KitCON-513

User's Manual

Version 1.1

In this manual the named products jointly constituting a registered trademark are not individually registered. A drawback of the ® mark is that it does not exclude these products from future Patent or Copyright registration.

The information in this document has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccurancies.
The company PHYTEC Meßtechnik GmbH neither gives any guarantee nor accepts any liability whatsoever for consequential damages occurring from the use of this handbook. It reserves the right to alter the information given in it without prior notification and accepts no responsibility for doing so.

In addition, PHYTEC Messtechnik GmbH offers no guarantee nor accepts any liability for damages arising from the improper usage or improper installation of the hardware. Equally it reserves the right to alter the layout or the design of the hardware without prior notice and accepts no liability for doing so.

PHYTEC Meßtechnik GmbH
Robert-Koch-Straße 39
D-55129 Mainz
Germany

Internet: http://www.phytec.de
e-Mail: info@phytec.de

1st edition, August 1995
2nd edition, April 1996

Introduction

This KitCON-513 User's Manual describes the board's design and functions. Precise specifications for the C513 microcontroller family can be found in the enclosed microcontroller Data Sheet/User's Manual. Please also refer to the enclosed documentation for the software development tools for use in programming the KitCON-513.

In this User's Manual and in the attached schematics, low active signals are denoted by a "/" in front of the signal name (i.e.: /RD). A "0" indicates a logic-zero or low-level signal, while a "1" represents a logic-one or high-level signal.

Handle the KitCON-513 with care in respect to ESD requirements.
Take precautions to handle the module only in a static-free workplace.

The KitCON-513 is one of a series of PHYTEC KitCONs which can be fitted with different controllers and, hence, offer various functions and configurations. PHYTEC supports all Siemens' 8- and 16-bit controllers in two ways:
(1) as the basis for Starter Kits in which user-designed hardware can be implemented on a wrap-field around the controller and
(2) as insert-ready, fully functional SBC micro- and miniMODULS which can be embedded directly into the user's peripheral hardware design.

PHYTEC's microcontroller modules allow engineers to shorten development horizons, reduce design costs and speed project concepts from design to market. Please contact PHYTEC for additional information:

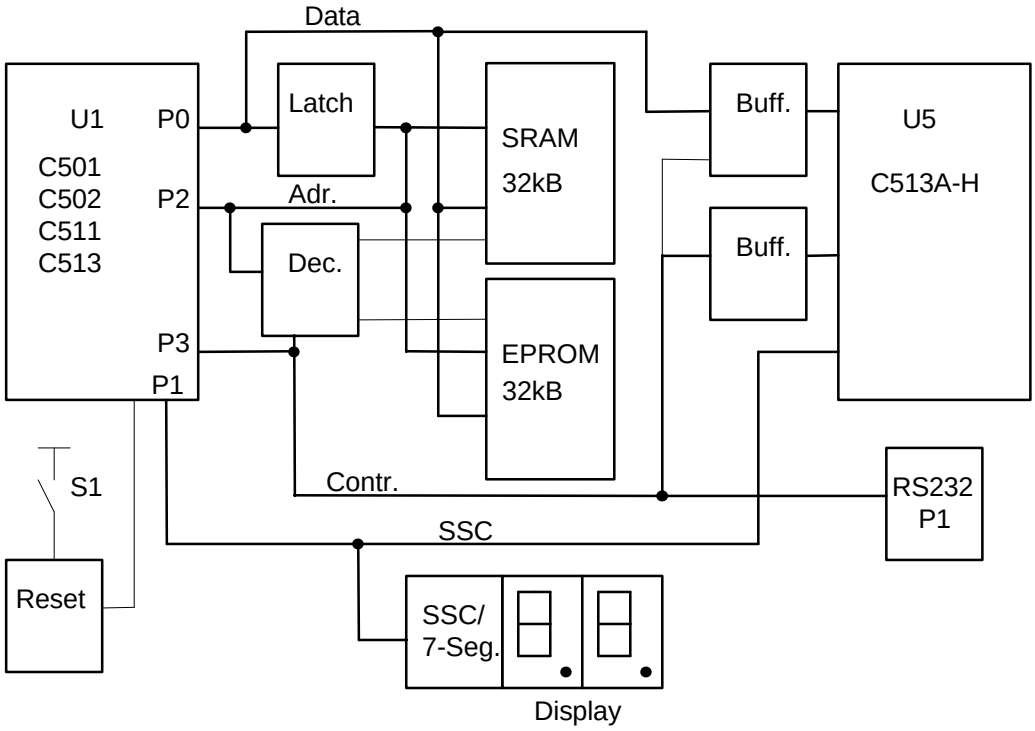
Address: PHYTEC Messtechnik
Robert-Koch-Str. 39
D-55129 Mainz
GERMANY
Web Site: http://www.phytec.de
e-mail: info@phytec.de
Voice: +(49) 6131 9221-0

Fax: +(49) 6131-9221-33

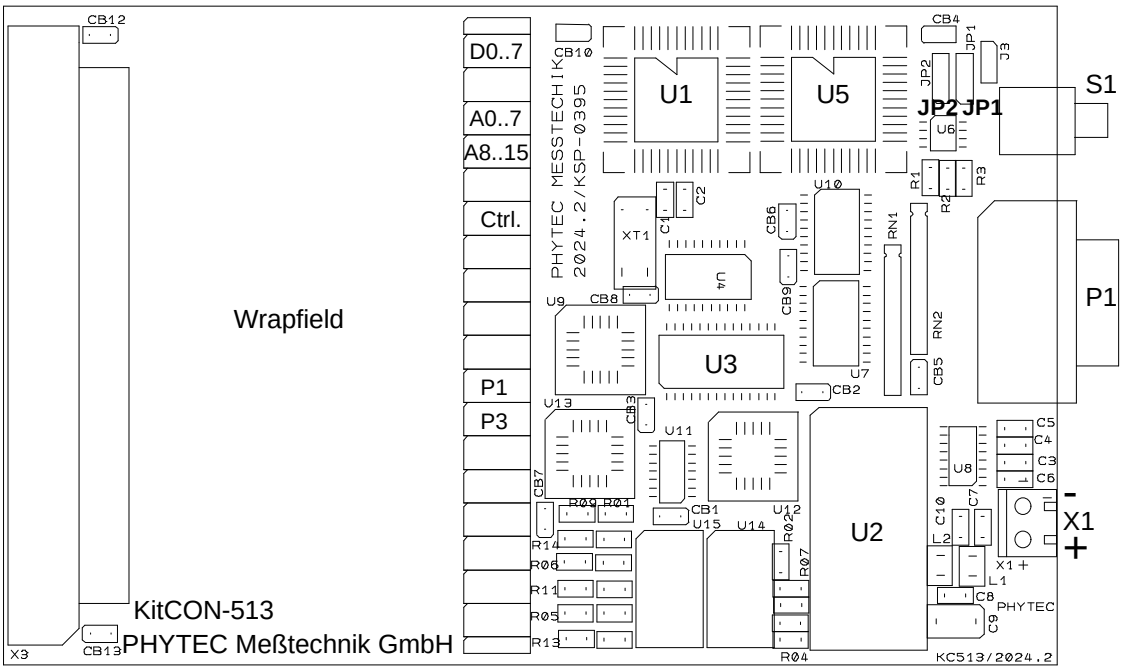
1. KitCON-513 Features

The KitCON-513 is an evaluation board for the Siemens C511/C513 microcontroller family. This 8-bit microcontroller family is compatible to the standard 80C32 microcontroller.
The microcontroller is clocked with 12 MHz and has access to 32kByte SRAM (CODE+XDATA) as well as 32kByte EPROM (CODE).
A 5V/500mA power supply is necessary (not included). Communication with a PC can be realized via the on-board RS232 interface (DB9-Connector). The display offers the possibility to show th e data which is transferred via the microcontroller's Synchronous Serial Channel (SSC) in hex-format. Using the PLCC-44 socket 'U5', the EEPROM version SAB-C513A-H can be programmed. Both microcontrollers can also communicate via the SSC.

