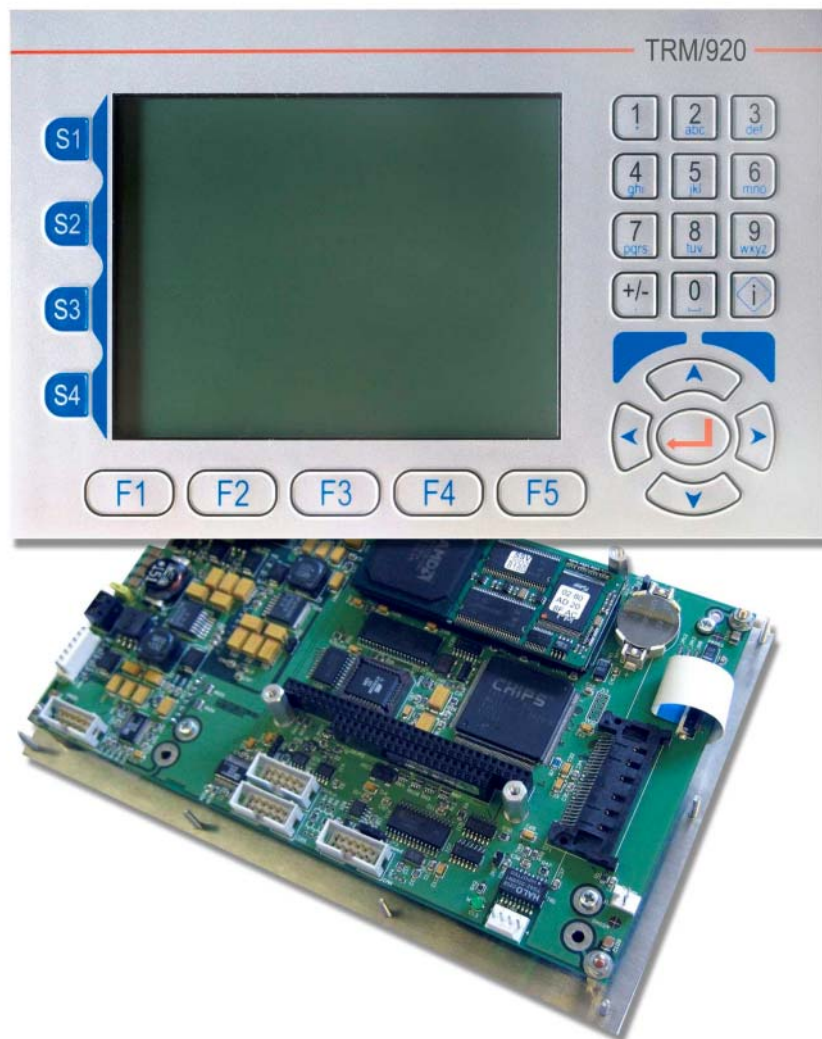


TRM/920



Hardware Manual

Content

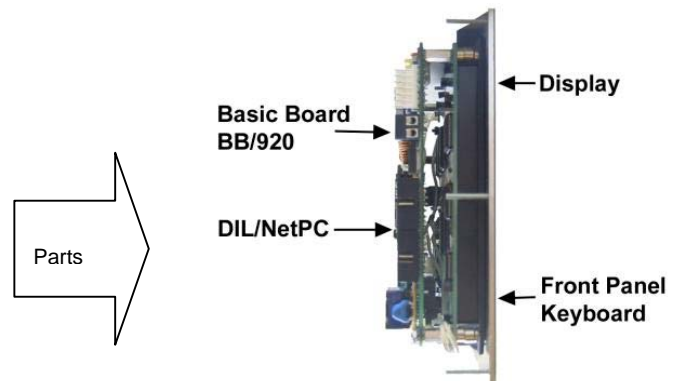
| | |
|---------------------------------------------------------|----|
| Parts of the TRM/920..... | 3 |
| Display | 3 |
| Front Panel Keyboard..... | 3 |
| Front Panel Keyboard: Keycodes..... | 4 |
| Basic Board BB/920..... | 5 |
| Basic Board BB/920 Connectors - Picture | 6 |
| Connector – Pinouts | 7 |
| Jumpers on TRM/920 | 9 |
| PC/104 - BUS on TRM/920 | 10 |
| Reserved / not available I/O-Addresses on TRM/920 | 11 |
| DIL/NetPC..... | 12 |
| Electrical characteristic TRM/920 | 13 |
| Block Structure TRM/920 | 14 |
| Additional Information | 15 |
| Startup Package | 16 |
| Pictures..... | 17 |
| Contact | 17 |
| Notes to this document | 17 |

Parts of the TRM/920

The TRM/920 including a new and innovative concept for an extremely small embedded PC system – complete for industrial and automation applications.

It is PC compatible, free programmable and available with different embedded operating systems. This small information gives you some more details about the system itself.

The TRM/920 is an open frame Ethernet PC system. The backside (behind the front panel matrix keyboard and the high resolution LC-Display) consists of the base board BB/920 and the popular DIL/NetPC. The right picture shows the details.

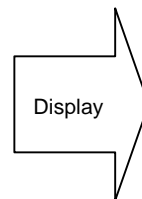


Picture 1: TRM/920 Parts

Display

Display Capacity: 320 x 240 Dots, QVGA TFT Color Display

Driving Method: Controller
 Module Size: 144 x 104,6 mm
 View Area: 115,2 x 86,4 mm
 Dot Pitch: 0,36 x 0,36 mm
 Response Time: ~50 ms (on 25°C)
 Operating Temp.: -10...+60/70°C

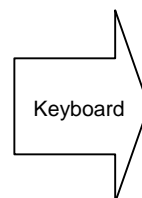


Picture 2: LC-Display

Front Panel Keyboard

The front panel contains a matrix keyboard with following functions:

- ◆ Numeric keys 1 to 0, and alphanumeric keys A to Z, similar with a mobile telephone (cellphone)
- ◆ Function keys F1 – F5
- ◆ Key +/-
- ◆ ENTER Key
- ◆ Softkeys S1 - S4
- ◆ Cursor UP/DOWN/LEFT/RIGHT keys for scroll menus.



Picture 3: Front Panel Keyboard

Front Panel Keyboard: Keycodes

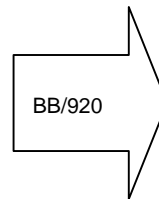
The TRM/920 keyboard is PC compatible – means you will get no difference between the scancodes of the TRM/920 – or your PC keyboard. (This is important for your own application!)

| Key: | Primary function | Secondary function |
|-----------|------------------|--------------------|
| Key S1 | ESC | ESC |
| Key S2 | Backspace | Backspace |
| Key S3 | TAB | TAB |
| Key S4 | F7 | F7 |
| Key 1 | 1 | * |
| Key 2 | 2 | a b c |
| Key 3 | 3 | d e f |
| Key 4 | 4 | g h i |
| Key 5 | 5 | j k l |
| Key 6 | 6 | m n o |
| Key 7 | 7 | p q r s |
| Key 8 | 8 | t u v |
| Key 9 | 9 | w x y z |
| Key 0 | 0 | Space |
| Key +/-. | . | :+/_ |
| Key F1 | F1 | F1 |
| Key F2 | F2 | F2 |
| Key F3 | F3 | F3 |
| Key F4 | F4 | F4 |
| Key F5 | F5 | F5 |
| Key UP | UP | UP |
| Key DOWN | DOWN | DOWN |
| Key ENTER | ENTER | ENTER |
| Key LEFT | LEFT | LEFT |
| Key RIGHT | RIGHT | RIGHT |
| Key "i" | F8 | F8 |

