Application Programming Interface

Draco tera

User Manual

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Contents

1 About This Manual

1.1 Scope

This manual describes how to install your Draco tera API, how to operate it and how to perform trouble shooting.

1.2 Validity

This manual is valid for all devices listed on the front page. The product code is printed on the base of the devices.

1.3 Cautions and Notes

The following symbols are used in this manual:

This symbol indicates an important operating instruction that should be followed to avoid any potential damage to hardware or property, loss of data, or personal injury.

This symbol indicates important information to help you make the best use of this product.

This symbol indicates best practice information to show recommended and optimal ways to use this product in an efficient way.

2 Safety Instructions

To ensure reliable and safe long-term operation of your Draco tera please note the following guidelines:

Installation

- ➔ Only use the device according to this User Manual. Failure to follow these procedures could result in damage to the equipment or injury to the user or installer.
- ➔ Only use in dry, indoor environments.
- ➔ The Draco tera and the power supply units can get warm. Do not install components in an enclosed space without any airflow.
- ➔ Do not obscure ventilation holes.
- ➔ Only use power supplies originally supplied with the product or manufacturer-approved replacements. Do not use a power supply if it appears to be defective or has a damaged chassis.
- ➔ Connect all power supplies to grounded outlets. In each case, ensure that the ground connection is maintained from the outlet socket through to the power supply's AC power input.
- ➔ Do not connect the link interface to any other equipment, particularly network or telecommunications equipment.
- ➔ Only connect devices to the serial interface that are protected against short circuit currents and incorrect voltages at the serial interface.
- ➔ To disconnect the Draco tera from the power supply, remove the power cord cables of all power supply units or switch supplies off.
- ➔ Take any required ESD precautions.

In order to disconnect the device completely from the electric circuit, all power cables have to be removed.

Repair

- ➔ Do not attempt to open or repair a power supply unit.
- ➔ Do not attempt to open or repair the Draco tera. There are no user serviceable parts inside.
- ➔ Please contact your dealer or manufacturer if there is a fault.

3 Description

3.1 Application

The Draco tera API is used to control the matrix externally by serial commands via serial (RS232) or network (TCP/IP) connection.

The Draco tera API has been successfully implemented with various common media control systems.

The Draco tera API provides the full scope of switching functionality. It does not support the configuration of a Draco tera system.

3.2 Access Options

You have the following options to access the Draco tera for external serial control:

Access Option	Symbol
Serial interface	
TCP/IP interface	

Both serial interface and TCP/IP interface use the same commands for the operation of the Draco tera matrix.

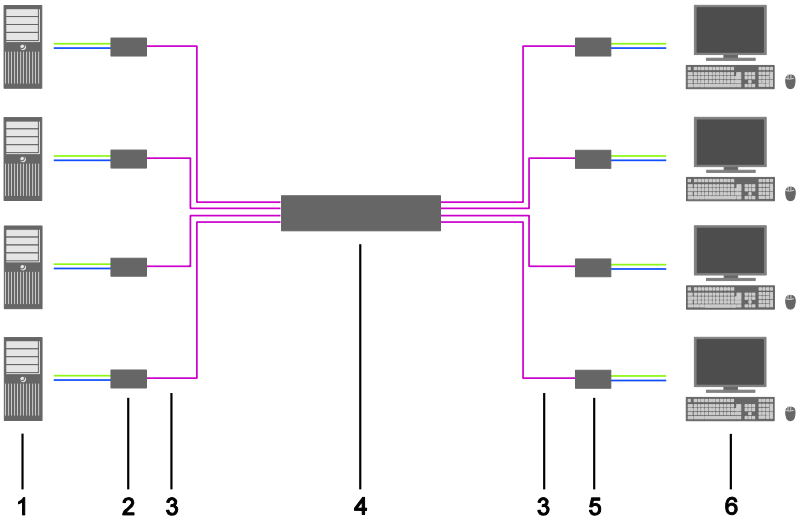
3.3 System Overview

A Draco tera matrix system consists of a Draco tera matrix and, for KVM applications, one or more CPU Units / CON Units. The Draco tera matrix is connected to the CPU Units / CON Units by interconnect cables or directly to the video devices where used as a video matrix.

CPU Units are connected directly to the sources (computer, CPU) by the provided cables.

Monitor(s), keyboard and mouse are connected to the CON Units.

Communication between the Draco tera matrix and the CPU Units / CON Units occurs over the respective interconnect cables.



System Overview (exemplary)

1 Source (computer, CPU)

2 CPU Units

3 Interconnect cable

4 Draco tera matrix

5 CON Units

6 Console (monitor, keyboard, mouse)

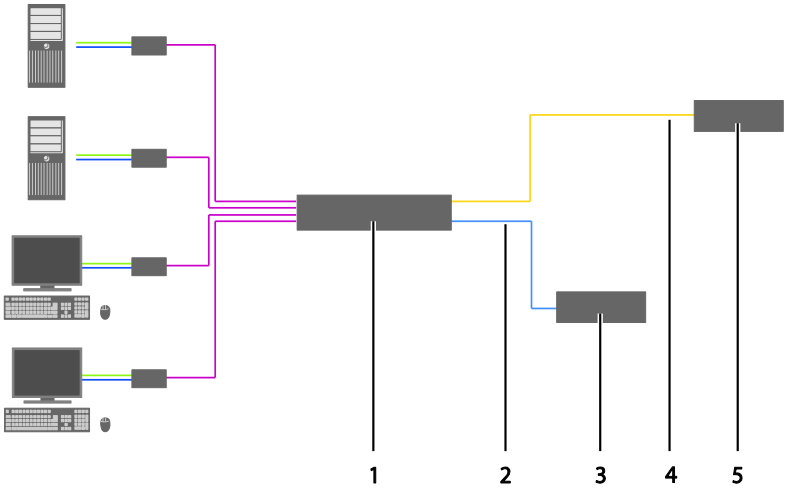
3.4 System Overview External Control

The Draco tera matrix can be connected to an external serial control via the CPU board and its connectors.

The CPU board provides the possibility for both serial and TCP/IP connections.

The serial connection to an external serial control is established by using a serial cable with D-Sub 9 connectors or a D-Sub 9 to RJ45 adapter cable (Draco tera Compact).

The TCP/IP connection is established by using a Cat X network cable.



System Overview (exemplary)

1 Draco tera matrix

2 Serial connection cable (D-Sub 9) or D-Sub 9 to RJ45 adapter cable

3 External serial control (RS232, option 1)

4 Network connection cable (Cat X)

5 External serial control (TCP/IP, option 2)

3.5 Product Range

Part No.	Description
K480-API	Draco tera matrix application programming interface (API)

4 Installation

4.1 Package Contents

Your package contains the following items:

- Application programming interface manual (API)

The package is available from the secured company download area.

If anything is missing, contact your dealer.

4.2 System Setup

First time users are recommended to setup the system in the same room as a test setup. This will allow you to identify and solve any cabling problems, and experiment with your system more conveniently.

Setup of the external control

1. Install the CPU and I/O boards.
2. Connect keyboard, mouse and monitor to the CPU board of the matrix.
3. Connect the matrix to the power supply.
4. Open OSD via 'Hot Key' and login with administrator rights in the main menu.
5. Configure initially as requested.
6. Connect the external control either via RS232 or TCP/IP to the matrix.

5 Configuration

5.1 General Remarks

The Draco tera API provides all commands that are necessary to switch the Draco tera matrix.

5.2 Draco tera Configuration

In order to operate the Draco tera matrix, it has to be configured appropriately. In the following section, all relevant chapters from the Draco tera manual are described. For a detailed explanation, reference is made to the main manual.

5.2.1 System Data

The Draco tera API relevant system configuration is set in this menu.

You have the following possibilities to access the menu:

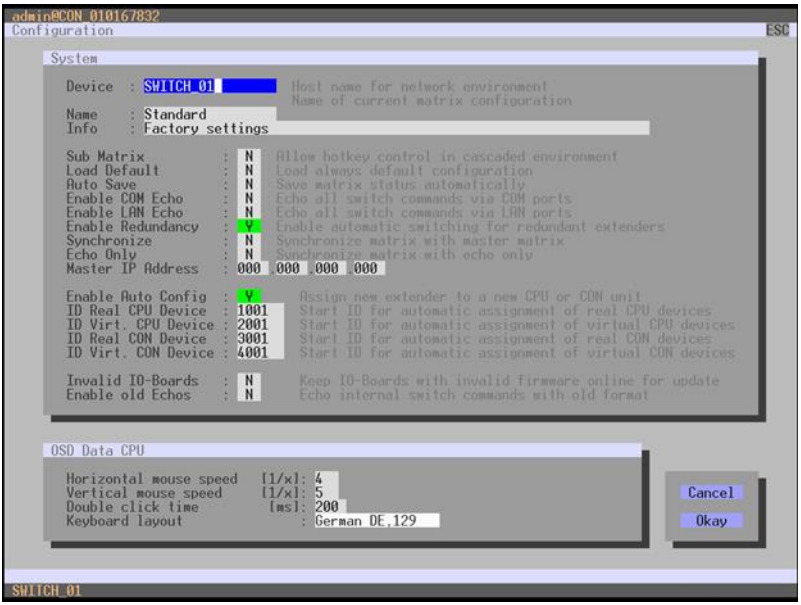
You can select between the following Draco tera API relevant settings:

Field	Selection	Description
Enable COM Echo	activated	Send all performed switching commands in the matrix as an echo via serial interface. **Note:** This function should be enabled when using a media control via serial interface.
	deactivated	Function not active (default)
Enable LAN Echo	activated	Send all performed switching commands in the matrix as an echo via LAN connection. **Note:** This function should be enabled when using a media control via TCP/IP connection.
	deactivated	Function not active (default)

OSD

➔ Select **Configuration > System** in the main menu.

