

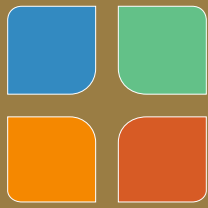
User Manual

XT Module

CV programmer ver. : 578K
XT module ver.: Sep '15



Digital Control
for car systems



Digital Controlled
Digital Car Control
for Car Systems

Congratulations on your purchase of this XT Module.

DC-Car-XT stands for eXTension and describes the way to actively transmit data for vehicles, which are equipped with a DC car decoder.

Our idea was to develop a module, which on one hand brings the hobby modeller the possibility to drive his cars by simple automatic processes and switching operations without having to deal with complicated PC controls or software.

On the other hand also advanced modellers should get a chance to control extensive processes and realize scenarios using a control software, building on specific Vehicle data recourse, which are provided by the vehicles themselves at your disposal.

There are countless applications possible, which we hereafter give you some:

- ☐ Emergency vehicles turn their way free (driving through red traffic lights)
- ☐ overtaking of vehicles (in conjunction with the DC-Car-Lane assistance)
- ☐ control of junction servos by direction signals
(junction servo adjusts itself automatically to the direction in which the turn light is flashing)
- ☐ controlling a bus stop (bus steers itself to the bus stop)
- ☐ sorting of vehicles (trucks may not enter the downtown)
- ☐ sorting of vehicles with empty battery directions them to a loading station
(in conjunction with a software, a fully automatic loading is possible)

This all is achieved by information from the vehicle which is send via an infrared connection to XT module. To do this the vehicle must have a DC-Car decoder (DC07 / DC08) mounted.

It transmitted the following information:

- ☐ Vehicle number
- ☐ Vehicle type
- ☐ Status of the left turn signal
- ☐ Status of the right turn signal
- ☐ Status of the hazard warning lights
- ☐ Status of the front flasher
- ☐ Status of the battery

The DC-Car XT module is delivered as a ready to go module and has the dimensions 68mm x 57mm x 22mm. It is designed so that it can be independently installed and operated. For example, right under the place where the desired action is to be executed.

DC-Car-products are subject to continuous development. Please pay attention to the current Firmware version of your products.

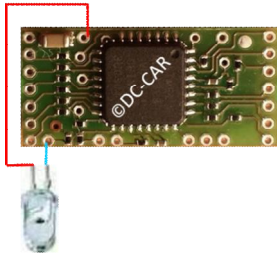
Note: Some functions are not available in conjunction with older decoders. For questions, please contact the DC-Car service.



Send Routine of the DC-Car Decoder

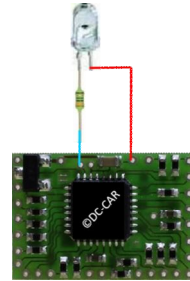
Basic requirement for sending information is a vehicle decoder DC07 or DC08 or up. The vehicle decoder generation D05, DC04 and older are not suitable.

The vehicle decoder sends an signal via a infrared LED which is connected to the terminal MF 5 or it sends the signal via the standard infrared LED, used for the DC-Car distance controll, at the back of a car.



The DC08 has the series resistor already on the board. Here, the LED can be connected directly.

When DC07, a series resistor must be added. The resistance value should be 100 ohms.



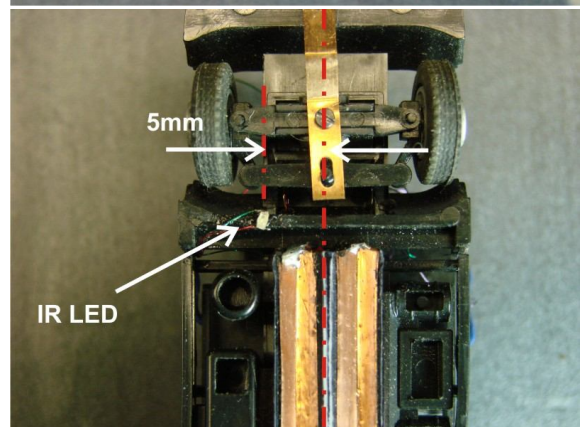
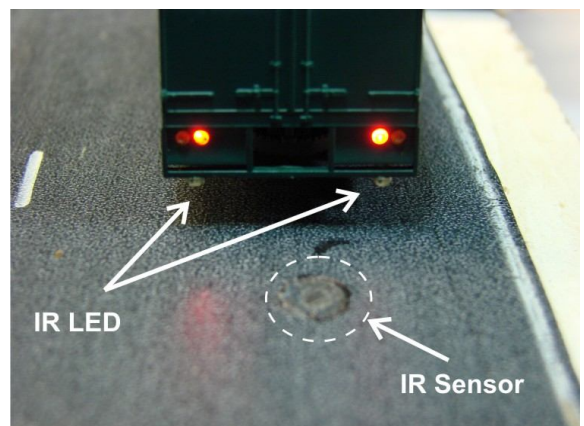
As infrared LED, you can use the standard 0603-IR-LEDs used for the distance control.