1.1 Blockdiagram



1.2 KitCON-513 Top View



1.3 Technical Data

Voltage:	5V +/- 5%
Power Consumption:	max. 500mA (fosz = 12MHz, Vcc = 5V)
Storage Temperature:	-40°C to +90°C
Ambient temperature under bias:	0°C to +70°C
Humidity (rel.):	0% to 90%, without condensation
Dimensions (total):	100mm x 160mm x 18mm (l x b x h) +/- 1mm

This data is valid for the standard configuration of the KitCON-513. The typical power consumption at 20°C is about 300mA.

2. How to use the KitCON-513

2.1 Initial Setup

Before you are using the KitCON-513 we recommend to read this User's Manual completely. Please read also the other manuals regarding the included hardware/software before using it.

Connect the power supply (5V=/500mA) to the 'X1' connector. Be sure about the polarity! Please use a power supply with constant 5V output only.

To build up a serial link to the PC, please connect the serial interface of the PC (COM1 or COM2) to the 'P1' connector (DB-9). The used cable must be build up as follows:

PC DB9-Connector COM1,2			KitCON-513 DB9-Connector 'P1'	
RxD	PIN 2	to	TxD	PIN 2
TxD	PIN 3	to	RxD	PIN 3
GND	PIN 5	to	GND	PIN 5
shield	case	to	shield	case

After switching on the power supply a microcontroller RESET is activated. After RESET the program (EPROM, U2) is executed. Another RESET can be activated by pressing the switch 'S1', then the program is started again.

2.2 Microcontroller, Description of Port-Pin Functionality

The microcontroller (U1) port-pins are used as follows:

P0 = Data D0..D7 and multiplexed Addresses A0..A7
P2 = Adresses A8..A15
P1.0 = /PCS (Program-Chipselect for programming mode using socket U5, otherwise not used)
P1.1 = PRES (Program-Reset for programming mode using socket U5, otherwise not used)
P1.2 = SCLK (SSC Clock-Signal, otherwise not used)
P1.3 = SRI (SSC Receive-Signal, driven by U9, coming from U5)
P1.4 = STO (SSC Transmit-Signal, otherwise not used)
P1.5 = /SLS (SSC Slave-Select-Signal and Display Enable/Clear-Signal, otherwise not used)
P1.6 = U5-RESET (Reset-Signal for Slave-Controller U5, otherwise not used)
P1.7 = U5-/EA (EA-Signal for Slave-Controller U5, otherwise not used)
P3.0 = RxD (Receive-Signal, RS232-Driver)
P3.1 = TxD (USART Transmit-Signal, RS232-Driver)
P3.2 = not used (free for application and connected to left display-dp.)
P3.3 = /PROG (Programming Mode Enable U5, Bus-Driver active)
P3.4 = not used (free for application)
P3.5 = /MODE (select memory model, please refer to chapter 2.3)
P3.6 = /WR (Write-Signal for XDATA-space, RAM)
P3.7 = /RD (Read-Signal for XDATA-space, RAM)

2.2.1 Microcontroller (U1), Single-Chip-Mode:

P0 = Data D0..D7 and multiplexed Addresses A0..A7
P2 = Adresses A8..A15
P3.0 = RxD (Receive-Signal, RS232-Driver)
P3.1 = TxD (USART Transmit-Signal, RS232-Driver)
P3.5 = /MODE (select memory model, please refer to chapter 2.3)
P3.6 = /WR (Write-Signal for XDATA-space, RAM)
P3.7 = /RD (Read-Signal for XDATA-space, RAM)
P1.0 to P1.7 and P3.2 to P3.4 are not used in this mode and might be used for the application.

