Ethernet Terminal

Interface Description

ipcas GmbH
Gundstraße 15
D-91056 Erlangen
Phone: +49 (0)9131/ 7677-0
Fax: +49 (0)9131/ 7677-78
Internet: http://www.ipcas.de
E-Mail: info@ipcas.de

DIN EN ISO 9001:2000

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1. Setup

For initial setup and more information about the configuration tool please read the general manual: "ipEther232 product family."

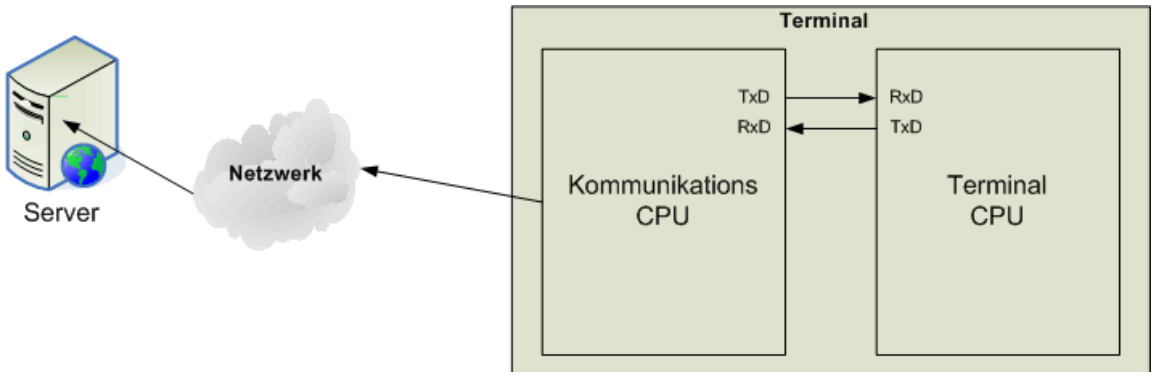
This manual only describes the communication with the Ethernet Terminal.

2. Communication

2.1 Hardware

The Terminal hardware consist of two parts

1. Communication CPU
2. Terminal CPU



The “Terminal CPU” contains all essential functions required for the activation and operation of the hardware.

The “Communication CPU“ handles the transportation of data over Ethernet.

2.2 Firmware: TCP/IP

The IP address of the Terminal will be set using the configuration program. Please consult the supplied ipEther manual for more details.

The Ethernet Terminal provides a TCP server.

The TCP port number: 3497
Number of simultaneous connections: 1

In order to maintain the connection, a command must be sent to the Ethernet Terminal about every 4 seconds (for example PING). If the Terminal doesn't receive any command for more than 10 seconds the fault text will be displayed, the keyboard locked, and the TCP connection closed.

If the connection is lost due to a malfunction, the server will have to re-establish the connection. Ten seconds after the last command has been received by the Terminal, it will disconnect and is then able to accept a new connection.

Each command has to be sent in its own TCP packet and as soon as possible. To accomplish this, the so-called "Nagle's Algorithm" has to be deactivated.

Depending on the operating system or programming language this can be done in the following ways:

In C: *setsockopt(fd, SOL_TCP, TCP_NDELAY, &one);*
In C#: *mySocket.SetSocketOption(SocketOptionLevel.Tcp, SocketOptionName.NoDelay, 1);*

2.3 Communication Commands

Basic structure of all commands:

Length of Message – low
Length of Message – high
Command Byte 1
Command Byte 2
Command Byte 3
Command Byte 4
Data
Data
Data

Length of Message: Length of the whole message, including the four command bytes, but without the two length bytes.

2.3.1 Commands sent to the Terminal

2.3.1.1 LCD Display

2.3.1.1.1 Text Output

Text output on the 4-line display.

Command	**LCDT**	LCD Text

Length low: of TEXT + 6
Length high: of TEXT + 6
L
C
D
T
Row
Column
T
E
X
T
…

Row	0,1,2,3
Column	0..19
Text	1..40 bytes – ASCII (according to the table of the LCD) (see *3.1*)

Special formats in the text.

