SYS TEC ELECTRONIC

DIPmodul Development Board

Hardware Manual

Edition January 2002

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Index of Figures and Tables

Preface

This Hardware Manual describes only the functions of the PHYTEC DIPmodul Development Board. Precise specifications for the installed DIPmodules or controller populating the DIPmodul can be found in the applicable Hardware Manual and 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 of Electro Magnetic Conformity of the DIPmodul Development Board

PHYTEC Single Board Computers and Development Boards (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.

Note:
PHYTEC products lacking protective enclosures are subject to damage by ESD and, hence, may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD-dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate these products. Moreover, PHYTEC products should not be operated without protection circuitry if connections to the product's pin header rows are longer than 3 m.

PHYTEC products fulfill the norms of the European Union's Directive for Electro Magnatic Conformity only in accordance to the descriptions and rules of usage indicated in this hardware manual (particularly in respect to the pin header row connectors, power connector and serial interface to a host-PC).

Implementation of PHYTEC products into target devices, as well as user modifications and extensions of PHYTEC products, is subject to renewed establishment of conformity to, and certification of, Electro Magnetic Directives. Users should ensure conformance following any modifications to the products as well as implementation of the products into target systems.

The DIPmodul Development Board is one of a series of PHYTEC Development Boards that can house different DIPmodules and, hence, offers various functions and configurations. PHYTEC supports all common 8- and 16-bit controllers in two ways:

(1) as the basis for Rapid Development Kits which serve as a reference and evaluation platform

(2) as insert-ready, fully functional OEM modules such as DIPmodul-164, CANopen-Chip 505CA or IEC-1131-PLC-Chip, 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.

1 Introduction

The DIPmodul Development Board , in EURO-card dimensions (160 by 100 mm), provides a flexible development platform enabling quick and easy start-up and subsequent programming of various DIP-40-sized Single Board Computer modules. The Development Board design allows easy operation of the installed DIPmodul in a **C**ontroller **A**rea **N**etwork (CAN) bus system and connection of additional expansion boards featuring various functions that support fast and convenient prototyping and software evaluation.

The DIPmodul Development Board is mounted with all necessary hardware components for immediate start-up; including 4 push buttons, 4 user programmable LEDs, two potentiometers, a DB-9 socket for RS-232 and a DB-9 plug for CAN signal connection. These components enable a quick and solder-free start-up and operation of any DIPmodul Single Board Computer mounted on the Development Board with user-designed software.

When used in conjunction with the SYSTEC IEC1131-PLC-Chip an additional RUN/STOP switch is provided on the DIPmodul Development Board as well as one RUN LED and one ERROR LED for indication of the operating mode of the IEC1131-PLC-Chip.

The DIPmodul Development Board is designed to house all DIPmodules with standard-width (2.54 mm / 0.10 in) pin header rows:

- CANopen-Chip 505 with CANopen Slave firmware
- DIPmodul-164 (freely porgrammable in C, w/o firmware)
- DIPmodul-164 CANopen-Chip with CANopen Slave firmware
- DIPmodul-164 with IEC1131-PLC firmware

Precise specifications for the installed DIPmodules or controller populating the DIPmodul can be found in the applicable Hardware Manual and controller User's Manual or Data Sheet. No description of the module or microcontroller functions is included in this Hardware Manual, as such functions are not relevant for the basic functioning of the DIPmodul Development Board.

The DIPmodul Development Board offers the following features:

- Development Board in EURO-card dimensions (160 x 100 mm) for start-up, and subsequent programming, of applicable DIPmodules
- DIPmodul-connector enabling mounting of applicable DIPmodules
- Reset button, signal level can be configured
- Boot button, signal level can be configured
- a low voltage socket connected to a voltage regulator accepting an unregulated input voltage in a range from 8 to 13 V
- a low voltage terminal block connected to a voltage regulator accepting an unregulated input voltage in a range from 8 to 13 V
- voltage regulator 5 VDC / 1 A (optionally 3.3VDC or adjustable)
- DB-9 socket for serial RS-232 interface connectivity
- DB-9 plug for CAN interface connectivity
- insertable jumpers to configure the I/O signals
- CAN bus interface circuitry (optional low-speed CAN transceiver available with 5 V power adapter version)
- I/O port expansions for CANopen-Chip 505CA available at wire wrap field (please note the included example schematics)
- RS-232 interface for DIPmodul-164 (all variants)
- four push buttons for digital input simulation
- four user LEDs for digital output simulation
- two potentiometers for analog input simulation
- one general purpose input/output connector for easy connection of external peripheral devices
- one additional RUN-/STOP switch (for IEC1131-PLC-Chip)
- two additional LEDs for RUN/STOP and ERROR indication (for IEC1131-PLC-Chip)
- a wire wrap field supporting development of user-designed peripheral hardware