Basic Board BB/920

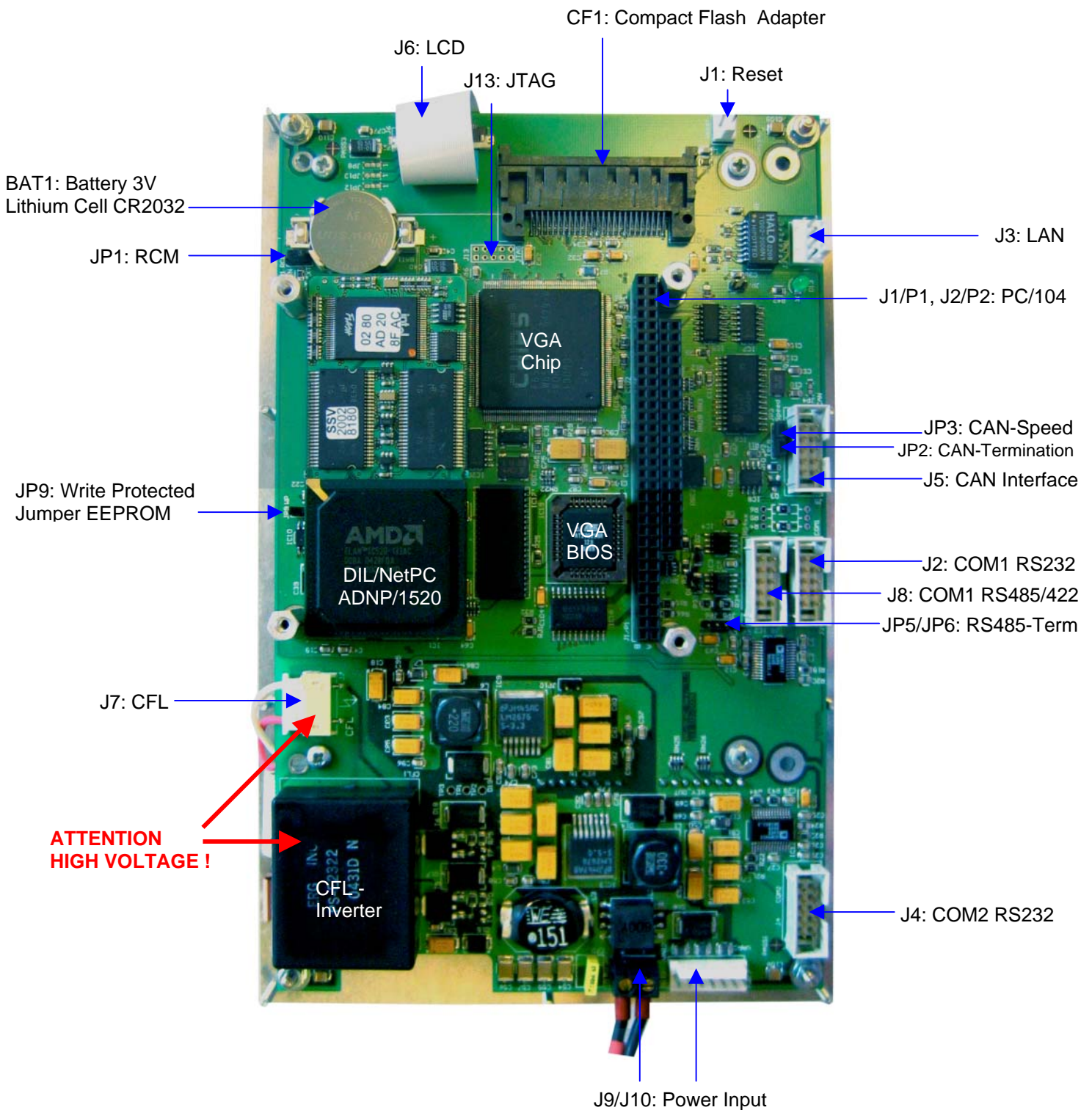
The basic board BB/920 contains connectors for the interfaces. The main features of the BB/920 with the standard DIL/NetPC ADNP/1520:

- DIL-connector for DIL/NetPC
- Connector for RESET-Key
- Jumper for Remote Console Modus RCM
- 10/100Mbps Ethernet LAN with RJ45 Connector, CS8900 Ethernet Controller, TCP/IP Stack
- Serial Interface: 1*RS232/RS422/RS485 (COM1)
1*RS232 (COM2)
- CAN Interface, Philips CAN SJA1000 Controller
- Connector for Compact Flash Cards
- PC/104 Extension Bus
- Connector for Power, 12-24VDC



Picture 4: Basic Board BB/920

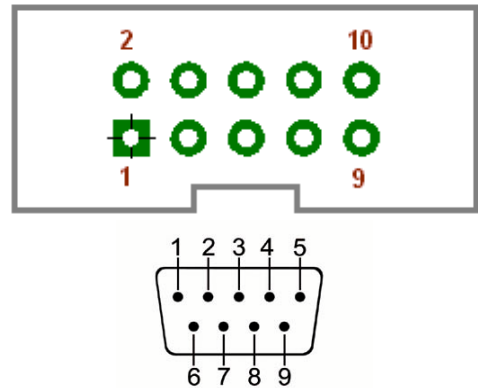
Basic Board BB/920 Connectors - Picture



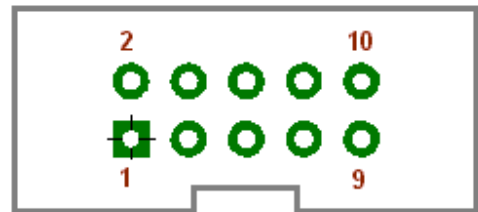
➔ Additional: All components and jumpers are named directly on the base board

Connector – Pinouts

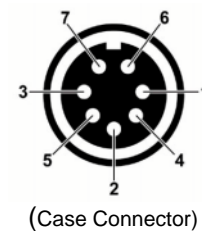
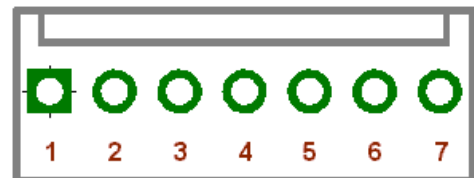
| J2/J4 – RS232 | | |
|---------------|-------|--------|
| Board | SUB-D | SIGNAL |
| 1 | 1 | DCD |
| 2 | 6 | DSR |
| 3 | 2 | RXD |
| 4 | 7 | RTS |
| 5 | 3 | TXD |
| 6 | 8 | CTS |
| 7 | 4 | DTR |
| 8 | 9 | RI |
| 9 | 5 | GND |
| 10 | - | nc |



| J5 – CAN | | |
|----------|-------|--------|
| Board | SUB-D | SIGNAL |
| 1 | 1 | Nc |
| 2 | 6 | GND |
| 3 | 2 | CAN_L |
| 4 | 7 | CAN_H |
| 5 | 3 | GND |
| 6 | 8 | Nc |
| 7 | 4 | Nc |
| 8 | 9 | Nc |
| 9 | 5 | Nc |
| 10 | - | Nc |



| J9 – Power | | | |
|------------|---------|--------|------------|
| Board | DIN (7) | IN/OUT | SIGNAL |
| 1 | 3 | INPUT | GND |
| 2 | 7 | | - 5VDC |
| 3 | 5 | | 12-24VDC |
| 4 | 2 | | - 12VDC |
| 5 | 4 | | OUTPUT (*) |
| 6 | 6 | | |
| 7 | 1 | | |

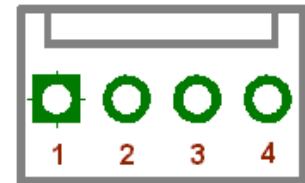


(* Important note:

Do not use 5VDC (Stabile +/-10%) as INPUT! It is possible, but it can damage your system. There is no specification and ESD-protection on this pin!
Please use 5VDC as OUTPUT on Pin 6 or Pin 7 only for very small applications with max. 50mA (Not more!).

| J10 – Power | | |
|-------------|--------|----------|
| Board | IN/OUT | SIGNAL |
| 1 / - | INPUT | GND |
| 2 / + | | 12-24VDC |

| J3 – RJ45 Ethernet | | |
|--------------------|----------|--------|
| Board | RJ45 (8) | SIGNAL |
| 1 | 6 | RXD- |
| 2 | 3 | RXD+ |
| 3 | 2 | TXD- |
| 4 | 1 | TXD+ |



| J8 – RS422/485 | | | |
|----------------|-------|-------|-----------|
| Board | SUB-D | RS422 | RS485 |
| 1 | 1 | nc | nc |
| 2 | 6 | RX+ | PullUP+ |
| 3 | 2 | TX+ | TX/RX+ |
| 4 | 7 | RX- | PullDown- |
| 5 | 3 | TX- | TX/RX- |
| 6 | 8 | nc | nc |
| 7 | 4 | nc | nc |
| 8 | 9 | nc | nc |
| 9 | 5 | nc | nc |
| 10 | - | nc | nc |



Most RS422/RS485 devices work perfect with this board assignment on short distance. Resistors are an option and are not included in the standard accessory.

If there is a long distance, the signal is better if you have smaller line impedances. In addition it activates the detection "line open". For that you have to close JP5 and JP6 and to equip this three resistors:

- R4 = 620 Ohm (to Vcc 5V, default on board 10KOhm)
- R5 = 120 Ohm (middle)
- R6 = 620 Ohm (to GND, default on board 10KOhm, need for RS232)

(That are sample values only!)

Please regard:

- > Handshake: RTS = ON for Transmit, RTS = OFF to receive (Samples on CD-ROM)
- > RS422: Resistors for line termination are active always. Do not set Jumper JP5 and JP6
- > RS485: Resistors can be set by Jumper JP5 and JP6, but you will receive your self sending ECHO
- > Do not use RS232 and RS422 in the same time on ttyS0 in Linux (COM1 in DOS)
- > Do not set RCM-Jumper JP1 (or on DNP board), if JP5 and JP6 are set. Because the boot-process stops

Jumpers on TRM/920

| JP1 – RCM | | |
|-----------|------|--------------------------------------------|
| Position | Mode | Description |
| 1-2 | ON | RCM permanent enabled (default) |
| 2-3 | EXT | RCM soft enabled, if DSR on COM1 active *) |
| Open | OFF | RCM disabled |

*) With using SSV-NULL-Modem cable: RCM-EXT is active, if your Terminal program is "online" and set line DTR.

| JP2 – CAN Term | | |
|----------------|------|--------------------------------------------------------|
| Position | Mode | Description |
| 1-2 | ON | Resistor 120 Ohm for line termination active (default) |
| Open | OFF | No termination |

(Please read specification of line driver, such as sample 82C251 or compatible)

| JP3 – CAN Speed | | |
|-----------------|------|----------------------|
| Position | Mode | Description |
| 1-2 | ON | High speed (default) |
| Open | OFF | Slow speed |

| JP5/JP6 – RS485 resistors (R4,R5,R6) | | |
|--------------------------------------|------|---------------------------------------------------------------------------------------------------|
| Position | Mode | Description |
| 1-2 | ON | RS232: Not usable (RX-TX echo) RS422: Not possible RS485: Line termination active |
| Open | OFF | RS232: Normal usage RS422: Line termination on RX line (default) RS485: No line termination |

| JP9 – WP EEPROM | | |
|-----------------|------|---------------------------------------|
| Position | Mode | Description |
| 1-2 | ON | EEPROM write protect option (default) |
| Open | OFF | Disabled |

(More information please read the file \HW-DOC\EEPROM\X25320.PDF on CDROM for TRM/920)