The serial interface can be blocked while OSD has been opened.



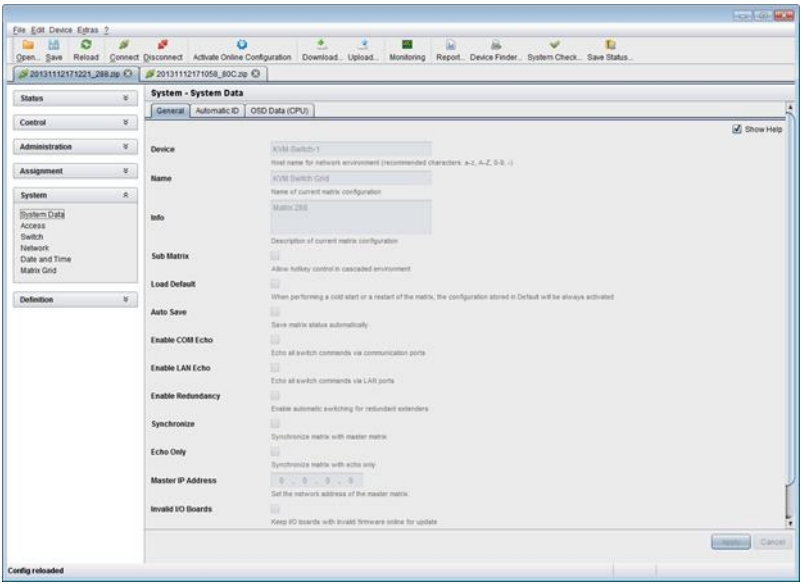
*Menu **Configuration – System***

You can select between the following buttons:

Button	Function
Cancel	Reject changes
Save	Save changes

Java Tool

➔ Select **System > System Data** in the main menu.



*Menu **System – System Data***

5.2.2 Network

The Draco tera API relevant network configuration is set in this menu.

You have the following possibilities to access the menu:

You can select between the following Draco tera API relevant settings:

Field	Selection	Description
DHCP	activated	The network settings are automatically supplied by a DNS server (default)
	deactivated	Function not active
IP address	Byte	Input of the IP address in the form "192.168.1.1", if DHCP is not active
Subnet Mask	Byte	Input of the subnet mask in the form "255.255.255.0", if DHCP is not active (default: 255.255.255.0)
Gateway	Byte	Input of the subnet mask in the form "192.168.1.1", if DHCP is not active
Draco Service	activated	LAN interface at the Draco tera acitvated for access via Java tool (Draco service port 5555)
	deactivated	Function not active
FTP Server	activated	FTP server for transmission of configuration files activated.
	deactivated	Function not active

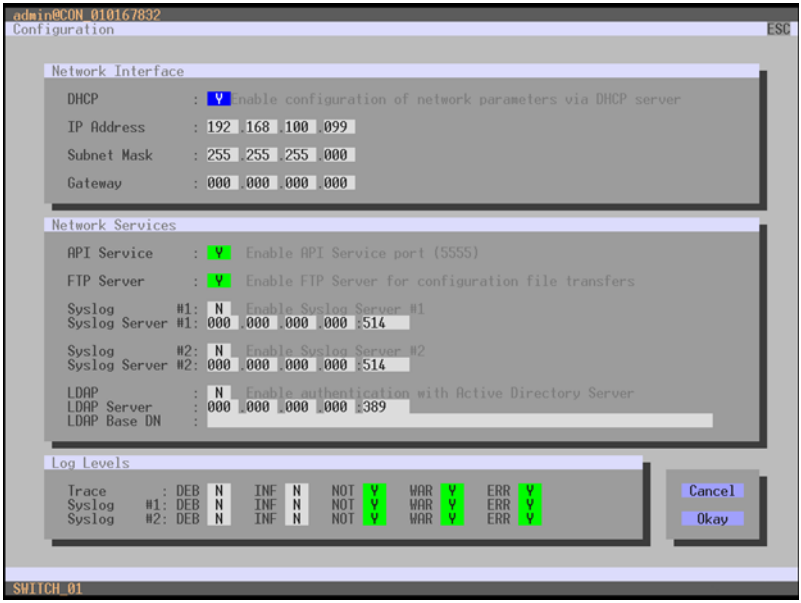
Activate the modified network parameters by doing a restart.

Consult your system administrator before modifying the network parameters. Otherwise unexpected results and failures can occur in combination with the network.

OSD

➔ Select **Configuration > Network** in the main menu.

The serial interface can be blocked while OSD has been opened.



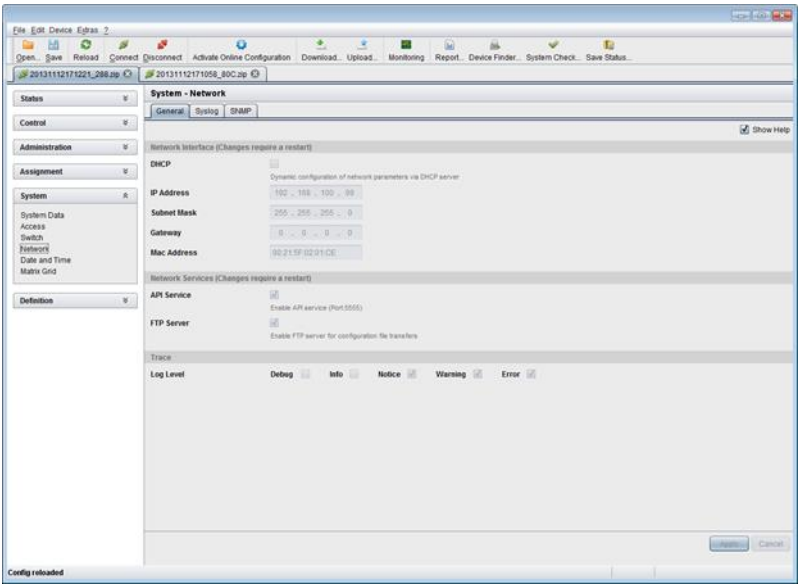
*Menu **Configuration – Network***

You can select between the following buttons:

Button	Function
Cancel	Reject changes
Save	Save changes

Java Tool

➔ Select **System > Network** in the task area.



*Menu **System – Network***

5.3 Communication Setup

TCP/IP socket connection

In order to control the Draco tera via TCP/IP socket connection the Draco Service has to be activated. See Chapter 3.7.4 Network Status and Chapter 5.4.5 Network in the Draco te ra manual for more information.

Java code example

```
// Create socket connection
Socket socket = new Socket("192.168.100.108", 5555);
final InputStream is = socket.getInputStream();

// Switch off all ports, Command: ESC [ A
final OutputStream os = socket.getOutputStream();
os.write(0x1B); // ESC
os.write(0x5B); // [
os.write(0x41); // A
os.flush();

if (is.read() == 0x06) {
// acknowledged
}

is.close();
os.close();
socket.close();
```

Serial connection

In order to establish the serial communication to the Draco tera, set the format for serial data transmission to the following parameters:

115.2K, 8, 1, NO
(115.2 KBAUD, 8 data bits, 1 stop bit, no parity)

5.4 Telegram Structure

5.4.1 Request

ESC <Server identification><Command> [<Size>, <Data>]

[ ] = Optional elements

5.4.2 Response

<ACK>, [<ECHO>]

or

ESC <Server identification><Command><Size><Data>

[ ] = Optional elements

<ACK> Acknowledge
<NAK> Negative Acknowledge

<ECHO> reports the matrix sequences solicited by a command and thus the new switching status of the matrix. The echo can be used to update user applications and to operate several matrices in parallel. See Chapter 5.4.1 System Data in the Draco tera manual to get more information about Echo Mode.

Use the <ECHO> reports to verify that the switch commands have been executed as requested. Update the external switch status according to the <ECHO> reports rather than according to your commands.

5.5 Constraints

- Maximum buffer size for data transfer is 8192 bytes.
- 16 sockets for TCP/IP communication over port 5555 are available. Ensure that there will be at least one socket left for the communication with the Java tool.
- Wait for a response before sending another request to the matrix.

6 Operation and Specifications

The Draco tera can be controlled via RS232 serial interface or TCP/IP socket (port 5555).

Telegram structure

Type	Bytes	Description
Control character	1	Always: ESC (0x1B)
Server identification	1	Identification of service
Command	1	A special command
Size	2	Optional, if telegram size > 3
Data	n	Optional, n bytes of data

Byte Order: **Little Endian**

Example: 1012 -> 0xF4 0x03 (not 0x03 0xF4!)

(Special) characters: ACK 0x06

NAK 0x15

Request

ESC <Server identification><Command> [<Size>, <Data>]

[ ] = Optional elements

Response

<ACK> , [<ECHO>]

or

ESC <Server identification><Command><Size><Data>

[ ] = Optional elements

<ECHO> reports the matrix sequences solicited by a command and thus the new switching status of the matrix. The echo can be used to update user applications and to operate several matrices in parallel.

Sequence of a Data Communication

Draco tera Matrix	Control CPU
–	Sending of a command
Acquiring of a command, processing of a command, blocking of further commands	–
a) Errors occurred: <NAK> b) No errors: <ACK> c) Optional: <ECHO> d) Optional: Reply telegram with data	–
–	a) Repeat telegram b) Next command c) Receive and process the reply telegram

The serial interface can be blocked while OSD has been opened.

6.1 System Requests

6.1.1 Get System Time

Request

Telegram
ESC (S

General Description
Get system time

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
(	1	Server identification	0x28
S	1	Command	0x53

Example
Get system time 0x1B 0x28 0x53

Response

Telegram
ESC) S Size Seconds Minutes Hours Day Date Month Year

General Description
Return system time

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
)	1	Server identification	0x29
S	1	Command	0x53
Size	2	Total length of telegram (12 Bytes)	0x0C 0x00
Seconds	1	Seconds (0 – 59)	0x00 – 0x59
Minutes	1	Minutes (0 – 59)	0x00 – 0x59
Hours	1	Hours (0 – 23)	0x00 – 0x23
Day	1	Day (1 – 7, Monday = 1)	0x01 – 0x07
Date	1	Date (1- 31)	0x01 – 0x31
Month	1	Month (1 – 12)	0x01 – 0x12
Year	1	Year (+2000)	e.g. 2012 = 0x12

Example
Return system time: Saturday 15:27:48 28.01.2012 0x1B 0x29 0x53 0x0C 0x00 0x48 0x27 0x15 0x06 0x28 0x01 0x12

The system is encoded in the BCD format.

6.1.2 Get System Status

Request

Telegram
ESC [z

General Description
Get system status

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
z	1	Command	0x7A

Example
Get system status 0x1B 0x5B 0x7B

Response

Telegram
ESC] z CRC bitset

General Description
Return system system status

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
z	1	Command	0x7A
Size	2	Total length of telegram (13 Bytes)	0x0D 0x00
Bitset 1	1	Bit 00: taskMAIN active Bit 01: taskLAN active Bit 02: taskSOCKET active Bit 03: taskSWITCH active Bit 04: taskSYNC active Bit 05: taskUART active Bit 06: taskINT active Bit 07: taskOSD1 active	0x00 – 0xFF 00000001 00000010 00000100 00001000 00010000 00100000 01000000 10000000
Bitset 2	1	Bit 08: Switch IC active Bit 09: Switch over-temp. Bit 10: Grid active Bit 11: Grid Master Bit 12: 576er Master CPU Bit 13: 576er Slave CPU Bit 14: Redundancy primary CPU Bit 15: Redundancy secondary CPU	0x00 – 0xFF 00000001 00000010 00000100 00001000 00010000 00100000 01000000 10000000
Bitset 3	1	Bit 16: PSU 1 available Bit 17: PSU 1 voltage ok Bit 18: PSU 1 error Bit 19: PSU 2 available Bit 20: PSU 2 voltage ok Bit 21: PSU 2 error Bit 22: PSU 3 available Bit 23: PSU 3 voltage ok	0x00 – 0xFF 00000001 00000010 00000100 00001000 00010000 00100000 01000000 10000000

Type	Bytes	Description	Hex Coding
Bitset 4	1	Bit 24: PSU 3 error Bit 25: PSU 4 available Bit 26: PSU 4 voltage ok Bit 27: PSU 4 error Bit 28: Fan 1 ok Bit 29: Fan 1 error Bit 30: Fan 2 ok Bit 31: Fan 2 error	0x00 – 0xFF 00000001 00000010 00000100 00001000 00010000 00100000 01000000 10000000
Bitset 5	1	Not in use	0x00
Bitset 6	1	Not in use	0x00
Bitset 7	1	Not in use	0x00
Bitset 8	1	Not in use	0x00
Bitset 9	4	GLActive Total number of Grid Lines in the system	e.g. 8 Grid Lines 0x08 0x00 0x00 0x00
Bitset 10	4	GLBusy Number of Grid Lines in use	e.g. 2 Grid Lines 0x02 0x00 0x00 0x00
Bitset 11	4	GLFree Number of unused Grid Lines [GLActive – GLBusy]	e.g. 6 Grid Lines 0x06 0x00 0x00 0x00

Example
Return system status 0x1B 0x5D 0x7A 0x0D 0x00 0x2D (00101101) 0x0D (00001101) 0x00 (00000000) 0x00 (00000000) 0x00 (00000000) 0x00 (00000000) 0x00 (00000000) 0x00 (00000000)

The system status is encoded in the CRC format.

6.2 Switch Commands

6.2.1 Switch off all ports

Request

Telegram
ESC [A

General Description
Switch off all ports

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
A	1	Command	0x41

Example
Switch off all ports 0x1B 0x5B 0x41

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.2 Get CPU device connected to CON device

Request

Telegram
ESC [H Size ConID

General Description
Get CPU device (input) connected to CON device (output)

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
H	1	Command	0x48
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example
Get CPU device connected to CON device (ConID = 3017) 0x1B 0x5B 0x48 0x07 0x00 0xC9 0x0B

Response

Telegram
ESC] H Size ConID CpuID

General Description
Return CPU device (input) connected to CON device (output)

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
H	1	Command	0x48
Size	2	Total length of telegram (9 Bytes)	0x09 0x00
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03

Example
Return CPU device (CpuID = 1012) connected to CON device (ConID = 3017) 0x1B 0x5D 0x48 0x09 0x00 0xC9 0x0B 0xF3 0x03

or <NAK>

6.2.3 Set connection of CPU device to CON device

Request

Telegram
`ESC [ I Size ConID CpuID`

General Description
Set CPU device connection (input) to CON device (output) Input data of CPU device (Video, USB, Audio, …) will be transmitted to CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
I	1	Command	`0x49`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`

Example
Set CPU device (`CpuID = 1012`) connection to CON device (`ConID = 3017`) `0x1B 0x5B 0x49 0x09 0x00 0xC9 0x0B 0xF4 0x03`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.4 Get CPU devices connected to CON devices

Request

Telegram
`ESC [ J Size ConCnt ConID[1] … ConID[ConCnt]`

General Description
Get CPU devices (input) connected to CON device (output) For `ConCnt = 0`, all CON devices will be returned

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
J	1	Command	`0x4A`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `ConCnt = 3` `0x0D 0x00`
ConCnt	2	Number of CON devices	e.g. `3 = 0x03 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`

Example
Return CPU devices connected to CON devices (`ConID = 3017, 3028, 3040`) `0x1B 0x5B 0x4A 0x0D 0x00 0x03 0x00 0xC9 0x0B 0xD4 0x0B 0xE0 0x0B`

Response

Telegram
`ESC ] J Size ConCnt <ConID, CpuID>[1] …` `<ConID, CpuID>[ConCnt]`

General Description
Get CPU devices (input) connected to CON devices (output). Returns a list of pairs of ConID, CpuID

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
J	1	Command	0x4A
Size	2	Total length of telegram (7 Bytes + data)	e.g. for ConCnt = 3 0x13 0x00
ConCnt	2	Number of CON devices	e.g. 3 = 0x03 0x00
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03

Example

Get CPU devices connected to CON devices

```
CpuID[1] = 1012, ConID[1] = 3017;
CpuID[2] = 1013, ConID[2] = 3028;
CpuID[3] = 1020, ConID[3] = 3040;
```

```
0x1B 0x5D 0x4A 0x13 0x00 0x03 0x00 0xC9 0x0B 0xF4 0x03
0xD4 0x0B 0xF5 0x03 0x0E 0x0B 0xFC 0x03
```

or <NAK>

6.2.5 Set connections of CPU devices to CON devices

Request

Telegram
`ESC [ K Size ConCnt <ConID, CpuID>[1] … <ConID, CpuID>[ConCnt]`

General Description
Set connections of CPU devices (input) to CON devices (output). Data of CPU (Video, USB, Audio, …) will be transmitted to CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
K	1	Command	`0x4B`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `ConCnt = 3` `0x13 0x00`
ConCnt	2	Number of CONs	e.g. `3 = 0x03 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`

Example

Set connections of CPU devices to CON devices
`ConID[1] = 3017, CpuID[1] = 1012;`
`ConID[2] = 3028, CpuID[2] = 3013;`
`ConID[3] = 3040, CpuID[3] = 1020;`
`0x1B 0x5B 0x4B 0x13 0x00 0x03 0x00 0xC9 0x0B 0xF4 0x03 0xD4 0x0B 0xF5 0x03 0x0E 0x0B 0xFC 0x03`

