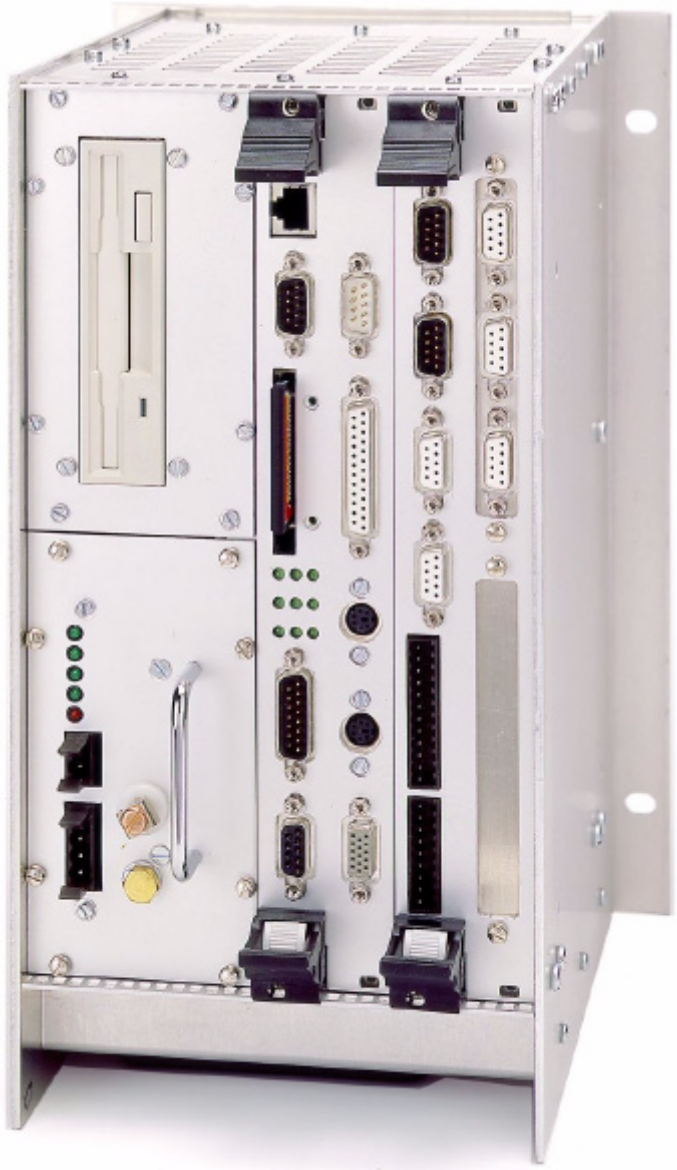

Assembly and Maintenance of the CNC D500

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Table of Contents

1 Overview

The CompactPCI CNC system D500 consists of the single board computer OMC500 and various interface modules, which are accommodated in a special rack with control elements and a floppy disk drive. Thanks to an efficient CNC core, the D500, together with application specific control software, is optimally applicable as multi-axis CNC, also for special technological requirements. In order to guarantee error free function for many years in rough industrial surrounding field, special value was set on durable structure, longevity, long availability, and easy maintenance. Except the fans and the associated filter pads, the complete system is absolutely maintenance-free. This document explicitly describes the assembly and maintenance of the D500 hardware.

2 Installation Hints

2.1 Cooling

When the D500 is installed, it must be paid attention that enough volume for circulation of air is available. The necessary quantity depends on the ambient temperature. No other devices may obstruct the air flow in the range of the fans and the perforations.

2.2 Wiring

Signal lines must be located as far as possible away from power lines and other lines that are afflicted with interfering signals. Signal line and return line must be located in such a way, that they include a area as small as possible. Twisted lines are optimal. Where shielded lines are prescribed according to the connection diagrams, this is to be adhered absolutely. Screens must be always connected electrically well leading at both ends with the respective equipment housing. Metallic or metallized plug housings at shielded cables must be connected with the screen.

3 Remarks on Handling OPTRONIC Assemblies

Electronic components are sensitive in relation to electrostatic loading. Therefore, it is important that you pay attention to a sufficient grounding of yourself and your workplace while handling them. A surge can destroy or damage electronic components. The latter is particularly problematic, since the equipment could suddenly and unexpectedly fail after a certain number of operation hours. Therefore, please consider the following rules:

- Only touch the D500 hardware if it is necessary.
- If possible, touch all assemblies only at the front plane.
- Removed assemblies should always be stored in antistatic bags.
- If the D500 is connected to the power supply, never connect or disconnect any other devices to the D500.
- Always use an antistatic mat and a grounding wristband, if you handle with removed assemblies.
- To remove an assembly, please proceed as follows:
    - Turn off the D500 power supply.
    - Make a connection between you and the housing of the D500 by use of the grounding wristband. If necessary, the connection can be established also with the unused hand.
    - Remove the assembly from the D500. Instantly put the removed assembly into an antistatic bag.
- An assembly can be installed as follows:
    - Turn off the D500 power supply.
    - Make a connection between you and the housing of the D500 by use of the grounding wristband. If necessary, the connection can be established also with the unused hand.
    - Take the assembly out of the antistatic bag.
    - Insert the assembly into the D500.

- If components of the assembly or the printed circuit board must be touched:
  - Make a connection between you and the antistatic mat by use of the grounding wristband.
  - Take the assembly out of the antistatic bag and put it on the antistatic mat.
- Accomplish soldering work on a assembly only if the assembly lies on an antistatic mat, and if you are connected with the antistatic mat and the soldering iron point, by use of a the grounding wristband.
- Avoid direct contact with the electronics of the D500. Substances such as glue, color, etc. can attack electronics or establish unwanted leading connections.

Please note that above listing is not compellingly concluding and that OPTRONIC AG does not lay a claim on completeness.

4 Assemblies of the D500

The system D500 is composed of assemblies of the series 500. An assembly name always consists of three capital letters, followed by a three digit number starting with digit '5' (ABC5xy). The last two digits specify the configuration of an assembly. If both digits are '0' in a statement, the statement is valid for all possible configurations. (Configuration '00' does not occur as name of a specific assembly.) Currently available assemblies are the CompactPCI rack OMR500, the 24V main power supply assembly OPS500, the add-on power supply module OPM500, the microcomputer OMC500, the multi-functional base interface OMI500, as well as various modules called OIP500. The D500 is not a multi-processor system. Therefore, only one microcomputer OMC500 can be used per OMR500. The OMC500 must be always located in slot 1. Slot 1 directly follows the OPS500 (refer to Illustration 1). The base interface OMI500 may be not inserted into slot 1, but in any other. It is equipped with a front plane with variable width, that can hold up to eight OIP500 modules, as well as an optional add-on power supply module OPM500 (refer to Illustration 1 and Illustration 2). OMI500, OPM500 and all OIP500 modules are internally connected by flat ribbon cables.
In order to cool all assemblies, the OMR500 is equipped with one or more fans, located at the bottom side. To pass mainly clean air through the D500, the fans are equipped with easy exchangeable filter pads.

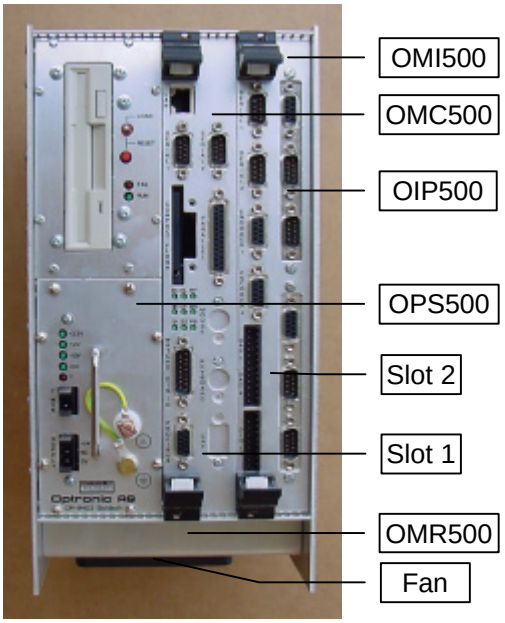

Illustration 1: „narrow" D500 with OMR500 (equipped with one fan), OPS500, OMC500, OMI500, and two OIP500

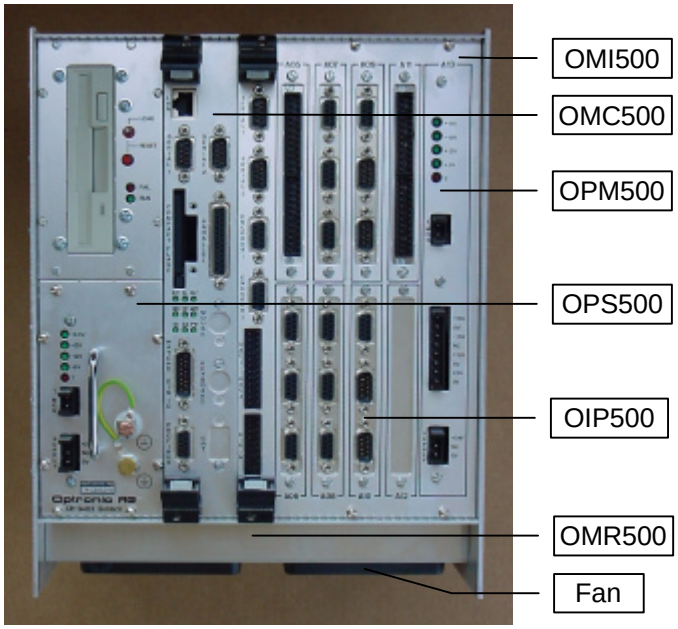

Illustration 2: „wide" D500 with OMR500 (equipped with two fans), OPS500, OMC500, OMI500, OPM500, and seven OIP500

5 Control Plate, Type Plate, and Type Label

Each D500 assembly is equipped with a control plate (refer to Illustration 4), the OMR500 additionally with a type plate at the housing side (refer to Illustration 5), and a type label at the housing front close to the fan(s) (refer to Illustration 3). The article number (e.g. 741.171.01A1), as well as the test date (e.g. -5.02/33) are noted on the control plate. On the type plate and the type label, the application specific device name (e.g. D512/34X5), as well as the device serial number of the D500 (e.g. 12345) are mounted. By use of the device name and the device serial number, OPTRONIC AG can clearly identify the device. OPTRONIC AG keeps records for each device, that provide information on arisen problems and made work.

Illustration 4: D500 control plate

Illustration 5: D500 type plate at the housing side

Illustration 3: D500 type label at the housing front

6 CompactPCI Rack OMR500

The D500 CompactPCI rack OMR500, which is designed for optimal electromagnetic compatibility (EMV) and usage in hard industrial environments, takes up all remaining assemblies. It is available for several expansion, differing in the width and the number of slots (for two examples, please refer to Illustration 6 and Illustration 7).

Illustration 6: "narrow" OMR500

Illustration 7: "wide" OMR500

Illustration 8: OMR500 control elements

Into the OMR500, a diskette drive and several control elements are integrated, that can be used for software maintenance and data exchange by use of diskettes. (refer to Illustration 8). Utilization of the control elements is described in detail in the operating instructions to the operating system OAGLinux.

6.1 24V Power Supply OPS500

The 24V power supply OPS500 is located below the diskette drive. For optimal handling, it is equipped with a metal handle. In order to dismount it from the OMR500, eight screws must be loosened. (see Illustration 9). Afterwards, the OPS500 can be pulled out at the metal handle. At installation time, it must be paid attention to the fact that the green OPS500 base printed circuit board (PCB) (see illustration 10) is inserted correctly into the red guide rails of the OMR500 (see illustration 11), and that all screws are tightened again for EMV technical reasons and to guarantee correct mode of operation.

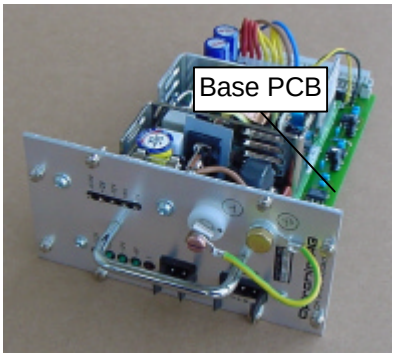

Illustration 10: dismounted OPS500

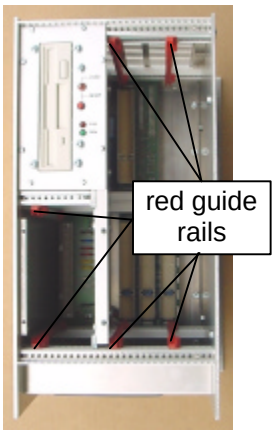

Illustration 11: OPM500 slots with red guide rails

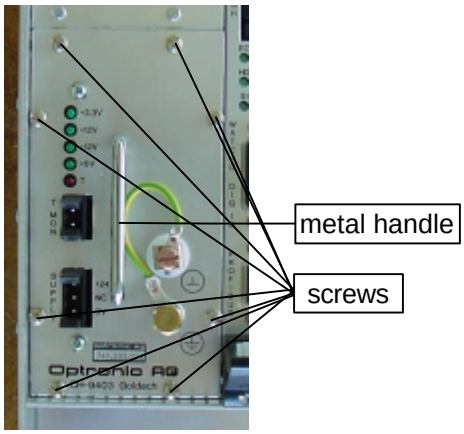

Illustration 9: installed OPS500

6.2 OMC500/OMI500

Right beside the diskette drive, the slots for the CompactPCI boards OMC500 and OMI500 are located. The OMC500 is secured by use of two hidden screws at the eject levers (see Illustration 12). Depending on the front plane width, the OMI500 is also fixed with two screws at the eject levers (refer to Illustration 12), and additional ones in the metal at the lower and upper border of the front plane (see Illustration 13). In order to remove the OMC500 or OMI500, it is first necessary to loosen all these screws. After that, both eject buttons must be pressed, and, at the same time, the levers carefully and simultaneously shifted to outside (in direction of the arrow, as shown in Illustration 12). Thereby, the assembly is lifted out and can be pulled safely out of the slot. It may happens that one of the hidden screws of the eject levers gets stuck in the metal of the OMR500. The impact is, that the eject lever cannot be operated correctly, and that the assembly gets stuck into the slot. In this case, please take again a suitable screw driver and screw for one revolution more to the left side. Now it should be possible to shift the eject lever to its end position and to remove the assembly.

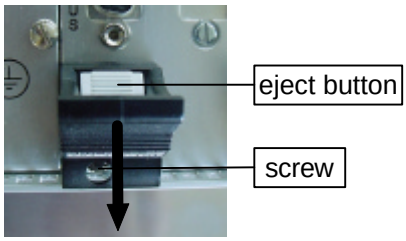

Illustration 12: OMC500/OMI500 eject lever

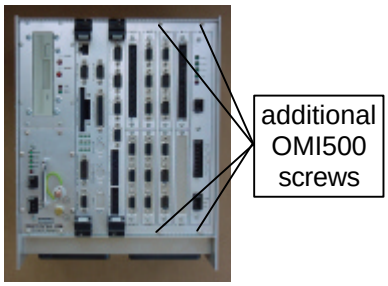

Illustration 13: OMC500 and OMI500 installed in a wide OMR500

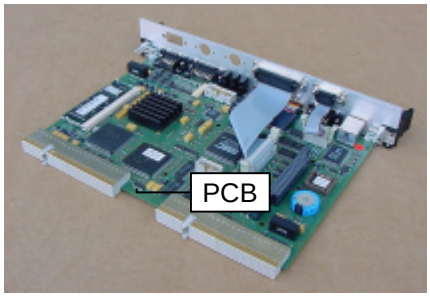

Illustration 14: removed OMC500

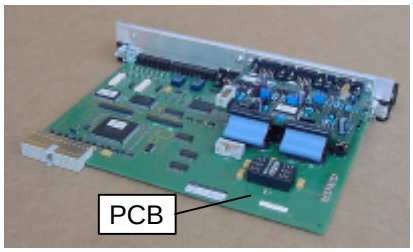

Illustration 15: removed OMI500

During installation of the OMC500 or OMI500, it must be paid attention that the green printed circuit board (refer to Illustration 14 and Illustration 15) is correctly inserted into the red guide rails of the OMR500 (see Illustration 11), and that all screws are screwed down fully to guarantee correct functionality and for EMV technical reasons.

6.3 Fan and Filter Pad

Fans and filter pads are the single D500 components that must be maintained. If a fan gets broken or a filter pad is heavy polluted, so that the air circulation is considerably reduced, the temperature inside the device rises. By use of the temperature monitoring offered by the power supplies OPS500 and OPM500, overheating of the D500 can be detected and a premature breakdown is therefore prohibited. The life cycle of a fan mainly depends on the ambient temperature, and the maximum time a filter pad can be used on the pollution of the ambient air.

The fan assembly is built up like presented in Illustration 16 and Illustration 17. It consists of the following parts:

- one base plate with fan(s)
- two supply wires, one EMV fence, and one inner cap per fan
- one white filter pad per fan

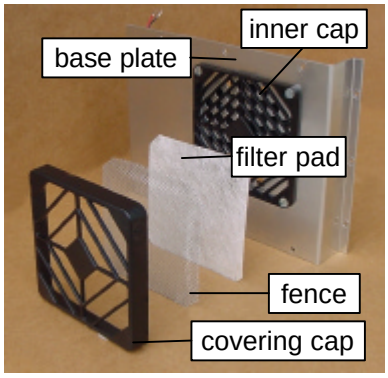

Illustration 16: build up of a small fan assembly

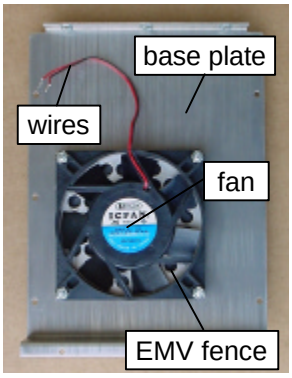

Illustration 17: rear view of the small base plate

- one fence per fan, as protection against damage
- one covering cap per fan

The covering cap takes up the fence and the filter pad. It is attached to the inner cap of the fan, and fixes the fence and the filter pad at the right position in front of the fan.
If a fan breaks down, the complete filter assembly should be replaced. It is available from OPTRONIC AG as spare part and can be easily exchanged. OPTRONIC AG discourages from exchanging the fan only, as its installation requires expertise. Additionally, the used fan is especially selected by OPTRONIC AG, in order to guarantee optimum cooling, and therefore a long life cycle of the D500. To exchange the fan assembly, please proceed as follows:

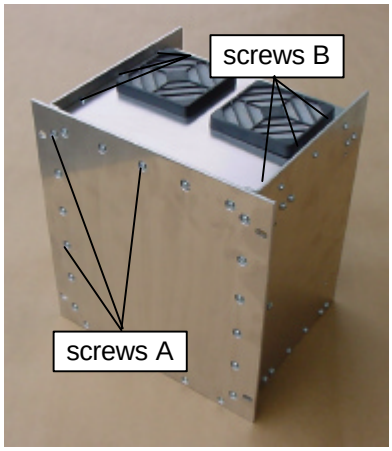

Illustration 19: bottom side and rear panel of the wide OMR500

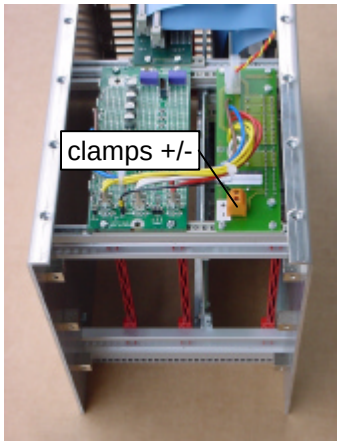

Illustration 18: "opened" small OMR500

1. Remove the screws at the backside of the device, which fix the rear wall (see Illustration 19: three of the screws A are marked). Remove the rear wall.
2. Remove the screws at the bottom side of the device, which fix the fan assembly that should be replaced (refer to Illustration 19: screws B). Remove the filter assembly.
3. Remove the fan supply wires from the clamps. (see Illustration 18: clamps +/-).
4. Connect the supply wires of the new fan assembly with the clamps (red wire: clamp +, black wire: clamp -; refer to Illustration 18).
5. Mount the new fan assembly and fix it with the designated screws.
6. Remount the rear wall and fix it with the designated screws.

A polluted filter pad can be easily replaced. Please proceed as follows:

1. Normally, OPTRONIC AG delivers the D500 with a spare filter pad for each fan. If you have no (more) filter pads, purchase new ones from OPTRONIC AG. *Exclusively use filter pads certified by OPTRONIC AG! The employed material was selected particularly and is optimally tailored to the requirements. Fan and filter efficiency, and therefore the life cycle of the D500, depend on the composition of the material.*
2. Remove the attached covering cap (refer to Illustration 20) from the fan at the bottom side of the device by pulling softly.
3. In the covering cap, the filer pad and the fence are located. Exchange the polluted filter pad by a new one.
4. Reattach the covering pad with the new filter pad in front of the fan.

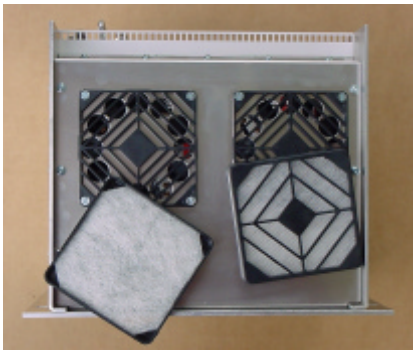
Illustration 20: bottom side of the wide OMR500 with removed covering caps

6.4 OMR500 Variants

The CompactPCI-Rack OMR500 is currently available in two models:

Name	Description
OMR511	narrow rack, two slots, right slot designed for OMI500 with 2 OIP500
OMR512	wide rack, two slots, right slot designed for OMI500 with 8 OIP500 and 1 OPM500

7 Power Supply Assemblies OPS500 and OPM500

The 24V power supply OPS500 (refer to Illustration 21 and Illustration 30) is the main power source of the D500. It supplies OMR500, OMC500, OMI500, as well as, depending on the configuration, all or a part of the OIP500. If the OPS500 is overemployed by the maximum requirements of electric current, the 24V add-on power supply module OPM500 (refer to Illustration 22 and Illustration 27) must be used, which is built into the OMI500. Normally, OPTRONIC AG delivers only preconfigured devices, so that you receive a D500 that fits the requirements of your application, and where a sufficient power supply is guaranteed.

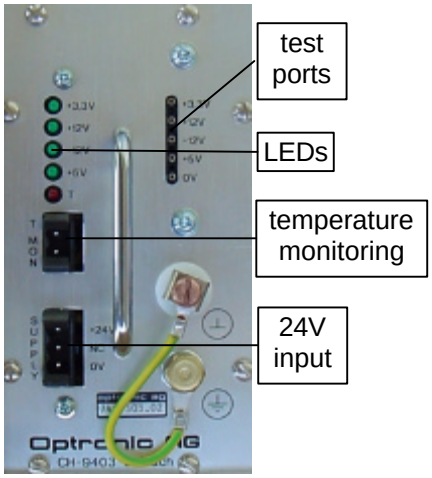

Illustration 21: exterior view OPS500

All OPS500 and OPM500 supply outputs are durable short-circuit proof and secured against overloading. A possible overload or a possible short-circuit does not lead to the loss or to the damage of the power supply. After recovery of the problem, both assemblies can be used further without problems The loss of a power supply assembly cannot lead to a sustained short-circuit on the 24V supply, because the 24V input is secured by an exchangeable non-resetting fuse (refer to Illustration 29, Illustration 28 and Illustration 26). Depending on the expansion stage of the OPM500, the fuse can be found at different locations. The OPS500 is secured with 6.3A. You can find the necessary fuses for the OPM500 in the table at the end of this chapter.

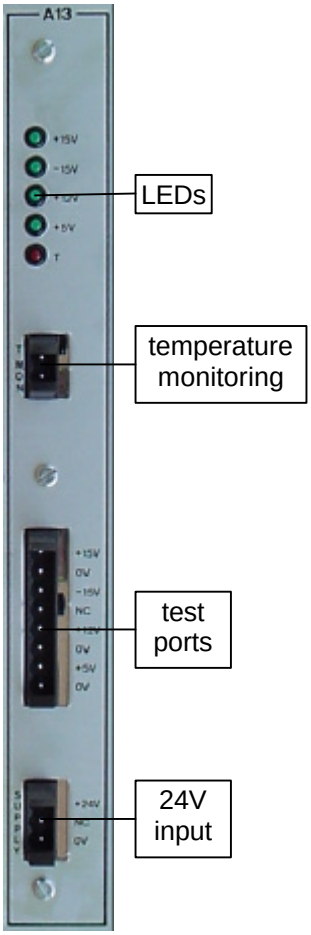

Illustration 22: exterior view OPM500

For easy voltage monitoring, the OPS500 and the OPM500 are equipped with a green LED for each output voltage (see Illustration 25 and Illustration 24). The OPM500 is available in several expansion stages, whereas the LEDs are only populated for the voltages supported by the module. A non-lighting or only weakly lighting green LED indicates a loss of the corresponding voltage. The power supply assembly is out of order and must be replaced. The OPS500 supplies +3.3V, +12V, -12V, and +5V, the OPM500 at the maximum expansion stage +15V, -15V, +12V, and +5V. On both assemblies, additional test ports, respectively auxiliary ports, are available for each voltage, that can be used to determine the exact voltage by use of a measuring instrument. (refer to Illustration 21, