kitCON-161CS/JC/JI

Hardware-Manual

Edition December 1999

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Preface

This kitCON-161CS/JC/JI User's Manual describes the board's design and functions. Precise specifications for the C161 microcontroller can be found in the enclosed microcontroller Data-Sheet/User's Manual. If software is included please also refer to additional documentation for this software.

In this hardware 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.

Declaration regarding EMV-Conformity of the PHYTEC kitCON-161CS/JC/JI

PHYTEC kitCON Single Board Computers (henceforth „products“) are designed for installation in electrical appliances or as dedicated Evaluation Boards (i.e.: for use as a test and prototype platform for hardware/software development) in laboratory environments.

PHYTEC products must be operated within protective, grounded circuitry. Moreover, PHYTEC products should not be operated without protection circuitry if connections to the products' pin header rows are longer than 3 m.

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The kitCON-161CS/JC/JI is one of a series of PHYTEC kitCONs that can be fitted with different controllers and, hence, offers various functions and configurations. PHYTEC supports all common Infineon' 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 universal, insert-ready, fully functional micro- and mini-MODULS 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:

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1 Introduction to the kitCON-161CS/JC/JI

The kitCON-161CS/JC/JI is an EURO-sized (160 x 100 mm) Evaluation Board for the Infineon C161x microcontroller of the C166-microcontroller family. It can house C161 derivatives of type C161CS/JC or JI in a TQFP-128 package. These derivatives differ in number and type of the on-chip interfaces *(refer to Table 1).* The kitCON-161CS/JC/JI is preconfigured and equipped with all necessary connectors required for immediate start-up *(refer to Figure 2).*

Precise specifications for the specific controller fitted on the board can be found in the enclosed microcontroller User's Manual.

controller	**number of CAN-interfaces**	**number of J1850-interfaces**
C161CS	2	none
C161JC	1	1
C161JI	none	1

Table 1: Number of CAN-/J1850-interfaces of the possible controllers

The kitCON-161CS/JC/JI offers the following features:

- Evaluation Board in EURO-card format 160 x 100 mm, including wrap-field (45 x 68 mm) for easy layout of user circuitry
- Improved interference safety through multi-layer technology
- Requires single unregulated 8 V to 12 V=/500 mA power source
- 256 kByte Flash on board (PLCC-package)(optionally expandable to up to 1 MB)[1]
- on-board Flash-programming
- No need for a dedicated programming voltage through use of 5 V-Flash devices
- 64 kByte SRAM on board (optionally expandable to up to 1 MB)[1]
- All controller ports, as well as data and address lines, are extended from the controller to the pins of the kitCON-Connector in the middle of the board
- first RS-232 serial interface, available at DB9-socket P1
- second RS-232 serial interface, available at X1
- first CAN-interface, available at DB9-plug P2 (C161CS and JC)
- second CAN-interface (C161CS) or J1850-interface (C161JC and JI), available at DB9-plug P3
- Two LED's to display the board's status
- Eight freely programmable LEDs at Port 2.8 - 2.15
- Up to four free Chip-Select signals for easy connection of peripheral devices (controller-dependent)
- Provision for operating the board with an ICE/connect-16x for easy emulation of the controller

[1] For more information about additional configurations see the PHYTEC product catalog

1.1 Block Diagram

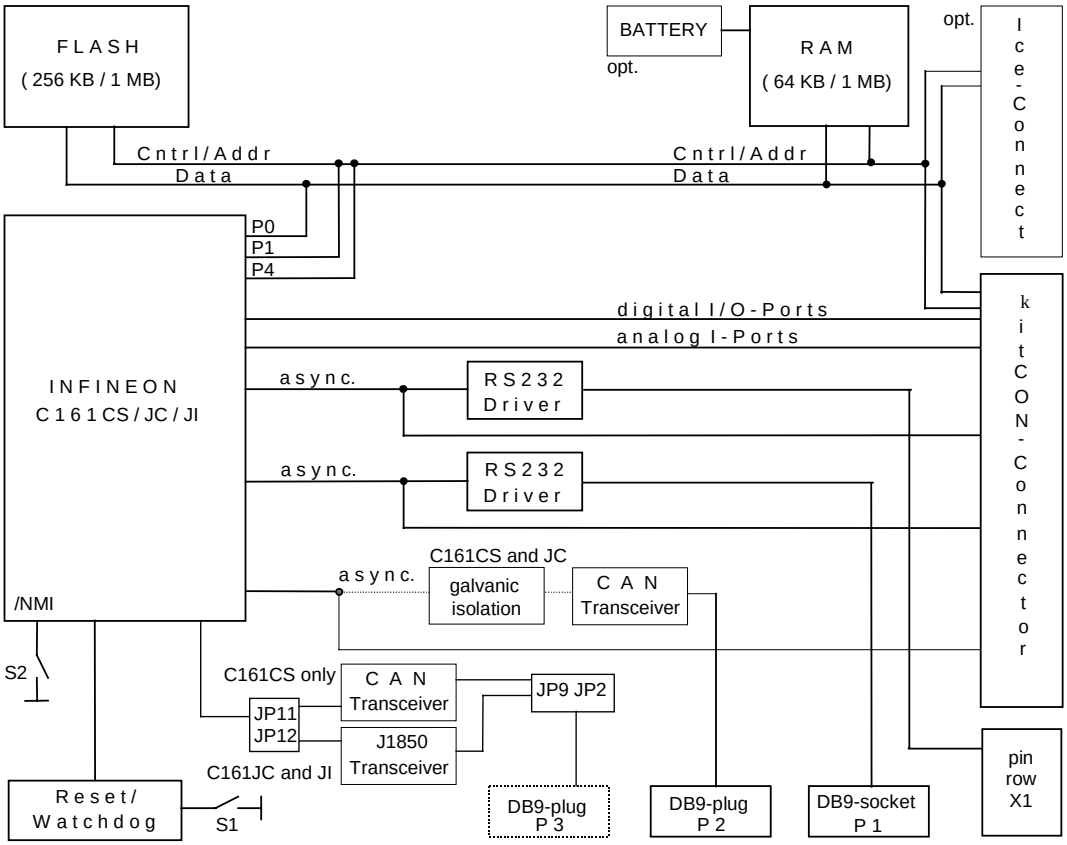


Figure 1: Block Diagram

1.2 Overview of the kitCON-161CS/JC/JI

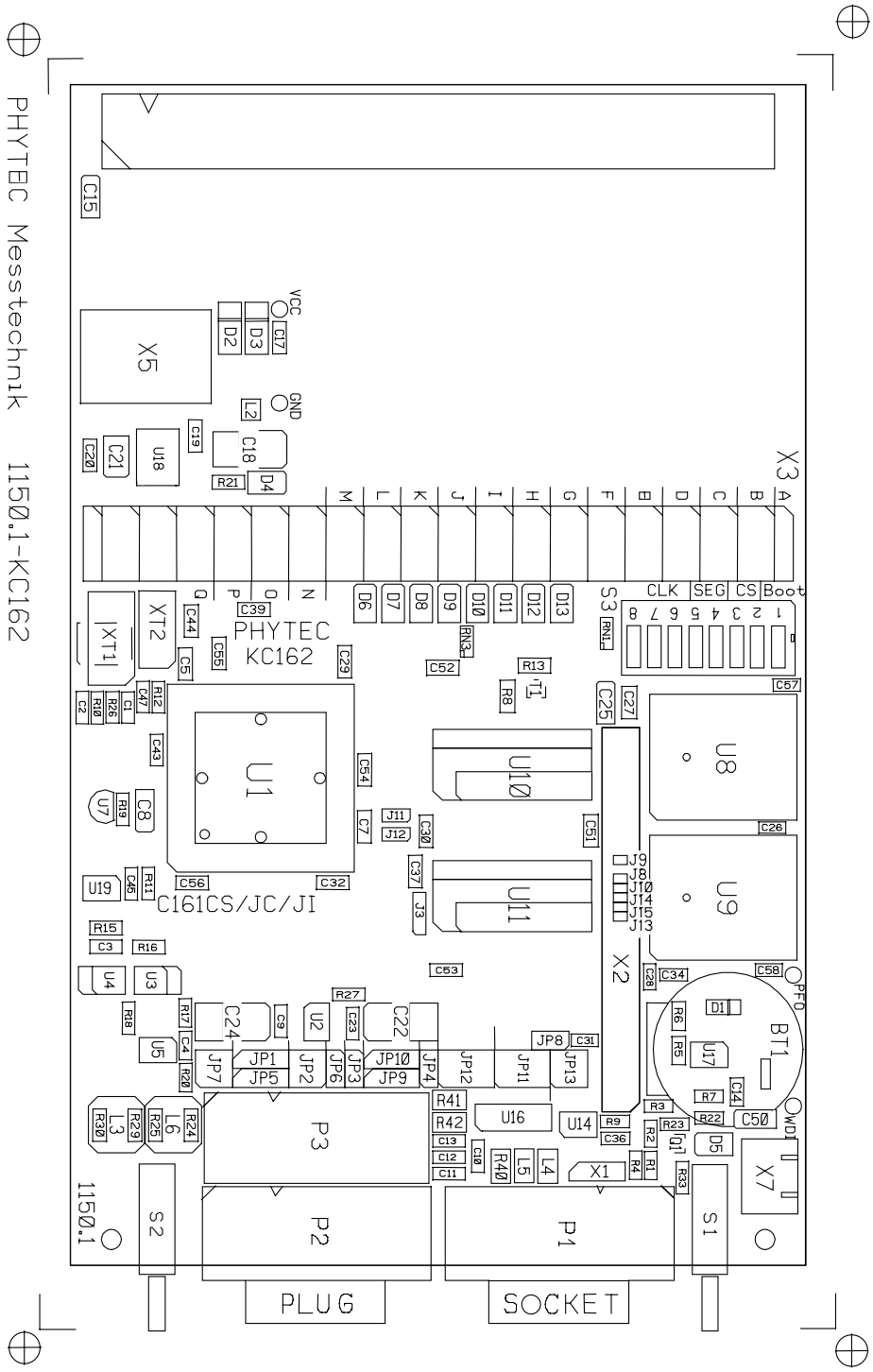


Figure 2: Overview of the kitCON-161CS/JC/JI (Component side)

2 Quickstart Instructions

This section provides a step-by-step instruction for putting the kitCON-161CS/JC/JI into operation. Please note that the following instructions refer to the current versions of the FlashTools and the Monitor-program from Keil Elektronik GmbH as of the pressing of this manual.

Generally the Bootstrap Loader allows downloading and starting of any program suitable for the target controller.

Depending on the terminal-program used, different applications and tools will be loaded and executed. For instance when executing the PHYTEC terminal program FLASHT.EXE, routines for programming the Flash (the so-called FlashTools[1]) will automatically be loaded and started. This is in contrast to the terminal-program MON166.EXE from Keil Elektronik GmbH, which downloads a Monitor program enabling simple debugging of user code.

The following sections provide a step by step description for starting the kitCON-161CS/JC/JI using the FlashTools as well as for starting the kitCON-161CS/JC/JI using the Monitor program[2].

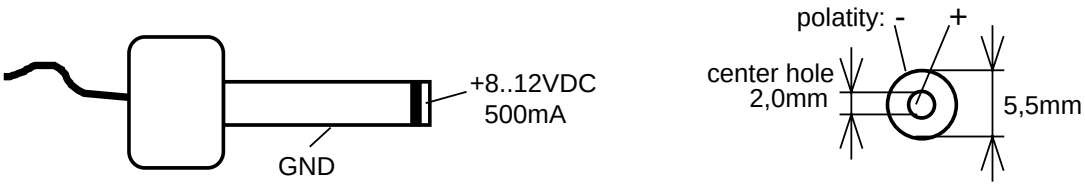


Figure 3: The Power-Plug

1: Software-tool for on-board Flash-programming, will be automatically loaded if the terminal-program FLASHT.EXE is used

2: The Monitor program is only shipped with kitCON boards included in an Infineon Starter Kit

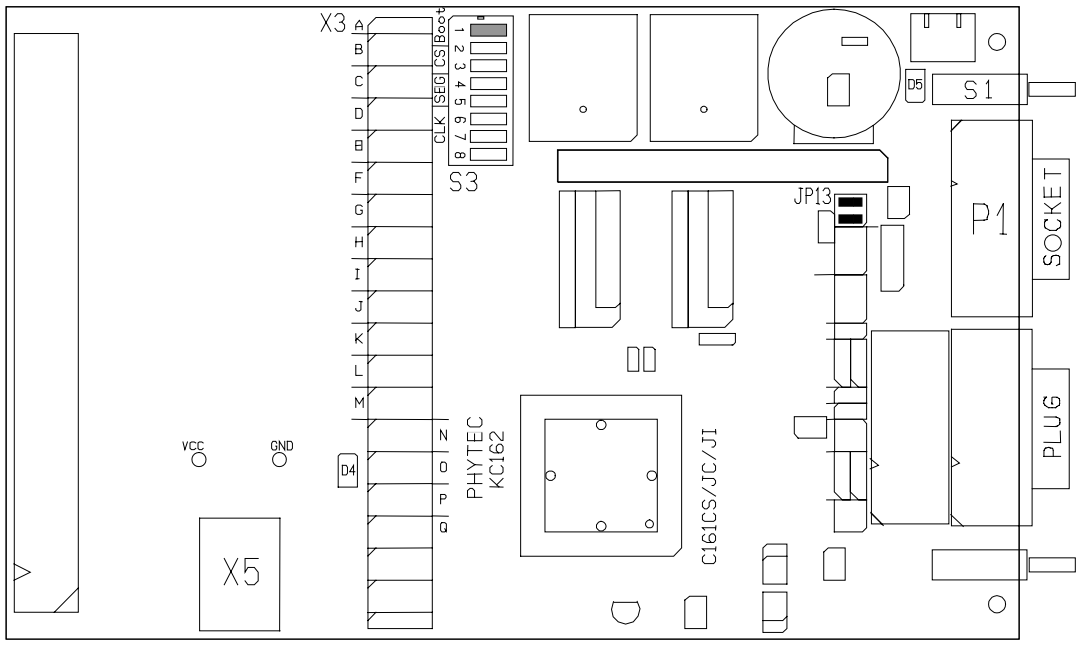


Figure 4: Important Jumpers and Connectors for Start-up

2.1 Starting the kitCON using a Monitor program

- Use of the Monitor program requires a kitCON-161CS/JC/JI and an IBM-PC or a compatible system, as well as an unregulated power supply for 8 V= - 12 V= /500 mA. Typically, all jumpers for configuring the kitCON-161CS/JC/JI have been correctly set upon delivery of the board.

- Connect your Host-PC (COM1 or COM2) to the DB9-socket P1 on the kitCON-161CS/JC/JI using a serial cable as shown below.

PC DB9-socket (COM1, 2)		**kitCON-161CS/JC/JI DB9-socket P1**
RxD PIN 2	to	TxD PIN 2
TxD PIN 3	to	RxD PIN 3
GND PIN 5	to	GND PIN 5

- No Hardware-Handshake-Line is required to invoke communication between the kitCON-161CS/JC/JI and the Host-PC, as the firmware contains a transmission protocol to ensure fault-free data transmission between the PC and the kitCON-161CS/JC/JI.

- Ensure that switch 1 of DIP switch S3 (right of the kitCON-Connector) is turned ON.

- Ensure also that jumper JP13 is closed in position 1+2 and 3+4.

- Attach a power supply to the power-connector X5. An unregulated 8 V= to 12 V=/500 mA power source can be used to supply the board. Use only a fixed voltage power supply and no power supply with variable voltage. Double-check the correct polarity of the socket as shown in *Figure 3.* If the power supply is attached correctly the red LED D4 will light up.

- Push switch S1 to perform a Reset and to start the Bootstrap Loader on the kitCON-161CS/JC/JI.

- Invoke the terminal program MON166.EXE on your Host-PC by entering the following at the DOS prompt:

  mon166 [*BR* (*Baudrate*)] [*COM port number*]

Other communication or terminal programs are not suitable for data transmission to and from the Monitor program on the kitCON-161CS/JC/JI, as a special transmission protocol is required. Ensure that only DOS is active at the time of the invocation.

Ensure that the directory in which MON166.EXE is started contains the two files 'boot' and 'monitor' for the Controller C161.

- The Monitor program will automatically load after invoking MON166.EXE and the green LED D5 will light up. The loading procedure can be viewed on the monitor screen of the Host-PC.

- After successfully loading, the Monitor program will automatically start and its '#' prompt will appear on the screen of the Host-PC.

- Enter *'load* Pathname***hello161'** now in order to load the demo program.

- Once downloading has finished and the '#' prompt reappears, enter the command 'g' to execute the demo program. Successful execution results in the message "Hello World !...' appearing on the screen of the Host-PC.

- To leave the Monitor program press <*F1*>

Quickstart Instructions for using a Monitor program - Summary

- Connect the kitCON-161CS/JC/JI to an IBM-PC or a compatible system using a serial cable (P1 to COM1 or COM2)
- Turn switch 1 of Dip-Switch S3 ON
- Verify that jumper JP13 is closed in position 1+2 and 3+4
- Attach an unregulated power supply with 8 V= to 12 V=/500 mA to X5 on the kitCON-161. **Double check the correct polarity.**
- Press switch <*S1*> to perform a RESET
- Start MON166.EXE on your Host- PC (*mon166 [2* (for COM2)*]*) from the DOS environment
- After the '#' prompt appears, enter *'load* Pathname***hello161"**
- Press <*ENTER*>
- After the '#' prompt reappears enter 'g'
- Press <*ENTER*>

  "Hello World !..." appears on the screen of your Host-PC.
- To leave the Monitor program press <*F1*>

2.2 Starting the kitCON and programming the Flash

- Use of the FlashTools requires a kitCON-161CS/JC/JI and an IBM-PC or a compatible system, as well as an unregulated power supply for 8 V= - 12 V= /500 mA. Typically, all jumpers for configuring the kitCON-161CS/JC/JI have been correctly set upon delivery of the board.
- Connect your Host-PC (COM1 or COM2) to the DB9-socket P1 on the kitCON-161CS/JC/JI using a serial cable as shown below.

PC DB9-socket (COM1, 2)		**kitCON-161CS/JC/JI DB9-socket P1**
RxD PIN 2	to	TxD PIN 2
TxD PIN 3	to	RxD PIN 3
GND PIN 5	to	GND PIN 5

  No Hardware-Handshake-Line is required to invoke communication between the kitCON-161 and the Host-PC, as the firmware contains a transmission protocol to ensure fault-free data transmission between the PC and the kitCON-161.
- Ensure that switch 1 of DIP switch S3 (right of the kitCON-Connector) is turned ON.
- Ensure also that jumper JP13 is closed in position 1+2 and 3+4.
- Attach a power supply to the power-connector X5. An unregulated 8 V= to 12 V=/500 mA power source can be used to supply the board. Use only a fixed voltage power supply and no power supply with variable voltage. Double check the correct polarity of the socket as shown in *Figure 3*. If the power supply is attached correctly the red LED D4 will light up.
- Push switch S1 to perform a Reset and to start the Bootstrap Loader on the kitCON-161CS/JC/JI.
- Invoke the terminal program FLASHT.EXE on your Host-PC by entering the following at the DOS prompt:

  flasht [*BR* (*Baudrate*)] [*COM port number*]

  Other communication or terminal programs are not suitable for data transmission to and from the Monitor program on the kitCON-161CS/JC/JI, as a special transmission protocol is required.
  Ensure that only DOS is active at the time of the invocation.

Ensure that the directory in which FLASHT.EXE is started, contains the two files 'boot' and 'flash'.

- The FlashTools will automatically be loaded after invoking FLASHT.EXE. The loading procedure can be viewed on the monitor screen of the Host-PC.

- After successfully loading the FlashTools will automatically start and the FlashTools main menu will appear on the monitor screen of the Host-PC.

```
======================================================================
FLASH-Utility for 80C16X V 2.5
======================================================================
 (c) 1994, PHYTEC Meßtechnik GmbH, D-55129 Mainz

Flash-Devices:              AMD 29F010
Flash-Area:                 000000H-03FFFFH
Software-Protected-Areas  #1:  none
#2: none
#3: none
No-Access-Areas             #1:  00EF00H-00FFFFH
#2: none
#3: none

 (1) Flash status information
 (2) Erase entire Flash-Area
 (3) Erase partial Flash-Area
 (4) Load INTEL-hexfile
 (5) Software-Reset
 (6) Run from address
 (7) Erase, Load and Software-Reset

> Command:
```

Figure 5: The main menu of the FlashTools

- All FlashTools menu options are intuitive. Select menu option 7, 'Erase, Load and Software-Reset' to download a demo program. Confirm that the unprotected sectors (i.e. the sectors available for user-applications) of the Flash can be erased by entering "Y".

- Following erasure of the unprotected Flash sectors, the next menu will automatically appear on the monitor screen of the Host-PC. Please press <*F2*> to indicate the name of the hexfiles to be downloaded into the Flash (specify the full pathname). To download the demo program enter 'Pathname***hello161.h86**'. Press <*Enter*> to start the download.

- HELLO161 will be automatically started following download. Successful execution results in the message 'Hello World !...' which appears on the screen of the Host-PC. The program can also be executed by pressing the RESET button on the kitCON-161CS/JC/JI after turning OFF switch 1 of DIP-switch S3 (i.e.: toggling the kitCON-161CS/JC/JI into execution mode).

- To leave FLASHT.EXE press <*F1*>

  If any difficulties should occur during start-up, please contact the PHYTEC Technical Support hotline.

Quickstart Instructions for Flash-programming - Summary

- Connect the kitCON-161CS/JC/JI to an IBM-PC or a compatible system using a serial cable (P1 to COM1 or COM2).
- Turn switch 1 of Dip-Switch S3 ON
- Verify that jumper JP13 is closed in position 1+2 and 3+4
- Attach an unregulated power supply with 8 V= to 12 V=/500 mA to X5 on the kitCON-161CS/JC/JI. **Double check the correct polarity.**
- Press switch <*S1*> to perform a RESET
- Start FLASHT.EXE on your Host- PC (*flasht [2* (for COM2)*]*) from the DOS environment
- Select menu option '7'
- Press *'Y'* to confirm 'Erase'
- Press <*F2*>
- Enter 'Pathname***hello161.h86**'
- Press <*ENTER*>

An automatic software reset will execute the program following download.

”Hello World!..." appears on the screen of your Host-PC.

- To leave the FlashTools press <*F1*>

To start the demo program again execute the following steps:

- Disconnect the power source
- turn switch 1 of Dip-Switch S3 OFF
- Reconnect the power source

2.3 Internal Flash memory programming

- Ensure that DIP-switch3 S1 is ON and JP1 is closed between 1+2.
- Start the bootstrap loader by pressing reset switch S1.
- Start “Memtools” on your PC.
- Erase and program the internal flash with your application as described in the Memtool help.
- Turn OFF DIP-switch3 S1 and change JP1 to 2+3.
- Reset the board by pressing switch S1. Your application starts from the internal flash.

Note:
Erased Flash memory cells contain all ‘0’s, contrary to standard EPROMs.

Note:
The new derivatives of the C161CS/JC/JI offer the “single chip mode”. If you want to start the bootstrap loader in this mode, you have to pull down the /RD pin after reset. This feature is NOT implemented on the actual board design.

3 Pinout

Please note that all module connections are not to exceed their expressed maximum voltage or current. Maximum input values are indicated in the corresponding controller manuals/data sheets. As damage from improper connections varies according to use and application, it is the user's responsibility to take appropriate safety measures to ensure that the module connections are protected from overloading through connected peripherals.
As shown in *Figure 6*, all relevant controller signals are brought out to the kitCON-Connector (X3) in the middle of the board. The kitCON-161CS/JC/JI is also prepared to accommodate an ICE/connect-16x (X2). This special connector enables easy emulation of the processor. The following section provides an overview of the pin assignment of the kitCON-Connector, while the ICE/connect-16x is described in *section 3.3*.. *Sections 3.4, 3.5* and *3.6* describe the pinout of the DB9-connectors P1, P2 and P3, while the additional RS-232-connector X1 is described in *section 3.7*. Further signal inputs and outputs are provided through the connectors PFO and WDI, which are described in *section 3.8*. And *section 3.9* describes the two-wire clamp X7.

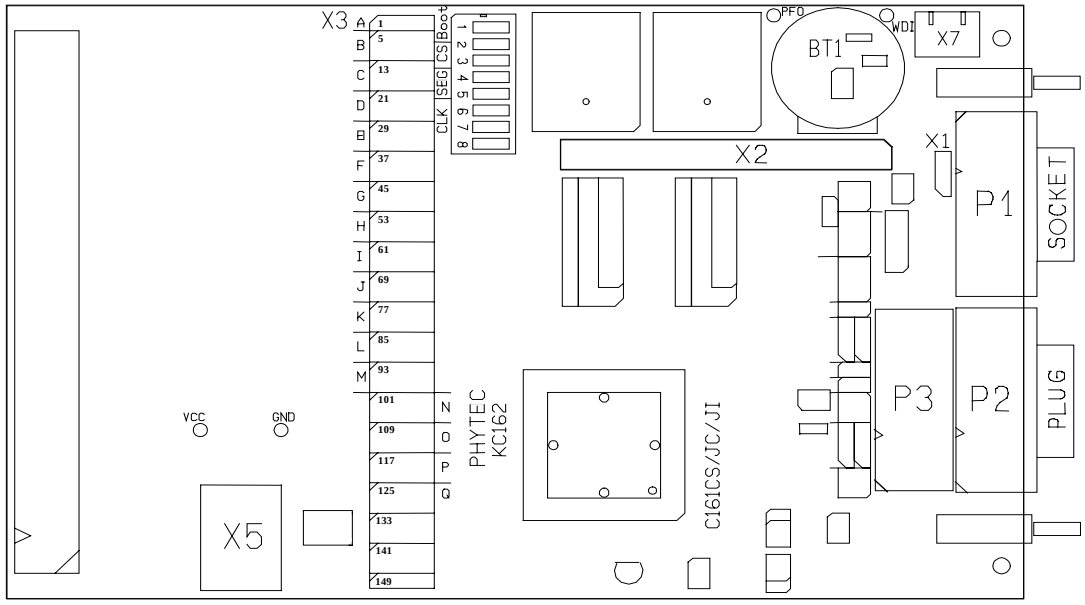


Figure 6: Position of the connectors

3.1 Power Connectors X5, X4

There are two ways to provide power to the kitCON-161CS/JC/JI:
- connection via the VG96 connector at X4
- connection via the low voltage socket at X5

Attention:
Please do not use a laboratory or variable power supply, as power spikes during power-up could destroy the PHYTEC module mounted on the kitCON-161CS/JC/JI.

Please also avoid changing Jumpers or modules while the kitCON-161CS/JC/JI is powered up.

3.1.1 Connecting via VG96-connector X4

A power supply via the VG96 connector X4 requires a constant voltage of + 5 V at the following pins:

Pin 1abc + 5 V regulated

Pin 32abc GND

Figure 7: Numbering of the VG96-connector X4 (front view)

Note:
Only pins 1abc and 32abc are preconnected at the VG96 connector. All other connector pins are freely available to the user.

3.1.2 Connection via the Low Voltage Socket X5

An unregulated power supply in the range of +8 V=...12 V=/ 500 mA can be connected to the kitCON-161CS/JC/JI at low voltage socket X5. Ensure the right polarity of the power supply as depicted in the figure below.

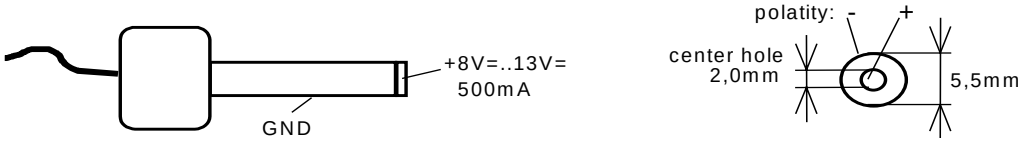


Figure 8: Polarity of the Power Supply

3.2 The kitCON-Connector

Supply Voltage	PIN 1	VCC	2	VCC	3	GND	4	GND
Data Bus	5	D0	6	D2	7	D4	8	D6
	9	D1	10	D3	11	D5	12	D7
	13	D8	14	D10	15	D12	16	D14
	17	D9	18	D11	19	D13	20	D15
Address Bus	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
Digital Port P4	37	P4.0 / A16	38	P4.2 / A18	39	P4.4 / A20 / SDLRxD	40	P4.6 / A22 / CANTX
	41	P4.1 / A17	42	P4.3 / A19	43	P4.5 / A21 / CANRX	44	P4.7 / A23 / SDLTxD
Control-Signals	45	/RD-U	46	/RD-U	47	/RESO-U	48	/RES-U
	49	/WRL	50	ALE	51	/EA	52	/NMI-U
Digital Port P6	53	P6.0 / CS0	54	P6.2 / CS2	55	P6.4 / CS4	56	P6.6 / HLDA
	57	P6.1 / CS1	58	P6.3 / CS3	59	P6.5 /HDL-V	60	P6.7 / BREQ
Reference Voltage	61	VREF	62	VGND	63	P2.8	64	
	65	VREF	66	VGND	67		68	
Digital Port P5	69	P5.0	70	P5.2	71	P5.4	72	P5.6
	73	P5.1	74	P5.3	75	P5.5	76	P5.7
	77		78		79	P5.12	80	P5.14
	81		82		83	P5.13	84	P5.15
	85		86		87		88	
	89		90		91		92	
Digital Port P2	93	P2.8	94	P2.10	95	P2.12	96	P2.14
	97	P2.9	98	P2.11	99	P2.13	100	P2.15
Digital Port P3	101	P3.0 / TxD1	102	P3.2	103	P3.4	104	P3.6
	105	P3.1 / RxD1	106	P3.3	107	P3.5	108	P3.7
	109	P3.8 / MRST	110	P3.10 / TXD0	111	/WRH	112	/RDY-U
	113	P3.9 / MTSR	114	P3.11 / RXD0	115	P3.13 / SCLK	116	P3.15
Digital Port P7	117		118		119	P7.4	120	P7.6
	121		122		123	P7.5	124	P7.7
Digital Port P9	125	P9.0, SDA0	126	P9.2, SDA1	127	P9.4, SDA2	128	
	129	P9.1, SCL0	130	P9.3, SCL1	131	P9.5	132	
	133		134		135		136	
	137		138		139		140	
	141		142		143		144	
	145		146		147		148	
Supply Voltage	149	VCC	150	VCC	151	GND	152	GND

Table 2: Pinout of the kitCON-Connectors X3

3.3 The ICE/connect-16x

The ICE/connect-16x provides an easy possibility for connecting a standard emulator, which uses the controller on-board, to the kitCON-161CS/JC/JI. It can be mounted at position X2 (*refer to Figure 6*). It carries all data- and address signals. The control signals coming from the controller are extended via pre-connections (J8-J10 and J13-J15) at the ICE/connect-16x to the peripheral devices. When using an emulator the emulator generates the control signals. In this case the pre-connections must be opened.

Table 3 shows the pinout of the ICE/connect-16x.

Note:
Pins 41+42, 43+44, 45+46, 47+48, 49+50 and 53+54 are pre-connected on the component side. When using an ICE/connect-16x these pre-connections must to be opened at jumpers J8, J9, J10, J13, J14 and J15.

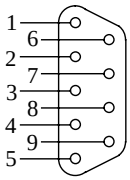
1	GND	D0	2
3	D1	D2	4
5	D3	D4	6
7	D5	D6	8
9	D7	GND	10
11	D9	D8	12
13	D11	D10	14
15	D13	D12	16
17	D15	D14	18
19	GND	A0	20
21	A1	A2	22
23	A3	A4	24
25	A5	A6	26
27	A7	GND	28
29	A9	A8	30
31	A11	A10	32
33	A13	A12	34
35	A15	A14	36
37	GND	ALE	38
39	GND	XT1	40
41	/RES_P	/RES_U	42
43	/HLD-P	/HLD-U	44
45	/RDY-P	/RDY-U	46
47	/RESO_P	/RESO_U	48
49	/NMI-P	/NMI-U	50
51	GND	GND	52
53	/RD_P	/RD_U	54
55	/WRL	/WRH	56
57	P66, HLDA	VCC	58
59	A16	A17	60
61	GND	GND	62
63	A18	A19	64
65	A20, SDL_RxD	A21, CANRX	66
67	A22, CANTX	A23, SDL_TxD	68
69	GND	GND	70
71	P6.0, CS0	P6.1, CS1	72
73	P6.2 CS2	P6.3 CS3	74
75	P6.4(CS4)	NC	76
77	NC	NC	78
79	GND	GND	80

Table 3: Pinout of the ICE/connect-16x X2

3.4 The DB9-socket P1

The DB9-socket P1 serves as RS-232-interface. The pinout is shown below.

DB9-socket P1: RS-232 interface



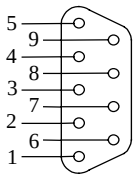
Pin 2:	TXD0 (RS-232)
Pin 3:	RXD0 (RS-232)
Pin 5:	GND

Figure 9: Pinout of the DB9-socket P1 (front view)

3.5 The DB9-plug P2

The DB9-plug P2 carries the CAN-Signals of the first CAN-Interface[1]. The pinout of the DB9-Socket is shown below.

DB9-plug P2: CAN interface



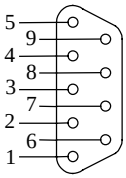
Pin 2:	CAN_L
Pin 7:	CAN_H
Pin 3,6:	CAN_GND
Pin 9:	CAN_VCC

Figure 10: Pinout of the DB9-plug P2 (CAN 0)(front view)

[1]: The availability of this interface depends on the controller mounted on the kitCON-161CS/JC/JI.

3.6 The DB9-plug P3

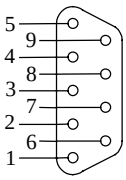
The DB9-plug P3 carries either the CAN-signals of the second CAN-Interface or of the J1850[1]-Interface. The pinout of the DB9-plug depends on the position of jumpers JP9 and JP2. The pinout is shown for both modes in the following.
Pinout of plug P3 if: JP2 = 1+2 and 3+4; JP9 = 2+3
DB9-plug P3: second CAN interface



Pin 2:	CAN1_L
Pin 7:	CAN1_H
Pin3, 6, 8:	GND

Figure 11: Pinout of the DB9-plug P3 (CAN 1)(front view)

J1850
Pinout of plug P3 if: JP2 = open and JP9 = 1+2
DB9-plug P3: J1850-Interface



Pin 3:	J1850 Bus
Pin6, 8:	GND

Figure 12: Pinout of the DB9-plug P3 (J1850)(front view)

3.7 Pin Row X1 (RS-232_1)

Pin row X1 is located behind DB9-socket P1 and carries the signals of the second serial interface[1]. The pinout is shown below:

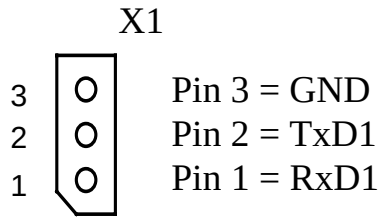


Figure 13: Pinout of Pin Row X1

3.8 The connectors PFO and WDI

The connectors WDI and PFO provide two additional signal inputs/ outputs. They are carried out as soldering holes in order to enable the mounting of test pins.

The WDI connector extends directly to the watchdog input of the watchdog device 694. The watchdog controls the input of the watchdog timer. As long as this connector is left open (i.e. the WDI pin is floating) the Watchdog Timer is disabled. If WDI is driven to either high or low level the Watchdog Timer is started. Reset is executed, if there is no further transition for the watchdog time-out period (see the LTC694 data sheet for further information on the exact timing of the Watchdog Timer).

The PFO connector extends directly to the power failure output of the watchdog device 694. PFO can be used to monitor the condition of the battery back-up or to indicate a power failure at VCC (i.e. VCC is below the battery voltage) (see the LTC694 data sheet for further information on the exact functioning of PFO and the trigger-levels).

1: The availability of this interface depends on the controller mounted on the kitCON-161CS/JC/JI.

3.9 Connector X7

The two-wire clamp X7 can be used to attach an external 9 V= - 16 V = power source to the J1850 Transceiver. To utilize this external source jumper JP10 must be closed in position 1+2. At the time of delivery jumper JP10 is closed at 2+3, i.e. the J1850 Transceiver is supplied from the kitCON-161CS/JC/JI's supply voltage.

Note:
To ensure full functionality of the J1850-bus the use of an external power supply for the transceiver is recommended.

4 Jumper

To configure the module, the kitCON-161CS/JC/JI has 13 insertable and 9 solderable jumpers. In order to ensure immediate use of the board the jumpers have been configured prior to delivery. *Figure 14* illustrates the numbering of the jumper, while *Figure 15* indicates the location of the jumpers on the board.

