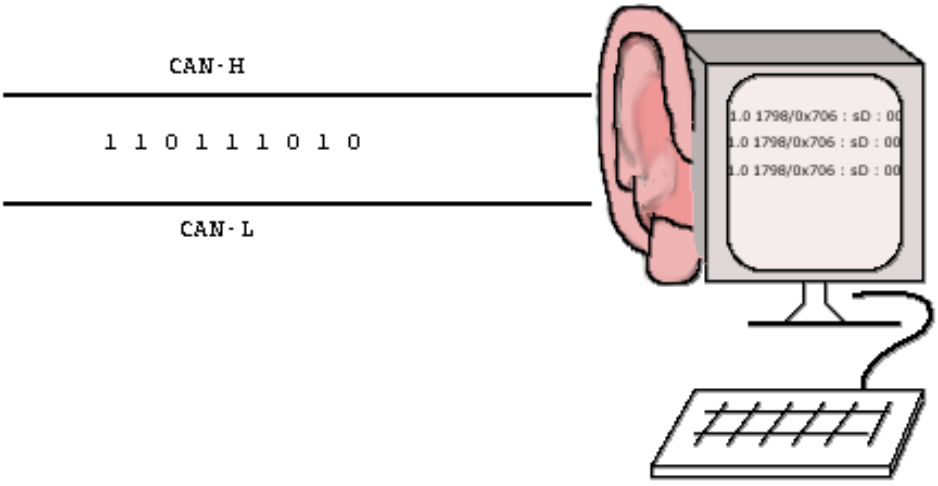
CANserver Horch
embedded Horch

Reference Manual



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1. Introduction

This manual describes functionality of *CANserver Horch* and *embedded Horch*. *CANserver Horch* is a CAN-to-TCP gateway, while *embedded Horch* is a CAN-to-RS232 gateway. Both gateways use the same ASCII format on the side of TCP resp. RS232. For this reason they are both called *horch*. Due to different architectures and differing requirements does not every implementation support all described features.

2. Common Functionality

2.1. Long Display Format

Received CAN Messages are displayed as ASCII text strings. *LONG DISPLAY FORMAT* is aligned with good readability in a terminal program.

The long format description is:

```
[timestamp] <id-dec>/0x<id-hex> : <type> : 0{<data>}8

type:    <frametype> + <datatype>
datatype:    D|R    , data or remote frame
frametype    x|s    , extended or standard frame format

example:
  991330039.943806  12/0x00c : sD : 80 12 34 0d
  991330039.944806  12/0x00c : xD : 80 12 34 0d
  991330039.945806  4660/0x1234 : xR : (length=0)
  991330039.946806  4660/0x1234 : xD : 01 02 03 04 05 06
  991330039.947806  4660/0x1234 : xR : (length=4)
```

The message ID is always displayed in decimal and hexa-decimal. The leading time stamp value is optional and can be activated by an interactive command. The format of the displayed data bytes can be selected by interactive commands from decimal, hexa-decimal or ASCII characters.

2.2. Short Display Format

Received CAN Messages are displayed as ASCII text strings. *SHORT DISPLAY FORMAT* is optimized for short lines and leads to short transfer times. The ASCII text strings make processing in applications that communicate with *horch* easier.

The short format description is:

```
[<timestamp>:]<idhex>:<type>:<length>:0{<data>}8:<chksum>

idhex:  Can-Identifier in hex without 0x
type:   <frametype> + <datatype>
datatype:   D|R    , data or remote frame
frametype:  x|s    , extended or standard frame format
data:   databyte in hex without 0x,
    two digits for one Byte,
    no space
chksum: simple one Byte XOR of all chars

hex-values use Capital characters

example:
99.300:620:sD:4:01020304:14
123.976:100:xD:8:01020304050607FF:29
138.959:180:sR:8::3B
156.768:1000056:xR:2::35
```

The message ID is always displayed in hexa-decimal. The leading time stamp value is optional and can be activated by an interactive command. The format of the displayed data bytes is limited to hexa-decimal.

2.3. Additional Outputs

Other messages than received CAN messages start with strings like:

```
ERROR:          CAN or driver errors
DEBUG:          debug messages received as CAN messages
INFO:           information
```

All messages are prepended by the time stamp, if enabled.

2.4. Interactive Commands

At run-time *horch* can be controlled through commands from it's stdin channel (console, RS232 or TCP/IP). Most commands consist of one letter and are used to change formatting of CAN messages. In case stdin comes from the console *horch* uses the system command *stty*(1) to switch the console into the **cbreak, noecho** mode.

? On-line help, show command overview

a Formatting of data bytes as ASCII characters

b Change bit rate on-line

```
b 125↵
```

Valid bit rate values are specified within the implementation table.

c print cut-mark

d Formatting of data bytes as decimal numbers

f ‹filter setting›
Install a new filter for receive messages. Previous settings are overwritten. The format of filter specification is described in chapter Filter

F Request of current filter settings

h Formatting of data bytes as hexa-decimal numbers

i On LINUX Systems an Interpreter program can be started which interprets and displays the present content of the **logfile**. The following command line is executed:
konvert -L -x std.int -n std.nam logfile | less

l Toggles the current state of local file logging. Logfiles are not created in server mode.

m ‹acc_code› ‹acc_mask›
Set the content of acceptance and mask register of the CAN controller chip. With the help of this command a message filtering based on the CAN chip hardware is possible. (see e.g. SJA1000 documentation) *This command is currently only available for can4linux and Janz CAN-USB.*
‹acc_code› and ‹acc_mask› can be a 32 bit value as decimal or hexadecimal number. The interpretation of this values is implementation specific.

N Switches over to long display format.

o ‹flag›
Setting of specified options via an option flag. Each bit in the flag has a special meaning and influences therefore the behavior of *horch* or the underlaying CAN

device driver. The following bits are already defined:

Bit 0 selfreception mode, receive self sent CAN frames
Bit 1 Listen Only Mode, don't acknowledge received CAN frames
Bit 2 Use TimeStamp, return receive time for received messages

If a bit is not set, the behaviour is reset, or the opposite.

```
Example:
o1↵
o 0x01↵
o 0x05↵
```

q quit program (in console mode)

Quit
quit program (in server mode)

R Reset the CAN controller, e.g. after an Error CAN Busoff.

s display statistic information
No generic information are available. Lines do always start with twice ‹:›. The possible information printed here are depending on the CAN controller type and the layer-2 CAN driver. The first column contains the name of the used CAN controller in plain text, followed by CAN controller specific register values. For the most often used CAN controller SJA1000 a statistic line looks like this:

```
:: sja1000 <act baud rate> <status register> <error_warning limit>
<rx errors> <tx errors> <error code> <buslast>
```

```
Example:
:: sja1000 125 12 96 0 0 166 0.0
```

S Switches over to short display format.

t activate display of time stamps.

T deactivate display of time stamps.

x change trigger settings

```
Format: x <idx> <mask> [r] <id> [<data>]
```

(see chapter Trigger)

y activates CAN message trigger.
Before using this command valid trigger values should be set (-x).

Y deactivates trigger settings

w and

W sends a CAN message
A CAN message is sent. All of the letters following the command letter are interpreted as arguments. The capital command letter **W** is used to send in extended frame format (using 29 bits) and the noncapital command letter **w** is used for the base frame format (using 11 bits). If the letter **r** is following the command letter as first argument, an RTR message is sent.

```
w [r] <id>  0{<data>}8

w 222 0xaa 0x55 100   ; standard message with three data bytes
w r 0x100 0 0 0       ; standard rtr message with data length code 3
W 0x100 1 2           ; extended  message with two data bytes
```

H Formatting of data bytes as hexa-decimal numbers
In contrast to **h** command letter, CAN message data are stored as binary data as canmsg_t structure (see can4linux c-header definition) if local file logging is enabled (-l). All other formats are stored as ASCII character lines.

V Request of the *horch* version

2.5. Filter

Format: f<filter 1>[,<filter 2> ...]

```
‹id›             ‹id› should pass the filter only
‹id1›-‹id2›   ‹id1› to  ‹id2›, message range should pass
‹id›-            beginning from ‹id› should pass the filter
-‹id›            from 0 to ‹id› should pass the filter

‹id›, ‹id1›, ‹id2› belong to the selected range (inclusive)
Example:
    f1,100-200,555,1200-↵
====================
```

The current filter settings can be requested by the online command **F.**

2.6. Trigger

Format: x <idx> <mask> [r] <id> [<data>]

idx is a value between 0 and 2 and specifies a trigger buffer. **mask** specifies which bits are 'don't care bytes' within a CAN message. A bit set means the data byte at this position in the received message and the data byte in the the option data must have the same value. A bit reset (0) means the data byte specified only the length of the trigger message. The value will be ignored by the trigger.

Is the 3rd parameter a **r**, so the trigger waits for a RTR Message
id is the CAN-ID to trigger on,
data are optional data bytes of the message that define the lenght of the message to be triggeres. When no data bytes are given the number is irrelevant.

```
Example:
    x 0 0 0x80↵
    y
```

In this example, *horch* waits for a CAN message with ID 0x80. Number and content of data bytes are not relevant.

2.7. CAN Errors

Errors recognized by the driver are displayed in the console as text messages. The following self-explanatory messages are known:

```
ERROR: OVERRUN          CAN chip overrun
ERROR: PASSIVE          Error passive
ERROR: BUSOFF           Error Busoff (use command R for Bus on)
ERROR: Buffer OVERRUN   Software buffer overrun
```

3. CANserver Horch

3.1. Commandline Synopsis

```
horch [dtSTV] [-D dev][[-a] -b baud][-C -c id][-l file][-p port][-s time]
```

Command line options

Options	short description
-a	- advanced - use option «-b baud» as BTR0/1 value
-b‹baud›	- CAN baud rate (in kBit/s, standard 125)
-C	- interpret message id given with -c as debug message
-c‹id›	- use CAN ID as debug ID
-d	- debug mode, useful for program developer
-l‹file›	- Logfilename, logging is enabled/disabled with interactive 'l'
-p‹n›	- use portnumber n in Servermode, default 7235
-s‹time›	- cyclic CAN status display (ms)
-t	- show time stamp at start up
-D‹device›	- CAN device name, (e.g. can1 (LINUX); 0..2 (Level-X))
-S	- TCP/IP server mode
-T	- use OS time, not drivers time stamp
-V	- show program version

additional for LevelX

Options	short description
-B‹board›	- board name (see *horch* -h)
-U‹number›	- board number (e.g. 1..4 COM port)

3.2. Description

CANserver Horch is a command line application that is capable of receiving and transmitting CAN messages and displaying them in a console window. The output can also be received over a TCP/IP connection in server mode. Because the receiving of CAN messages depends on a special hardware, the application is divided in the two parts, hardware dependent part for CAN receipt and console specific part.

The hardware layer can be a direct interface routine to a CAN controller or an operating system device driver.

The console application part is used to configure the application and shows the received CAN messages in different formats. Display formats are selectable on-line via control characters.

In the *Server Mode* the *CANserver Horch* acts as a TCP/IP server waiting for a client that connects to it. It can bee seen that **stdin** and **stdout** are served by the TCP/IP connection

in the further command description.

The EtherCAN version of *CANserver Horch* shows an established client connection by switching **Status 1** LED on.

Different implementations of *CANserver Horch* are available. The single client version *CANserver Horch* can serve only one TCP/IP client. An extended multi client version of the *CANserver Horch* is available. It can serve up to ten TCP/IP clients. Application specific extensions are possible. The current version is shown with the

```
$ horch -V
```

command.

A special message ID, which can be changed using *-c ID* is interpreted as debug message when developing embedded CAN applications. This CAN message contains a continous character stream which is displayed as text message. CAN devices that have no serial output for debug information can use CAN via the function `debug_print_can(unsigned char level, char *fmt, ...);` for formatted text output. This C-function works with the CANopen Library by ***port*** and can be requested if necessary. Text is displayed line by line.

It is possible to filter out interesting messages according to the message ID, others are ignored (see: Filter).

Another feature is the definition of trigger messages. Up to three different messages can be defined. Nothing will be received or shown, until one of these messages are recognized on the CAN bus (see: Trigger).

3.3. Options

-a If specified, the baud value given with **-b baud** is used to set the bit-timing registers directly. The value alignment is driver dependent. *(currently only implemented for can4linux).*

```
example:
      horch -a -b 0x13c
```

-b ‹Bitrate›
use baud rate **Bitrate** in kbaud. Without this option the driver is opened with the value from file */proc/sys/Can/Baud* (LINUX can4linux). Otherwise 125 Kbit/s is the default bit rate.

```
example:
      horch -b 250
```

-d Switch debug mode on
Messages about internal states and program flow are printed to **stderr.**

-C

-c ‹CAN-ID›

The CAN message ID given as an argument to the **-c** option gets a special interpretation if the option **-C** is set. It's content is interpreted and displayed as an ASCII character stream. CAN applications get the opportunity to send text messages, e.g. debugging messages via CAN. The debug messages are collected until a finishing new-line is received. Then the collected ASCII string is printed, proceeded by the string **DEBUG:**

```
example:
      horch -C -c 385
```

-l ‹filename›

The formatted display output can be saved in a local log file. The default name is **logfile**. With the following option it is possible to change the log-file name. Logging is activated sending the interactive command ‹l›. to the *horch*.
Logfiles are not created in Server mode.