Infrared transmission - reception strength

Transmitting

For sending data from the DC-Car decoder we have some choices.

1. Back transmission: Sending data via IR LEDs used for the distance controll, they are at the back of all DC-Car cars.
2. Bottom transmission: Sending data via an extra IR LED at the bottom of the car. The IR LED is connected to the MF 5 output of the DC-Car decoder. For bottom transmission we advice an IR LED position of 5mm to the right of the centre of the bottom (seen in driving position) and it should be as close to the front axle as possible.



3. Side transmission: Sending data via an extra IR LED at the side of the car. The IR LED is connected to the MF 5 output of the DC-Car decoder (In systems with left driving should the assembly of course take place on the left).

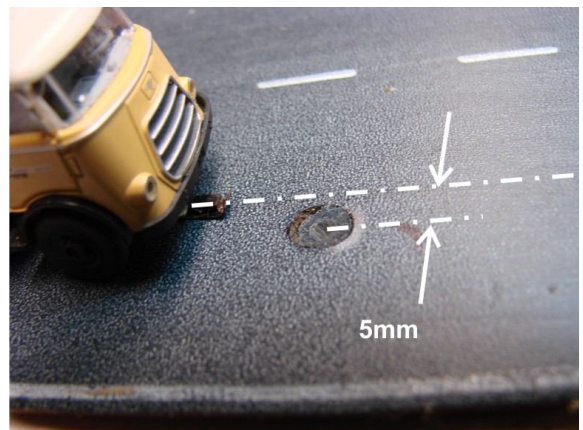


Receiving

To receive the data from the transmission LED of the car, a phototransistor is necessary. Again, you can rely on the tried and tested DC Car components.

1. For all 3 types of transmitting you can simply use a phototransistor used for DC-Car-distance control. This can be well camouflaged mounted at the roadside for example, to trees, shrubs, buildings, trash bins or parked vehicles.

2. For bottom transmission you can hide the phototransistor in the roadway. We have nice manhole covers lookalike ones available from our shop. Advantage of this mounting is that at the moment of transmission external light influences can be virtually ruled out because the vehicle completely covers the phototransistor. The manhole cover sensors are easy to install: drill a hole plug-in the sensor, connect the wires to XT module and of you go.



3. For both side and back transmission we have delineators with build in photo transistor available they have purple and green wires (don't mix them up with delineators with IR LED, they have red and green wires. They can **transmit** commands by infrared light they are also used for XT module to send DC-Car commands to the cars!).



Due to the larger distance between transmitter and receiver the tolerance in assembling height is significantly greater. The distance between the transmitting diode and the photo transistor should not exceed 5cm. Installation is very easy: drill a hole plug-in the delineator, connect the two wires to the XT Module and of you go.

DC-Car XT-module

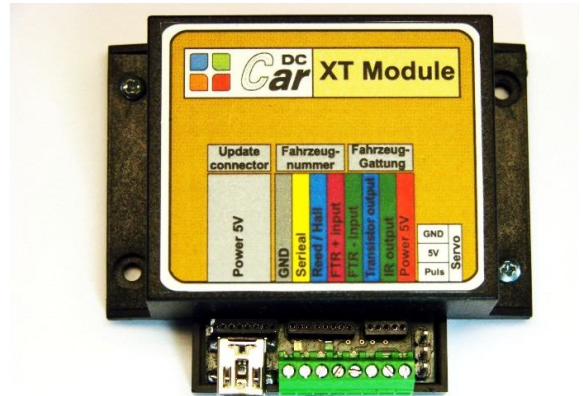
The DC-Car-XT module is the counterpart to the DC-Car decoders. It serves primarily as a separate control unit to perform individually adjustable functions. In addition, it converts the received signals, and placing them in various formats for further processing available.

For example, to be fed into a feedback bus or for evaluating software with a PC.

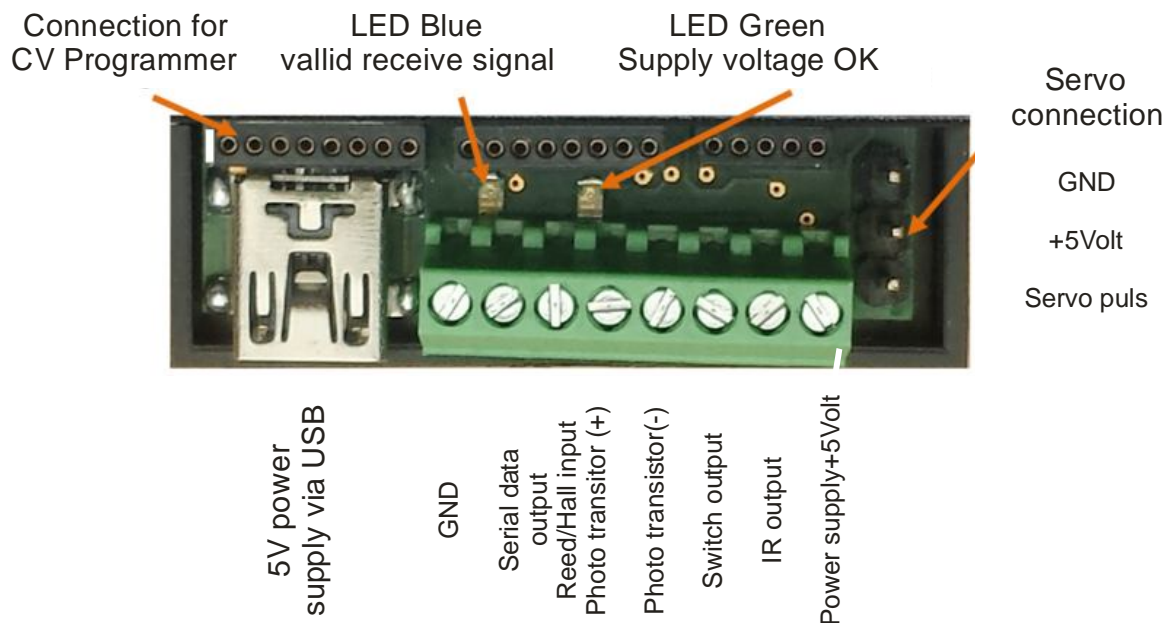
The following functions are currently available:

1. Driving a servo switch
(2-, 3- or 4-way switch selectable)
2. Switch a contact to ground / GND
3. Emitting a freely selectable DC-Car-infrared command

You also can select how the respective function is reset: after a certain time or by trigger from a reed contact, Hall sensor etc.



DC-Car-XT module pin connections



Description

Power supply:

The DC-Car-XT module requires a DC voltage of 5V / 500mA for correct operation. This can be either on screw terminal or supplied to the mini-USB port. The USB connector is only used for this purpose. (no data exchange!).

LED green (left) and blue (right)

The green LED indicates the presence of the 5V power supply.
The blue LED lights up for the period when a valid signal was received.



Reed / Hall Contact:

This connector is used to reset a tripped function.
For example, if the reed / Hall contact has to switch to ground / GND the servo junction is reset.

Phototransistor (+ and -)

Here the phototransistor is connected to receive the data with the correct polarity.
The DC-Car-standard provides: Plus (+) = violet; Minus (-) = green

Infrared LED

Here the negative pole (cathode) is connected to an infrared LED which transmits a freely selectable DC-Car-infrared command. For example, a stop command, a direction signals or the assignment of a lane for the Lane assistance system (future application).
The IR command is transmitted as long as a valid signal is received from the vehicle.
Note: A series resistor is not necessary, this is already on the board!

Switching transistor

Here, a relay or other load is connected, which is turned on. Please notice that a ground connection between the XT module and the control electronics of the respective consumer are made. For example, you can thus operate a servo decoder or traffic light decoder by means of the optional Input print for these decoders.

Servo connection

The servo connection is used for direct control of a model construction servo through the XT module. You can here connect all common available servos. Please observe the correct connection, as these may vary with the various manufacturers.

