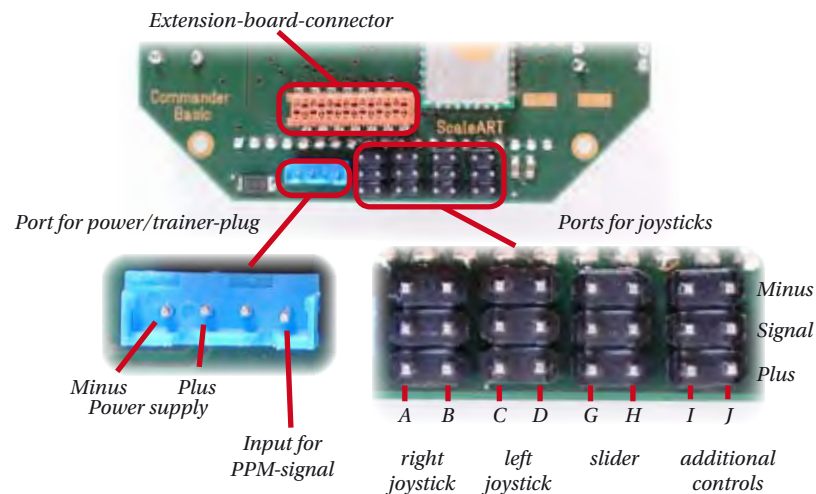
PPM-SIGNALS

In case you want to go on with your 40mhz models, the original electronic of the transmitter, which shall be upgraded, must not be replaced!

Replugging the joystick whenever you want to switch between Commander and analog usage is not comfortable at all - for this speacial case the SA-Basic provides an input for ppm-signals. Using this port you can process trainer-bush signals of the original remote control. So, if you run the transmitter in ´Commander mode´ the SA-Basic will receive the positions of the eight proportional functions from this port - the joystick can remain on its original board.

If possible, you should not make use of this possibility: the signal would then be converted from analog to digital back and forth - this causes an inaccurate, imprecise control and wastes time.

If you do not have a choice: the inner pin of the quadripolar plug will receive the signal. To process it go to the "basic settings" and set the "ppm-mode" option to "F14 mode".

Please do not forget to set the new joystick paths.

Extension-board-connector

Port for power/trainer-plug

Ports for joysticks

Minus
Plus
Power supply

Input for PPM-signal

Minus
Signal
Plus

A B   C D   G H   I J

right joystick   *left joystick*   *slider*   *additional controls*

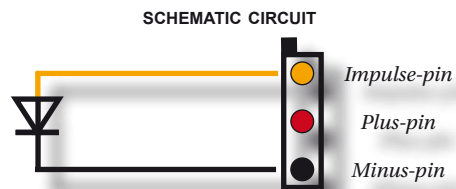| TECHNICAL DATA (SA_BASIC)	
Power supply:	7,0 to 13,8 Volt, 300 mA
PPM input (trainer-plug):	2,0 to 7,0 Volt, positive or negative Pulse, max. 8 channels
Joystick inputs:	A voltage of 3,3 Volt is supplied between pin 1 and pin 3, connect signal to pin 2. For best resolution the voltage swing at pin 2 should be at least 1,2 volt for the full movement of each control

CONNECTING SIMPLE DEVICES

Commander receivers can provide simple switching signals on all servo ports alternatively to the servo impuls. Small consumers (like LED´s) can be operated directly on the receiver output. For greater consumers you need an external switching step.

Receiver outputs provide a maximum voltage of 3,3 while operating. The Commander is limited to 220 ohm by an internal resistor.
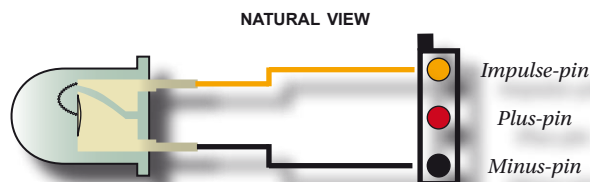
DIRECTLY ATTACHING LED

CONNECTION VIA SWITCHING STAGE

Single diodes can be connected between impuls output and minus-pin of the receiver. The plus-pin stays clear.

