

Vorwort

Dieses Handbuch wurde in zwei Sprachen verfaßt. Um Ihnen die Handhabung zu erleichtern, ist der deutschsprachige Teil mit einem dunkelgrauen Balken und der englischsprachige durch einen hellgrauen Balken gekennzeichnet.

Preface

This manual has been written in English and in German. In order to differentiate between the two languages quickly, the German section has a dark grey bar and the English section has a light grey bar.

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PANELWARE

C130 CAN CONTROLLER

Version: **1.0** (March 1997)

Model No.: **MAPWC130-0E**

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General Information

The PANELWARE C130 CAN Controller can be connected with a display module and up to 7 keypad modules. The controller is equipped with a CAN interface allowing display and keypad modules to be integrated in a CAN network. The display and keypad functionality is controlled from the PCC. Data is exchanged by means of control sequences which correspond to an expanded VT100/C100 command set.

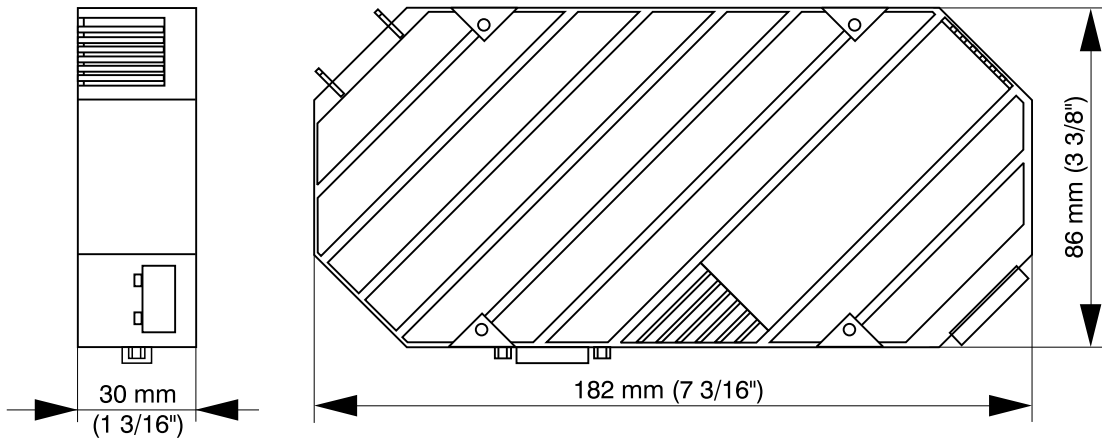
Technical Data

Model Name	C130 CAN Controller
Model Number	4C1300.01-510
External Supply	24 VDC (min. 18 VDC, max 30 VDC)
Power Consumption	Max. 2 W (24 VDC)
CAN Interface	9 pin D-type connector (M); max. 500 KBaud
Processor	uPD70325 (NEC) (=V25), 16 MHz
Noise Immunity Burst ¹⁾ EDS ²⁾ Surge ²⁾ Emission Radiation	EN61131-1:1994; Burst Measurement EN61000-4-4:1995 EN61131-1:1994; ESD Measurement EN61000-4-2:1994 IEC 1000-4-5 EN50081-2:1993; Emission Measurement EN55011:1991 IEC 1000-4-3
Operating Temperature	5 to 60° C (41 - 140°F)
Relative Humidity	0 to 95%
Dimensions	182 mm, 86 mm, 30 mm (7 3/16", 3 3/8", 1 3/16") [W x H x D]

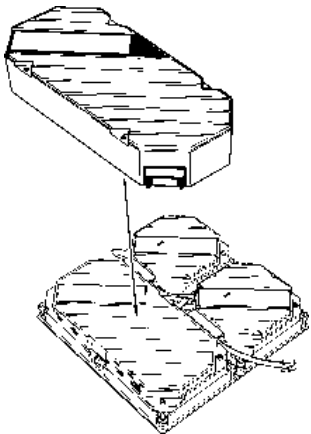
¹⁾ Exception: display module interface

²⁾ Exceptions: display module interface; keypad module interface

Dimensions

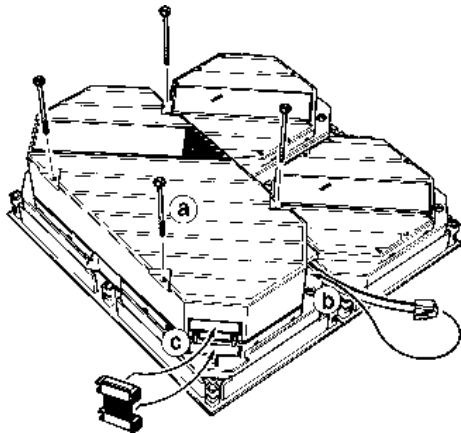


Installation Instructions



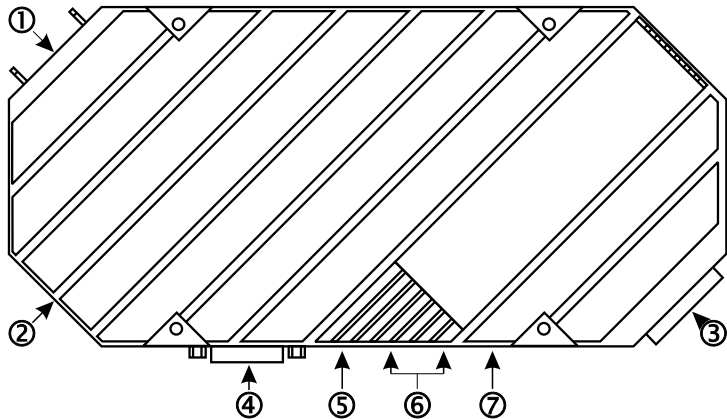
Set the C130 CAN Controller in place on the back side of the display and keypad modules. The display and keypad module connections on the controller and must be aligned with those on the display and keypad modules.

Installation Instructions



- a) Screw controller in place
- b) Connect keypad cable
- c) Connect display cable

Overview of Connections and Operational Elements



Overview of Connections and Operational Elements

1) Display Module Connector

2) Keypad Module Connector

3) 24 VDC Supply Connector

4) CAN Interface

5) Number Dial: Not Used

6) Number Dials: Baudrate / CAN Node #

7) Number Dial: Not Used

Processor

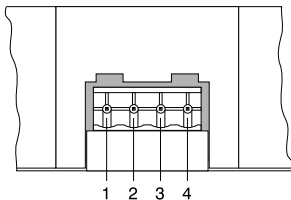
A uPD70325 (V25) 16 MHz processor from NEC is used in the C130 Panel Controller.

The following table gives an overview of the C130 Panel Controller.

Information	C130 CAN Controller (4C1300)
CPU	uPD70325GJ-10
Clock	16 MHz
SRAM	128 Kbytes
OTP	128 Kbytes
CAN Interface	9 pin D-type connector (M)

Power Supply

The power supply generates the voltages required to operate the controller as well as the display and keypad modules from the 24 V input voltage (not electrically isolated). The protective circuit for the input voltage resists BURST, ESD and SURGE. The controller must be provided with a good ground using the grounding terminal on the supply voltage plug. Additionally, the controller has reverse polarity protection, a fuse and also soft-start. The pin assignments for the supply voltage plug are printed on the housing.



Pin	Description
+	+24 VDC
-	GND ⊥
⊥	Ground
⊥	Ground

Keypad Module Interface

Up to 7 keypad modules with 16 illuminated keys can be connected to the C130 CAN Controller. The software limits the number of LEDs that can be lit at once to 48. The interface is short circuit and overload protected. A short circuit (e.g. on a keypad module) does not effect the function of the panel controller (no processor reset, ...), however the interface to the keypad modules no longer functions (no echo of data). There is no electrical isolation to the controller or to the 24 VDC supply. The data interface has a protective circuit against Burst according to EN61131-1:1994. A termination connector is not required if keypad modules are not connected.



A keypad module requires approx. 7 mA (8 V), an LED requires approx. 8.5 mA (8 V). 7 keypad modules with 16 keys each and LEDs results in the following current load:

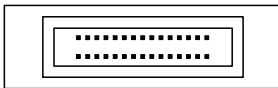
$$16 \text{ keys} \times 8.5 \text{ mA / LED} + 7 \text{ mA / module} = 143 \text{ mA / keypad module} \times 7 \text{ pcs.} = \mathbf{1A} \text{ (8 V)}$$

Display Module Interface

All B&R PANELWARE display units can be connected to the C130 CAN Controller. The display module interface is short circuit and overload protected. A short circuit resets the processor on the panel controller. There is no electrical isolation to the controller or to the 24 VDC supply.

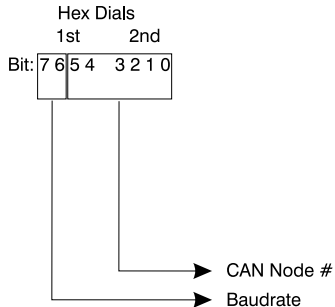
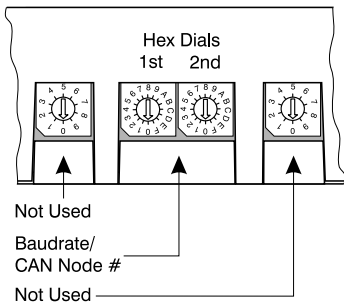


A connection to this interface is not allowed to be made under power.



Number Dials

The hex dials are used to set the baudrate and the CAN node number. The two other dials are presently not being used. Each hex dial has a 4 bit value range. The first 2 bits of the first hex dial set the baudrate. The second 2 bits of the first hex dial along with all 4 bits of the second hex dial set the CAN node number. 1 - 32 are valid CAN node numbers, 0 and 33 - 63 are invalid. Baudrates are set as follows; (00 - 250 Kbaud, 01 - 125 Kbaud, 10 - 20 Kbaud and 11 - 500 Kbaud).



Hex Dials

1st	2nd	Baudrate	CAN Node #
0	0	N/A	Invalid
0	1 - F	250 KBaud	1 -15
1	0 - F	250 KBaud	16 - 31
2	0	250 KBaud	32
2	1 - F	N/A	Invalid
3	0 - F	N/A	Invalid

Hex Dials

1st	2nd	Baudrate	CAN Node #
4	0	N/A	Invalid
4	1 - F	125 KBaud	1 -15
5	0 - F	125 KBaud	16 - 31
6	0	125 KBaud	32
6	1 - F	N/A	Invalid
7	0 - F	N/A	Invalid

Hex Dials

1st	2nd	Baudrate	CAN Node #
8	0	N/A	Invalid
8	1 - F	20 KBaud	1 -15
9	0 - F	20 KBaud	16 - 31
A	0	20 KBaud	32
A	1 - F	N/A	Invalid
B	0 - F	N/A	Invalid

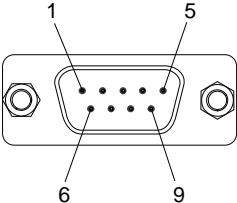
Hex Dials

1st	2nd	Baudrate	CAN Node #
C	0	N/A	Invalid
C	1 - F	500 KBaud	1 -15
D	0 - F	500 KBaud	16 - 31
E	0	500 KBaud	32
E	1 - F	N/A	Invalid
F	0 - F	N/A	Invalid

CAN Interface

The C130 CAN Controller is equipped with a CAN interface. This interface has a protective circuit and is electrically isolated from the 24 VDC supply.