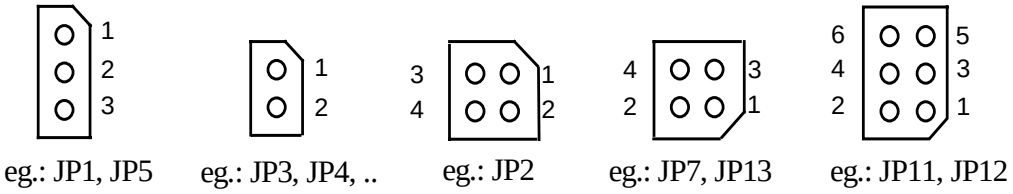
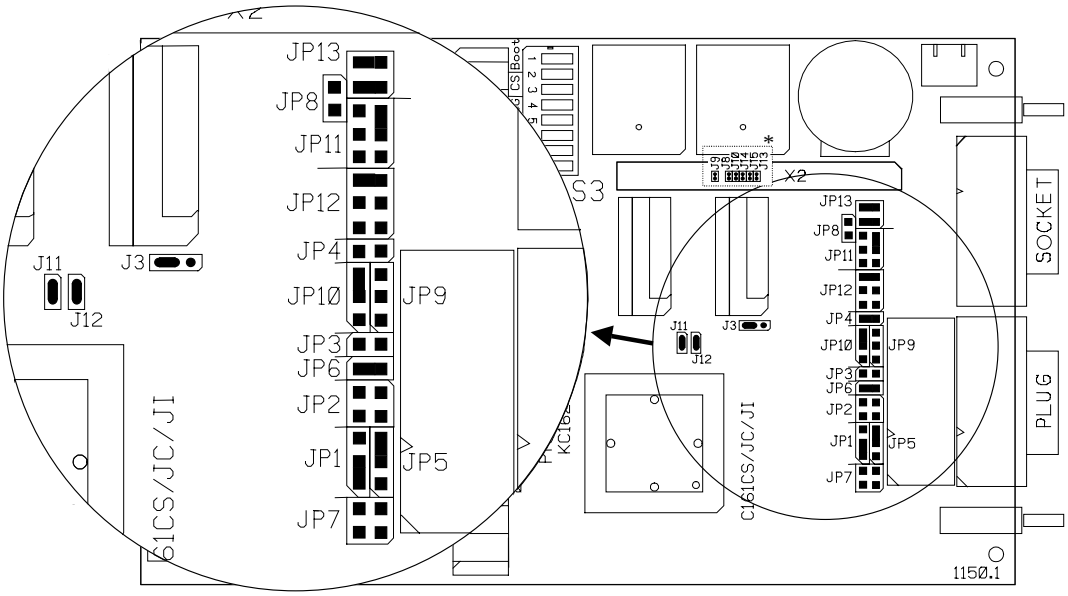


Figure 14: Numbering of the Jumper-Pads



* = J8 – J10 and J13 – J15 are on the back side of the kitCON-161CS/JC/JI

Figure 15: Position of the Jumpers (component side) and default-setting (standard version of the kitCON-161CS/JC/JI)[1]

[1]: In order to utilize the special features of a specific controller on the kitCON-161CS/JC/JI other jumpers might be set additionally

The jumpers (S3 = DIP-switch S3, JP = insertable jumper, J = solderable jumper) have the following functions:

	Default Setting[1]		Alternate Setting	
JP1	(1+2)	external ROM/Flash active	(2+3)	internal ROM/Flash active
JP2	(open)	CAN1[2] not connected to DB9-plug P3	(1+2) (3+4)	DB9-plug P3 for second CAN-interface CAN1[2]
JP3	(open)	CAN0[2] at P2 not terminated	(closed)	CAN0[2] at P2 terminated with 120Ω resistor
JP4	(open)	CAN1[2] at P3 not terminated	(closed)	CAN1[2] at P3 terminated with 120Ω resistor
JP5	(2+3)	CAN-VCC derived from supply voltage	(1+2)	CAN-VCC derived from CAN-network via DB9-plug P2
JP6	(closed)	CAN-GND derived from supply voltage	(open)	CAN-GND derived from CAN-network via DB9-plug P2
JP7	(open)	CAN0[2] and CAN1[2] separate	(1+2) (3+4)	CAN0[2] and CAN1[2] connected
JP8	(open)	J1850-driver regular function	(closed)	J1850-driver in Loopback Mode
JP9	(open)	Pin 3 of DB9-plug P3 is open	(1+2) (2+3)	Pin 3 is J1850[2]-Bus Pin 3 is GND (for CAN1[1])
JP10	(2+3)	supply voltage for J1850[2] driver derived from boards supply voltage	(1+2)	supply voltage for J1850[2] driver derived from external source via connector X7
JP11 JP12	These jumpers configure the functions of ports P4.4 – P4.7 in consideration of the controller mounted on the kitCON-161CS/JC/JI			
JP13	(1+2) (3+4)	/CS1 for RAM /CS0 for FLASH	(2+4) (1+3)	/CS1 for FLASH /CS0 for RAM
J3	(2+3)	256 kByte or 64 kByte RAM	(1+2)	1 MB RAM
J8-J10, J13-J15	(closed)	no ICE/connect-16x installed	(open)	ICE/connect-16x installed on X2
J11, J12	(closed) (closed)	V_{AREF} and V_{AGND} derived from supply voltage VCC and GND	(open) (open)	V_{AREF} and V_{AGND} derived from external voltage source via kitCON-Connector pins 61/65 and 62/66

1: In order to utilize the special features of a specific controller on the kitCON-161CS/JC/JI other jumpers might be set additionally

2: The availability of this interface depends on the controller mounted on the kitCON-161CS/JC/JI.

S3 switch 1	(on)	Boostrap mode	(off)	normal Program Execution Mode
S3 switch 2 switch 3		five /CS-Signals (off) available at port (off) P6		Number of /CS-Signals at port P6 (0, 2 or 3)
S3 switch 4 switch 5	Lines (off)	two Segment Address (A17, A16) at port (off) P4 available		Number of Segment Address Lines at port P4 (0, 4 or 8)
S3 switch 6 switch 7 switch 8	 (off) (off)	System Clock (off) Speed = XT1 * 4		Prescaler to generate the System Clock Speed from XT1 (*1, *2, *3 or *5)

Table 4: Jumper Setting

4.1 Program Storage JP1

At the time of delivery, Jumper JP1 is preconnected between pins 1+2. This default configuration means that the program stored in the external program memory is executed after Reset. In order to allow the execution of a specific controller's internal program memory, jumper JP1 must be closed at 2+3.

Code-Access	**JP1**
external Program Storage	1+2*
internal Program Storage	2+3

* = Default-Setting

4.2 DB9-plug P3 JP2, JP4, JP9

If the kitCON-161CS/JC/JI houses a C161CS or Jx Controller DB9-plug P3 carries either the CAN-Signals or the signals of the J1850-Interface. Jumper JP2 and JP9 determine which signals are available at DB9-plug P3.

Signals at DB9-plug P3	**JP2**	**JP9**
CAN1 (S-Controller only)	1+2 3+4	2+3
J1850 (Jx-Controller only)	open	1+2

With jumper JP4 a CAN-bus connected to DB9-plug P3 can be terminated with a 120Ω resistor.

	JP4
CAN1 not terminated	open
CAN1 terminated with 120Ω resistor	closed

4.3 DB9-plug P2 JP3

With jumper JP3 a CAN-bus connected to DB9-plug P2 can be terminated with a 120Ω resistor.

	JP3
CAN0 not terminated	open
CAN0 terminated with 120Ω resistor	closed

4.4 Supply voltage of the CAN-Interface JP5, JP6

The CAN-driver of the first CAN-interface on the kitCON-161CS/JC/JI can be optically isolated using the optocouplers on U3 and U4. In order to achieve a complete isolation of the CAN-bus, the CAN-circuitry should be supplied through the CAN-interface - DB9-plug P2 (12 V on pin 9, GND on pin 3 and 6). This requires that jumper JP6 be open and jumper JP5 be connected between pads 1+2. If jumper JP6 is closed and JP5 is connected between 2+3 the supply voltage of the CAN-circuitry is supplied from the kitCON-161CS/JC/JI's Supply Voltage.

Supply Voltage of the CAN-circuitry	**JP6**	**JP5**
derived from CAN-network via DB9-plug P2	open	1+2
derived from the supply voltage of the kitCON-161CS/JC/JI	closed*	2+3*

* = Default-Setting

4.5 Connection of the CAN-Interfaces JP7

If the kitCON-161CS/JC/JI houses a C161CS Controller it is possible to connect both CAN-interfaces of the controller via jumper JP7. Using this option enables easy testing of CAN-applications without the necessity to attach a second CAN-node to the kitCON-161 CS/JC/JI.

	JP7
CAN0 and CAN1 not connected	open*
CAN0 connected to CAN1	1+2 3+4

* = Default-Setting

4.6 J1850-Driver Function JP8

Jumper JP8 configures the mode of the J1850-Driver. Having jumper JP8 closed, the Loopback mode of the J1850-Driver is active. Using this option enables easy testing of applications for the J1850-bus without the necessity to attach a second node to the kitCON-161 CS/JC/JI.

	JP8
Loopback-Function not active	open*
Loopback-Function active	closed

* = Default-Setting

4.7 Supply voltage of the J1850-Driver JP10

Jumper JP10 selects the supply voltage for the J1850-driver. The driver can be supplied either from the board-level power supply for the kitCON-161CS/JC/JI, or through an external power supply that can be connected to the two-wire clamp at X7

Supply voltage of the J1850-Driver	**JP10**
derived from the supply voltage of the kitCON-161CS/JC/JI	open*
derived via X7 from external power supply	closed

* = Default-Setting

Note:
To ensure full functionality of the J1850-bus the use of an external power supply for the transceiver is recommended.

4.8 Configuration of ports P4.4 – P4.7 JP11, JP12

The kitCON-161CS/JC/JI can be equipped with different C161 derivatives. These derivatives vary in number and type of the interfaces available at ports P4.4 – P4.7. With jumpers JP11 and JP12 these alternate functions of port P4 can be enabled on the kitCON-161CS/JC/JI. The Table below shows the pinout of ports P4.4 – P4.7. If no alternate function is given the port serves only as digital I/O or address line.

Controller	**P4.4**	**P4.5**	**P4.6**	**P4.7**
C161CI	-	CAN_RXD	CAN_TXD	-
C161JI	SDL_RXD	-	-	SDL_TXD
C161JC	SDL_RXD	CAN1_RXD	CAN1_TXD	SDL_TXD

In order to utilize the interfaces jumpers JP11 and JP12 must be configured as shown below:

C161CS

	JP11	**JP12**
P4.4 as CAN1_RxD		1+2
P4.5 as CAN_RxD		5+6
P4.6 as CAN_TxD	3+5	
P4.7 as CAN1_TxD	2+4	

C161JI

	JP11	**JP12**
P4.4 as SDL_RxD		2+4
P4.7 as SDL_TxD	4+6	

C161JC

	JP11	**JP12**
P4.4 as SDL_RxD		2+4
P4.5 as CAN_RxD		5+6
P4.6 as CAN_TxD	3+5	
P4.7 as SDL_TxD	4+6	

NOTE:
Other configurations of jumpers JP11 and JP12 are reserved for future functions. If ports P4.4 – P4.7 are used as digital I/O or address line jumpers JP11 and JP12 must remain open..

4.9 Configuration of the Chip-Select Signals /CS0, /CS1 JP13

Jumpers JP13 enables swapping of Chip Select signals for the SRAM and Flash devices. Hence, following a RESET, the command cycle can execute out of external SRAM without modification of the ADDRESELx- or BUSCONx-registers. In other words, setting Jumper JP13 allows the same user code to run out of the external SRAM or Flash memory.

/CS-activated memory	**JP13**
/CS0 selects Flash /CS1 selects RAM	1+2* 3+4*
/CS0 selects RAM /CS1 selects Flash	1+3 2+4

* = Default-Setting

4.10 Memory Size J3

Jumper J3 configures the memory size, which is dependent upon the specific memory devices mounted at U10/U11 on the board. The standard memory of the kitCON-161CS/JC/JI offers 64 kByte external memory[1] mounted at U10 and U11.

Memory Size of U10/U11	**J3**
1 MB RAM	1+2
256 kByte or 64 kByte	2+3*

* = Default-Setting

[1]: More information about additional configurations can be found in the PHYTEC product catalog

4.11 Reference Voltage of the A/D Converter J11, J12

The A/D converter of the controller requires a reference voltage ($V_{AREF,}$ V_{AGND}) applied at pins 35 and 36 of the controller. This reference voltage can be derived either from an external source connected to the kitCON-Connector pins 61/65 and 62/66 or from the internal supply voltage of the kitCON-161CS/JC/JI. The source of the reference voltage can be chosen with the jumpers J11 and J12.

Reference Voltage of the A/D Converter	**J11 (V_{AGND})**	**J12 (V_{AREF})**
external reference voltage connected to kitCON-Connector X3 pins 61/65 and 62/66	open	open
derived from the internal supply voltage of the kitCON-161CS/JC/JI	closed*	closed*

* = Default-Setting

4.12 Configuration during System Reset DIP-Switch S3

Most of the programmable features of the C161x are either selected during the initialization phase or repeatedly during program execution. However there are some features that must be selected earlier, because they are used for the first access of the program execution. These selections are made during reset via the pins of Port P0, which are read at the end of the internal reset sequence. During reset, internal pull up devices are active at Port P0 meaning that high input levels are the default configuration on Port P0. To change the configuration external pull down devices have to be connected to the respective port pins. This can be done with the help of DIP-Switch S3, as DIP-Switch S3 allows the configuration of the board during system reset (*for more information about the configuration during system reset refer also to the C161 User's manual, section "System Reset")*. Some configurations that are usually made once can be changed by installing optional resistors.

The following figure shows Port P0, the function of the pins during reset and how they can be changed (either with DIP-Switch S3 or with optional resistors). The shaded pins are fixed and must not be changed with DIP-Switch S3.

Function of Port P0 during System Reset (High-Byte)							
Bit H7	H6	H5	H4	H3	H2	H1	Bit H0
CLKCFG *S3 switch 6, 7 and 8*			SALSEL *S3 switch 4 and 5*		CSSEL *S3 switch 2,* 3		WRC *0*

Function of Port P0 during System Reset (Low-Byte)							
Bit L7	L6	L5	L4	L3	L2	L1	Bit L0
BUSTYP *1*	*0*	**R**	BSL *S3 switch 1*	**R**	**R**	ADP *R3*	EMU *R4*

Reserved pins must remain high in order to ensure proper operation
The configuration of these pins must not be changed

The following sections contain a more detailed description of the configuration done with DIP-Switch S3.

4.12.1 Boot-Switch S3 (switch 1)

The C161 houses an on-chip Bootstrap Loader that can be activated with switch 1 of DIP-Switch S3. The Bootstrap Loader is started if pin 4 of port P0 is low during reset. This is accomplished by turning ON switch 1 of DIP-Switch S3.

Boot Mode	**S3 switch 1**
Bootstrap mode	ON*
normal Program Execution	OFF

- = Default-Setting

4.12.2 Chip-Select Signals S3 (switch 2 and 3)

The C161 Controller provides up to five Chip-Select Signals at Port P6. The number of Chip-Select Signals active can be defined during system reset through configuring P0.9 and P0.10. This configuration can be done with DIP-Switch S3 (switch 2 and 3). These pins are open in the default configuration meaning that all Chip-Select Signals are active. Please note that /CS0 and /CS1 are used to control the Flash devices on U8 and U9 and the RAM on U10 and U11. Hence 3 Chip-Select Signals are available for other purposes.

Chip-Select Signals	**S3 switch 2**	**S3 switch 3**
five (/CS0-/CS4)	OFF*	OFF*
three (/CS0-/CS2)	ON	ON
two (CS0-/CS1)	OFF	ON
none	ON	OFF

* = Default-Setting

4.12.3 Segment Address Lines S3 (switch 4 and 5)

The C161 controller family allows user configuration of the number of address-lines available for segment addressing at port P4. The configuration of port P0.11 and P0.12 during system reset specifies the number of active address lines. This configuration can be done with DIP-Switch S3 (switch 4 and 5).

Segment Address Lines	**S3 switch 4**	**S3 switch 5**
only A16 and A17 are active	OFF*	OFF*
four A16 - A19 are active	ON	ON
all A16 - A23 are active	ON	OFF
none are active	OFF	ON

* = Default-Setting

4.12.4 Clock MODE S3 (switch 6, 7 and 8)

The CPU-clock can be derived either directly from the oscillator clock or from the on-chip PLL that allows definition of a prescaler. To determine the clock source and the prescaler port P0.13 -P0.15 must be configured with DIP-Switch S3 (switch 6, 7 and 8) during system reset. The standard version of the kitCON-161CS/JC/JI is equipped with a 5 MHz quartz (XT1) meaning that the frequency of the CPU clock is 20 MHz with the default jumper setting.

Clock - Mode	**S3 switch 6**	**S3 switch 7**	**S3 switch 8**
XT1 x 4(2,5-6,25 MHz)	OFF*	OFF*	OFF*
XT1 x 3(3,3-8,3 MHz)	ON	OFF	OFF
XT1 x 2(5-12,5 MHz)	OFF	ON	OFF
XT1 x 5(2-5 MHz)	ON	ON	OFF
OSC1 x 1(1-25 MHz) direct drive	ON	ON	ON
XT1 x 1.5 (6.66-16,66 MHz)	ON	OFF	ON
XT1 / 2(2-50 MHz)	OFF	ON	ON
XT1 x 2.5(4-10 MHz)	ON	ON	ON

* = Default-Setting

5 Memory Models

The C161x Controller provides up to five Chip-Select Signals at port P6 for easy selection of external peripherals or memory banks. Two of those Chip-Select Signals (/CS0, /CS1) are used internally. Depending on the setting of jumper JP13 these Chip-Select Signals select Flash bank 1 on U8/U9 and RAM bank1 on U10/U11. Flash bank 1 houses a total memory of either 256 kByte or 1 MB whereas RAM bank1 house memory devices of type 32 kByte, 128 kByte or 512 kByte within a SO28-32 package.

In order to use the Chip-Select Signals they have to be enabled during reset. The assignment of the Chip-Select Signals to specific address areas is done with the corresponding ADDRESELx and BUSCONx register. Note that ADDRESELx has to be configured prior activating of the Chip-Select Signal with BUSCONx. Take care that the memory areas do not conflict.

Prior definition of the ADDRESELx and the BUSCONx register only /CS0 is active in the entire address space and remains active for all areas not assigned to an other Chip-Select Signal.

On the next page you will find two examples for configuring the memory area. These examples refer to the standard configuration of jumper JP13 (1+2, 3+4), i.e. /CS0 controls Flash bank1 and /CS1 RAM bank1. These examples match the needs of most standard applications.