1. Displaying the time “It is {DD.MM.YYYY HH:mm:ss}“
   DD day
   MM month
   YYYY year 4-digit
   YY year 2-digit
   HH hours 24h format
   hh hours 12h format
   mm minutes
   ss seconds
   AP AM/PM
2. Plain input „enter ID _ _ _”
3. Masked input (password) „enter PIN ^_ _ _”

In this case “_” is a place holder on the display output. After entering the input by using the digit keys, the entered characters will be sent with the command **KEYI**. Input is considered complete if either as many characters as place holders have been entered or if OK has been pressed. The number of wild cards does not coincide with the number of characters the user must enter, but with the number of characters he/she can enter!

2.3.1.1.2 Clearing the LCD display

To wipe the entire display clean.

Command	**LCDC**	LCD Clear

Length low: 4
Length high: 0
L
C
D
C

2.3.1.1.3 Deleting a line

To clear a single line (row) of the display.

Command	**LCDE**	LCD Erase

Length low: 5
Length high: 0
L
C
D
E
Row

2.3.1.1.4 LCD Backlight

Turning the background light of the display on or off.

Command	**LCDB**	LCD Backlight

Length low: 5
Length high: 0
L
C
D
B
0=off / 1 = on

2.3.1.2 Real-Time Clock

Functions for setting and reading the clock, or converting the time from UTC to local time.

2.3.1.2.1 Setting the Clock

Set up the time in UTC (in seconds since 1.1.1900).

Command	**RTCS**	RTC Set

Length low: 8
Length high: 0
R
T
C
S
Time (sec-1900) Byte1 L
Time (sec-1900) Byte2
Time (sec-1900) Byte3
Time (sec-1900) Byte4 H

Time	Seconds since 1.1.1900

2.3.1.2.2 Reading the Time

	RTCG	RTC Get

Length low: 5
Length high: 0
R
T
C
G
0 = UTC, 1 = Local

Depending on the parameter the Terminal reports the time as UTC or local time.

2.3.1.2.3 Setting of the Time Zone

Setup the time zone for a correct display or report of the local time.
These settings will be saved in the EEPROM.

	RTCZ	RTC Zone

Length low: 60
Length high: 0
R
T
C
Z
TimeZoneT (the following structure)

```
typedef struct
{
        ByteT           Month;                  // 1..12    0 = No Daylight Saving Time
        ByteT           DayOfWeek;              // Sunday = 0, Monday = 1, and so on, 6 = Saturday
        ByteT           Day;                    // 1..5      , 1=First, 2=Second, ... 5 = Last
        ByteT           Hour;
        ByteT           Minute;
} TimeRuleT;


typedef struct
{
        IntT            Bias;                   // Bias in min. from GMT (-780...+720)
        IntT            StandardBias;           // Bias in min. when in Standard Time (normally 0)
        IntT            DaylightBias;           // Bias in min. when in Daylight Time (normally -60)
        TimeRuleT       EndDaylightTime;        // End of Daylight Saving Time
        TimeRuleT       StartDaylightTime;      // Start of Daylight Saving Time
        char            TimeZoneName[40];       // 0 terminates string!
// Key in HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Time Zones
} TimeZoneT;
```

2.3.1.3 RFID

2.3.1.3.1 Switching the Antenna On or Off.

To save energy or only selectively recognise RFID tags, the antenna can be turned on or off.

Command	**RFIA**	RFID Antenna

Length low: 5
Length high: 0
R
F
I
A
0 = off / 1 = on

2.3.1.3.2 RFID Detection Delay

This command configures a delay period during which the same RFID transponder will not be reported again.

Command	**RFDL**	RFID Delay

Length low: 6
Length high: 0
R
F
D
L
Delay Low
Delay High

Delay	Detection Delay in Milliseconds

2.3.1.4 Digital Output

2.3.1.4.1 Turning Relay Output On or Off

	OUTS	Output Set

Length low: 6
Length high: 0
O
U
T
S
Pin
0 = off / 1 = on

Pin	Output Pin (0, 1)

2.3.1.4.2 Relay Output Pulse

	OUTP	Output Pulse

Length low: 9
Length high: 0
O
U
T
P
Pin
Duration in msec. Low
Duration in msec.
Duration in msec.
Duration in msec. High

Pin	Output Pin (0, 1)
Duration	Duration of the pulse in milliseconds. The pulse duration can be extended (retriggered) by sending a new pulse command before the previous timer runs out. OUTP (0) or OUTS disable the timer.

2.3.1.5 Digital Input

2.3.1.5.1 Digital Input Configuration

The settings are stored in the EEPROM. After a successful parameterization the Terminal responds with **INPP** (same structure).

	INPP	Input Parameter

Length low: 9	
Length high: 0	
I	
N	
P	
P	
Scan Cycle	
Debounce	
Counter Message Cycle Low	
Counter Message Cycle High	
	P3 P2 P1 P0

Scan Cycle	Sampling rate of digital input in millisecond: 1..255 ms
Debounce	Number of stable samples before acceptance: 0..10
Transmit Single Events	Transmit any change on a pin (**INPT**) per pin; default=0
Counter Message Cycle	Report counters every “n” msec (**INPC**): 0=disabled

2.3.1.5.2 Query Digital Input Parameters

The Terminal reports its current parameters with **INNP** (as in *2.3.1.5.1 Digital*).

	INPP	Input Parameter

Length low: 4
Length high: 0
I
N
P
P

2.3.1.5.3 Resetting the Counter

The Terminal responds with **INPR** (same structure) after a successful reset.

	INPR	Input Reset Counter

Length low: 9
Length high: 0
I
N
P
R
Pin
Reset Value Low
Reset Value
Reset Value
Reset Value High

Pin	Input Pin
Reset Value	The counter is decreased by this value.

2.3.1.5.4 Poll Counters

The Terminal responds with **INPC** (see *2.3.2.6.1*)

	INPC	Input Counter

Length low: 4
Length high: 0
I
N
P
C

2.3.1.6 LED

2.3.1.6.1 LED Switching

	LEDS	LED Set

Length low: 6
Length high: 0
L
E
D
S
LED
0 = off / 1 = on

LED	LED number (0, 1, 2, 3)

2.3.1.6.2 LED Flashing

	LEDP	LED Pulse

Length low: 7
Length high: 0
L
E
D
P
LED
Duration in msec Low
Duration in msec High

LED	LED number (0, 1, 2, 3)
Duration	The pulse duration in milliseconds. LEDP (0) or LEDS clears the timer.

2.3.1.7 Loudspeaker

2.3.1.7.1 Beep Tone

	BEEP	Beep Sound

Length low: 6
Length high: 0
B
E
E
P
Frequency / 10
Duration / 10

Frequency	Frequency/10	100 = 1 kHz (not implemented yet)
Duration	Duration/10	100 = 1 second

2.3.1.8 RS232

2.3.1.8.1 Parameterization

Sets the RS232 transmission parameters.

Command	**232P**	RS232 Parameter

Length low: 13
Length high: 0
2
3
2
P
Baud rate Low
Baud rate High
Data bits
Parity
Stop Bits
RX-Timeout Low
RX-Timeout High
Char Distance
Flags

Baud rate	Baud rate 300..115200 (115200 = 65535)
Data bits	7 – 8
Parity	0 (space) – 1 (mark) – n (none) – e (even) – o (odd)
Stop Bits	1 – 2 (two stop bits not implemented)
RXTimeout	Send a block not later than after “n” milliseconds
Char Distance	Send block if the gap between two characters is >”n” milliseconds
Flags	1 = Hardware flow control (RTS/CTS) 2 = Software flow control (XON/XOFF) 4 = Half duplex mode for RS485

2.3.1.8.2 *Parameter Query*

Reads the RS232 transmission parameters. The Terminal responds with **232P** (see above).

Command	**232P**	RS232 Parameter

Length low: 4
Length high: 0
2
3
2
P

2.3.1.8.3 Transmitting Data

A maximum of 500 bytes can be sent at one time.

Command	**232T**	RS232 Transmit Data

Length low: 4 + DataLen
Length high: 0
2
3
2
T
Data
Data
…

2.3.1.8.4 Status Query

The Terminal will respond with **232S** (see *2.3.2.7.2 Status*).

Command	**232S**	RS232 Status

Length low: 4
Length high: 0
2
3
2
S

2.3.1.9 System

2.3.1.9.1 Maintain Connection

About every 4 seconds the PING command should be sent to the Terminal, otherwise the connection will be terminated after 10 seconds. All other commands sent to the Terminal will be recognized as a “keep alive” as well. (In response to a PING command the Terminal sends a PONG.)

Command	**PING**	Send Ping

Length low: 4
Length high: 0
P
I
N
G

2.3.1.9.2 Version Request

The Terminal will respond with SYSV including the version string (see *2.3.2.8.1 Version*).

Command	**SYSV**	Version Request

Length low: 4
Length high: 0
S
Y
S
V

2.3.1.9.3 Firmware Update

The Terminal will jump to the boot loader and wait for a new firmware on the RS232 interface. A separate Windows program for the firmware upload will be delivered together with the new firmware. Updates can be found on http://www.ipcas.de.

Command	**SYSB**	Version Update

Length low: 4
Length high: 0
S
Y
S
B

2.3.1.9.4 Defining the Boot Text

This text is stored in the EEPROM and will be shown on the display after the start up.

Command	**LCDS**	LCD Start Up Text

Length low: 4 + 80
Length high: 0
L
C
D
S
20 characters for line 1
20 characters for line 2
20 characters for line 3
20 characters for line 4

2.3.1.9.5 Defining the Failure Text

This text is stored in the EEPROM and will be shown on the display, when no telegrams have been received for more than 10 seconds from the server (for example PING). In this case all the input will be locked (keyboard, RFID, and digital input). Counting of digital inputs will not be affected by the lockout though.

Command	**LCDL**	LCD Connection Lost Text

Length low: 4 + 80
Length high: 0
L
C
D
L
20 characters for line 1
20 characters for line 2
20 characters for line 3
20 characters for line 4

2.3.1.9.6 User Input Lock

With the LOCK command the keyboard and RFID detection can be locked for user input. As long as the lock is active keyboard and RFID will not respond.

Command	**LOCK**	Keyboard and RFID detection will be locked

Length low: 5
Length high: 0
L
O
C
K
1 = active / 0 = inactive

2.3.2 Commands sent by the Terminal

2.3.2.1 Error

Should the firmware recognise an error, for example a RS232 receiver error, it will be reported with this command.

Command	**EROR**	Error

Length low: 4+n
Length high: 0
E
R
O
R
Text
Text
Text
Text
…

2.3.2.2 Clock

In response to the **RTCG** command. Reports the current time in seconds since 1.1.1900. UTC or local time are possible (see *2.3.1.2.2*).

Command	**RTCC**	RTC Clock

Length low: 9
Length high: 0
R
T
C
C
0 = UTC, 1 = Local time
Time (sec-1900) Byte1 L
Time (sec-1900) Byte2
Time (sec-1900) Byte3
Time (sec-1900) Byte4 H

2.3.2.3 Keyboard

Reports a pressed key after the key has been released.

Command	**KEYU**	Key Up

Length low: 5
Length high: 0
K
E
Y
U
Key-Code

KEYI reports the input performed in a LCDT _ _ _ input field.

(see *2.3.1.1.1 Text*)

Command	**KEYI**	Key Input string that was requested with LCDT

Length low: 4 + Length
Length high: 0
K
E
Y
I
Input Key-Code
..
..
Input Key-Code

2.3.2.4 RFID

Provides the ID of a recognized transponder. So far only the transponder type EM4102 is supported. The technical specification is available from EM Microelectronic. A re-identification of same transponder can be blocked for a configurable duration (see *2.3.1.3.2 RFID*).

Command	**RFID**	RFID

Length low: 10
Length high: 0
R
F
I
D
Code 0 = EM4102
Customer ID
Data
Data
Data
Data

2.3.2.5 Digital Output

2.3.2.5.1 Status Report of the Relays

Transmitted for every change of the relay status.

	OUTS	Output Set

Length low: 6
Length high: 0
O
U
T
S
Pin
0 = off / 1 = on

Pin	Output Pin (0, 1)

2.3.2.6 Digital Input

2.3.2.6.1 Counter Report

Counter values for the input pins are periodically sent according to the cycle time set with the command INPP.

	INPC	Input Counter

Length low: 26
Length high: 0
I
N
P
C
UTC
UTC
UTC
UTC
MSEC 0-7
MSEC 8-15
Pin0: Counter Value Low
Pin0: Counter Value
Pin0: Counter Value
Pin0: Counter Value High
Pin1: Counter Value Low
Pin1: Counter Value
Pin1: Counter Value
Pin1: Counter Value High
Pin2: Counter Value Low
Pin2: Counter Value
Pin2: Counter Value
Pin2: Counter Value High
Pin3: Counter Value Low
Pin3: Counter Value
Pin3: Counter Value
Pin3: Counter Value High

2.3.2.6.2 Digital Input Report

Each input event will only be reported if the specific pin has been enabled in the INPP command. The internal ring buffer has a limited capacity, thus too many events may lead to a buffer overflow error message.

	INPT	Input

Length low: 4 + (n*7)	
Length high: 0	
I	
N	
P	
T	
UTC	
UTC	
UTC	
UTC	
MSEC 0-7	
MSEC 8-15	
Pin	Value
UTC	
UTC	
UTC	
UTC	
MSEC 0-7	
MSEC 8-15	
Pin	Value
....	

2.3.2.7 RS232

2.3.2.7.1 Receive Data

A maximum of 254 bytes of data received on the RS232 can be transferred at once.

Command	**232R**	RS232 Receive Data

Length low: 4 + DataLen
Length high: 0
2
3
2
R
Data
Data
…

2.3.2.7.2 Status

Reports the state (fill level) of the receive and transmit buffers for the serial port.

Command	**232S**	RS232 Status

Length low: 8
Length high: 0
2
3
2
S
TX-Buffer left Low
TX-Buffer left High
RX-Buffer left Low
RX-Buffer left High

When the fill level of these buffers changes this status report will be sent periodically.

2.3.2.8 System

2.3.2.8.1 Version Response

The Terminal responds to a version request (using SYSV) with this telegram (see 2.3.1.9.1)

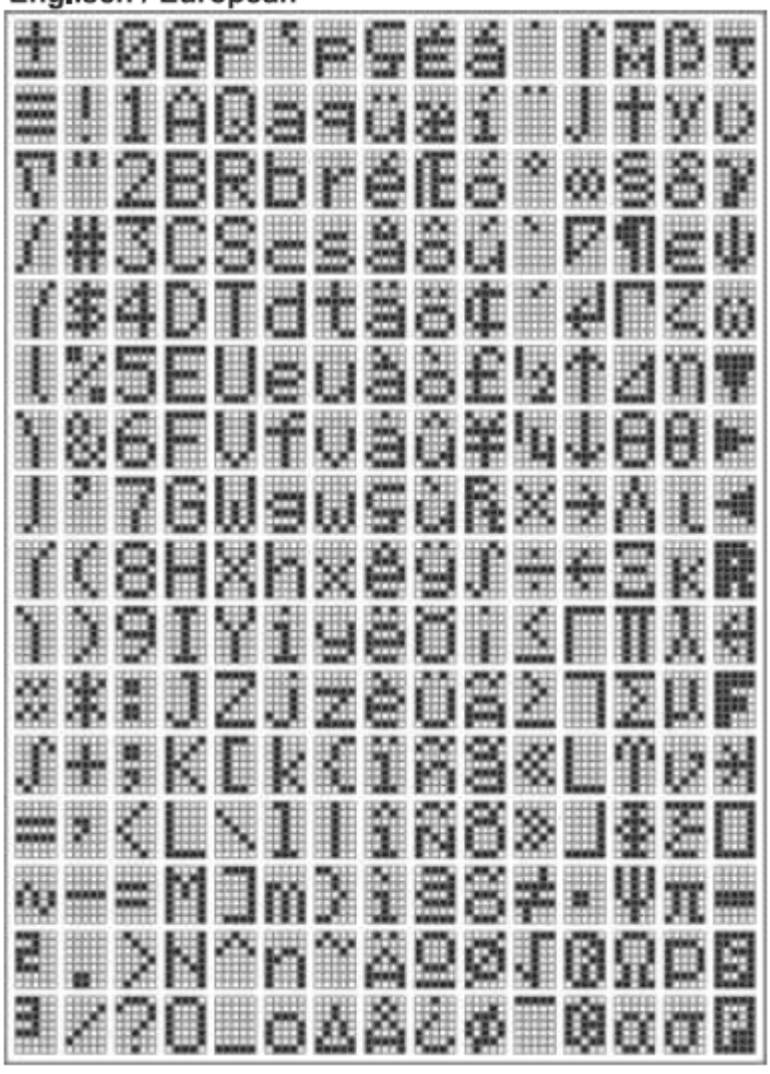
Command	**SYSV**	Version Answer

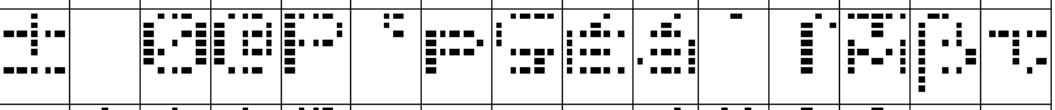
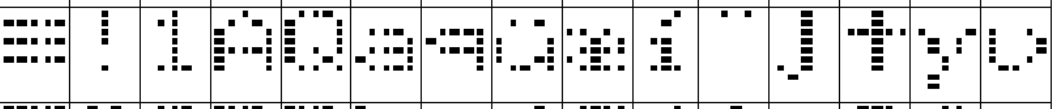
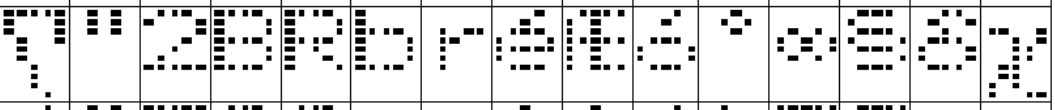
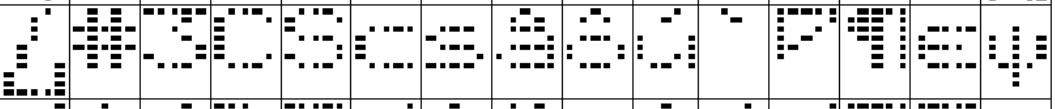
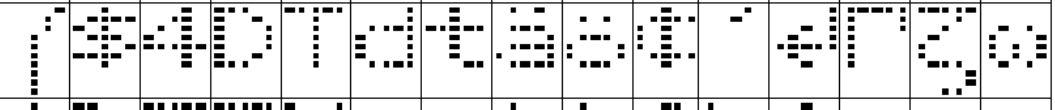
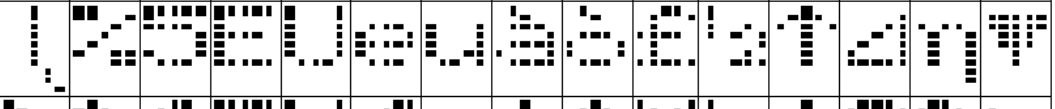
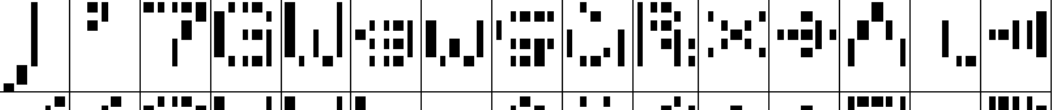
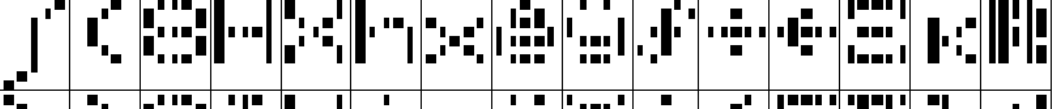
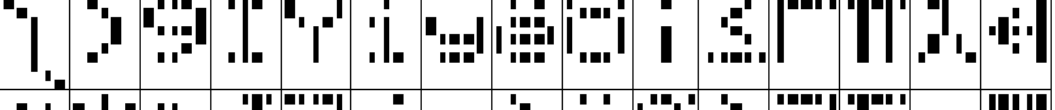
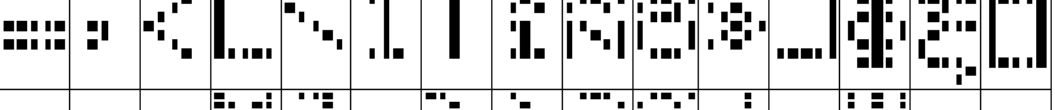
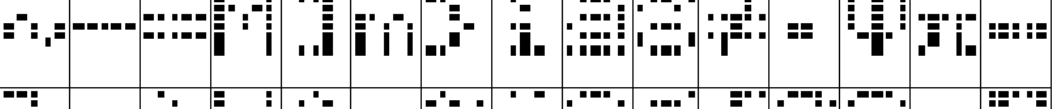
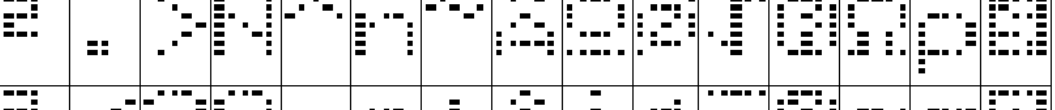
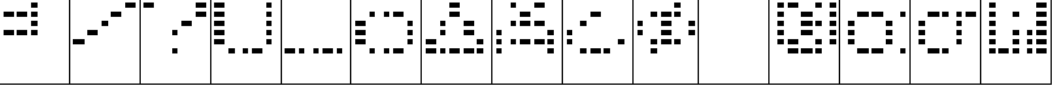
Length low: 4 + length(Text)
Length high: 0
S
Y
S
V
Text

3. Appendices

3.1 Display layout

Englisch / European



Upper 4 bit / Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	CG RAM (2)															
LLHL	CG RAM (3)															
LLHH	CG RAM (4)															
LHLL	CG RAM (5)															
LHLH	CG RAM (6)															
LHHL	CG RAM (7)															
LHHH	CG RAM (8)															
HLLL	CG RAM (1)															
HLLH	CG RAM (2)															
HLHL	CG RAM (3)															
HLHH	CG RAM (4)															
HHLL	CG RAM (5)															
HHLH	CG RAM (6)															
HHHL	CG RAM (7)															
HHHH	CG RAM (8)															

3.2 Keyboard layout

Key	Hex-/Char-merit	
0	0x30	
1	0x31	
2	0x32	
3	0x33	
4	0x34	
5	0x35	
6	0x36	
7	0x37	
8	0x38	
9	0x39	
ESC	0x1B	
Enter (Num-Block, arrow keys)	0x42	
F1	0xf1	
F2	0xf2	
F3	0xf3	
F4	0xf4	
F5	0xf5	
F6	0xf6	
Arrow up	U	(for UP)
OK	O	(for Ok)
Arrow down	D	(for Down)
Back (bent arrow)	M	(for Menü)

4. Glossary

ARP	Address Resolution Protocol
BPS	Bits per second (also known as the baud rate)
CCP	Compression Control Protocol
CTS	Clear to Send
DHCP	Dynamic Host Configuration Protocol
DCE	Data Communication Equipment
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
HTML	Hyper Text Markup Language
HTTP	HyperText Transfer Protocol
ICMP	Internet Control Message Protocol
IEEE	Institute (of) Electrical (and) Electronic Engineers
IP	Internet Protocol
LAN	Local Area Network
MAC	Media Access Control
MDA	*Machine Data Acquisition*
PC	Personal Computer
PDA	*Production Data Acquisition.*
RFC	Request for Comments
RS232	Serial Interface (e.g. COM-Port) according to the RS232 Standard
RTS	Request To Send
RXD	Receive Data
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
SUB-D9	9-pol. connector
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TXD	Transmit Data
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
UTC	Universal Time Code
XML	Extensible Markup Language

Contact Information

ipcas GmbH
Gundstraße 15
D-91056 Erlangen
Telefon: +49 9131 7677 0

Fax: +49 9131 7677 78
Internet: http://www.ipcas.de
E-Mail: info@ipcas.de

Support: ipEther-support@ipcas.de

Support: 0900/1472274
(1,99 Euro/Minute in Germany)