Plus- and minus-pin of LED´s can be distinquished by the different lengths of their pins. But, when assembling to a model you have to cut those pins depending on the construction parameters given by the model. So, this way of identifying plus-and minus-pin does

Stronger consumers, e.g. relais or light-bulbs, cannot be supplied directly by the receiver. For operating them you need a switching step. But it is highly recommended to have some knowledge refering electronics (at least how to operate a transistor as switch). Please note that there is an essential difference between operating consumers directly on the impuls-pin and on the port via switching step:

the impuls-pin provides a positive voltage - it switches to plus (3,3v). The consumer is connected to minus (mass).

Simple switching steps swtich to minus, the consumer is connected to plus.

In the most easiest case, you can use a single transistor as switching step. For there is a resistor limiting the current installed in Commander receivers you may attach bipolar power transistors directly again. The in the circuit diagram illustrated diode is necessary to protect the transistor from current peaks (occuring when switching off the load).

SCHEMATIC CIRCUIT

Impulse-pin

Plus-pin

Minus-pin

not work all the time. Even though, you can easily distinquish them at any given time: for LED´s with visible light the minus-contact always leads to the greater inner metal plate of the LED.

Such single LED´s can be used for the interior lighting of your model or as turning lights (doubled).
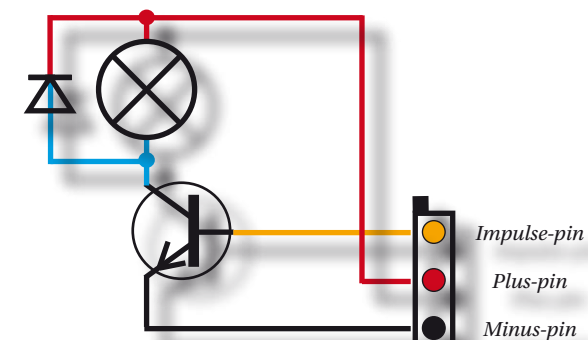
NATURAL VIEW

Impulse-pin

Plus-pin

Minus-pin

Impulse-pin

Plus-pin

Minus-pin

MEMORY CARD FUNCTIONS

All Commander transmitter can work with memory cards of type sd (or micro-sd). You may save and load model and transmitter data using such a memory card.

On the SA-5000 the card slot is on the right-hand side of the main display behind a black cover. The micro-sd slot of the SA-Basic is the top right-hand corner of the screen.

For the SA-1000 you have to open the rear cover of the transmitter to access on the sd-slot on the main-board.menu options for

accessing the data will only appear, if the memory card is inserted and can be recognized by the transmitter (format). Only essential data system functions are available - that means the transmitter cannot format the memory card. So you have to format the meory card on your computer or tablet (with Windows, Linuy, MAC-OS or Android) first, before you can oeprate it with your Commander.

Commanders support the format Fat (fat16 and fat32). You may use the standard preset as cluster size.

The transmitter creates folders on the enw card:

/COMMANDER/MODELS - in this folder you can fidn all data refering to the model (receiver configs. and single transmitter memory entries).

/COMMANDER/TRANSMITTER - in this folder all data refering the transmitter is saved (transmitter configs., address book).

SAVE AND LOAD MODEL DATA

Save and load model configurations via clip-board. There are the following procedures scheduled:

Save: take the data to the clip-board, then save the board to the memory-card.

load: load the data into the clip-board and then take it to the element.

In the model menu the following additional points will appear, if the memory card is attached and can be recognized by the transmitter:

DIRECTORY

Shows the directory of the memory-card and serves for switching the working directory. It is kept easy, smiliar to DOS. Data is displayed with the name, directories with their names in brackets (<name>).