Response

<ACK> [<ECHO>] or <NAK>

[ ] = Optional elements

6.2.6 Get CON device connected to CPU device

Request

Telegram
`ESC [ L Size CpuID`

General Description
Get CON device (input) connected to CPU device (output)

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
L	1	Command	`0x4C`
Size	2	Total length of telegram (7 Bytes)	`0x07 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`

Example
Get CON device connected to CPU device (`CpuID = 1012`) `0x1B 0x5B 0x4C 0x07 0x00 0xF4 0x03`

Response

Telegram
`ESC ] L Size CpuID ConID`

General Description
Return CON device (input) connected to CPU device (output)

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
L	1	Command	0x4C
Size	2	Total length of telegram (9 Bytes)	0x09 0x00
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example
Return CON device (ConID = 3017) connected to CPU device (CpuID = 1012) 0x1B 0x5D 0x4C 0x09 0x00 0xF4 0x03 0xC9 0x0B

or <NAK>

6.2.7 Set connection of CON device to CPU device

Request

Telegram
`ESC [ M Size CpuID ConID`

General Description
Set CON device (input) connection to CPU device (output) Input data of CON device (USB, Audio) will be transmitted to CPU device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
M	1	Command	`0x4D`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`

Example
Set CON device (`ConID = 3017`) connection to CPU device (`CpuID = 1012`) `0x1B 0x5B 0x4D 0x09 0x00 0xF4 0x03 0xC9 0x0B`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.8 Get CON devices connected to CPU devices

Request

Telegram
`ESC [ N Size CpuCnt CpuID[1] … CpuID[CpuCnt]`

General Description
Get CON devices (input) connected to CPU devices (output). For `CpuCnt = 0`, all CPU devices will be returned

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
N	1	Command	`0x4E`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `CpuCnt = 3` `0x0D 0x00`
CpuCnt	2	Number of CPU devices	e.g. `3 = 0x03 0x00`
CpuID	2	ID of CPU device	e. g. `1012 = 0xF4 0x03`

Example
Get CON devices connected to CPU devices (`CpuID = 1012, 1013, 1020`) `0x1B 0x5B 0x4E 0x0D 0x00 0x03 0x00 0xF4 0x03 0xF5 0x03 0xFC 0x03`

Response

Telegram
`ESC ] N Size CpuCnt <CpuID, ConID>[1] …` `<CpuID, ConID>[CpuCnt]`

General Description
Return CON devices (input) connected to CPU devices (output). Returns a list of pairs of CpuID, ConID

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
N	1	Command	0x4E
Size	2	Total length of telegram (7 Bytes + data)	e.g. for CpuCnt = 3 0x13 0x00
CpuCnt	2	Number of CPU devices	e.g. 3 = 0x03 0x00
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example

Return CON devices connected to CPU devices

```
CpuID[1] = 1012, ConID[1] = 3017;
CpuID[2] = 1013, ConID[2] = 3028;
CpuID[3] = 1020, ConID[3] = 3040;
```

```
0x1B 0x5D 0x4E 0x13 0x00 0x03 0x00 0xF4 0x03 0xC9 0x0B
0xF5 0x03 0xD4 0x0B 0xFC 0x03 0x0E 0x0B
```

or <NAK>

6.2.9 Set connection of CON devices to CPU devices

Request

Telegram
`ESC [ O Size CpuCnt <CpuID, ConID>[1] … <CpuID, ConID>[CpuCnt]`

General Description
Set connection CON devices (input) to CPU devices (output). Data of CON device (USB, Audio) will be transmitted to CPU device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
O	1	Command	`0x4F`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `CpuCnt = 3` `0x13 0x00`
CpuCnt	2	Number of CPU devices	e.g. `3 = 0x03 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`

Example

Set connection of CON devices to CPU devices.
`CpuID[1] = 1012, ConID[1] = 3017;`
`CpuID[2] = 1013, ConID[2] = 3028;`
`CpuID[3] = 1020, ConID[3] = 3040;`
`0x1B 0x5B 0x4F 0x13 0x00 0x03 0x00 0xF4 0x03 0xC9 0x0B`
`0xF5 0x03 0xD4 0x0B 0xFC 0x03 0x0E 0x0B`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.10 Set connection of CON device to CPU device (bidirectional)

Request

Telegram
`ESC [ P Size CpuID ConID`

General Description
Set CON device (input) connection to CPU device (output) and CPU device (input) connection to CON device (output) Data of CON device (USB, Audio, …) will be transmitted to CPU device Data of CPU device (Video, USB, Audio, …) will be transmitted to CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
P	1	Command	`0x50`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`

Example
Set CON device (`ConID = 3017`) connection to CPU device (`CpuID = 1012`) `0x1B 0x5B 0x50 0x09 0x00 0xF4 0x03 0xC9 0x0B`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.11 Set connection of CON devices to CPU devices (bidirectional)

Request

Telegram
`ESC [ Q Size Cnt <CpuID, ConID>[1] … <CpuID, ConID>[Cnt]`

General Description
Set connection of CON devices (input) to CPU devices (output) and CPU devices (input) to CON devices (output) Data of CON device (USB, Audio, …) will be transmitted to CPU device Data of CPU device (Video, USB, Audio, …) will be transmitted to CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
Q	1	Command	`0x51`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `Cnt = 3` `0x13 0x00`
`Cnt`	2	Size of list	e.g. `3 = 0x03 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`

Example

Connect CONs with CPUs and CPUs with CONs
`CpuID[1] = 1012, ConID[1] = 3017;`
`CpuID[2] = 1013, ConID[2] = 3028;`
`CpuID[3] = 1020, ConID[3] = 3040;`
`0x1B 0x5B 0x51 0x13 0x00 0x03 0x00 0xF4 0x03 0xC9 0x0B 0xF5 0x03 0xD4 0x0B 0xFC 0x03 0x0E 0x0B`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.12 Get connections for all CON devices and CPU devices

Request

Telegram
ESC [R

General Description
Get all CPU device – CON device connections

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
R	1	Command	0x52

Example
Get all CPU device – CON device connections 0x1B 0x5B 0x52

Response

Telegram
ESC] R Size CpuCnt ConCnt <CpuID, ConID>[1] … <CpuID, ConID>[CpuCnt] <ConID, CpuID>[1] … <ConID, CpuID>[ConCnt]

General Description
Return all CPU device – CON device connections in pairs. For each defined CPU device the ConID of the connected CON device will be added, or 0 if the CPU device is disconnected. For each defined CON device the CpuID of the connected CPU device will be added, or 0 if the CON device is disconnected.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
R	1	Command	0x52
Size	2	Total length of telegram (9 Bytes + data)	e.g. for CpuCnt = 3 ConCnt = 2 0x15 0x00
CpuCnt	2	Number of CPU device	e.g. 3 = 0x03 0x00
ConCnt	2	Number of CON device	e.g. 2 = 0x02 0x00
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example

Return all CPU device – CON device connections in pairs

```
CpuID[1] = 1012, ConID[1] = 3017;
CpuID[2] = 1013, ConID[2] = 3028;
CpuID[3] = 1020, ConID[3] = 3040;

ConID[1] = 3017, CpuID[1] = 1012;
ConID[2] = 3028, CpuID[2] = 0;

0x1B 0x5D 0x52 0x15 0x00 0x03 0x00 0x02 0x00 0xF4 0x03
0xC9 0x0B 0xF5 0x03 0xD4 0x0B 0xFC 0x03 0x0E 0x0B 0xC9
0x0B 0xF4 0x03 0xD4 0x0B 0x00 0x00
```

or <NAK>

6.2.13 Set connection for all CON devices and CPU devices

Request

Telegram
`ESC [ S Size CpuCnt ConCnt <CpuID, ConID>[1] … <CpuID, ConID>[ CpuCnt] <ConID, CpuID>[1] … <ConID, CpuID>[ ConCnt]`

General Description
Set a connection for all defined CON devices and CPU devices. For each defined CPU device add the ConID, or 0 if the CPU device is disconnected. For each defined CON device add the CpuID, or 0 if the CON device is disconnected.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
S	1	Command	0x53
Size	2	Total length of telegram (9 Bytes + data)	e.g. for CpuCnt = 3 ConCnt = 2 0x15 0x00
CpuCnt	2	Number of CPUs	e.g. 3 = 0x03 0x00
ConCnt	2	Number of CONs	e.g. 2 = 0x02 0x00
CpuID	2	ID of CPU device	e.g. 1012 = 0xF4 0x03
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example

Set a connection for all defined CON devices and CPU devices

```
CpuID[1] = 1012, ConID[1] = 3017;
CpuID[2] = 1013, ConID[2] = 3028;
CpuID[3] = 1020, ConID[3] = 3040;

ConID[1] = 3017, CpuID[1] = 1012;
ConID[2] = 3028, CpuID[2] = 0;

0x1B 0x5B 0x53 0x15 0x00 0x03 0x00 0x02 0x00 0xF4 0x03
0xC9 0x0B 0xF5 0x03 0xD4 0x0B 0xFC 0x03 0x0E 0x0B 0xC9
0x0B 0xF4 0x03 0xD4 0x0B 0x00 0x00
```