Pin Assignments

9 pin D-type (M)	Pin No.	Signal	Description
	1	NC	Not connected
	2	CAN L	CAN Low
	3	CAN GND	CAN Ground
	4	NC	Not connected
	5	NC	Not connected
	6	NC	Not connected
	7	CAN H	CAN High
	8	NC	Not connected
	9	NC	Not connected

CAN Identifier

The CAN send and receive identifiers are calculated as follows using the CAN node number:

$\text{sendID} = 1054 + (\text{CAN node number} - 1) \times 16$
[sending from PCC to control panel]

$\text{receiveID} = 1054 + (\text{CAN node number} - 1) \times 16 + 1$
or $\text{receiveID} = \text{sendID} + 1$
[receiving from the control panel]

This calculation considers the entry of CAN IDs on B&R 2003 digital and analog modules and the entry of CAN IDs according to the “General PG Communication” concept for CAN (CAN_FBASE).

Therefore, CAN ID collisions are not possible if all CAN bus participants have a different node number from 1 to 32.

Data Transfer

On the C130 CAN Controller, data is transferred to and from the control panel using CAN frames. A maximum of 8 bytes of data can be transferred with a CAN frame. If the data is longer than 8 bytes, it must be sent or received in blocks. The minimum delay is the time between individual CAN frames when sending information from the control panel to the PCC. The PCC must be able to receive CAN frames containing 8 bytes of data from the control panel at the following intervals when the minimum delay is set to 0 msec, otherwise the the delay must be set higher:

Baudrate	Interval
500 KBaud	1 msec
250 KBaud	2 msec
125 KBaud	2 msec
20 KBaud	7 msec

The C130 CAN Controller can receive and process CAN frames with 8 bytes of data from the PCC every 6 msec. Therefore, the PCC should not continually send frames at a higher speed. A higher short-term data rate is possible because the C130 has a 256 byte receive buffer.

C130 Command Set

The command set is VT100/C100 compatible and has been expanded for the C130 CAN Controller. The expansion includes a new command for setting the minimum delay between the individual CAN frames when sending data from the control panel to the PCC. An existing command was also changed.

A description of the VT100/C100 command set can be found in the "B&R PANELWARE Hardware and Installation Manual" (Model No.:MAPWHW-E), in Appendix B. A description of the new command and changes made to an existing command can be found in this manual (Expansions to the VT100/C100 Command Set).

Expansions to the VT100/C100 Command Set

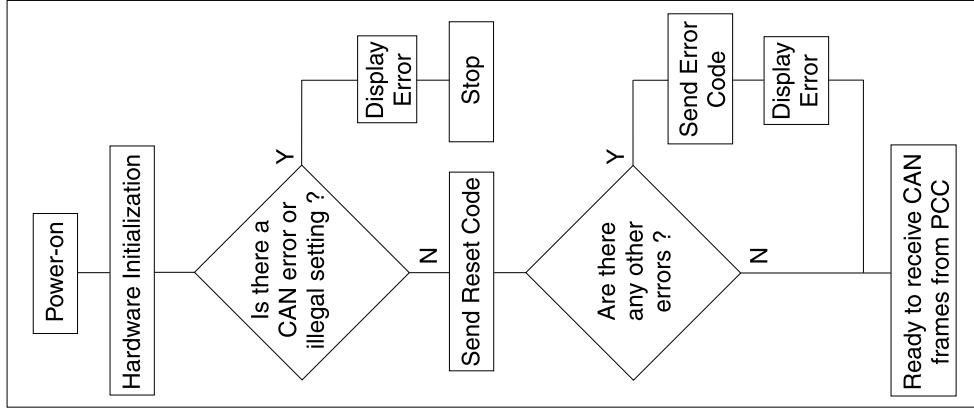
Command Name: SET MINIMUM DELAY (new command)

Description: This command can be used to set the minimum amount of time that must pass between two CAN frames which have been sent from the C130 controller to the PCC. The maximum delay is 999 msec and can be set in steps of 1 msec. The default delay is 10 msec since the control panel sends a reset code and, if necessary, an error code to the PCC after initialization. The control panel can only receive data or commands after sending the reset code.