Connection for CV-Programmer

This 8-pin jack is used to connect the module to the DC-Car CV Programmer. This is required to deal with the free software "CV-Programmer" to configure the XT module individually. It is the same program and the hardware as used to change the CVs of the DC-Car decoders. The software (version 478.XT) You can free download from our website. The hardware is available in the shop. (Unfortunately the software is only in German at the moment)

Vehicle serial data and 5-pin and 8-pin socket

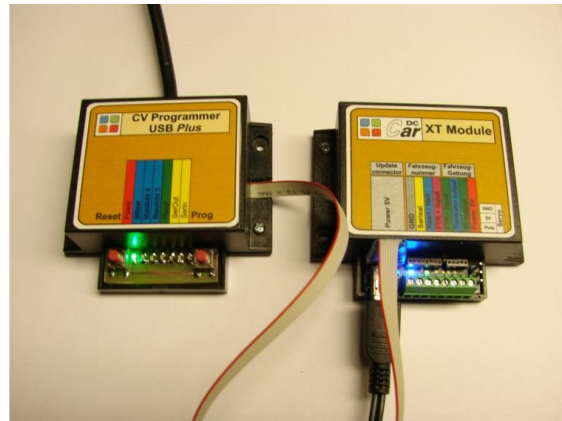
These connectors are used to convert the received data to a feedback bus or software. The information is available either serially (connection on the terminal strip) or binary (8/5-pin female) output.

Connecting to a PC

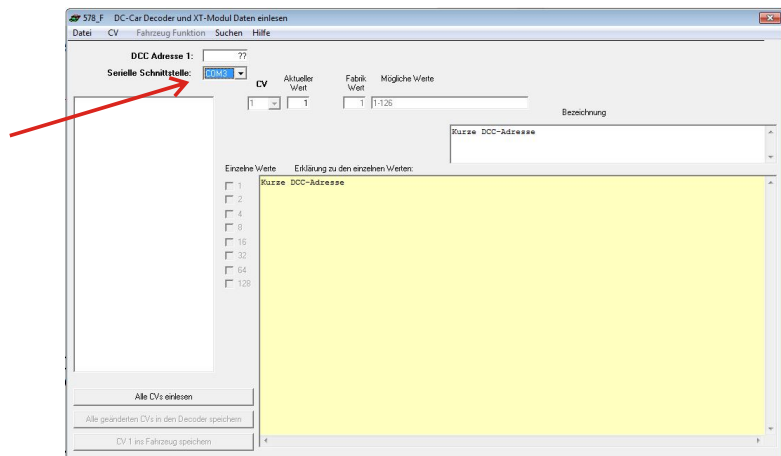
We recommend the use of "CV-Programmer USB *Plus*" as interface between XT module and PC. Connect the 8-wire cable to the 8-pin Update connector of the XT module (see picture).

The update plug of the CV Programmer is marked with a white stripe and must be inserted in accordance with the update connector. If you accidentally plug in wrong the XT module will not enter the programming mode as described below.

Simultaneously press the "RESET" and "PROG" button. After this, release the "RESET" button. Now the blue LED flashes this indicates that the module is in programming mode. You can now release the "PROG" button.

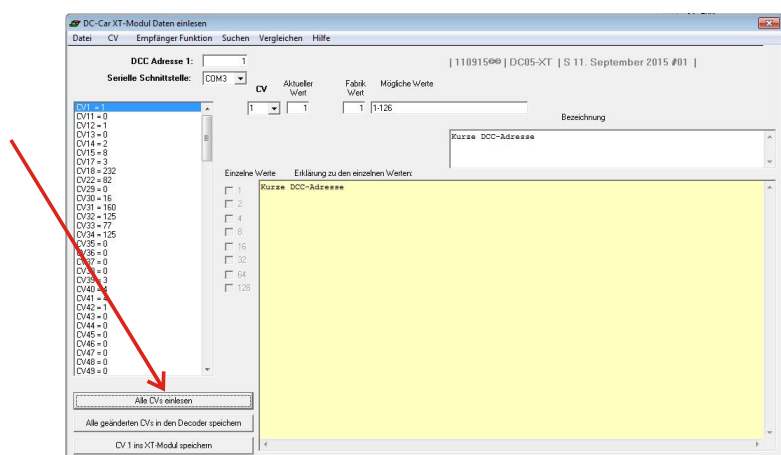


Start the PC program "CV-Programmer". Choose under "Serielle Schnittstelle" (Serial port) the COM port with which the CV-Programmer is connected to your PC.



Now press the button "Alle CVs vom einlesen" (Read all CVs). Now all CVs of the XT module are read and displayed.

In the menu bar you can now see that the "Empfänger Funktion" is changed from grey to black.



Please note that you use a external power supply / power adaptor with min. 500mAh if you have connected a servo. Otherwise the attached servo pulls is supplied from the CV programmer (USB port of the PC). The servo may pull down the voltage and the XT module can not be achieved by the PC. Alternatively, you can also disconnect the servo subsequently. This is no problem through the practical 3-pin plug connection.

General Function

In the first step you have to define how and what to analyze and process with the XT module. The following options are available for selection:

- ◇ Light Function
- ◇ evaluate only vehicle type
- ◇ evaluate only vehicle number

Not yet available, the evaluation of:

- ◇ vehicle type is combined with vehicle number as well as
 - ◇ vehicle type and vehicle number separated
- Therefore, these are still greyed out.

Click to set the desired function, first on the menu item "*Empfänger Funktion*" (Receiver function) and select "*Generell*" (General). This opens another window.

Now select the desired type by clicking on the item.

Now you need to define how to reset the chosen function. The reset can be made by:

- ◇ timing (defined in CV 97)
- ◇ Reed / switching contact or Hall sensor

If the servo has arrived the home position after execution of the function, the power supply can be switched off.

This prevents unnecessary power consumption and the "servo jitter" which can be heard in some servos. For this purpose, simply select the menu item "*Servo abschalten nach Ausführung der Drehbewegung*" (Disconnect the servo after movement).

After completing the configuration, click on the button "*CV98 speichern*". There is a confirmation prompt as a parallel evaluation of the light function and vehicle number /vehicle type, is not possible. You need to confirm this.

Generelle Funktion des Empfängers

Menü

Wert in CV98: 48

- ☐ Keine Funktion
- ☐ 1 Gattung CV101 - CV108 und Fahrzeugnummer CV111 - CV118
- ☐ 2 Nur Gattung auswerten
- ☐ 4 Nur Fahrzeugnummer auswerten
- ☐ 8 Gattung wird mit Fahrzeugnummer kombiniert CV160 - CV167
- ☒ 16 Lichtfunktion
- ☒ 32 Rückstellung auf Zeit
- ☐ 64 Rückstellung durch Reedkontakt

☐ Servo abschalten nach Ausführung der Drehbewegung

Abbrechen CV98 speichern

Defining light functions

The light function of the XT-module has the purpose to perform actions or sequences, which is controlled by the illumination of the vehicles.

For example, a vehicle with a set left turn direction light, set a turn out servo to the left. Or an emergency vehicle with activated front flashers triggers a stop signal for all other vehicles at an intersection.

There are evaluated:

- ◇ Left indicator
- ◇ Right indicator
- ◇ Hazard lights
- ◇ Front flashers
- ◇ Battery Warning

Click to set the desired function on the menu item "*Empfänger Funktion*" (Receiver function) and choose "*Lichtfunktion*" (Light function). This opens another window.

Now choose the lighting function which should be evaluated.

Then you decide what should be carried out.

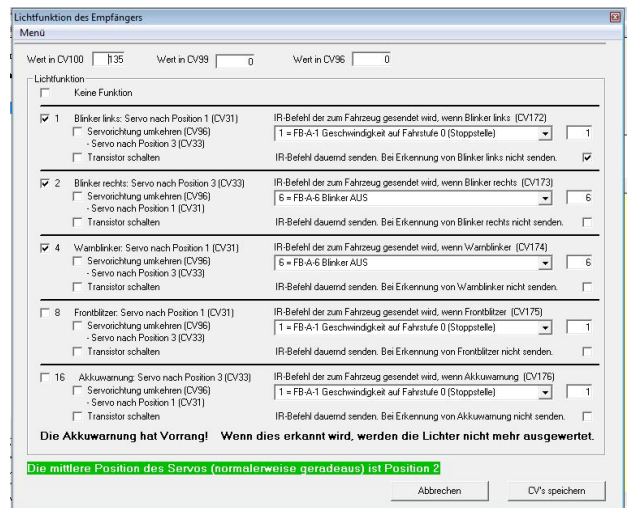
These are available:

- ◇ Set the servo
- ◇ Switch on the transistor (trigger contact)
- ◇ Send freely selectable infrared command

All three functions can autonomously be performed by the XT module.

You will need the appropriate connections with the XT module. The connection description can be found on page 5 of this documentation.

After completing the configuration click on the button " CV's speichern " (Save). A confirmation must be given whether you really want to activate the light function as a parallel evaluation with vehicle number / vehicle type is not possible. You need to confirm. The software will now transfer the configuration to the XT module. Note: If you forget to set in the menu item "Generell" (General), the lighting function, it will automatically be done in the implementation of the above procedure.



Setting the servo function

The XT module is able to control a servo turn out. Thus, it is not necessary to purchase a separate servo decoder.

To use this feature, you must adjust the XT module to your servo.

Just click in the menu " Empfänger Funktion" (Receiver function) on " Weichenfunktion" (servo function). Now you can set whether you want a 2-, 3- or 4-way servo function.

After you click on the " CV39 speichern" (Save CV39) button, the setting is transferred to the XT module and acknowledged.

Note: When activating the light function a 3-way switch is automatically set.



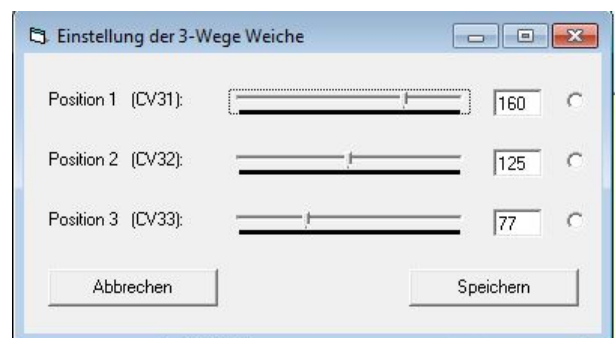
In the next step you have to define the starting position of the servo when turning on the XT module, and returns to execution of the movement function. This setting procedure is automatic, you only need to follow the on-screen instructions.

Now select the item "Set Servo" (Set servo) in the menu " Empfänger Funktion" (Receiver function).

Depending on the chosen servo function you now can find 2, 3 or 4 sliders.

These sliders allow you to adjust your servo end positions for your chosen servo.

By clicking on the point on the right side behind each entry, you can set the servo in the appropriate position.



By clicking on the " Speichern" (Save) button, the data is saved into the XT-module, and thus the servo configuration is complete.

Evaluation of the vehicle type

The vehicle type is used to distinguish different types of vehicles. The vehicle type has to be set in the set CV100 in each DC-Car decoder. There are 15 types available:

- 0 = General
- 1 = short truck
- 2 = long truck
- 3 = truck with trailer
- 4 = Tractor
- 5 = Tractor
- 6 = agriculture (tractor, etc.)
- 7 = freely usable
- 8 = vans (Sprinter etc.)
- 9 = car
- 10 = emergency vehicle with fire brigade function [transmitter of distance control at stop "OFF"]
- 11 = Emergency Vehicle [transmitter of distance control at stop "ON"]
- 12 = free
- 13 = garbage truck, post, etc.
- 14 = Bus [transmitter of distance control at stop "OFF"]
- 15 = Bus [transmitter of distance control at stop "ON"]

A total of 8 memory locations are available for the generic evaluation purposes, i.e. the XT module can handle a maximum amount of 8 in parallel.

Example of use:

All emergency vehicles of the type 10 are evaluated. The XT module sends a IR stop command which stops all other vehicles at a crossing. After 5 seconds, the stop command will be cancelled and all the vehicles will continue.

Click to adjust the generic evaluation in the menu item to " *Empfänger Funktion* " (Receiver function), go to the point " *Erkennen* " (Recognise) , and then select " *Auswertung der Gattung* " (Evaluation of vehicle type) . It opens a new window.

Place 1-8 determines which type on which location is evaluated.

Activation of the desired function is done by double clicking in the appropriate window.

This corresponds to

- 0 = disabled
- 1 = enabled

Available functions:

- ♦ servo turn out (incl. switching off)
- ♦ transistor switch (trigger contact)
- ♦ send freely selectable infrared command

Auswertung der Gattung am Empfänger

Hilfe

Platz 1-8 der auszuwertenden Gattung:

	CV101	CV102	CV103	CV104	CV105	CV106	CV107	CV108
Funktion je nach Gattung:	0	0	0	0	0	0	0	0

	G = 0 CV120	G = 1 CV121	G = 2 CV122	G = 3 CV123	G
Servo Position 1	0	0	0	0	
Servo Position 2	0	0	0	0	
Servo Position 3	0	0	0	0	
Servo Position 4	0	0	0	0	
Schalttransistor Ein	0	0	0	0	
Servo Position umkehren	0	0	0	0	
Sendet Funktionskommando aus CV43-CV50	0	0	0	0	
Sendet Funktionskommando dauernd	0	0	0	0	

Einsetzen:

- Mit der Maus auf das Feld doppelklicken, Funktion wird aktiviert [1] oder deaktiviert [0].
- Zum Löschen aller Funktionen, auf den Button "Alle Funktionen löschen" klicken.
- Zum Löschen aller Gattungen, auf den Button "Alle Gattungen löschen" klicken.

Alle Funktionen löschen Alle Gattungen löschen Abbrechen Speichern

When activating the " *Funktionskommando* " (Function commands) this opens another window in which you can select the DC-Car-infrared commands. With a click on the button " *Übernehmen* " (Copy) you confirmed your selection.

When you have finished, click " *Speichern* " (Save). Thereafter, the module is configured, and the data is transferred.

Funktionskommando Gattung

Gattung: 0 CV: 43

Funktionskommando:

4 = FB A-4 Blinker LINKS EIN

Abbrechen Übernehmen

Auswertung der Fahrzeugnummer

The vehicle number is used to distinguish between different types of vehicle of the same type. They must be set in CV113 in every DC-Car decoder. The vehicle numbers 0-31 are adjustable per type. The vehicle number has nothing to do with the DCC Digital address, this is not evaluated by XT module!

A total of 8 memory locations are available for the evaluation of vehicle numbers, ie the maximum amount of 8 parallel vehicle numbers.

Evaluate by XT module.

Example of use:

All buses of the type 14 are evaluated. However, only buses with vehicle numbers 1, 4 and 6 may stop in a specific bus stop,

Approach. So The XT module switches upon detection of the corresponding vehicle numbers a servo turn out and only allows these buses to retract in the bus stop. All other vehicles and buses run normally. After crossing a reed contact through the bus the servo turn out is reset immediately.

To adjust the vehicle number evaluation click under the menu item to " *Empfänger Funktion* " Receiver function), go to the point " *Erkennen* " (Recognise) and select then " *Auswertung der Fahrzeugnummern* " Evaluating vehicle number). It opens a new window.

Location 1-8 specifies which types of vehicles are evaluated.

The activation of the desired function is done

by double clicking in the appropriate window.

This corresponds to

0 = disabled

1 = enabled

Available functions:

- ♦ servo turn out (incl. switch off function)
- ♦ transistor switch (trigger contact)
- ♦ Send freely selectable infrared command

When activating the " *Funktionskommando* " it opens another window where you can select the DC-Car-infrared command. With click on the button " *Übernehmen* " to confirm your selection.

To finish click " *Speichern* " (Save). Thereafter the module is configured and the data is transferred.

Auswertung der Fahrzeugnummer am Empfänger

Platz 1-8 der auszuwertenden Fahrzeugnummer:

	CV111	CV112	CV113	CV114	CV115	CV116	CV117	CV118
	0	0	0	0	0	0	0	0

Funktion je nach Fahrzeugnummer:

	F = 0 CV140	F = 1 CV141	F = 2 CV142	F = 3 CV143	F = 4
Servo Position 1	0	0	0	0	0
Servo Position 2	0	0	0	0	0
Servo Position 3	0	0	0	0	0
Servo Position 4	0	0	0	0	0
Schalttransistor Ein	0	0	0	0	0
Servo Position umkehren	0	0	0	0	0
Sendet Funktionskommando aus CV60-CV91	0	0	0	0	0
Sendet Funktionskommando dauernd	0	0	0	0	0

Einstellen:

- Mit der Maus auf das Feld doppelklicken, Funktion wird aktiviert [1] oder deaktiviert [0].
- Zum Löschen aller Funktionen, auf den Button "Alle Funktionen löschen" klicken.
- Zum Löschen aller Fahrzeugnummern, auf den Button "Alle Fahrzeugnummern löschen" klicken.