You can get to the superordinate menu by selecting the entry <..>. You can navigate through the menu (up, down and to the sides) with the cursor. ´Ok´ activates the selection. The here selected directory is the working directory for the following memory functions.
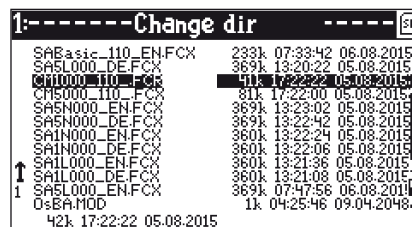
SAVE CLIPBOARD

With this the content of the clip-board gets stored to the memory card. As data name the model name is automatically suggested. The ending is RXn, thereby the ´n´ stands for the element id (1-8).

LOAD CLIPBOARD

Load element configurations from a file to the clip-board. A directory appears, as illustratetd in the picture above, displaying only data with the ending .RX (that means only receiver configs.). When accepting with ´ok´ the selected data is loaded to the clip-board and the "individual connection" menu is immediately displayed.

SAVE ADDRESS BOOK ENTRY

Saves the address book entry of the current model to the memory card (model name and bluetooth-address). As data name the model name is automaticall suggested.

The ending "Mnn", thereby both `n` stand for the number of the memory in the transmitter.

SAVE AND LOAD TRANSMITTER DATA

I n the "basic settings" menu appears for attached and recognized memory cards the additional menu "data functions". In case the menu is not available even if the memory card is attached, you will have to check wheather or not the card is inserted correctly (snaps noticeably) and has the suiting format. To remove the card, first push it slightly into the port, so it is unlocked, then the card is automatically ejected.

In case you checked on everything and the card is still not operational, take it to your computer or tablet again and make sure you set the correct format (FAT16 or FAT32).

The submenu "data function" provides the following entries:

CHANGE DIR

Shows the contetn of the directory and serves for switching to a different directory.

LOAD TX-DATA

Loads address book entries or special configurations from the memory card. In the directory selection only data with the entry "Mxx" (model entries) and "Txx" (transmitter entries) are displayed. When loading a transmitter configuration you are directly linked
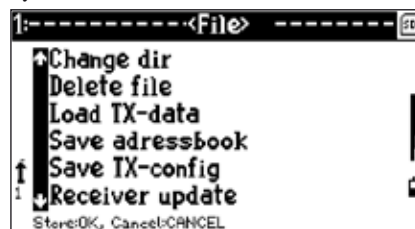
to the joystick path" setting. Make sure the displayed values are suiting your transmitter. Save the configuration with holding ´ok´. By pressing ´cancel´ the setting is discarded and the previous configuration is reinstated.

SAVE ADDRESSBOOK

Saves all used address book entries of the transmitter in a single data. Ending ".MOD"

SAVE TX-CONFIG

Creates a data with the configuration of the transmitter. Ending ".TXC".

RECEIVER UPDATE

With this menu you transmit the firm-ware data from the sd-card to the receiver. Closer details in section ´receiver-update´.

DATA AND DIRECTORY NAMES

A s file name the according transmitter or model name is suggested. It can be adjusted: with ◄ and ➤ you navigate the cursor (text cursor)., ▲ and ▼ change the selected character. You insert and delete characters by holding the ´menu´ button while pressing ➤ for inserting and ◄ for deleting them.

File names must not be longer than 80 characters. Please do not make changes to the endings!
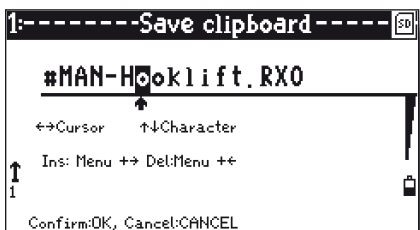
The memory routine makes sure that there is no name doubled. Even though, you may creat files with equal names, the directory- and loading routine of the Commander can handle that. The files will appear in the order they have been saved (last entry at the bottom). But most likely Windows will cause problems and try to "fix" it.

In case Windows or another operating sys. crashed the file ´repairing´ it, there is still hope:

Each file created by the Commander contains the original text as file name within the data. Simply open the file with the text editor.

SOFTWARE-UPDATE

TRANSMITTER UPDATE

Unpack the firmware and save it to a newly formatted sd-card.