This value guarantees that a receive task running on the PCC in task class 1 [10 msec] can receive all data.

Without this delay, data blocks could be sent every 1 msec (worst case).

C130 CAN Controller Start-up Diagram



Command:**Syntax** <ESC> <Y> (zzz)**hex.** 1B 59 (z2) (z1) (z0)**dec.** 27 89 (z2) (z1) (z0)**Parameter:** (zzz) Delay in steps of 1 msec.

Valid values: <0><0><0> to <9><9><9>

If the minimum delay is set to 000, the maximum transfer rates according to the table in the "Data Transfer" section are valid.

Command Name: EXPANDED STATUS REQUEST

Description: This command can be used on the PCC to request a status string from the control panel which contains information about the panel configuration or hardware errors and the setting of the number switches.

Command:

Syntax <ESC> <S>

hexadec. 1B 53

dec. 27 83

Structure of the String Sent:

	Start	0.....1.....2.....3.....	End
		0123456789012345678901234567890123456789	
String	<DC2>	Version: x.y Status: abccdefgh	<DC4>
hexadec.	12	corresponding to ASCII table	14
dec.	18	corresponding to ASCII table	20

Version: x Operating System Version Number
 y Operating System Revision Number

Status: a Display Code

0 - No display connected	5 - LCD Display 2 x 20
1 - VFD Display 2 x 20	6 - LCD Display 8 x 40, graphic capable
3 - VFD Display 2 x 40	E - LCD Display 4 x 40
4 - LCD Display 4 x 20	F - LCD Display 16 x 40, graphic capable

b Character C will always be output [C for CAN].
 cc CAN node number [1 to 32].
 d Baudrate: corresponds to the first 2 bits of the first hex dial (see "Number Dials" section).
 0 ... 250 KBaud, 1 ... 125 KBaud, 2 ... 20 KBaud, 3 ... 500 KBaud

e Number of Keypad Module Connected
 f Keypad Module Error
 g RAM Error
 h EPROM Error

CAN Bus Access

In order to access the CAN bus on B&R 2000 systems, the CAN driver CAN2000.BR and the Library Runtime Module CAN_LIB.BR are required on the PCC.

The CAN Library contains the following functions for accessing the CAN bus:

CANopen	CAN - Initialize the CAN controller
CANwrite	CAN - Write data
CANread	CAN - Read data
CANdftab	CAN - Define variable table
CANrwtab	CAN - Process variable table

A description of the CAN Library functions can be found in the "B&R SYSTEM 2000 Library Reference Manual" (Model No.:MASYS2LRM-E).

Status Display and Error Messages

The following status display is shown on the C130 after initialization:

Display:	Range:
V A.B Can-NodeNr:CC	A.B Version number 1.0 onwards
DDDkBaud EKeyboards	CC 01 to 32
	DDD 020, 125, 250, 500
	E 0 to 7

If an error occurs, the 2nd line contains one of the error messages on the next page (highest priority error shown if multiple errors occur).

Priority	Error Message	Description
5	Invalid CAN-NodeNr.	CAN node number set incorrectly
4	EPROM Checksum Error	Incorrect checksum
3	RAM Error	RAM test results in an error
2	CAN Error [YY]	CAN controller could not be fully initialized (YY has no meaning for the user)
1	Keyboard Error, YOk	Defective keypad module (Y - number of error free keypad modules)

Error Correction

Error Message

Corrective Measures

Invalid CAN-NodeNr.

Check hex dial settings

Settings incorrect: Make correct settings, restart C130

Settings correct: Replace Hardware

EPROM Checksum Error

Replace Hardware

RAM Error

Replace Hardware

CAN Error [YY]

Replace Hardware

Keyboard Error, YOk

1) Check connections

2) Check for termination connector on last module

3) Are all keypad modules in working order ?

No: Replace Hardware

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