1.1 View of the DIPmodul Development Board

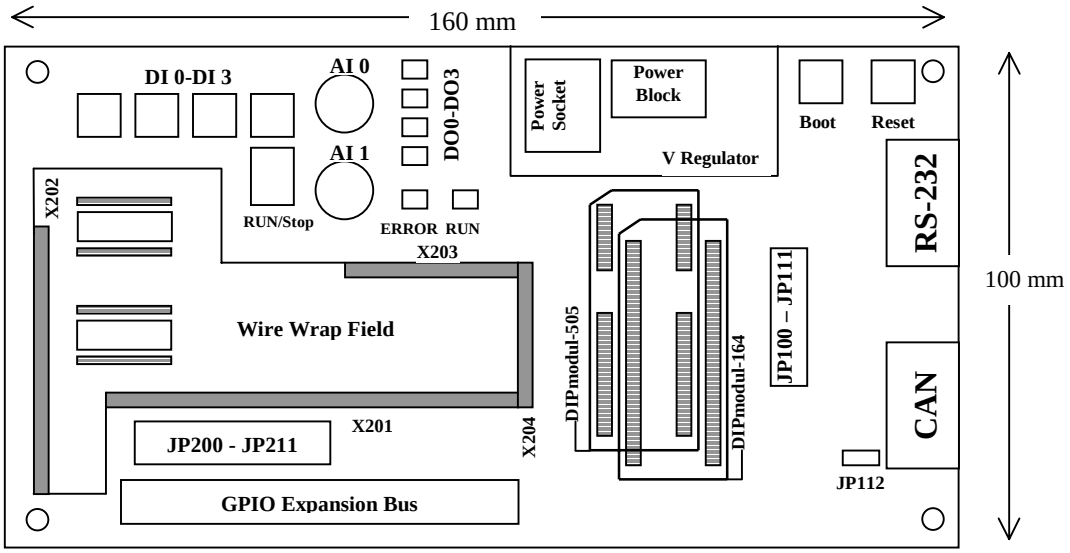


Figure 1: View of the DIPmodul Development Board (component side)

As shown in *Figure 1*, the following display and control units are available on the DIPmodul Development Board:

DI0 – DI3	momentarily closable push buttons for simulation of digital inputs
AI 0 / AI 1	potentiometers for simulation of analog inputs
DO0 – DO3	user programmable LEDs for simulation of digital outputs
RUN/STOP	Run/Stop switch for PLC applications
ERROR	Error indication LED for PLC applications
RUN	Run indication LED for PLC applications

2 Connector Description

As shown in *Figure 2*, the following connectors are available on the DIPmodul Development Board:

X102	low-voltage socket for power supply connectivity
X103	low-voltage terminal block for power supply connectivity
P1	DB-9 socket for serial RS-232 interface connectivity
P2	DB-9 plug for CAN interface connectivity
X100	mating receptacle for CANopen-Chip 505CA
X101	mating receptacle for DIPmodul-164
X200C/D	GPIO Expansion Bus connector
X201	General Purpose I/O connector
X203	I/O expansion bus connector with data/address and control signals
X202	VCC connections
X204	GND connections
TP101	GND connector (for connection of GND signal of measuring devices such as an oscilliscope)

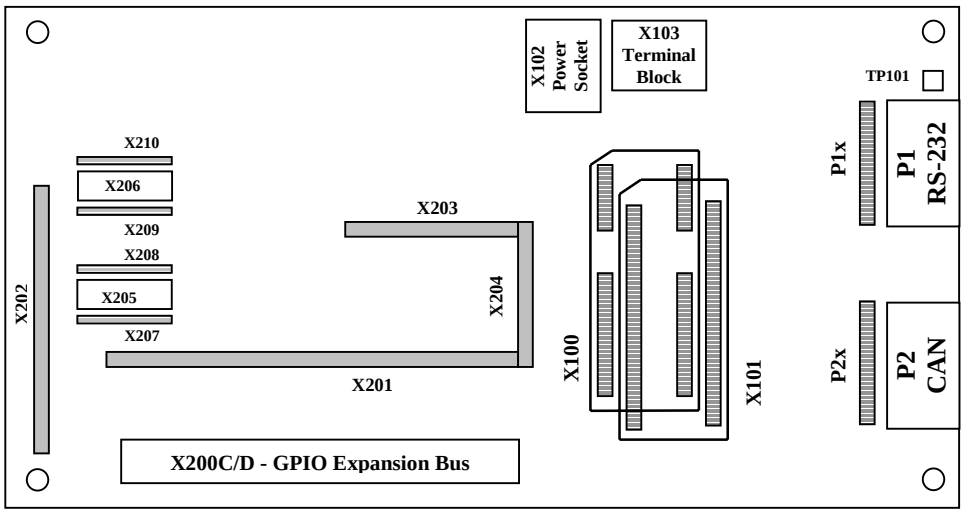


Figure 2: Location of Connectors

Please note that all module and Development Board connections are not to exceed their expressed maximum voltage or current. Maximum signal input values are indicated in the corresponding controller User's Manual/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.

2.1 Power Supply Connection

There are two ways to connect a power supply to the DIPmodul Development Board:

- Connection via the low voltage socket at X102 (8 - 13VDC)
- Connection via low voltage terminal block at X103 (8 - 13VDC)

Attention:
Please avoid changing jumpers or modules while the Development Board is powered up!

The required current load capacity of the power supply depends on the specific configuration of the DIPmodul mounted on the Development Board as well as whether an optional expansion board or user circuitry is connected to the Development Board. An adapter with a minimum supply of 500 mA is recommended.

2.1.1 Connection via the Low Voltage Socket X102

Permissible input voltage: +8....13 VDC unregulated

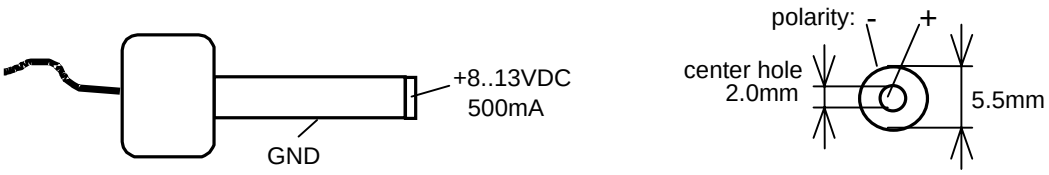


Figure 3: Connecting the Supply Voltage at X102

An unregulated power supply in the range of +8 V...13 V can be connected to the Development Board at low voltage socket X102. The maximum available current draw on the regulated on-board voltage (5 V or 3.3 V depending on voltage regulator option) is 1 A.

2.1.2 Connection via the Low Voltage Terminal Block X103

The low voltage terminal block is located next to the low voltage socket. Both connectors are arranged in parallel. The values for voltage and current are the same as described in *section 2.1.1*.

Please ensure that the correct polarity is applied to the terminal block. This is shown on the silkscreen on the PCB next to the terminal block at X103.

2.2 Communication Interface Connectors

2.2.1 RS-232 Interface at Socket P1

P1 is directly connected to the RS-232 transceiver on the DIPmodul Development Board at U101. The RS-232 transceiver can be connected via jumpers to the RS-232 interface of the DIPmodul-164. When connected to a host-PC, the DIPmodul-164 can be rendered in FlashTools mode via signals applied to the socket P1.

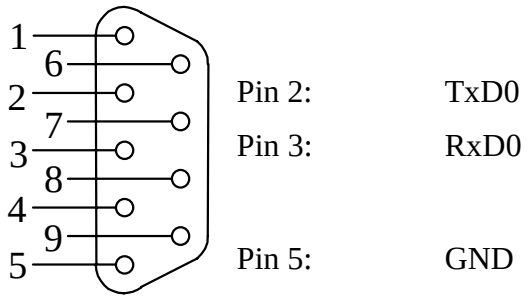
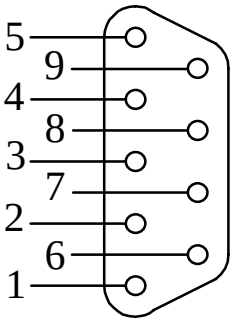


Figure 4: Pin Assignment of the DB-9 Socket P1 as RS-232 (front view)

The solder holes at P1x carry all signals of the DB-9 socket P1. Other signals can be routed to the DB-9 socket via P1x using wire connections.

2.2.2 CAN Interface at Plug P2

P2 can be connected to the CAN interface of the installed DIPmodul via jumpers. An overview of available jumpers used to configure plug P2 as CAN interface, as well as these jumper functions, can be found in *section 3.7 and 3.10*.



Pin 3:	GND (Development Board GND, optional)
Pin 7:	CAN_High
Pin 2:	CAN_Low
Pin 6:	GND (Development Board GND, optional)

Figure 5: Pin Assignment of the DB-9 Plug P2 as CAN (front view)

The solder holes at P2x carry all signals of the DB-9 plug P2. Other signals can be routed to the DB-9 socket via P2x using wire connections.

2.3 DIPmodul Receptacle Connectors

2.3.1 Receptacle for CANopen-Chip 505CA X100

The receptacle connector X100 on the DIPmodul Development Board is designed to house the CANopen-Chip 505CA. Pin 1 is located in the upper left hand corner of the connector and marked with a diagonal edge in the designator silk screen. The location of the receptacle connector X100 is shown in *Figure 2*.

2.3.2 Receptacle for DIPmodul-164 X101

The receptacle connector X101 on the DIPmodul Development Board is designed to house the DIPmodul-164 in all variants. Pin 1 is located in the upper left hand corner of the connector and marked with a diagonal edge in the designator silk screen. The location of the receptacle connector X101 is shown in *Figure 2*.

2.4 GPIO Expansion Bus Connector X200C/D

Various I/O and other signals of the installed DIPmodul extend to the GPIO Expansion Bus connector X200 on the DIPmodul Development Board if Jumpers JP200 – JP211 are set to position 2+3. These signals, in turn, are routed to the patch field on an optional expansion board that mounts to the Development Board at X200.

Please note that the DIPmodul Development Board only supports one of two possible expansion bus connectors (Molex connectors) with 2*80 pins. A two dimensional numbering matrix identifies signals on the Expansion Bus connector (X200 on the Development Board) as well as the patch field on a connected expansion board such as the PHYTEC mini-IO Board or Bare PCB.

The following table gives an overview of the Expansion Bus connector X200 pin assignment.

X200C	Signal	X200D	Signal		X200C	Signal	X200D	Signal
1C	VCC	1D	VCC		41C	IO_3	41D	N.C.
2C	VCC	2D	VCC		42C	GND	42D	N.C.
3C	GND	3D	GND		43C	N.C.	43D	IO_4
4C	GPIO1	4D	N.C.		44C	N.C.	44D	GND
5C	N.C.	5D	N.C.		45C	N.C.	45D	N.C.
6C	N.C.	6D	N.C.		46C	N.C.	46D	IO_11
7C	GND	7D	N.C.		47C	GND	47D	N.C.
8C	N.C.	8D	GPIO_2		48C	N.C.	48D	N.C.
9C	/BOOT	9D	GND		49C	N.C.	49D	GND
10C	RESET	10D	N.C.		50C	IO_12	50D	N.C.
11C	N.C.	11D	GPIO_3		51C	N.C.	51D	N.C.
12C	GND	12D	N.C.		52C	GND	52D	N.C.
13C	N.C.	13D	GPIO_4		53C	IO_13	53D	N.C.
14C	N.C.	14D	GND		54C	N.C.	54D	GND
15C	N.C.	15D	N.C.		55C	N.C.	55D	N.C.
16C	N.C.	16D	GPIO_5		56C	IO_14	56D	N.C.
17C	GND	17D	N.C.		57C	GND	57D	N.C.
18C	N.C.	18D	N.C.		58C	N.C.	58D	IO_15
19C	N.C.	19D	GND		59C	N.C.	59D	GND
20C	GPIO_6	20D	N.C.		60C	N.C.	60D	N.C.
21C	N.C.	21D	N.C.		61C	N.C.	61D	IO_16
22C	GND	22D	N.C.		62C	GND	62D	N.C.
23C	GPIO_7	23D	N.C.		63C	N.C.	63D	N.C.
24C	N.C.	24D	GND		64C	N.C.	64D	GND
25C	N.C.	25D	N.C.		65C	IO_17	65D	N.C.
26C	GPIO_8	26D	N.C.		66C	N.C.	66D	N.C.
27C	GND	27D	N.C.		67C	GND	67D	N.C.
28C	N.C.	28D	GPIO_9		68C	IO_18	68D	N.C.
29C	N.C.	29D	GND		69C	N.C.	69D	GND
30C	N.C.	30D	N.C.		70C	N.C.	70D	N.C.
31C	N.C.	31D	GPIO_10		71C	IO_23	71D	N.C.
32C	GND	32D	N.C.		72C	GND	72D	N.C.
33C	N.C.	33D	N.C.		73C	N.C.	73D	IO_24
34C	N.C.	34D	GND		74C	N.C.	74D	GND
35C	IO_1	35D	N.C.		75C	N.C.	75D	N.C.
36C	N.C.	36D	N.C.		76C	N.C.	76D	IO_25
37C	GND	37D	N.C.		77C	GND	77D	N.C.
38C	IO_2	38D	N.C.		78C	N.C.	78D	N.C.
39C	N.C.	39D	GND		79C	N.C.	79D	GND
40C	N.C.	40D	N.C.		80C	IO_26	80D	N.C.

Table 1: GPIO Expansion Bus Connector X200 Pin Assignment

2.5 I/O Connector X201

All available I/O signals of the installed DIPmodul extend to the I/O connector X201 on the DIPmodul Development Board. In addition, connections for an external reference voltage are available at X201. The following table gives an overview of the I/O connector X201 pin assignment.

Pin #	**Signal**	**Pin #**	**Signal**		**Pin #**	**Signal**	**Pin #**	**Signal**
1	IO_1	8	IO_8		15	IO_15	22	IO_22
2	IO_2	9	IO_9		16	IO_16	23	IO_23
3	IO_3	10	IO_10		17	IO_17	24	IO_24
4	IO_4	11	IO_11		18	IO_18	25	IO_25
5	IO_5	12	IO_12		19	IO_19	26	IO_26
6	IO_6	13	IO_13		20	IO_20	27	VAGND_ext
7	IO_7	14	IO_14		21	IO_21	28	VAREF_ext

Table 2: I/O Connector X201 Pin Assignment

2.6 Connector with Data/Address and Control Signals X203

The 8-bit data bus, two address line A14 and A15 as well as the control signals /Read and /Write of an installed CANopen-Chip 505CA extend to connector X203 on the DIPmodul Development Board. This connector must not be used when working with a DIPmodul-164. The following table gives an overview of the I/O connector X203 pin assignment.

Pin #	1	2	3	4	5	6
Signal	/Read	/Write	Data0	Data1	Data2	Data3
Pin #	7	8	9	10	11	12
Signal	Data4	Data5	Data6	Data7	A14	A15

Table 3: Data/Address and Control Signal Connector X203 Pin Assignment

2.7 Supply Connectors X202 and X204

The VCC supply voltage of the DIPmodul Development Board is available on the solder holes at X202 while the Ground (GND) potential is routed to solder holes at X204. These signals are provided for easy assembly of user-specific circuitry on the prototyping area.

2.8 GND Connector TP101

The Ground (GND) potential of the DIPmodul Development Board is available on connector X5 providing easy connectivity to measuring devices, such as multimeters and oscilloscopes.

3 Jumpers

Jumpers can be used to configure the connection of peripheral components on the DIPmodul Development Board to the specific pin layout of the DIPmodul according to the application requirements. Jumper blocks JP100 – JP111 and JP200 – JP211, JP112 as well as two solder jumpers J100 and J101 on the DIPmodul Development Board are pre-configured if the applicable DIPmodul is delivered as Development Kit.

Figure 6 illustrates the numbering of the jumper pads, while *Figure 7* indicates the location of the jumpers on the Development Board.

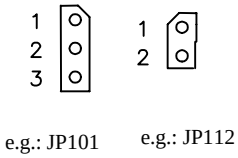


Figure 6: Numbering of Jumper Pads

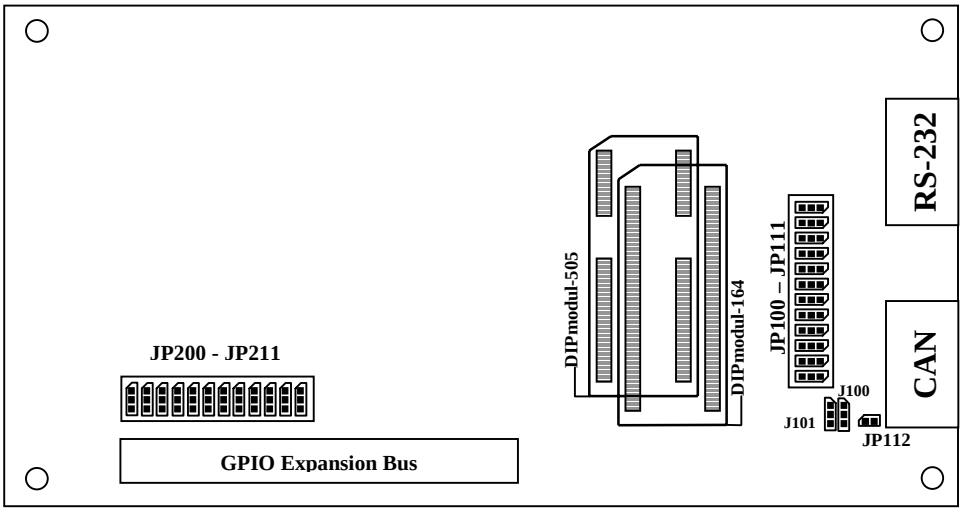


Figure 7: Location of the Jumpers (view of the component side)

Applicable Module	Jumper 3 2 1	Jumper Function	Jumper Position	
			1 + 2	2 + 3
CANopen-Chip 505CA and DIPmodul-164	JP100	Reset Signal Level	Active High	Active Low
	JP101	Reset Signal	Reset Button	not connected
	JP102	Boot Signal Level	Active High	Active Low
	JP103	Boot Signal	Boot Button	not connected
DIPmodul-164	JP104	I/O Line at Pin 39	X201/Pin 26	TxDC (CAN)
	JP105	I/O Line at Pin 36	X201/Pin 25	RxDC (CAN)
	JP106	I/O Line at Pin 1	X201/Pin 1	RxD (RS-232)
	JP107	I/O Line at Pin 2	X201/Pin 2	TxD (RS-232)
	JP108	I/O Line at Pin 3	X201/Pin 3	RUN LED (SPS)
	JP109	I/O Line at Pin 5	X201/Pin 5	Error LED (SPS)
	JP110	I/O Line at Pin 18	X201/Pin 12	R/S Switch
CANopen-Chip 505CA	JP111	I/O Line at Pin 37	CAN_Low	RxDC (CAN)

Table 4: Jumper Functions JP100 - JP111

Applicable Module	Jumper 3 2 1	Jumper Function	Jumper Position	
			1+2	2+3
CANopen-Chip 505CA and DIPmodul-164	JP200	I/O Line IO_22	DO_0	X200/Pin 4C
	JP201	I/O Line IO_21	DO_1	X200/Pin 8D
	JP202	I/O Line IO_20	DO_2	X200/Pin 11D
	JP203	I/O Line IO_19	DO_3	X200/Pin 13D
	JP204	I/O Line IO_5	AI_0	X200/Pin 16D
	JP205	I/O Line IO_6	AI_1	X200/Pin 20C
	JP206	I/O Line IO_7	DI_0	X200/Pin 23C
	JP207	I/O Line IO_8	DI_1	X200/Pin 26C
	JP208	I/O Line IO_9	DI_2	X200/Pin 28D
	JP209	I/O Line IO_10	DI_3	X200/Pin 31D
	JP210	VAREF	VCC	X201/Pin 28
	JP211	VAGND	GND	X201/ Pin 27

Table 5: Jumper Functions JP200 – JP211

3.1 Boot/Reset Jumper JP101 and JP103

Jumpers JP101 and JP103 configure the Boot and Reset inputs of the DIPmodul mounted on the Development Board. The Boot and Reset push buttons are connected to the corresponding module input if both jumpers are closed at position 1+2. Jumper position 2+3 should not be used as this configuration does not connect the Boot and Reset input pins of the installed DIPmodul to any signal.

Note:
Jumpers JP101 and JP103 should always remain in position 1+2!

Boot and Reset Signal	JP101	JP103
Reset input of the installed DIPmodul connected to Reset button S2	1 + 2*	
Boot input of the installed DIPmodul connected to Boot button S1		1 + 2*
Reset and Boot signals controlled via RS-232 signals (future option)	2 + 3	2 + 3

*= Default setting

Table 6: JP101 and JP103 Boot/Reset Configuration

3.2 Boot/Reset Signal Level JP100 and JP102

Jumpers JP100 and JP102 configure the signal level of both Boot and Reset inputs of the DIPmodul mounted on the Development Board. The Boot signal has an actice low signal level for all supported DIPmoduls while the active level for the Reset signal is high.

Boot and Reset Signal Level	JP100	JP102
Reset active with high signal level	1 + 2*	
Reset active with low signal level	2 + 3	
Boot active with low signal level		1 + 2*
Boot active with high signal level		2 + 3

*= Default setting

Table 7: JP100 and JP102 Boot/Reset Signal Level Configuration

3.3 CAN Interface Configuration Jumper JP104 and JP105

Jumpers JP104 and JP105 configure the use of signals on connector pins 36 and 39 of a DIPmodul-164 mounted on the Development Board. These pins on the DIPmodul-164 can be used as general purpose I/O lines (IO_25 and IO_26) that are available at connectors X200 and X201. As an option, pins 36 and 39 of the DIPmodul-164 can also carry the CAN signals RxDC and TxDC that can be connected to an external CAN transceiver optionally available on the Development Board.

The following table shows the default jumper settings for JP104 and JP105. When using an external CAN transceiver, the setting of the two solder jumpers J100 and J101 needs to be taken into consideration. Refer to *section 3.10* for more details.

Module and Configuration	**JP104**	**JP105**
DIPmodul-164 for programming in C and on-board CAN transceiver	1 + 2	1 + 2
DIPmodul-164 for programming in C and external CAN transceiver	2 + 3	2 + 3
DIPmodul-164 with CANopen Slave firmware and on-board CAN transceiver	1 + 2	1 + 2
DIPmodul-164 with CANopen Slave firmware and external CAN transceiver	2 + 3	2 + 3
DIPmodul-164 with IEC-1131 PLC firmware for CAN and on-board CAN transceiver	1 + 2	1 + 2
DIPmodul-164 with IEC-1131 PLC firmware for CAN and external CAN transceiver	2 + 3	2 + 3
DIPmodul-164 with IEC-1131 PLC firmware for RS-232	1 + 2	1 + 2

Table 8: JP104 and JP105 CAN Interface Configuration

Note:
When using the installed DIPmodul in conjunction with an external CAN transceiver additional modifications on the DIPmodul-164 might be required. Please refer to the DIPmodul-164 Hardware Manual for additional configuration information.

3.4 RS-232 Interface Jumper JP106 and JP107

Jumpers JP106 and JP107 can be used to route the RS-232 signals of the DIPmodul-164 available on connector pins 1 and 2 to an RS-232 transceiver on the Development Board at U101. The RS-232 interface is only available on the DIPmodul-164 (all variants) and allows for easy firmware update with PHYTEC FlashTools, software debugging or generic serial interface functions. Use of the RS-232 interface requires Jumpers JP106 and JP107 in position 2+3. If the general purpose I/O lines IO_1 and IO_2 are configured at connector pins 1 and 2 then JP106 and JP107 should be closed at position 1+2.

Default settings for JP106 and JP107 are shown in the table below:

Module and Configuration	**JP106**	**JP107**
DIPmodul-164 with CANopen Slave firmware	1 + 2	1 + 2
DIPmodul-164 with IEC-1131 PLC firmware for CAN	1 + 2	1 + 2
DIPmodul-164 with IEC-1131 PLC firmware for RS-232	2 + 3	2 + 3
DIPmodul-164 for programming in C	2 + 3	2 + 3

Table 9: JP106 and JP107 RS-232 Interface Configuration

3.5 CANopen-Chip 505CA CAN Interface Jumper JP111

CANopen-Chip 505CA	**JP111**
Using the on-board CAN transceiver, CAN_L at P2	1 + 2
CAN_RxD connects to optional CAN transceiver U103	2 + 3

Table 10: JP111 CANopen-Chip 505CA CAN Interface Configuration

3.6 PLC Peripherals Jumper JP108 - JP110

Jumpers JP108, JP109 and JP110 are provided to configure the Development Board for use with a DIPmodul-164 with IEC-1131 PLC firmware. When set to position 2+3, these jumpers configure specific DIPmodul pins with additional components on the Development Board. For all other DIPmodul-164 variants Jumpers JP108 – JP110 must be set to position 1+2. This connects the module pins with the I/O lines IO_3, IO_4 and IO_12 that are available at connectors X200 and X201.

-RUN LED Jumper JP108

Jumper JP108 in position 2+3 connects pin 3 of the DIPmodul-164 with the green RUN LED D204. This LED indicates the current operating mode of the PLC software.

-ERROR LED Jumper JP109

Jumper JP109 in position 2+3 connects pin 5 of the DIPmodul-164 with the red ERROR LED D205. This LED indicates possible error states of the PLC software.

-RUN/STOP switch Jumper JP110
The operating mode of the PLC software can be changed using the RUN/STOP switch S7. Jumper JP110 in position 2+3 connects pin 18 of the DIPmodul-164 with the RUN/STOP switch.

Module and Configuration	**JP108**	**JP109**	**JP110**
DIPmodul-164 with CANopen Slave firmware	1 + 2	1 + 2	1 + 2
DIPmodul-164 with PLC firmware for CAN	1 + 2	1 + 2	1 + 2
DIPmodul-164 with PLC firmware for RS-232	2 + 3	2 + 3	2 + 3
DIPmodul-164 for programming in C	2 + 3	2 + 3	2 + 3

Table 11: JP106 and JP107 RS-232 Interface Configuration

3.7 CAN Bus Termination Jumper JP112

Jumper JP112 connects the CAN bus lines CAN_H and CAN_L to the on-board 120 Ω terminating resistor R107. If the jumper is closed, the CAN bus is properly terminated. JP112 must remain open if the DIPmodul installed on the Development Board is not located at the end of the CAN bus or an external terminating resistor is installed on the cable.

3.8 I/O Signal Jumpers JP200 – JP209

Jumpers JP200 – JP209 are provided to configure applicable I/O signals from the installed DIPmodule to the various I/O peripherals on the Development Board. The DIPmodul Development Board features 4 user programmable LEDs, 4 push buttons and 2 potentiometer. If the Jumpers JP200 – JP209 are closed in position 1+2, the I/O signals from the CANopen-Chip 505CA or the DIPmodul-164 are routed to these on-board devices. Setting the jumpers to position 2+3 makes the I/O signals available at the GPIO Expansion Bus connector X200 (*refer to section 2.4*).

Jumper	**I/O Signal**	**Position 1+2**	**Position 2+3**
		I/O signal routed to	**I/O signal routed to**
JP200	IO_22	LED D200 / DO0	Signal GPIO_1
JP201	IO_21	LED D201 / DO1	Signal GPIO_2
JP202	IO_20	LED D202 / DO2	Signal GPIO_3
JP203	IO_19	LED D203 / DO3	Signal GPIO_4

Table 12: JP200 – JP203 I/O Signal / LED Configuration

Jumper	**I/O Signal**	**Position 1+2**	**Position 2+3**
		I/O signal routed to	**I/O signal routed to**
JP204	IO_5	Potentiometer AI0	Signal GPIO_5
JP205	IO_6	Potentiometer AI1	Signal GPIO_6

Table 13: JP204 and JP205 I/O Signal / Potentiometer Configuration

Jumper	I/O Signal	Position 1+2	Position 2+3
		I/O signal routed to	I/O signal routed to
JP206	IO_7	Push Button S3 / DI0	Signal GPIO_7
JP207	IO_8	Push Button S4 / DI1	Signal GPIO_8
JP208	IO_9	Push Button S5 / DI2	Signal GPIO_9
JP209	IO_10	Push Button S6 / DI3	Signal GPIO_10

Table 14: JP206 – JP209 I/O Signal / Push Button Configuration

3.9 Analog Reference Jumpers JP210 and JP211

Jumpers JP210 and JP211 can be used to connect the analog reference inputs VAREF and VAGND of the DIPmodul installed on the Development Board to the on-board potentials VCC and GND or an external reference source connected to X201 (pins 27 and 28).

Jumper	Signal	Position 1+2	Position 2+3
		Signal routed to	Signal routed to
JP210	VAREF	on-board VCC	ext. VAREF/X201 pin 28
JP211	VAGND	on-board GND	ext. VAGND/X201 pin 27

Table 15: JP210 and JP211 Analog Reference Configuration

3.10 CAN Transceiver Solder Jumpers J100 and J101

An optional low-speed CAN transceiver TJA1054 can populate the DIPmodul Development Board at U103. Solder jumpers J100 and J101 can be used to route CAN signals, generated by the TJA1054 CAN transciever or directly from the installed DIPmodul, to the CAN plug at P2. The following table shows the configuration options:

Module	CAN Transceiver	J100	J101
CANopen-Chip 505CA and DIPmodul-164	on-board (DIPmodul)	1 + 2*	1 + 2*
	external (Development Board)	2 + 3	2 + 3

*= Default setting

Table 16: J100 and J101 Solder Jumpers for CAN Transceiver Selection

4 Jumper Settings for Immediate Startup

Jumpers JP100 – JP111 must be configured in accordance to the DIPmodul installed on the Development Board for immediate startup. The following example configurations only show the standard settings for various DIPmodul/Development Board combinations.

4.1 CANopen-Chip 505CA with CANopen Slave Firmware

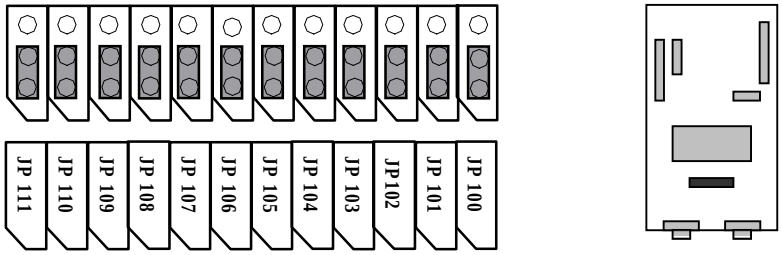


Figure 8: Default Jumper Settings for CANopen-Chip 505CA

4.2 DIPmodul-164 with CANopen Slave Firmware

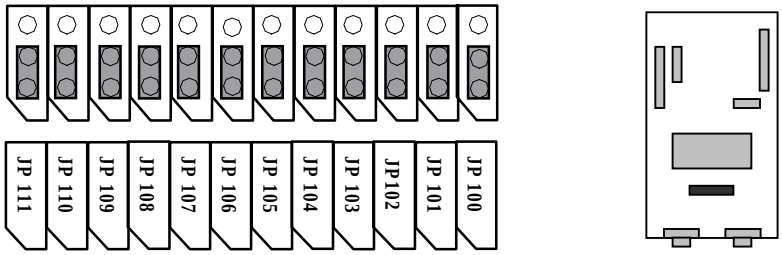


Figure 9: Default Jumper Settings for DIPmodul-164 (CANopen Slave)

4.3 DIPmodul-164 with PLC Firmware for CAN

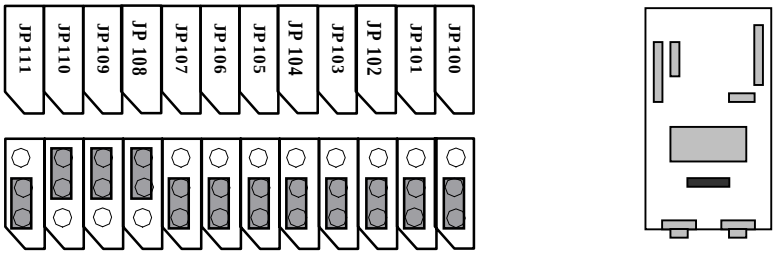


Figure 10: Default Jumper Settings for DIPmodul-164 (PLC Firmware for CAN)