PC/104 - BUS on TRM/920

| Pin | J1/P1 Row A | J1/P1 Row B | J2/P2 Row C | J2/P2 Row D |
|-----|----------------|----------------|-------------|---------------|
| 0 | -- | -- | GND | GND |
| 1 | IOCHCHK / n.c. | GND | SBHE | MEMCS16 |
| 2 | SD7 | RESETDRV | LA23 | IOCS16 |
| 3 | SD6 | +5V | LA22 | IRQ10 |
| 4 | SD5 | IRQ9 / n.c. | LA21 | IRQ11 |
| 5 | SD4 | -5V | LA20 | IRQ12 |
| 6 | SD3 | DRQ2 / n.c. | LA19 | IRQ15 / n.c. |
| 7 | SD2 | -12V | LA18 | IRQ14 |
| 8 | SD1 | ENDXFR / n.c. | LA17 | DACK0 / n.c. |
| 9 | SD0 | +12V | MEMR | DRQ0 / n.c. |
| 10 | IOCHRDY | GND | MEMW | DACK5 / n.c. |
| 11 | AEN | SMEMW | SD8 | DRQ5 / n.c. |
| 12 | SA19 | SMEMR | SD9 | DACK6 / n.c. |
| 13 | SA18 | IOW | SD10 | DRQ6 / n.c. |
| 14 | SA17 | IOR | SD11 | DACK7 / n.c. |
| 15 | SA16 | DACK3 / n.c. | SD12 | DRQ7 / n.c. |
| 16 | SA15 | DRQ3 / n.c. | SD13 | +5V |
| 17 | SA14 | DACK1 / n.c. | SD14 | MASTER / n.c. |
| 18 | SA13 | DRQ1 / n.c. | SD15 | GND |
| 19 | SA12 | REFRESH / n.c. | GND | GND |
| 20 | SA11 | SYSCLK | -- | -- |
| 21 | SA10 | IRQ7 | -- | -- |
| 22 | SA9 | IRQ6 | -- | -- |
| 23 | SA8 | IRQ5 / n.c. | -- | -- |
| 24 | SA7 | IRQ4 / n.c. | -- | -- |
| 25 | SA6 | IRQ3 | -- | -- |
| 26 | SA5 | DACK2 / n.c. | -- | -- |
| 27 | SA4 | TC / n.c. | -- | -- |
| 28 | SA3 | BALE | -- | -- |
| 29 | SA2 | +5V | -- | -- |
| 30 | SA1 | OSC | -- | -- |
| 31 | SA0 | GND | -- | -- |
| 32 | GND | GND | -- | -- |

Reserved / not available I/O-Addresses on TRM/920

| Reserved I/O – Addresses | |
|--------------------------|--------|
| I/O - Address | Device |
| 1F0h - 1F7h | CF/IDE |
| 220h - 22Fh | PD3 |
| 280h - 281h | CAN |
| 2A0h - 2Afh | PD3 |
| 2F8h - 2FFh | COM2 |
| 300h - 30Fh | LAN |
| 3A0h - 3Afh | PD3 |
| 3C0h - 3DFh | VGA |
| 3F6h - 3F6h | CF/IDE |
| 3F8h - 3FFh | COM1 |

| Reserved Interrupts | | |
|---------------------|------|--------------|
| IRQ | ADNP | Device |
| IRQ0 | | Timer |
| IRQ1 | INT7 | free for ISA |
| IRQ2 | | Slave |
| IRQ3 | INT1 | Keyboard |
| IRQ4 | | COM1 |
| IRQ5 | | LAN |
| IRQ6 | INT4 | CAN |
| IRQ7 | INT5 | free for ISA |
| IRQ8 | | CMOS/RTC |
| IRQ9 | | - |
| IRQ10 | INT3 | free for ISA |
| IRQ11 | | COM2 |
| IRQ12 | INT2 | free for ISA |
| IRQ13 | | FPU |
| IRQ14 | INT6 | IDE/CF |
| IRQ15 | | - |

DIL/NetPC

The SSV DIL/NetPC is an embedded PC family with different boards. Following DIL/NetPC are available within the TRM/920 at present:

ADNP/1486:

- AMD SC-410
- 33/100 MHz
- 16MB DRAM
- 4MB Flash
- Serial Interface COM1 RS232
- Ethernet LAN, 10Mbps
- Watchdog Timer
- ISA Signalbus



Picture 5: DIL/NetPC ADNP/1486

ADNP/1520 (Standard):

- AMD SC-520
- 133 MHz
- 64MB DRAM
- 16MB Flash
- Serial Interface COM1 (RS232/422/485), COM2 (RS232)
- Ethernet LAN, 10/100Mbps
- Watchdog Timer
- ISA Signalbus



Picture 6: DIL/NetPC ADNP/1520

Please note: The complete DIL/NetPC documentation is part of the Startup Package. Please use the DIL/NetPC CD-ROM for exact and detailed information about Getting-Started with the DIL/NetPC family.

Electrical characteristic TRM/920

| Modul | I / mA | | | | P / W | | | |
|-----------|--------|-------|-----|-----|-------|-------|-----|------|
| | min | Linux | DOS | max | Min | Linux | DOS | max |
| ADNP/1486 | 280 | 655 | 725 | 770 | 3,4 | 7,9 | 8,7 | 9,2 |
| ADNP/1520 | 250 | 630 | 795 | 840 | 3,0 | 7,6 | 9,5 | 10,1 |

12VDC

| Modul | I / mA | | | | P / W | | | |
|-----------|--------|-------|-----|-----|-------|-------|-----|------|
| | min | Linux | DOS | max | min | Linux | DOS | max |
| ADNP/1486 | 150 | 340 | 375 | 400 | 3,6 | 8,2 | 9,0 | 9,6 |
| ADNP/1520 | 140 | 330 | 400 | 420 | 3,4 | 7,9 | 9,6 | 10,1 |

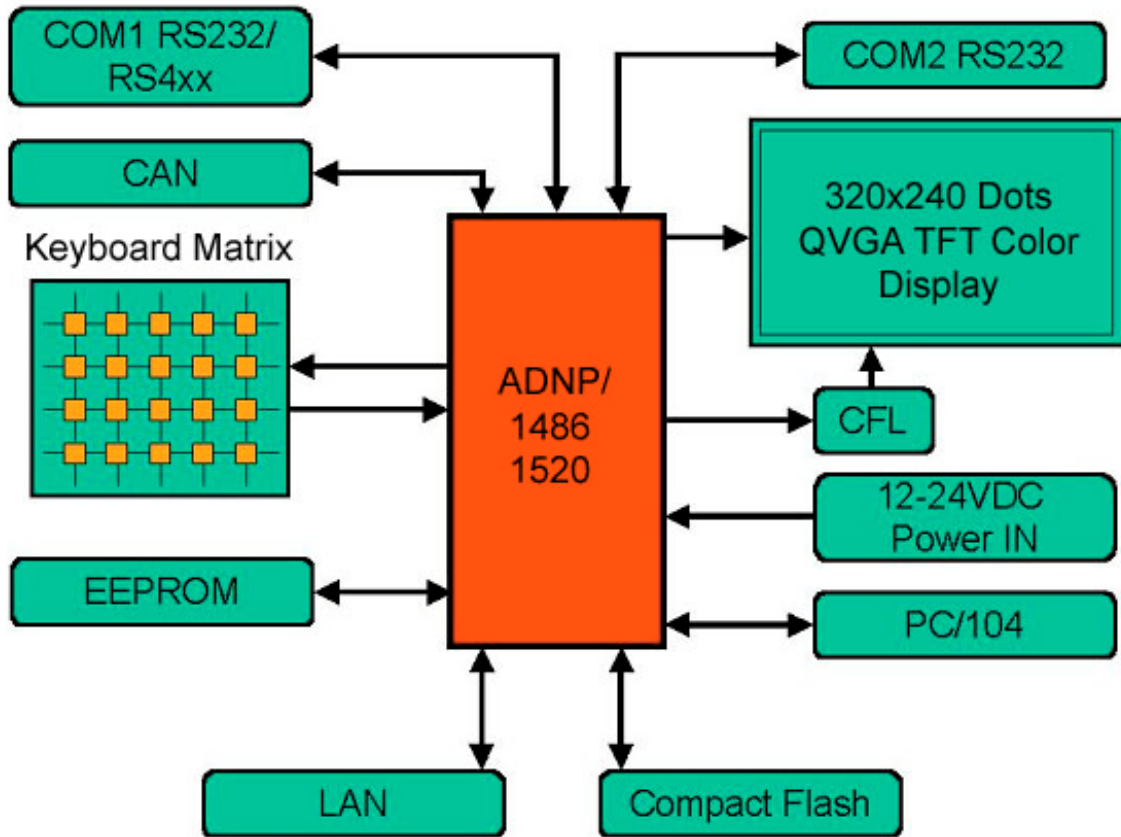
24VDC

Test conditions:

ADNP/1486 with 33MHz
 ADNP/1520 with 133MHz

min: Power-Save mode for CPU and LCD. CFL-Backlight is off (LCD is unreadable).
 Linux: Typical with hlt-mode enabled (default) and FLTK graphic demo on LCD.
 DOS: Typical with demo application and show a slide show on LCD.
 max: Maximal power for Linux and DOS, CPU full in action on LCD.