2.2.2 Microcontroller (U1), SSC-Mode using U5:

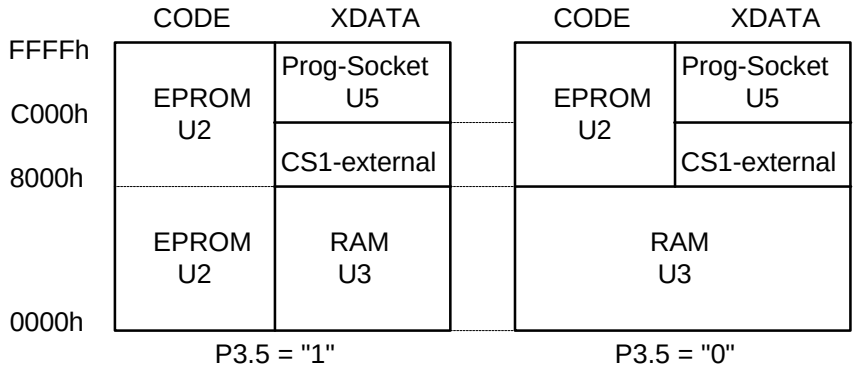
P0 = Data D0..D7 and multiplexed Addresses A0..A7
P2 = Adresses A8..A15
P1.2 = SCLK (SSC Clock-Signal)
P1.3 = SRI (SSC Receive-Signal, driven by U9, coming from U5)
P1.4 = STO (SSC Transmit-Signal)
P1.5 = /SLS (SSC Slave-Select-Signal and Display Enable Signal)
P1.6 = U5-RESET (Reset-Signal for Slave-Controller U5)
P1.7 = U5-/EA (EA-Signal for Slave-Controller U5)
P3.0 = RxD (Receive-Signal, RS232-Driver)
P3.1 = TxD (USART Transmit-Signal, RS232-Driver)
P3.3 = /PROG (Programming Mode Enable U5, Bus-Driver active, must be kept '1')
P3.5 = /MODE (select memory model, please refer to chapter 2.3)
P3.6 = /WR (Write-Signal for XDATA-space, RAM)
P3.7 = /RD (Read-Signal for XDATA-space, RAM)
P1.0, P1.1, P3.2 and P3.4 are not used in this mode and might be used for the application.

2.2.3 Microcontroller (U1), Programming-Mode using U5:

P0 = Data D0..D7 and multiplexed Addresses A0..A7
P2 = Adresses A8..A15
P1.0 = /PCS (Program-Chipselect for programming mode using socket U5)
P1.1 = PRES (Program-Reset for programming mode using socket U5)
P1.3 = SRI (SSC Receive-Signal, driven by U9, coming from U5)
P1.6 = U5-RESET (Reset-Signal for Slave-Controller U5)
P1.7 = U5-/EA (EA-Signal for Slave-Controller U5)
P3.0 = RxD (Receive-Signal, RS232-Driver)
P3.1 = TxD (USART Transmit-Signal, RS232-Driver)
P3.3 = /PROG (Programming Mode Enable U5, Bus-Driver active)
P3.5 = /MODE (select memory model, please refer to chapter 2.3)
P3.6 = /WR (Write-Signal for XDATA-space, RAM)
P3.7 = /RD (Read-Signal for XDATA-space, RAM)
P1.2, P1.4, P1.5, P3.2 and P3.4 are not used in this mode and might be used for the application.

2.3 Memory Organization

The KitCON-513 is delivered using the following memory organization:



While P3.5 = '1' (after RESET) the EPROM is active for the total CODE-space while the RAM is defined as XDATA at address 0000h to 8000h.

With P3.5 = '0', 32kByte RAM can be used as CODE/XDATA-memory. It is located at 0000h to 8000h ('von Neumann' model). The EPROM (CODE-space) starts at 8000h. The socket U5 can be selected as XDATA-memory starting at C000h as well. An external /CS1-Signal is free for applications in XDATA area 8000h to BFFFh.

2.4 Jumpers

There are three Jumpers J1, J2 and J3 on the KitCON-513. J1 and J2 are jumpered for normal operation mode, while J3 must not be changed for 5V operation. If you are intending to change the configuration, the meaning of jumper position is as follows:

J1 RESET-polarity at , U1
1+2 /RESET = low active
2+3 RESET = high active (standard).
For detailed information, please refer to the microcontroller datasheet.

J2 /EA-Pin at at microcontroller, U1
1+2 /EA = VCC Execution of internal ROM code after RESET
2+3 /EA = GND Execution of external EPROM code after RESET (standard).

J3 3V Power-on-Reset
1+2 CTL = GND 5V operation (standard)
2+3 CTL = VCC 3,3V operation (R1, R2 and R3 neccessary).
This jumper defines the reset level for the reset generator MAX700 as the KitCON is prepared for usage at 3.3V as well. The resistors R1 to R3 has to be added and all peripherals must be specifed for 3V operation.

2.5 Connectors

There are two connectors at the KitCON-513. The power supply connector X1 and the serial interface (RS232, DB9) P1. Both connectors are located at the front end of the KitCON-513.
The application area supports the portpins of the microcontroller, the data- and addressbus, the control-lines as well as Vcc and Vss lines.

Top view to the application support area:

PIN 1	VCC	2	VCC	3	GND	4	GND
5	D0	6	D2	7	D4	8	D6
9	D1	10	D3	11	D5	12	D7
13	nc	14	nc	15	nc	16	nc
17	nc	18	nc	19	nc	20	nc
21	A0	22	A2	23	A4	24	A6
25	A1	26	A3	27	A5	28	A7
29	A8	30	A10	31	A12	32	A14
33	A9	34	A11	35	A13	36	A15
37	nc	38	nc	39	nc	40	nc
41	nc	42	nc	43	nc	44	nc
45	/RD	46	/PSEN	47	RES	48	/RES
49	/WR	50	ALE	51	/EA	52	nc
53	/CS1	54	nc	55	nc	56	nc
57	nc	58	nc	59	nc	60	nc
61	nc	62	nc	63	/INT0	64	nc
65	nc	66	nc	67	nc	68	nc
69	nc	70	nc	71	nc	72	nc
73	nc	74	nc	75	nc	76	nc
77	nc	78	nc	79	nc	80	nc
81	nc	82	nc	83	nc	84	nc
85	P1.0	86	P1.2	87	P1.4	88	P1.6
89	P1.1	90	P1.3	91	P1.5	92	P1.7
93	P3.0	94	P3.2	95	P3.4	96	P3.6
97	P3.1	98	P3.3	99	P3.5	100	P3.7
101	nc	102	nc	103	nc	104	nc
105	nc	106	nc	107	nc	108	nc
109	nc	110	nc	111	nc	112	nc
113	nc	114	nc	115	nc	116	nc
117	nc	118	nc	119	nc	120	nc
121	nc	122	nc	123	nc	124	nc
125	nc	126	nc	127	nc	128	nc
129	nc	130	nc	131	nc	132	nc
133	nc	134	nc	135	nc	136	nc
137	nc	138	nc	139	nc	140	nc
141	nc	142	nc	143	nc	144	nc
145	nc	146	nc	147	nc	148	nc
149	VCC	150	VCC	151	GND	152	GND

2.6 Synchronous Interface and Display

The Siemens 8-Bit microcontroller C511/C513 family integrates a serial synchronous channel (SSC). At the KitCON-513 this interface is connected to a 7-segment display via a decoder. Therefore, any data which is sent by this interface can be seen at this display in hex-format. The display can be reset (00h) by an high pulse at P1.5 (/SLS) at the microcontroller, U1. While P1.5 = '0', a rising edge at P1.2 (SCLK) shifts the data at P1.4 (STO) into a 8-bit register. The content of this register is shown at the display in hex-for mat (see below).

In addition, data can be sent from the microcontroller U1 to the microcontroller U5 and vice versa. For this, the microcontroller U5 must execute certain software which is located in the internal (EEP)ROM. The ports at the microcontroller U1 must be programmed as follows:
P3.3 = "1" (Programming mode U5 inactive)
P1.7 = "1" (/EA, U5 = "1", execute internal CODE),
P1.6 = "0" (RESET, U5 inactive, start execution of internal program).

The decimal point of the left display is showing an low level on P3.2 of U1 while the decimal point of the right display is showing an active programming mode of socket U5.

The controller located in the socket U5 must be changed only if supply voltage (Vcc) is disconnected!

2.7 Programming Socket and Programming Functions

For programming the EEPROM version SAB-C513A-H a P-LCC-44 socket, U5 is available. Serial communication with the microcontroller U1 can be done via the on-chip SSC as well.

After power-on of the KitCON-513, the socket U5 is active but in reset:

- Vcc is on at U5
- Clock (U1, XTAL1) is connected to U5
- ControlsignalsU1, P1.7 is connected to U5, PMS0 (/EA)
- Controsignal U1, P1.6 is connected to U5, PMS3 (RESET)
- Both SSC (U1, U5) are connected (P1.2 to P1.5)
- PROG mode is disabled

To execute internal program code of the microcontroller U5

- U1, P1.7 must be set (U1, P1.7 = '1') - /EA = '1'
- U1, P1.6 must be cleared (U1, P1.6 = '0') - RESET = '0' (check selected reset polarity)

To activate the programming mode

- U1, P1.7 must be cleared (U1, P1.7 = '0') - /EA = '0'
- U1, P1.6 must be set (U1, P1.6 = '1') - RESET = '1'
- U1, P3.3 must be cleared (U1, P3.3 = '0') - Busdriver at U5 is active
- Decimal point of the right display segment is active (Busdriver at U5 is active)

Note: U1, P3.3 must not be cleared before U1, P1.7 is cleared, U1, P1.6 is set and the first bus access takes place!

Overview, important portpins for controlling the programming interface:

U1, P1.0 = /PCS (U5, Program-Chipselect)
U1, P1.1 = PRES (U5, Program-Reset)
U1, P1.3 = SRI (SSC, Recieve-Signal, driven by U9)
U1, P1.6 = PMS3 = RESET (U5, Reset-Pin)
U1, P1.7 = PMS0 = /EA (U5, /EA-Pin)
U1, P3.3 = /PROG (U5, activate programming mode)

3. Appendix

3.1 GAL-Listing

U9:

```
*IDENTIFICATION
Title           GAL U9 Decoder for KC513 PCB-No.2024.2
Revision        1.2
Company         PHYTEC Messtechnik GmbH Mainz
Date            28.05.1996

*PAL
 TYPE = GAL16V8_C8;
*PINS
 PSEN           = 1,
 RD             = 2,
 A15            = 3,
 RES            = 4,
 P35            = 5,
 P34            = 6,
 P33            = 7,
 P32            = 8,
 P10            = 9,
 SLSi           = 11,
 SLSo           = 12,
 A14            = 13,
 CE4            = 14,
 PROG           = 15,
 PRD            = 16,
 CE3            = 17,
 CE2            = 18,
 CE1            = 19;

*BOOLEAN-EQUATIONS
/CE1  = /P35 & A15 & RES                        !U2 ROM (CO:80..FF)
      +  P35 & RES;                             !U2 ROM (CO:00..FF)

/CE2  = /P35 &/A15 & RES                        !U3 RAM (VN:00..7F)
      +  P35 &/A15 & RES;                       !U3 RAM (XD:00..7F)

/CE3  = /P35 & A15 & A14 & RES & /P33 & /P10    !U7 (XD:C0..FF)
      +  P35 & A15 & A14 & RES & /P33 & /P10;   !U7 (XD:C0..FF)

/CE4  = /P35 & A15 &/A14 & RES                  !CS1 (XD:80..BF)
      +  P35 & A15 &/A14 & RES;                 !CS1 (XD:80..BF)

/PROG = /P35 & /P33 & RES                       !U5 PROG
      +  P35 & /P33 & RES;                      !U5 PROG

/PRD  = /P35 & (/PSEN + /RD) & RES              !RAM-RD VN (CODE+XDATA)
      +  P35 &  /RD & RES;                      !RAM-RD XD (XDATA)

SLSo  = /SLSi & RES;

*END
```