4.4 DIPmodul-164 with PLC Firmware for RS-232

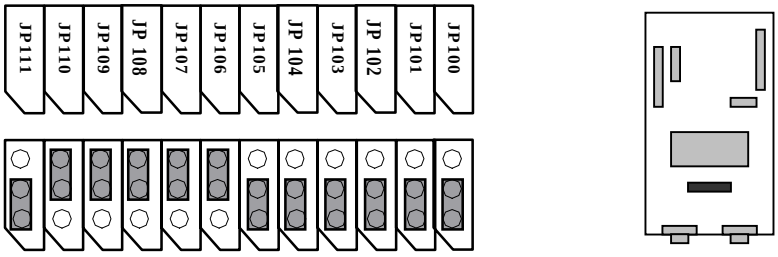


Figure 11: Default Jumper Settings for DIPmodul-164 (PLC Firmware for RS-232)

4.5 DIPmodul-164 Freely Programmable in C

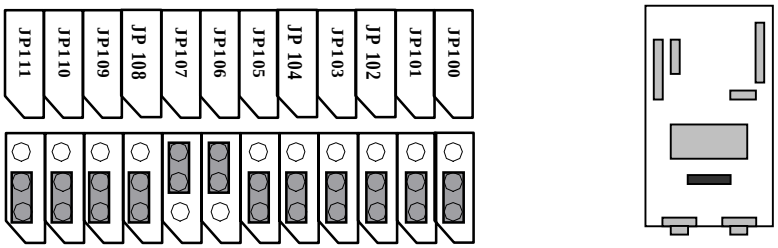


Figure 12: Default Jumper Settings for DIPmodul-164 (Freely Programmable)

4.6 Default Configuration Jumper JP200 – JP211

Jumpers JP200 – JP211 are configured to connect applicable pins on the DIPmodul installed on the Development Board to the corresponding on-board peripherals. For more details on the individual jumper functions refer to *Table 5* and *sections 3.8* and *3.9*.

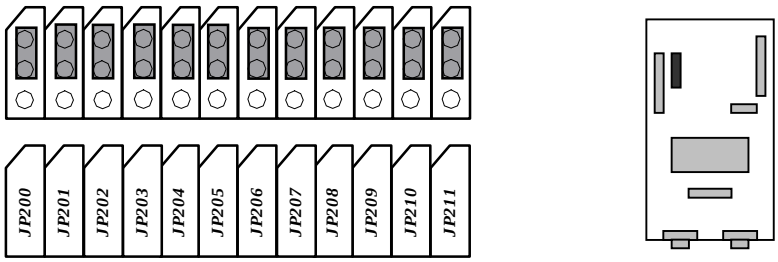


Figure 13: Default Settings I/O Jumper (all modules)

4.7 Starting FlashTools (DIPmodul-164, Programming in C)

When using the DIPmodul-164 with the option for free programming in C on the DIPmodul Development Board, firmware download is possible from a PC or laptop to the SBC module. A specific bootloader program is provided in the C164CI controller. The combination of this bootloader and the corresponding software installed on the PC (PHYTEC FlashTools) allows for on-board Flash download with application programs via an RS-232 interface.

Note:
In order to start FlashTools on a DIPmodul-164 mounted on the DIPmodul Development Board, simultaneously press the Reset (S2) and Boot (S1) buttons on the Development Board. First release the Reset (S2) and then, two to three seconds later, releasing the Boot (S1) button.
On-board firmware update is **NOT** available on the CANopen-Chip 505CA or the DIPmodul-164 with pre-configured firmware such as CANopen or IEC-1131 PLC firmware.

5 Control and Display Units

For demonstration and testing purposes, the DIPmodul Development Board is mounted with the following hardware components: 4 push buttons, 4 LEDs, two potentiometers and additional peripherals especially for PLC applications. The location of these units is shown in *Figure 1*.

The peripheral control and display units are active high. This means LEDs will illuminate through receipt of a binary value "1". Software running on the DIPmodul will return a binary value "1" when the corresponding push button was pressed.

The power supply for analog inputs is connected to the on-board VCC and GND potential. Setting Jumpers JP210 and JP211 to position 2+3 an external reference voltage source can be connected via connector X201 (pins 27 and 28) next to the wire wrap field.

6 Technical Specifications

The maximum height of all components and the inserted DIPmodul above the top side of the PCB is approximately 22 mm. The profile of the bottom side of the circuit board is approximately 2.5 mm. The PCB itself is approximately 1.5 mm thick and has 4 layers. It is possible to insert the device into a 19" chassis.

Additional data:

- Dimensions: 160 mm x 100 mm
- Weight: approximately 108 g
- Storage temperature: -40°C to +90°C
- Operating temperature: 0°C to +70°C,
- Humidity: maximum 95 % r.F. not condensed
- Operating voltage: 8 V – 13 V supplied via low voltage socket X102 or terminal block X103
- Power consumption
  peripheral components
  without installed DIPmodul: approximately 16 mA
  complete unit with
  installed DIPmodul: maximum 150 mA

These specifications describe the standard configuration of the DIPmodul Development Board as of the printing of this manual.

Index

Document: **DIPmodul Development Board**
Document number: **L-1000e_1, January 2002**

How would you improve this manual?

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