Block Structure TRM/920

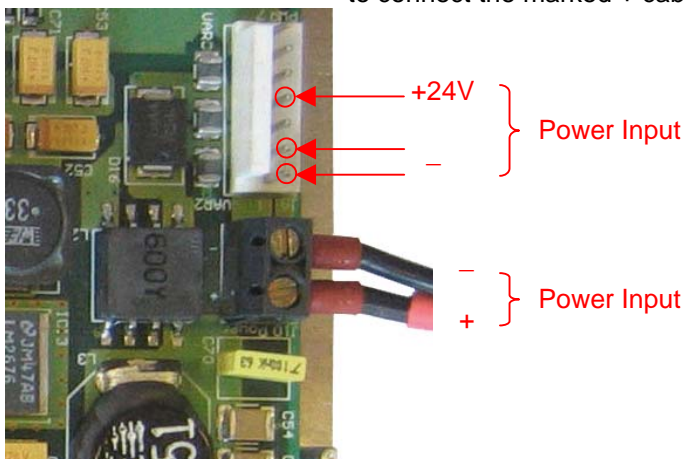


Additional Information

| | |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compact Flash Card: | The TRM/920 can use compact flash cards for memory upgrade or with SSV special features, e.g. USB. |
| CAN Interface: | The TRM/920 contains an on-board CAN controller, type Philipps SJA1000. |
| LCD Contrast: | The TRM/920 contains an on-board elec. contrast adjusting. In normal applications it is not necessary to change the contrast. If you want to do this, please use the software for adjusting the contrast. |
| Web Server: | If you want to install a web server for the TRM/920, please explore the DIL/NetPC CD. The web server is a part of the DIL/NetPC. We put the web server httpd on the CD (and the documentation for using) too. |
| RAM Disc, Drive C and D: | The internal flash memory is drive C: We prepared the TRM/920 with a RAM disc, you can use this as drive D: – or if you are using a compact flash card E: We recommend to use the RAM disc for exploring our samples. This is the faster way (for downloading) and you save the flash life with using the RAM disc. |
| Case Version – Evaluation System: | <p>We recommend to use the starter kit as open frame system. It is easier to use on a table for the programming and software development phase.</p> <p>If you want to begin with a case version, you have to open the TRM/920 case to use all the evaluation features of the TRM/920, e.g. RCM mode etc.</p> <p>If you have finished your software development, you can close the system and use the case version again.</p> |

Power Supply

Please use the pictures as follows to connect the power cables on the base board BB/916 – the + signal on the SSV power supply is marked – make sure to connect the marked + cable with the + marked pin on the connector:



Picture 7: Power Connection

Startup Package

The startup package for TRM/920 include all necessary accessories for the first development environment. It contains the following components:

Power Supply (PWR4-TRM):

External power supply 100-240VAC, Output 12V and power cable.



Nullmodem Cable (KK-NM-TRM):

For serial transfer (RCM Mode).



CD-ROM:

Documentation and user manuals, keyboard- and display driver, sample software for TRM/920 and embedded GUI graphic support (FLTK, SDL, FB).



Cable Kit with Adapter (KK1-TRM):

1*COMPORT, 1*Reset, Ethernet LAN.



Picture 8: Startup Package

Pictures

| | |
|----------------------------------------------|----|
| Picture 1: TRM/920 Parts | 3 |
| Picture 2: LC-Display..... | 3 |
| Picture 3: Front Panel Keyboard | 3 |
| Picture 4: Basic Board BB/920 | 5 |
| Picture 5: DIL/NetPC ADNP/1486 | 12 |
| Picture 6: DIL/NetPC ADNP/1520 | 12 |
| Picture 7: Power Connection..... | 15 |
| Picture 8: Startup Package..... | 16 |

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Notes to this document

| Revision | Date | | Name |
|----------|----------|------------------------|----------|
| 1.00 | 03.08.05 | First version | hjlw/smu |
| 1.01 | 12.08.05 | Technical additions | hne |
| 1.02 | 29.08.05 | DIL/NetPC modification | smu |
| 1.03 | 13.06.06 | Case Connectors | smu |

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