Example a)

ADDRESEL1: 0404h = Memory area 04:0000h - 04:FFFFh
(64 kByte RAM Bank 1 on U10/11)
ADDRESEL2: 0806h = Memory area 08:0000h - 0B:FFFFh
(256 kByte free I/O area)
ADDRESEL3: 0C06h = Memory area 0C:0000h - 0F:FFFFh
(256 kByte free I/O area)
ADDRESEL4: 1000h = Memory area 10:0000h - 10:0FFFh
(4 kByte free I/O area)
BUSCON0: 04AFh : Bus active for /CS0 (Flash bank 1 U8/9)
BUSCON1: 04AFh : Bus active for /CS1 (RAM bank 1 U10/11)
BUSCON2: 04AFh : Bus active for /CS2 (free I/O)
BUSCON3: 04AFh : Bus active for /CS3 (free I/O)
BUSCON4: 068Ch : Bus active for /CS4 (free I/O)
BUSCON0-3: for all 55 ns memory devices (0 Waitstate, R/W-Delay, no Tri-state, short ALE, 16-bit Demultiplexed)
BUSCON4: for free I/O area (3 Waitstate, RW-Delay, Tri-state Wait 300 ns, long ALE, 16-bit Demultiplexed)

Example b)

ADDRESEL1: 0006h = Memory area 00:0000h - 03:FFFFh
(256 kByte RAM Bank1 on U10/11)
ADDRESEL2: 0806h = Memory area 08:0000h - 0B:FFFFh
(256 kByte free I/O)
ADDRESEL3: 0C06h = Memory area 0C:0000h - 0F:FFFFh
(256 kByte free I/O)
ADDRESEL4: 1006h = Memory area 10:0000h - 13:FFFFh
(256 kByte free I/O)
BUSCON0: 04AFh : Bus active for /CS0 (Flash bank1 U8/9)
BUSCON1: 04AFh : Bus active for /CS1 (RAM bank1 U10/11)
BUSCON2: 04AFh : Bus active for /CS2 (free I/O)
BUSCON3: 04AFh : Bus active for /CS3 (free I/O)
BUSCON4: 068Ch : Bus active for /CS4 (free I/O)
BUSCON0-3: for all 55 ns memory devices active (0 Waitstate, RW-Delay, no Tri-state, short ALE, 16-bit Demultiplexed)
BUSCON4: for free I/O area (3 Waitstate, RW-Delay, Tri-state, long ALE, 16-bit Demultiplexed)

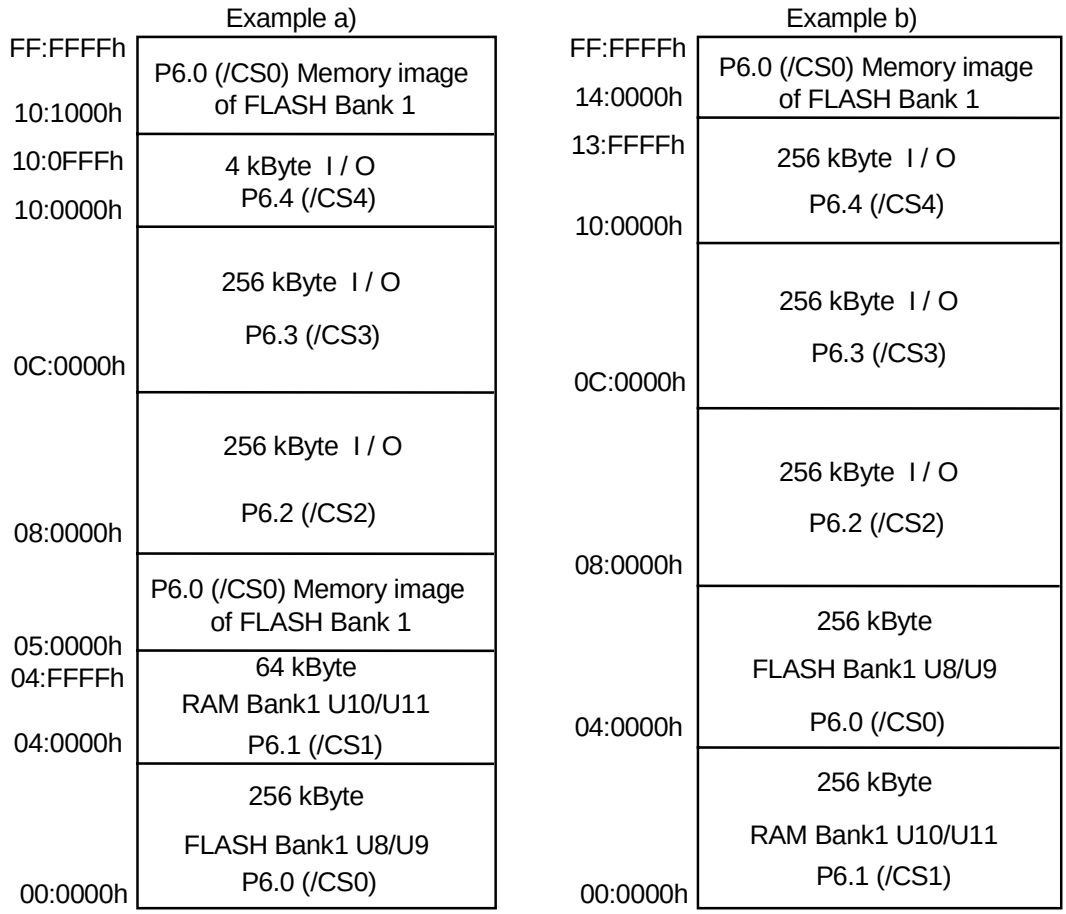


Figure 16: Examples for memory models

6 Flash Memory

6.1 Internal Flash

The on-chip Flash module of the C161CS/JC/JI has a capacity of 256 kByte (organized in sectors of 16 kByte, 8 kByte, 8 kByte, and 7 times 32 kByte). It combines the advantages of a very fast read access of 32-bit in one machine cycle with protected but simple writing algorithms for programming and erase. Read accesses of code and data are possible in any addressing mode, thus realizing the highest CPU performance with fetch of double word instructions in a single cycle.
The lower 32 kBytes of the on-chip Flash memory of the 161CS/JC/JI (sectors 0, 1, 2) can be mapped to either segment 0 (00'0000 H to 00'7FFF H) or segment 1 (01'0000 H to 01'7FFF H) during the initialization phase to allow external memory to be used for additional system flexibility. The upper 224 kBytes of the on-chip Flash memory (sectors 3...9) are assigned to locations 01'8000 H to 04'FFFF H .
If you want to use the external RAM in combination with the internal Flash you should modify your startup-code that chip select 1 (/CS1) is active from 50000H. To ensure that /CS1 is connected with the external RAM please check the setting of Jumper JP13.
Infineon Technologies offers a PC based software called "Memtool" to program the internal flash memory.

Note:
The new derivatives of the C161CS/JC/JI offer the "single chip mode". If you want to start the bootstrap loader in this mode, you have to pull down the /RD pin after reset. This feature is NOT implemented on the actual board design.

6.2 External Flash

Flash is a highly functional means of storing non-volatile data. The kitCON-161CS/JC/JI can house Flash devices of type 29F010 (128 kByte memory) or of type 29F040 (512 kByte memory) as Flash memory. Use of 5 V Flash devices means that no dedicated programming voltage is required on board.

On-board programming is done with a utility program developed by PHYTEC, so called "FlashTools" (*refer to section 12, "FlashTools"*). FlashTools must be loaded with the Bootstrap Loader prior to use.

Use of a Flash device as the only means of code storage results in no or limited usability of the Flash memory as non-volatile memory for data. This is due to the internal structure of the Flash device, as during the Flash-internal programming process the reading of data from Flash is not possible. Hence, for Flash-programming, program execution must be transferred out of Flash (such as into von-Neumann RAM). This usually equals the interruption of a "normal" program execution cycle.

As of the printing of this manual, Flash devices generally have a life expectancy of at least 100,000 Erase-/Program-cycles.

7 The CAN-Interface

The kitCON-161CS/JC/JI can be equipped with a C161CS or a C161JC controller. One of the special features of these derivatives is the on-chip Full-CAN-Controller (two with C161CS) which enables the kitCON-161CS/JC/JI to be run within a CAN-network. Running the C161 controller at 20 MHz CPU clock, a bit rate of up to 1 MB can be achieved.

Programming of the CAN-controller is done by means of control-registers, which are mapped into segment 0 of the normal memory area of the controller at the addresses 00:EF00h through 00:EFFFh.

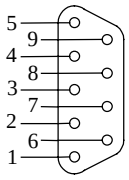
A detailed description of the registers and how to program the controller can be read in the corresponding controller manual of the C161Cx..

Note:
When any CAN interface is to be used the segment address output on Port 4 must be limited to 4-bits i.e. A19…A16 (*refer to section 4.12.3*). This is necessary to enable the alternate function of the CAN interface pins.

7.1 First CAN-interface

When utilizing the CAN-interface portpins P4.5 (RXDC) and P4.6 (TXDC) should not be connected to any other circuitry. The CAN-bus can be connected directly to DB9-plug P2. The pinout of the DB9-plug P2 is shown in *Figure 17*. The CAN-signals from the controller are also present at pin 40 and pin 43 of the kitCON-connector.

DB9-plug P2



Pin 9:	CAN_VCC
Pin 7:	CAN_H
Pin 3,6:	CAN_GND
Pin 2:	CAN_L

Figure 17: Pinout of the DB9-plug P2 (CAN-interface)(front view)

7.2 Second CAN-interface on C161CS

A second CAN-interface is available if the kitCON-161CS/JC/JI is equipped with a C161CS controller. The second on-chip Full-CAN-Controller has the same features as the first one.

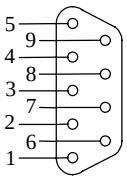
When utilizing the second CAN-interface the portpins P4.4 (RXDC) and P4.7 (TXDC) should not be connected to any other circuitry. This leads on a 1 MB maximum directly accessible address space because P4.4 can not be used as address line A20. The second CAN-bus can be connected directly to DB9-plug P3. The pinout of the DB9-plug P3 is shown in *Figure 18* . Ensure that Jumper JP2 is set to 1+2 and 3+4 and that Jumper JP9 is set to 2+3. The CAN1-signals from the controller are also present at pin 39 and pin 44 of the kitCON-connector.

The programming of the CAN1-controller is done by means of control-registers, which are mapped into segment 0 of the normal memory area of the controller at the addresses 00:EE00h through 00:EEFFh.

A detailed description of the registers and how to program the controller can be read in the corresponding controller manual of the C167CS.

Note:
When any CAN interface is to be used the segment address output on Port 4 must be limited t 4-bits i.e. A19…A16 (*refer to section 4.12.3*). This is necessary to enable the alternate function of the CAN interface pins.

DB9-plug P3



Pin 7:	CAN2_H
Pin 3,6,8:	CAN_GND
Pin 2:	CAN2_L

Figure 18: Pinout of the DB9-plug P3 (CAN2-interface)(front view)

8 The LEDs

8.1 The Status LEDs D4 and D5

The kitCON-161CS/JC/JI is fitted with two LEDs D4 and D5, which indicate the status of the board.

The red LED D4 simply indicates proper connection to the power source.

The green LED D5 gives the status of the initialization of the controller done by software. At the end of the basic initialization in any program a 'EINIT' command should be executed. Following execution of this command the SYSCON-register is protected and can not be changed accidentally. The green LED D5 lights up after this command is executed to indicate the end of the basic initialization (*see the 'Instruction Set Manual' for further information about 'EINIT'*).

These LEDs are automatically controlled by hardware.

8.2 General Purpose LEDs D6 - D13 at Port P2

In addition to the status LEDs the kitCON-161CS/JC/JI is equipped with 8 red LEDs at D6 - D13. These are connected to Port P2.15 to P2.8 and can be controlled by software. Writing a low-level to one of the ports will activate the corresponding LED.

The general purpose LEDs D6-D13 can only be activated by a user-application.

D6	D7	D8	D9	D10	D11	D12	D13
P2.15	P2.14	P2.13	P2.12	P2.11	P2.10	P2.9	P2.8

9 The Battery Buffer

To prevent loss of data in case of sudden power failure the kitCON-161CS/JC/JI can be equipped with a battery. This battery buffers the memory devices on U10 and U11. However, this battery buffer is not otherwise essential to the functioning of the kitCON-161CS/JC/JI.

Position BT1 on the component side of the module is provided for mounting a battery type CR2032. As of the pressing of this manual, a lithium battery is recommended as it offers relatively high capacity at low self-discharge. In the event of a power failure at VCC, the RAM memory blocks will be buffered by a connected battery via VBAT.

The current consumption depends on the components populating the board and memory size. For the standard devices used on the board the draw is typically 1 µA (max. 100 µA) per RAM-device.

Regarding data and code integrity, please be advised that despite the battery buffer, changes in the data content within the RAM can occur given disturbances. The battery-buffer does not completely remove the danger of data destruction.

Note:
Utilizing the battery buffer for the RAMs the storage temperature is only 0°C to +70°C.

10 Technical Specifications

The physical dimensions of the kitCON-161CS/JC/JI are represented in *Figure 19.* The board's profile is about 17 mm thick, including the DB9 sockets. The components on the soldering side have a maximum height of 3.5 mm and approximately 12 mm on the component side. The board itself is approximately 1.5 mm thick.

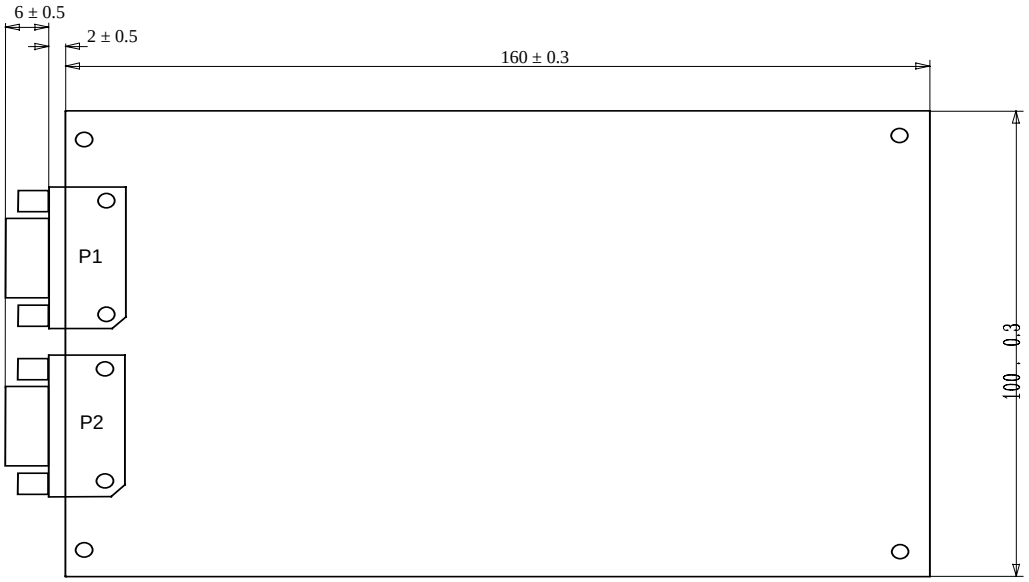


Figure 19: Physical Dimensions

Additional specifications:

- Dimensions: 160 x 100 mm., ± 0.03 mm.
- Weight: approximately 112g if fitted with maximum of 1 MB memory devices
- Storage temperature: -40°C to +90°C, using the battery buffer 0°C to +70°C
- Standard operating temperature: 0°C to +70°C, extended -40°C to +85°C
- operating temperature: 0°C to +70°C, extended -40°C to +85°C
- humidity: 90% r.F. not condensed
- Operating voltage: 5 V ±10%
- Supply voltage: 8 V to 12 V=/500 mA, VBAT 3 V ±20%
- Power consumption:: 250 mA. at 20 MHz CPU-clock.

These specifications describe the standard configuration of the kitCON-161CS/JC/JI as of the pressing of this manual.

Typically the current consumption is 170 mA with 64 kByte SRAM memory and 256 kByte Flash memory at 20°C.

Note:
Utilizing the battery buffer for the RAMs the storage temperature is only 0°C to +70°C.

11 Hints for Handling the Module

Removal or exchange of the standard quartz or oscillator is not advisable given the compact nature of the kitCON-161CS/JC/JI. Should this nonetheless be necessary, please ensure that the board, as well as surrounding components and sockets, remain undamaged during removal. Overheating the board can cause the solder pads to loosen, rendering the module inoperable. Carefully heat neighboring connections in pairs. After a few alternations, components can be removed with the solder-iron tip. Alternatively, a hot air gun can be used to heat and loosen the bonds.

When changing the controller ensure that the controller to be used is pin-compatible to the C161CS/JC/JI Controller and that special hardware features are compatible with the layout of the board.

12 FlashTools

Flash is a highly functional means of storing non-volatile data. With the kitCON-161CS/JC/JI equipped with two Flash devices this modern technique is at your disposal. One of the main advantages of using Flash devices is the on-board programming capability. On-board programming can be easily done with a special utility program, the 'FlashTools', described in this section.

The FlashTools do not resist permanently on the board. They have to be loaded with the Bootstrap Loader prior programming of the Flash.

The following section describes the use of the Bootstrap Loader as well as of the FlashTools. These descriptions are valid only for the use of the enclosed FlashTools and are not intended as guidelines for use with any other Flash utility program.

12.1 Starting FlashTools

To load the FlashTools the Bootstrap Loader has to be started first after reset. Once activated, the Bootstrap Loader awaits the start of a terminal program on the Host-PC to which the kitCON-161 is connected. Depending on the terminal-program started, a specific program will be downloaded into the external RAM and executed. To use the FlashTools the terminal program FLASHT.EXE has to be invoked.

Programming the Flash devices with the help of the FlashTools can be done as described below.

Turn Switch 1 of Dip-Switch S3 ON.

Ensure that jumper JP13 is closed in position 1+2 and 3+4.

Connect the kitCON-161CS/JC/JI to a Host- PC (using either the COM1 or COM2 serial communication port) with a serial cable as shown below:

Host-PC (COM1 or 2)		**kitCON-161CS/JC/JI DB9 socket P1**
RxD Pin 2	to	TxD Pin 2
TxD Pin 3	to	RxD Pin 3
GND Pin 5	to	GND Pin 5

Attach a power supply to the power-connector X5. An unregulated 8 V = to 12 V =/500 mA power source can be used to supply the board. Use only a fixed voltage power supply and no power supply with variable voltage. Double check the correct polarity of the socket as shown in *Figure 3*. If the power supply is attached correctly the red LED D4 will shine.

Push switch S1 to perform a reset and to start the Bootstrap Loader on the kitCON-161CS/JC/JI.

Invoke the included terminal program using the following syntax:

flasht [BR(*Baudrate*)] [*COM port number*]

Ensure that the directory from where FLASHT.EXE is started, contains the two files 'boot' and 'flash'.

The Bootstrap Loader determines the baud rate automatically. Hence, only after starting the Bootstrap Loader on the kitCON-161CS/JC/JI, FLASHT.EXE can be started with a baud rate of your choice. Thereafter, the Bootstrap Loader will automatically configure the serial port for this baud rate.

Note:
Some controllers are only able to generate specific baud rates. Hence, it is possible that the controller can not generate a baud rate specified by the invocation of the terminal program and transmission fails. In this case the terminal program should be invoked again specifying a lower baud rate.

Once FLASHT.EXE has been successfully invoked, loading of the FlashTools starts and the green LED D5 shines. The downloading can be viewed on the Host-PC monitor screen. FlashTools start immediately following loading and the main menu appears on the screen. You can leave the FlashTools at any time except during a download by pressing *'F1'*.

12.2 Downloading into Flash

The main menu gives access to the different functions of the FlashTools *(refer to*
Figure 5*)*. The tools enable the partial or total erasure of the Flash device, as well as programming of the device. They also allow device status information to be read from the Flash. All menu options are intuitive. Only Intel-hexfiles can be used for programming purposes.

After user code has been downloaded into the Flash, it can be executed following a software reset. Alternatively, turn Switch 1 of Dip-Switch S3 to OFF in order to switch the kitCON-161CS/JC/JI into execution mode following a hardware reset.

FLASHT.EXE can always be exited, except during downloading of user code, with the special-function key 'F1'.

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Document number: **L-356e_2, December 1999**

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Did you find any mistakes in this manual? page

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