SA-BASIC:

Insert the sd-card from behind with the contact area upside-down, the card locks nocticeably and is flush with the pod.

SA-1000:

Solve the screws from the bottom of the transmitter and cautiously remove the cover. Attention: the speaker cable!

You may keep it plugged. Insert the card with the contact area facing towards you. It will snap noticeably, if locked.

SA-5000:

Open the cover of the sd-card slot on the right side of the display. Then insert the card with the contact area upside-down, it snaps noticeably when locked.

Turn on your transmitter while holding the menu and ok button (SA-Basic: press on the joystick) to open the update menu. After releasing all buttons the file should appear. Select with the cursor and start the update by holdin ok.

When the update granted the transmitter automatically starts the new Commander software. The sd-card can stay attached. Now replug the transmitter, close the cover and do not forget the screws (for the SA-1000: mind the speaker cable).

RECEIVER UPDATE

Please make sure that the model cannot move by jacking up the drive axle or detaching the engine before starting the update. The Commander receiver does not process control signals while updating, but we can not guarantee what the cruise control and servos will do. Unpack the firmware file and save it to the sd-card. Then insert the card to your transmitter and connect it to your model.

Go to the "basic settings" and select with ◄ and ► the "data function" option in the top line. Access the option with ok. THe last point in the displayed list is the update function - press ok.

Now you see the selction of elements which can be updated. ◄ and ► move the selection, ok accepts the selection and starts the update.

The receiver is now being prepared for the update, this process may takes up to 10 seconds.

Once the receiver is ready it shows a list of all available update. Select the desired update and accept with holding ok.

The progrress bar appears as soon as the update is started. First, the receiver veryfies the data (whether the data suits the hardware) and ignores incorrect files.

In case the progress bar stagnates at 0% you have most likely selected the wrong file, so abort the update with cancel and restart with the correct file.

When the update is succesfully installed, the receiver automaticall restarts and is ready for usage.
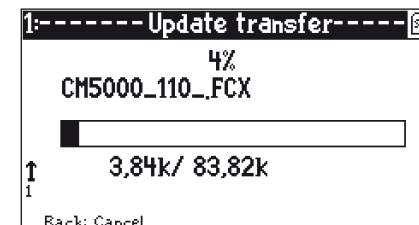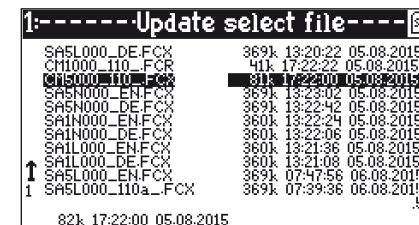
Hint:
Even though you can abort the update with cancel, the receiver remains in update mode and does not accept control signals till the firmware mode is activated again. In case the progress bar has already moved before pressing cancel, there is no firmware left on the receiver. So it will not be operational untill new firmware has been installed.
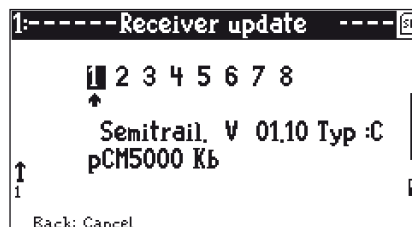
STRUCTURE OF THE DATA

This section is intended for computer experts. If you see the intel and are like "I do not understand a single thing" just go ahead to the next page, your Commander will operate perfectly well without this specialized information.

All files exist in text format and are editable with every standardized text editor. Entries that are evaluated when loading the file start with the character "#".

This character must not appear on any other position, otherwise the file is broken.

In between the lines starting with "#" you may add any comments you want. They are ignored when it comes to loading the file.

Within the receiver configuration files the individual port settings are listed as readable comments. The extract on the right-hand side shows such a configuration file refering the receiver.

Hint:
The files containing the receiver configurations also contain the configs. of every port of the element, but this is no requirement!
E.g. if you want to save only a single, especially succesfull function element configuration, simply delete all other port lines on your computer.
So when loading a file only the listed port-data is considered for the clip-board.

EXTRACT OF A FILE WITH RECEIVER CONFIGURATION

```
#BOARD.RX0                          original filename
#p<?>
mñïò≥µº¥∂∑12ôõôúôùôûôüô†ô°ô¢ô£ô§ô•ô¶ôßô®ô©ô™    coded names of ports
#sîRX∑∏12'"öõöúöùöûöüö†ö°ö¢ö£ö§ö•ö¶ößö®ö©ö™      and function blocks
#d00 00 10 FF 0F 00 00 00 00 00 00 00 00 00 1F
{0x00, 0x00, 0x10, 0xFF, 0x0F, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, },
#r00 00 10 00 00 1B 00 00 09 00 00 0A 00 00 F7
{0x00, 0x00, 0x10, 0x00, 0x00, 0x1B, 0x00, 0x00, 0x09, 0x00, 0x00, 0x0A, 0x00, 0x00, },
#BOARD                              model name and address
00:07:80:66:C2:28
Baustein ID:1: Auflieger           module name
1:Fahren
2:Fahren
3:Fahren
4:Fahren                           the 8 layer names
5:Fahren
6:Fahren
7:Fahren
8:Fahren

        from here You find the configurations of ports, then function blocks

Port  1: Lenkung,,Servo Prop     von  A rev   , Ebenen 12345678, Neutral:+000%, Wege:100% / 100%,  Failsafe:kein    plain readable text
#00:00 00 52 FF 00 01 83 00 05 55 80 80 00 01 44 FE 00 00 00 00 00 00 00 00 3B    machine coded
Port  2: Sound 1,,Servo Hydraulik   von  h      , Ebenen 12345678, Neutral:+000%, Wege:100% / 100%,  Failsafe:kein
#01:00 00 53 FF 17 9F 00 00 05 00 80 80 00 00 00 FE 00 00 00 00 00 00 00 00 20
Port  3: Regler,,Aus            von  C       , Ebenen 12345678, Neutral:+000%, Wege:100% / 100%,  Failsafe:+000%
#02:00 00 01 FF 02 04 00 00 05 22 80 80 01 01 00 FE 00 00 00 00 00 00 00 00 DE
Port  4: AHK,,Schaltservo       von  d rev   , Ebenen 12345678, Neutral:+039%, Wege:100% / 100%,  Failsafe:kein
#03:00 00 57 FF 13 7C 80 32 14 55 80 80 00 00 00 06 00 00 00 00 00 00 00 00 CD
Port  5: Getriebe,,Servo Prop     von  F?2      , Ebenen 12345678, Neutral:+000%, Wege:100% / 100%,  Failsafe:kein
#04:00 00 52 FF 55 0F 00 00 01 00 80 80 00 01 00 FE 00 00 00 00 00 00 00 00 F6
```

TECHNICAL PARAMETERS

Radio system:	Bluetooth 2.0 class 1	Servo - pulselength:	1,0 ms to 2,0 ms at 100% servo travel,
Frequency:	2,4 GHz, automatic channel selection		0,5 ms to 2,5 ms at 200% servo travel
Transmit power:	min. 1 mW, max. 10 mW, automatic power control	Pulse framelength:	16 ms (CM-5000)
Modulation:	FHSS		20 ms (CM-1000)
Range:	min. 300 m line of sight	Pulse voltage:	3,3 Volt
Identification:	48-bit serial number		
Connection establishment:	average 5 sec.	Power supply (CM-1000, CM-5000)	
Network mode:	piconet-multi-slave	via servo-port (BEC):	4,0 to 6,0 Volt, 300 mA
Transmission:	encrypted	via battery-terminal:	4,8 to 18 Volt, 300 mA

Resolution:

joystick:	12 bit	transmission:	9 bit
receiver data processing:	16 Bit	pulse generation:	12 Bit

Internal electronic speed controller (CM-5000)
Power supply from battery-terminal CM-5000: 8,0 to 15,0 Volt. Disabled if outside this range.
Average current: max. 3,5 Ampere. Internally electronically limited.

IMPRINT