-p ‹port›

The internet protocol uses **port number ‹port›** to address a specific service on an server host. This is port number 7235 for *CANserver Horch* . When starting the port number can be set with this option.

-s ‹time›

Display CAN controller status information every ‹time› ms.

-t By default displaying of the time stamp is disabled at start up. It can be enabled interactively. With this option given, it is enabled at start up.

-D ‹dev›

Select the CAN channel to be used (LINUX and Windows drivers). ‹**dev**› is the device name. Under Linux this is interpreted as /dev/**dev** . Precondition is an installed LINUX CAN device driver. (can4linux, cpc).
For CPC interfaces under Windows ‹**dev**› is interpreted according the setting in <windir>/cpcconf.ini The default entry is `CHAN00`.

For Level-X Interfaces under Windows the following additional parameters are necessary.

-B ‹board›

-U ‹unit›

```
Example: PCI-IntelliCAN under WinXP:
    horch_lxbc.exe -BLXN4pi2j -U0 -D0
```

The correct board name depends on the driver type and version used and depends on the operating system it runs on. Possible values can be requested using option **-h**.
Unit 0 is the first board.
Device 0 is CAN0 on the two channel PCI-IntelliCAN board.

-S Using *CANserver Horch* in TCP/IP server mode.
This server is reachable within the local host as *localhost*, or within a TCP/IP networks with the name of the hosted computer or the IP address and the port number 7235. All interactive commands to *CANserver Horch* can be given over socket streams.
For the command mode the server can also be reached by the common **telnet** application.

```
telnet host 7235
```

-T use operating system time as time stamp.
By default *CANserver Horch* uses the time stamp provided by the driver at receive time. If the driver does not support time stamps, the operating system time can be used instead. Usually this time is not the receive time, rather the display time.

-V prints the version number to **stdout**

4. embedded Horch

Implementing of embedded Horch depends strongly on architecture and development environment and is therefore not part of this manual.

4.1. embedded Horch for UConnect-XE164

embedded Horch for UConnect-XE164 is a *horch* implementation for the USB UConnect stick by Infineon. Communication with the PC works via a virtual COM interface.

5. Overview Implementations

5.1. Overview CANserver Horch

function	can4linux	CPC-Windows
Display		
Long Display Format	x	x
Short Display Format	-	-
CAN Bus Error	x	x
debug message	x	x
info message	x	x
interactive commands		
? (help)	x	x
a (ASCII)	x	x
b (bitrate,kbit/s)	10, 20, 50, 100, 125, 250, 500, 800, 1000	10, 20, 50, 100, 125, 250, 500, 800, 1000
c (line)	x	x
d (Decimal)	x	x
f (filter)	x	x
F (filter)	x	x
h (hex)	x	x
i (interpreter)	x	-
l (log)	x	x
m (mask)	x	x
N (long format)	default	default
o (optional)	x	-
q (quit)	x	x
R (CAN Reset)	x	x
s (statistic)	x	x
S (short format)	-	-
t (timestamp)	x	x
T (timestamp)	x	x
x (trigger)	x	x
y (trigger)	x	x
Y (trigger)	x	x
w (send base frame)	x	x
W (end ext. frame)	x	x
H (hex)	x	-

function	can4linux	CPC-Windows
V (version)	x	x
command line options		
-a (special bitrates)	x	x
-C (CAN debug)	x	x
-c (CAN Debug)	x	x
-s (status)	x	x
-T (time stamp)	x	x

x..supported
-..not yet supported

5.2. Overview embedded Horch

function	UConnect-XE164
Display	
Long Display Format	x
Short Display Format	x
CAN Bus Error	x
debug message	-
info message	x
interactive commands	
? (help)	-
a (ASCII)	-
b (bitrate,kbit/s)	50, 125, 250, 500, 1000
c (line)	x
d (Decimal)	-
f (filter)	-
F (filter)	-
h (hex)	x
i (interpreter)	not applicable
l (log)	not applicable
m (mask)	-
N (long format)	x
o (optional)	-
q (quit)	not applicable
R (CAN Reset)	x
s (statistic)	bitrate
S (short format)	x
t (timestamp)	x
T (timestamp)	x
x (trigger)	-
y (trigger)	-
Y (trigger)	-
w (send base frame)	x
W (end ext. frame)	x
H (hex)	not applicable
V (version)	-

x..supported
-..not yet supported