Alle Funktionen löschen Alle Fahrzeugnummern löschen Abbrechen Speichern

Funktionskommando Fahrzeugnummer

Fahrzeug: 0 CV: 60

Funktionskommando:

4 = FB A.4 Blinker LINKS EIN

Abbrechen Übernehmen

Connection to a feedback system or PC with software

To use the XT-module data for feedback to a feedback bus or PC for further processing, there are three possibilities:

1. Serial output
The received data are output as a serial signal at pin "Serial"
2. Switching Output
The switching output can be connected to the input of a feedback decoder (S88®, Loconet® etc.) and thus be used quite simple for additional switch operations or the visualization in a model railroad control program (eg WinDigipet®, Traincontroller®, iTrain®).
3. Binary signal
The XT module provides a total of 12 outputs, which is a signal output switching to ground / GND.
These outputs the received type of vehicle and the vehicle number in binary coding.
The signals switches to ground / GND, enabling a direct connection to the Input print of a servo decoder.
A valid signal is defined by a check bit and output at "valid".
When the XT module is configured to " Light function ", the values on the socket " vehicle number" are for the battery and lights
The value for the hazard warning lights is composed of the addition of left indicator + right indicator together.
Example: The vehicle with the vehicle number 9 and type 3 is detected,
The following outputs are shown: Vehicle number value 1 + value 8; Type number: 1 + value 2

Evaluation

Vehicle number / type



Connection for
CV programmer

Vehicle number:1
Vehicle number:2
Vehicle number:4
Vehicle number:8
Vehicle number:16
Not used
Not used
Vehicle number: valid

Vehicle type:1
Vehicle type:2
Vehicle type:4
Vehicle type:8
Vehicle type: valid

Light function



Connection for
CV programmer

Light function Battery:"-"/GND
Light function Turn out left:"-"/GND
Light function Turn out left:"-"/GND
Light function Front flashers:"-"/GND
Not used
Not used
Not used
Light function: valid

Warranty and Security Notice

The finished module of the XT module has been extensively tested by us. Since we do not affect the correct and appropriate use, we can only guarantee a proper functioning of the module itself.

We assume neither a guarantee nor any liabilities for damages or consequential damages in connection with the use of this product. We reserve the right to repair, make improvements, supply spare parts or return the purchase price.

We can assume no liability for the damage on turnouts, signals, railroad crossings, servos, etc. or other to the module connected, components. It should be noted that the servos connected develop a not to be underestimated force which can bend or break the installation components when no special mechanisms are used. Appropriate precautions must be taken by the user of the decoder to avoid damage. It must be assumed that a defect in a servo make it run beyond its end position. This can be avoided when the connection between the servo and for example Semaphore Signal is not rigid, but decoupled by a spring, dampers, rubber, etc..

The following invalidate the warranty does not apply to the module:

- ☐ Unauthorised modification of the circuit
- ☐ Connecting incorrect voltage or current
- ☐ alteration or repair attempts
- ☐ polarity of voltages or servos
- ☐ failure to observe the operating instructions and the connection plan
- ☐ misuse, abuse or negligent treatment
- ☐ damaged by other persons
- ☐ kit soldered and constructed improperly
- ☐ use of other, non-original parts belonging to the kit
- ☐ Incorrect placement and the resulting consequential damages

Safety note:

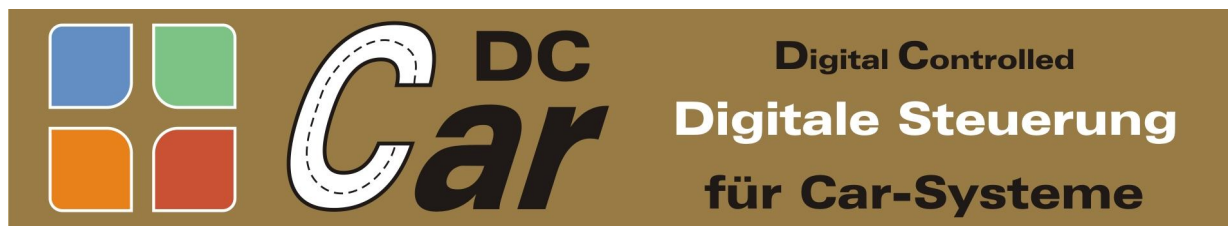
Operation of the XT module is only allowed at the designated voltages.

The XT module does not belong in children's hands.

The XT module is intended for use in clean, dry rooms.

The XT module is kept away from liquids.

Use only at normal room temperatures.



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You will also find lots of information on:
<http://wiki.dc-car.de/>