U12, U13:

```
*IDENTIFICATION
Title           GAL U12,U13 7Seg.-Decoder for KC513 PCB-No. 2024.0/1/2
Revision        1.0
Company         PHYTEC Messtechnik GmbH Mainz
Date            18.07.1995

*PAL
 TYPE = GAL16V8_C8;

*PINS
 I[1..4]  = [6..9],
 P        = 1,
 O[1..7]  = [13..19],
 PO       = 12;

*BOOLEAN-EQUATIONS
; Sofware for 7Seg.Decoder (GAL16V8)
; U12=U13/KitCON-513
/PO = /P;

*FUNCTION-TABLE
$(I[4..1]) : (O[7..1]);
    0000   :    0 0 0 0 0 0 1;   0
    0001   :    1 0 0 1 1 1 1;   1
    0010   :    0 0 1 0 0 1 0;   2
    0011   :    0 0 0 0 1 1 0;   3
    0100   :    1 0 0 1 1 0 0;   4
    0101   :    0 1 0 0 1 0 0;   5
    0110   :    0 1 0 0 0 0 0;   6
    0111   :    0 0 0 1 1 1 1;   7
    1000   :    0 0 0 0 0 0 0;   8
    1001   :    0 0 0 0 1 0 0;   9
    1010   :    0 0 0 1 0 0 0;   A
    1011   :    1 1 0 0 0 0 0;   b
    1100   :    0 1 1 0 0 0 1;   C
    1101   :    1 0 0 0 0 1 0;   d
    1110   :    0 1 1 0 0 0 0;   E
    1111   :    0 1 1 1 0 0 0;   F
    REST   :    1 1 1 1 1 1 1;  DISPLAY DARK

*END
```

3.2 EU-CE declaration

EG-KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY

Wir (Name des Herstellers)
We (Name of the producer)

PHYTEC Meßtechnik GmbH

Adresse
Address

Robert-Koch-Straße 39,
D-55129 Mainz

Erklären in alleiniger Verantwortung, daß das Produkt:
declare under sole responsibility, that the product:
Bezeichnung
Name

KitCON-513

Type, Modell, Artikel-Nr.
Type, Model, Article No.

PCB 2024.2 / KSP-0395

die Anforderungen folgender Normen erfüllt
fullfills the requirements of the standards

- prEN 50 082-2 (1995)
- EN 50 081-1 (1992)

und damit folgender der EG-Richtlinie entspricht.
and therefore corresponds to the EU-Directive

Elektromagnetische Verträglichkeit (89/336/EWG)

Diese Erklärung gilt für alle Exemplare die das CE-Zeichen tragen und verliert ihre Gültigkeit wenn Veränderungen am Produkt vorgenommen werden.
This declaration is valid for all units with the CE label on it and it lose its validity if a modification is done on the product.

Name / *Name*	**Dipl. Phys. Karl Neubecker**
Funktion / *Title*	**Geschäftsführer**
Mainz, den 10. Oktober 1996	
Datum / *Date*	..... Unterschrift / *Signature*