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.14 Set extended connection

Request

Telegram
`ESC [ b Size CpuID ConID Mode`

General Description
Set CON device (input) connection to CPU device (output) and CPU device (input) connection to CON device (output) Data of CON device (USB, Audio, …) is transmitted to a CPU device Data of CPU device (Video, USB, Audio, …) is transmitted to a CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
b	1	Command	`0x62`
Size	2	Total length of telegram	`0x0B 0x00`
CpuID	2	ID of a CPU device	e.g. `1012 = 0xF4 0x03`
ConID	2	ID of a CON device	e.g. `3017 = 0xC9 0x0B`

Mode	2	Connection mode
		(0 = full access,
		1 = video only,
		2 = private mode)
			`0 = 0x00 0x00`
			`1 = 0x01 0x00`
			`2 = 0x02 0x00`

Example

Set CON device connection to CPU device and CPU device connection to CON device
`CpuID = 1012, ConID = 3017, Mode = private mode`
`0x1B 0x5B 0x62 0x0B 0x00 0xF4 0x03 0xC9 0x0B 0x02 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.15 Set connection of CON device to CPU device (bidirectional, port mode)

Request

Telegram
`ESC [ C Size ConPort CpuPort`

General Description
Set connection of CON port (input) to CPU port (output) and connection of CPU port (input) to CON port (output). Data of CON device (USB, Audio, …) will be transmitted to CPU device. Data of CPU device (Video, USB, Audio, …) will be transmitted to CON device.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
C	1	Command	`0x43`
Size	2	Total length of telegram (9 bytes)	`0x09 0x00`
ConPort	2	Port number of CON device	e.g. `10 = 0x0A 0x00`
CpuPort	2	Port number of CPU device	e.g. `20 = 0x14 0x00`

Example
Set CON port (`ConPort = 10`) connection to CPU port (`CpuPort = 20`) `0x1B 0x5B 0x43 0x09 0x00 0x0A 0x00 0x14 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.16 Set connection of CON device to CPU device (port mode)

Request

Telegram
`ESC [ F Size ConPort CpuPort`

General Description
Set connection of CPU port (input) to CON port (output). Data of CPU device (Video, USB, Audio, …) will be transmitted to CON device.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
F	1	Command	`0x46`
Size	2	Total length of telegram (9 bytes)	`0x09 0x00`
ConPort	2	Port number of CON device	e.g. `10 = 0x0A 0x00`
CpuPort	2	Port number of CPU device	e.g. `20 = 0x14 0x00`

Example
Set CON port (`ConPort = 10`) connection to CPU port (`CpuPort = 20`) `0x1B 0x5B 0x46 0x09 0x00 0x0A 0x00 0x14 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.17 Set connection of CPU devices to CON devices (port mode)

Request

Telegram
`ESC [ G Size CpuCnt <ConPort, CpuPort>[1] … <ConPort, CpuPort>[CpuCnt]`

General Description
Set connection of CPU port (input) to CON port (output). Data of CPU device (Video, USB, Audio, …) will be transmitted to CON device.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
G	1	Command	`0x47`
Size	2	Total length of telegram (19 bytes)	`0x13 0x00`
ConCnt	2	Number of CON devices	e.g. `3 = 0x03 0x00`
ConPort	2	Port number of CON device	e.g. `10 = 0x0A 0x00`
CpuPort	2	Port number of CPU device	e.g. `20 = 0x14 0x00`

Example

Set CON port connections to CPU ports
`ConPort[1] = 5, CpuPort[1] = 3;`
`ConPort[2] = 2, CpuPort[2] = 6;`
`ConPort[3] = 4, CpuPort[3] = 7;`
 	
`0x1B 0x5B 0x47 0x13 0x00 0x03 0x00 0x05 0x00 0x03 0x00 0x02 0x00 0x06 0x00 0x04 0x00 0x07 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.18 Get CPU device connected to CON device (port mode)

Request

Telegram
`ESC [ B Size ConID`

General Description
Get port of CPU device (input) connected to CON device (output).

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
B	1	Command	`0x42`
Size	2	Total length of telegram (7 bytes)	`0x07 0x00`
ConID	2	ID of CON device	e.g. `5 = 0x05 0x00`

Example
Get CPU device connected to CON device (`ConID = 3017`) `0x1B 0x5B 0x42 0x07 0x00 0x05 0x00`

6.2.19 Get CPU devices connected to CON devices (port mode)

Request

Telegram
`ESC [ D Size ConCnt ConID[1] … ConID[ConCnt]`

General Description
Get CPU devices (input) connected to CON device (output). For `ConCnt = 0`, all CON devices will be returned.

Type	**Bytes**	**Description**	**Hex Coding**
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
D	1	Command	`0x44`
Size	2	Total length of telegram (13 bytes)	e.g. for `ConCnt = 3` `0x0D 0x00`
ConCnt	2	Number of CON devices	e.g. `3 = 0x03 0x00`
ConID	2	ID of CON device	e.g. `2 = 0x02 0x00`

Example
Return ports of CPU devices connected to CON devices (`ConPort = 2, 4, 5`) `0x1B 0x5B 0x44 0x0D 0x00 0x03 0x00 0x02 0x00 0x04 0x00 0x05 0x00`

6.2.20 Set local CPU connection

Request

Telegram
`ESC [ f Size ConID KVM`

General Description
Set CON device (input) connection to local CPU device (output).

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
f	1	Command	`0x66`
Size	2	Total length of telegram (9 bytes)	`0x09 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`
KVM	2	Connection mode	Primary port: `1 = 0x01 0x00` Secondary port: `2 = 0x02 0x00` Local CPU: `3 = 0x03 0x00`

Example
Set CON device connection to local CPU `0x1B 0x5B 0x66 0x09 0x00 0xC9 0x0B 0x03 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.21 Set connection of single CPU extenders to single CON extenders in Multi-Head devices

Request

Telegram
`ESC [ l Size CpuID ConID`

General Description
Set CPU extender connection (input) to CON extender (output) Input data of CPU extender (Video, USB, Audio, …) will be transmitted to CON extender

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
l	1	Command	`0x6C`
Size	2	Total length of telegram (13 bytes)	`0x0D 0x00`
CpuID	2	ID of CPU device	e.g. `1012 = 0xF4 0x03`
CpuExt	2	Extender number of CPU device	e.g. `4 = 0x04 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`
ConExt	2	Extender number of CON device	e.g. `2 = 0x02 0x00`

Example
Set CPU extender connection (`CpuExt = 4`) of CPU device (`CpuID = 1012`) to CON extender (`ConExt = 2`) of CON device (`ConID = 3017`). `0x1B 0x5B 0x6C 0x0D 0x00 0xF4 0x03 0x04 0x00 0xC9 0x00 0x02 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.22 Execute CON/User Macro

Request

Telegram
`ESC [ o Size Key KeyUser KeyCon ConID`

General Description
Execute a CON or user macro.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
]	1	Server identification	`0x5B`
p	1	Command	`0x6F`
Size	2	Total length of telegram (13 Bytes)	`0x0D 0x00`
Key	2	Macro key (F1 – F32)	e.g. `F1 = 0x01 0x00`
KeyUser	2	Enable user macro	Enable for UserID = 5 `0x05 0x00`, disable `0x00 0x00`
KeyCon	2	Enable CON macro	enable `0x01 0x00`, disable `0x00 0x00`
ConID	2	ID of CON device for executing the macro	e.g. `3017 = 0xC9 0x0B`

Example
Execute user macro F3 (`UserID = 5`) at CON device (`ConID = 3017`) `0x1B 0x5B 0x6F 0x0D 0x00 0x03 0x00 0x05 0x00 0x00 0x00 0xC9 0x0B`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.2.23 Get CPU List

Request

Telegram
ESC [g Size First

General Description
Get list of all CPU devices (output) including ID, name and online status First: Index of CPU device from which the list scan will start

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
g	1	Command	0x67
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
First	2	Index of first CPU	e.g. 3 = 0x03 0x00 0 (all) = 0x00 0x00

Example
Get all CPUs 0x1B 0x5B 0x67 0x07 0x00 0x00 0x00

Response

Telegram
ESC] g Size Count Next List [1] … List [Count]

General Description	
Count:	Number of items in the CPU list
Next:	Index of the next CPU, if the list of CPU devices exceeds the telegram size. Contains 0 if there are no more CPU devices.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
g	1	Command	0x67
Size	2	Total length of telegram	e.g. 33 = 0x21 0x00
Count	2	Number of CPUs	e.g. 1 = 0x01 0x00
Next	2	ID of first CPU in next list	e.g. 0 = 0x00 0x00 (no further CPU)
Id	4	ID of CPU device	e.g. 1000 = 0xE8 0x03 0x00 0x00
Name	17	Name of CPU	e.g. CPU_Video1 = 0x43 0x50 0x55 0x5F 0x56 0x69 0x64 0x65 0x6F 0x31
Status	1	Status of CPU device	= 0x00 = offline ≠ 0x00 = online

Example
Return list of CPUs 0x1B 0x5D 0x67 0x21 0x00 0x01 0x00 0x00 0x00 0xE8 0x03 0x00 0x00 0x43 0x50 0x55 0x5F 0x56 0x69 0x64 0x65 0x6F 0x31 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x01 0x00 0x00

or <NAK>

6.2.24 Get CON List

Request

Telegram
ESC [h Size First

General Description
Get list of all CON devices (input) including ID, name, online status and user First: Index of CON device from which the list scan will start

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
h	1	Command	0x68
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
First	2	Index of first CON	e.g. 5 = 0x05 0x00 0 (all) = 0x00 0x00

Example
Get all CONs 0x1B 0x5B 0x68 0x07 0x00 0x00 0x00

Response

Telegram
ESC] h Size Count Next List [1] … List [Count]

General Description	
Count:	Number of items in the CON list
Next:	Index of the next CON, if the list of CON devices exceeds the telegram size. Contains 0 if there are no more CON devices.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
h	1	Command	0x68
Size	2	Total length of telegram	e.g. 33 = 0x21 0x00
Count	2	Number of CONs	e.g. 1 = 0x01 0x00
Next	2	ID of first CON in next list	e.g. 0 = 0x00 0x00 (no further CON)
Id	4	ID of CON device	e.g. 3000 = 0xB8 0x0B 0x00 0x00
Name	17	Name of CON	e.g. CON_Video1 = 0x43 0x4F 0x4E 0x5F 0x56 0x69 0x64 0x65 0x6F 0x31
Status	1	Status of CON device	= 0x00 = offline ≠ 0x00 = online
Info	2	Info about logged in user	e.g. user with ID 1 1 = 0x01 0x00

Example
Return list of CONs 0x1B 0x5D 0x68 0x21 0x00 0x01 0x00 0x00 0x00 0xB8 0x0B 0x00 0x00 0x43 0x4F 0x4E 0x5F 0x56 0x69 0x64 0x65 0x6F 0x31 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x01 0x01 0x00

or <NAK>

6.2.25 Get User List

Request

Telegram
ESC [i Size First

General Description
Get list of all users First: Index of the user from whom the list scan will start

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
i	1	Command	0x69
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
First	2	Index of first user	e.g. 1 = 0x01 0x00 0 (all) = 0x00 0x00

Example
Get all users 0x1B 0x5B 0x69 0x07 0x00 0x00 0x00

Response

Telegram
ESC] i Size Count Next List [1] … List [Count]

General Description	
Count:	Number of items in the user list
Next:	Index of the next user, if the list of users exceeds the telegram size. Contains 0 if there are no more users.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
i	1	Command	0x69
Size	2	Total length of telegram	e.g. 33 = 0x21 0x00
Count	2	Number of users	e.g. 1 = 0x01 0x00
Next	2	ID of first user in next list	e.g. 0 = 0x00 0x00 (no further user)
Id	4	ID of user	e.g. 1 = 0x01 0x00 0x00 0x00
Name	20	Name of user	e.g. admin = 0x61 0x64 0x6D 0x69 0x6E

Example
Return list of users 0x1B 0x5D 0x69 0x21 0x00 0x01 0x00 0x00 0x00 0x01 0x00 0x00 0x00 0x61 0x64 0x6D 0x69 0x6E 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

or <NAK>

6.2.26 Get Link Status

Request

Telegram
ESC [m Size ConID

General Description
Get link status of CON device

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
m	1	Command	0x6D
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B

Example
Get link status of CON device (ConID = 3001) 0x1B 0x5B 0x6D 0x07 0x00 0xB9 0x00

Response

Telegram
ESC [m Size ConID Status

General Description
Status: Link status of extender

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
m	1	Command	0x6D
Size	2	Total length of telegram (9 Bytes)	0x09 0x00

Type	Bytes	Description	Hex Coding
ConID	2	ID of CON device	e.g. 3017 = 0xC9 0x0B
Status	2	Status of extender link	Primary link: 0x01 0x00 Secondary link: 0x02 0x00 Local CPU: 0x03 0x00

Example
Return extender link for CON device connected via link 1 0x1B 0x5B 0x6D 0x07 0x00 0xB9 0x00 0x01 0x00

or <NAK>

Only the first extender of a CON device can be queried.

6.3 Assignments

6.3.1 Get Virtual CON Device

Request

Telegram
ESC [T Size RConID

General Description
Get virtual CON device of a real CON device

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
T	1	Command	0x54
Size	2	Total length of telegram (7 Bytes)	0x07 0x00
RConID	2	ID of real CON device	e.g. 3017 = 0xC9 0x0B

Example
Get virtual CON device of a real CON device (RConID = 3017) 0x1B 0x5B 0x54 0x07 0x00 0xC9 0x0B

Response

Telegram
ESC] T Size RConID VConID

General Description
Return virtual CON device of a real CON device

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
T	1	Command	0x54
Size	2	Total length of telegram (9 Bytes)	0x09 0x00
RConID	2	ID of real CON device	e.g. 3017 = 0xC9 0x0B
VConID	2	ID of virtual CON device	e.g. 4034 = 0xC2 0x0F

Example
Return virtual CON device (VConID = 4034) of a real CON device (RConID = 3017) 0x1B 0x5B 0x54 0x09 0x00 0xC9 0x0B 0xC2 0x0F

or <NAK>

6.3.2 Set Virtual CON Device to a Real CON Device

Request

Telegram
`ESC [ U Size RConID VConID`

General Description
Set virtual CON device to a real CON device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
U	1	Command	`0x55`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
RConID	2	ID of real CON device	e.g. `3017 = 0xC9 0x0B`
VConID	2	ID of virtual CON device	e.g. `4034 = 0xC2 0x0F`

Example
Set virtual CON device (`VConID = 4034`) to a real CON device (`RConID = 3017`) `0x1B 0x5B 0x55 0x09 0x00 0xC9 0x0B 0xC2 0x0F`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.3.3 Get Real CPU Device

Request

Telegram
`ESC [ V Size VCpuID`

General Description
Get real CPU device of a virtual CPU device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
V	1	Command	`0x56`
Size	2	Total length of telegram (7 Bytes)	`0x07 0x00`
VCpuID	2	ID of virtual CPU device	e.g. `2018 = 0xE2 0x07`

Example
Get real CPU device of a virtual CPU device (`VCpuID = 2018`) `0x1B 0x5B 0x56 0x07 0x00 0xE2 0x07`

Response

Telegram
`ESC ] V Size VCpuID RCpuID`

General Description
Return real CPU device of a virtual CPU device

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
V	1	Command	0x56
Size	2	Total length of telegram (9 Bytes)	0x09 0x00
VCpuID	2	ID of virtual CPU device	e.g. 2018 = 0xE2 0x07
RCpuID	2	ID of real CPU device	e.g. 1012 = 0xF4 0x03

Example
Return real CPU device (RCpuID = 1012) of a virtual CPU device (VCpuID = 2018) 0x1B 0x5D 0x56 0x09 0x00 0xE2 0x07 0xF4 0x03

or <NAK>

6.3.4 Set Real CPU Device to a Virtual CPU Device

Request

Telegram
`ESC [ W Size VCpuID RCpuID`

General Description
Set real CPU device to a virtual CPU device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
W	1	Command	`0x57`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
`VCpuID`	2	ID of virtual CPU device	e.g. `2018 = 0xE2 0x07`
`RCpuID`	2	ID of real CPU device	e.g. `1012 = 0xF4 0x03`

Example
Set real CPU device (`RCpuID = 1012`) to a virtual CPU device (`VCpuID = 2018`) `0x1B 0x5B 0x57 0x09 0x00 0xE2 0x07 0xF4 0x03`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.3.5 Get Virtual CON Devices

Request

Telegram
`ESC [ X Size ConCnt RConID[1] … RConID[ConCnt]`

General Description
Get virtual CON devices of a real CON devices For `ConCnt = 0`, all real CON devices with assignments to virtual CON devices will be returned.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
X	1	Command	`0x58`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `ConCnt = 3` `0x0D 0x00`
ConCnt	2	Number of CON device	e.g. `3 = 0x03 0x00`
RConID	2	ID of real CON device	e.g. `3017 = 0xC9 0x0B`

Example
Return virtual CON devices of a real CON devices as pairs (`RConID = 3017, 3028, 3040`) `0x1B 0x5B 0x58 0x0D 0x00 0x03 0x00 0xC9 0x0B 0xD4 0x0B 0xE0 0x0B`

Response

Telegram
`ESC ] X Size ConCnt <RConID, VConID>[1] …` `<RConID, VConID>[ConCnt]`

General Description
Return virtual CON devices of a real CON devices as pairs

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
X	1	Command	0x58
Size	2	Total length of telegram (7 Bytes + data)	e.g. for ConCnt = 3 0x13 0x00
ConCnt	2	Number of CON devices	e.g. 3 = 0x03 0x00
RConID	2	ID of real CON device	e.g. 3017 = 0xC9 0x0B
VConID	2	ID of virtual CON device	e.g. 4034 = 0xC2 0x0F

Example

Returns virtual CON of a real CON as pairs

```
RConID[1] = 3017, VConID[1] = 4034;
RConID[2] = 3028, VConID[2] = 4042;
RConID[3] = 3040, VConID[3] = 4045;
```

```
0x1B 0x5D 0x58 0x13 0x00 0xC9 0x0B 0xC2 0x0F 0xD4 0x0B
0xCA 0x0F 0xE0 0x0B 0xCD 0x0F
```

or <NAK>

6.3.6 Set Virtual CON Devices to Real CON Devices

Request

Telegram
`ESC [ Y Size ConCnt <RConID, VConID>[1] … <RConID, VConID>[ConCnt]`

General Description
Set virtual CON devices to real CON devices

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
Y	1	Command	`0x59`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `ConCnt = 3` `0x13 0x00`
ConCnt	2	Number of CON devices	e.g. `3 = 0x03 0x00`
RConID	2	ID of real CON device	e.g. `3017 = 0xC9 0x0B`
VConID	2	ID of virtual CON device	e.g. `4034 = 0xC2 0x0F`

Example

Set virtual CON devices to real CON devices
`RConID[1] = 3017, VConID[1] = 4034;`
`RConID[2] = 3028, VConID[2] = 4042;`
`RConID[3] = 3040, VConID[3] = 4045;`
`0x1B 0x5B 0x59 0x13 0x00 0xC9 0x0B 0xC2 0x0F 0xD4 0x0B 0xCA 0x0F 0xE0 0x0B 0xCD 0x0F`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.3.7 Get Real CPU Devices

Request

Telegram
ESC [Z Size CpuCnt VCpuID[1] … VCpuID[CpuCnt]

General Description
Get real CPU devices of virtual CPU devices For CpuCnt = 0, all virtual CPU devices with assignments to virtual CPU devices will be returned.

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
[	1	Server identification	0x5B
Z	1	Command	0x5A
Size	2	Total length of telegram (7 Bytes + data)	e.g. for ConCnt = 3 0x0D 0x00
CpuCnt	2	Number of CPU devices	e.g. 3 = 0x03 0x00
VCpuID	2	ID of virtual CPU device	e.g. 2018 = 0xE2 0x07

Example
Get real CPU devices of virtual CPU devices (VCpuID = 2018, 2030, 2035) 0x1B 0x5B 0x5A 0x0D 0x00 0x03 0x00 0xE2 0x07 0xEE 0x07 0xF3 0x07

Response

Telegram
ESC] Z Size CpuCnt <VCpuID, RCpuID>[1] … <VCpuID, RCpuID>[CpuCnt]

General Description
Return real CPU devices of virtual CPU devices as pairs

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
Z	1	Command	0x5A
Size	2	Total length of telegram (7 Bytes + data)	e.g. for CpuCnt = 3 0x13 0x00
CpuCnt	2	Number of CPU devices	e.g. 3 = 0x03 0x00
VCpuID	2	ID of virtual CPU device	e.g. 2018 = 0xE2 0x07
RCpuID	2	ID of real CPU device	e.g. 1012 = 0xF4 0x03

Example
Return real CPU devices of virtual CPU devices as pairs VCpuID[1] = 2018, RCpuID[1] = 1012; VCpuID[2] = 2030, RCpuID[2] = 1013; VCpuID[3] = 2035, RCpuID[3] = 1020; 0x1B 0x5D 0x5A 0x13 0x00 0x03 0x00 0xE2 0x07 0xF4 0x03 0xEE 0x07 0xF5 0x03 0xF3 0x07 0xFC 0x03

or <NAK>

6.3.8 Set Real CPU Devices

Request

Telegram
`ESC [ a Size CpuCnt <VCpuID, RCpuID>[1] … <VCpuID, RCpuID>[CpuCnt]`

General Description
Set real CPU devices to virtual CPU devices

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
a	1	Command	`0x61`
Size	2	Total length of telegram (7 Bytes + data)	e.g. for `CpuCnt = 3` `0x13 0x00`
CpuCnt	2	Number of CPU devices	e.g. `3 = 0x03 0x00`
VCpuID	2	ID of virtual CPU device	e.g. `2018 = 0xE2 0x07`
RCpuID	2	ID of real CPU device	e.g. `1025 = 0x16 0x04`

Example

Set real CPU devices to virtual CPU devices
`VCpuID[1] = 2018, RCpuID[1] = 1012;`
`VCpuID[2] = 2030, RCpuID[2] = 1013;`
`VCpuID[3] = 2035, RCpuID[3] = 1020;`
`0x1B 0x5B 0x61 0x13 0x00 0x03 0x00 0xE2 0x07 0xF4 0x03 0xEE 0x07 0xF5 0x03 0xF3 0x07 0xFC 0x03`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.3.9 Set Real CPU Device to a CPU Group

Request

Telegram
`ESC [ q Size RCpuID GCpuID`

General Description
Set real CPU device to a CPU group

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
[	1	Server identification	`0x5B`
q	1	Command	`0x71`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
RCpuID	2	ID of real CPU device	e.g. `1006 = 0xEE 0x03`
GCpuID	2	ID of CPU group	e.g. `2003 = 0xD3 0x07`

Example
Set real CPU device (`RCpuID = 1006`) to CPU group (`GCpuID = 2003`) `0x1B 0x5B 0x71 0x09 0x00 0xEE 0x03 0xD3 0x07`
Delete the CPU group assignment of a real CPU device (`RCpuID = 1006`) with `GCpuID = 0` `0x1B 0x5B 0x71 0x09 0x00 0xEE 0x03 0x00 0x00`
Remove all real CPU devices from a CPU group (`GCpuID = 2003`) with `RCpuID = 0` `0x1B 0x5B 0x71 0x09 0x00 0x00 0x00 0xD3 0x07`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

6.3.10 Get CPU Group of a Real CPU Device

Request

Telegram
`ESC [ p Size RCpuID`

General Description
Get CPU group of real CPU device

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
]	1	Server identification	`0x5D`
p	1	Command	`0x70`
Size	2	Total length of telegram (7 Bytes)	`0x07 0x00`
RCpuID	2	ID of CPU group	e.g. `1006 = 0xEE 0x03`

Example
Get CPU group of real CPU device (`RCpuID = 1006`) `0x1B 0x5B 0x70 0x07 0x00 0xEE 0x03`

Response

Telegram
`ESC ] p Size RCpuID GCpuID`

General Description
Return CPU group of a real CPU device

Type	Bytes	Description	Hex Coding
ESC	1	Control character	0x1B
]	1	Server identification	0x5D
p	1	Command	0x70
Size	2	Total length of telegram (9 Bytes)	0x07 0x00
RCpuID	2	ID of CPU group	e.g. 1006 = 0xEE 0x03
GCpuID	2	ID of CPU group	e.g. 2003 = 0xD3 0x07

Example
Get CPU group (GCpuID = 2003) of real CPU device (RCpuID = 1006) 0x1B 0x5D 0x70 0x09 0x00 0xEE 0x03 0xD3 0x07

or <NAK>

6.3.11 Login User at CON Device

Request

Telegram
`ESC [ e Size ConID UserID`

General Description
Login a user at a CON device. Access to CPUs is immediately available.

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
]	1	Server identification	`0x5B`
e	1	Command	`0x65`
Size	2	Total length of telegram (9 Bytes)	`0x09 0x00`
ConID	2	ID of CON device	e.g. `3017 = 0xC9 0x0B`
UserID	2	ID of User	e.g. `1 = 0x01 0x00`

Example
Login user (`UserID = 1`) at CON device (`ConID = 3017`) `0x1B 0x5B 0x49 0x09 0x00 0xC9 0x0B 0x01 0x00`

Response

<ACK> [<ECHO>] or <NAK>.

[ ] = Optional elements

To logout a user, use the UserID = 0.

6.3.12 Set Fix Frame Color

Request

Telegram
`ESC [ r Size CpuID ConID ColorID`

General Description
Set specific fix frame color to CON or CPU

Type	Bytes	Description	Hex Coding
`ESC`	1	Control character	`0x1B`
]	1	Server identification	`0x5B`
r	1	Command	`0x72`
Size	2	Total length of telegram (11 Bytes)	`0x0B 0x00`
CpuID	2	ID of CPU device	e.g. `1001 = 0xE9 0x03`
ConID	2	ID of CON device	e.g. `3007 = 0xBF 0x0B`
ColorID	2	Color code	e.g. `green = 0x02 0x00`

Example
Set red frame for CPU device (`CpuID = 1001`) `0x1B 0x5B 0x72 0x0B 0x00 0xE9 0x03 0x00 0x00 0x04 0x00`
Set green frame for CON device (`ConID = 3007`) `0x1B 0x5B 0x72 0x0B 0x00 0x00 0x00 0xBF 0x0B 0x02 0x00`

Color	Color Code
Off	0x00
Blue	0x01
Green	0x02
Cyan	0x03
Red	0x04
Magenta	0x05
Yellow	0x06
White	0x07

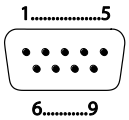
Response

<ACK> [<ECHO>] or <NAK>.

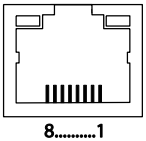
[ ] = Optional elements

6.4 Connector Pinouts

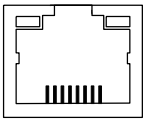
D-Sub 9 (Serial) RS232

Picture	Pin	Signal	Pin	Signal
	1	n.c.	6	DSR
	2	RxD	7	RTS
	3	TxD	8	CTS
	4	DTR	9	n.c.
	5	GND		

RJ45

Picture	Pin	Signal	Pin	Signal
	1	D1+	5	n.c
	2	D1–	6	D2–
	3	D2+	7	n.c
	4	n.c	8	n.c

RJ45 (Serial)

Picture	Pin	Signal	Pin	Signal
	1	DCD	5	RxD
	2	DSR	6	TxD
	3	RTS	7	CTS
	4	GND	8	DTR

7 Best Practice

This chapter provides an overview of the most commonly used switching commands and how they can be operated by using proven code examples of the external serial control.

Full Access (establishing a KVM connection)

Set CON device (`ConID = 3017`) connection to CPU device (`CpuID = 1012`):

```
0x1B 0x5B 0x62 0x09 0x00 0xF4 0x03 0xC9 0x0B 0x00 0x00
```

Disconnect:

```
0x1B 0x5B 0x62 0x09 0x00 0x00 0x00 0xC9 0x0B 0x00 0x00
```

Video Access (establishing a video only connection)

Set CPU device (`CpuID = 1012`) connection to CON device (`ConID = 3017`):

```
0x1B 0x5B 0x62 0x09 0x00 0xC9 0x0B 0xF4 0x03 0x01 0x00
```

Disconnect:

```
0x1B 0x5B 0x62 0x09 0x00 0xC9 0x0B 0x00 0x00 0x01 0x00
```

Private Access (establishing an exclusive KVM session)

Set CON device connection to CPU device and CPU device connection to CON device, `CpuID = 1012` and `ConID = 3017`:

```
0x1B 0x5B 0x62 0x0B 0x00 0xF4 0x03 0xC9 0x0B 0x02 0x00
```

Disconnect:

```
0x1B 0x5B 0x62 0x0B 0x00 0x00 0x00 0xC9 0x0B 0x02 0x00
```

USB 2.0 Access (establishing a USB 2.0 data connection)

In order to set a USB 2.0 connection based on devices that only consists of USB 2.0 standalone extenders, you have to split the required bidirectional switching into two steps:

1. Set CON device (`ConID = 3017`) connection to CPU device (`CpuID = 1012`) and CPU device (`CpuID = 1012`) connection to CON device (`ConID = 3017`):
   `0x1B 0x5B 0x50 0x09 0x00 0xC9 0x0B 0xF4 0x03`

Switching from a device within an existing connection to another device requires closing the current connection at first. The disconnect has to be performed in two steps:

1. Disconnect CPU device (`CpuID = 1012`) from CON device (`ConID = 3017`):
   `0x1B 0x5B 0x49 0x09 0x00 0xC9 0x0B 0x00 0x00`
2. Disconnect CON device (`ConID = 3017`) from CPU device (`CpuID = 1012`)
   `0x1B 0x5B 0x4D 0x09 0x00 0xF4 0x03 0x00 0x00`

After disconnecting the existing connection, a switching break of 1-2 seconds is strongly recommended until the next switching operation should be executed.

8 Troubleshooting

In the following chapters, support for problems with the Draco tera API is provided. If you have problems regarding the involved devices, especially the Draco tera matrix, refer to the respective device manuals.

8.1 Network Error

Diagnosis	Possible Reason	Measure
Network settings are not assumed after editing.	Restart of the matrix not yet completed.	➔ Restart the matrix.

8.2 Failure at the Matrix

Diagnosis	Possible Reason	Measure
Serial control impossible or only restrictedly possible.	Different Baud rate of CPU and matrix.	➔ Adapt Baud rate in the CPU.
Serial control via RJ45 port not possible.	Wrong network cable.	➔ Use a crossed network cable

9 Technical Support

Prior to contacting support please ensure you have read this manual, and then installed and set-up your Draco tera as recommended.

9.1 Support Checklist

To efficiently handle your request it is necessary to complete our checklist for support and problem cases (Download). Keep the following information available before you call:

- Company, name, phone number and email
- Type and serial number of the device (see bottom of device)
- Date and number of sales receipt, name of dealer if necessary
- Issue date of the existing manual
- Nature, circumstances and duration of the problem
- Involved components (such as graphic source/CPU, OS, graphic card, monitor, USB-HID/USB 2.0 devices, interconnect cable) including manufacturer and model number
- Results from any testing you have done

10 Glossary

The following terms are commonly used in this guide or in video and KVM technology:

Term	Explanation
AES/EBU	Digital audio standard that is officially known as AES3 and that is used for carrying digital audio signals between devices.
Cat X	Any Cat 5e (Cat 6, Cat 7) cable
CGA	Color Graphics Adapter (CGA) is an old analog graphic standard with up to 16 displayable colors and a maximum resolution of 640x400 pixels.
Component Video	Component Video (YPbPr) is a high-quality video standard that consists of three independently and separately transmittable video signals, the luminance signal and two color difference signals.
Composite Video	Composite Video is also called CVBS and it is part of the PAL TV standard.
CON Unit	Component of a KVM Extender or Media Extender to connect to the console (monitor(s), keyboard and mouse; optionally also with USB 2.0 devices)
Console	Keyboard, mouse and monitor
CPU Unit	Component of a KVM Extender or Media Extender to connect to a source (computer, CPU)
CVBS	The analog color video baseband signal (CVBS) is also called Composite Video and it is part of the PAL TV standard.
DDC	Display Data Channel (DDC) is a serial communication interface between monitor and source (computer, CPU). It allows a data exchange via monitor cable and an automatic installation and configuration of a monitor driver by the operating system.
DisplayPort	A VESA standardised interface for an all-digital transmission of audio and video data. It is differentiated between the DisplayPort standards 1.1 and 1.2. The signals have LVDS level.
Dual Access	A system to operate a source (computer, CPU) from two consoles

Term	Explanation
Dual Link	A DVI-D interface for resolutions up to 2560x2048 by signal transmission of up to 330 MPixel/s (24-bit)
Dual-Head	A system with two video connections
DVI	Digital video standard, introduced by the Digital Display Working Group (http://www.ddwg.org). Single Link and Dual Link standard are distinguished. The signals have TMDS level.
DVI-I	A combined signal (digital and analog) that allows running a VGA monitor at a DVI-I port – in contrast to DVI-D (see DVI).
EGA	The Enhanced Graphics Adapter (EGA) is an old analog graphic standard, introduced by IBM in 1984. A D-Sub 9 connector is used for connection.
Fiber	Single-mode or multi-mode fiber cables
HDMI	An interface for an all-digital transmission of audio and video data. It is differentiated between the HDMI standards 1.0 to 1.4a. The signals have TMDS level.
KVM	Keyboard, video and mouse
Mini-XLR	Industrial standard for electrical plug connections (3 pole) for the transmission of digital audio and control signals
Multi-mode	62.5µ multi-mode fiber cable or 50µ multi-mode fiber cable
OSD	The On-Screen-Display is used to display information or to operate a device.
Quad-Head	A system with four video connections
RCA (Cinch)	A non-standard plug connection for transmission of electrical audio and video signals, especially with coaxial cables
S/PDIF	A digital audio interconnect that is used in consumer audio equipment over relatively short distances.
SFP	SFPs (Small Form Factor Pluggable) are pluggable interface modules for Gigabit connections. SFP modules are available for Cat X and fiber interconnect cables.

Term	Explanation
Single Link	A DVI-D interface for resolutions up to 1920x1200 by signal transmission of up to 165 MPixel/s (24-bit). Alternative frequencies are Full HD (1080p), 2K HD (2048x1080) and 2048x1152.
Single-Head	A system with one video connection
Single-mode	9µ single-mode fiber cable
S-Video (Y/C)	S-Video (Y/C) is a video format transmitting luminance and chrominance signals separately. Thereby it has a higher quality standard than CVBS.
TOSLINK	Standardized fiber connection system for digital transmission of audio signals (F05 plug connection)
Triple-Head	A system with three video connections
USB-HID	USB-HID devices (Human Interface Device) allow for data input. There is no need for a special driver during installation; "New USB-HID device found" is reported. Typical HID devices include keyboards, mice, graphics tablets and touch screens. Storage, video and audio devices are **not** HID.
VGA	Video Graphics Array (VGA) is a computer graphics standard with a typical resolution of 640x480 pixels and up to 262,144 colors. It can be seen as a follower of the graphics standards MDA, CGA and EGA.

10.1 API specific Glossary

Term	Explanation
ACK	Since packet transfer is not reliable, a technique known as positive acknowledgment with retransmission is used to guarantee reliability of packet transfers.
API	An application programming interface (API) is a specification intended to be used as an interface by software components to communicate with each other. An API may include specifications for routines, data structures, object classes and variables.
Echo	The response of the Draco tera matrix to an external command (optional).
NACK	A transmission control character sent by a station as a negative response to the station with which the connection has been set up.
Serial	In telecommunication and computer science, serial communication is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus.
TCP/IP	The Internet protocol suite is the set of communication protocols used for the Internet and similar networks and generally the most popular protocol stack for wide area networks.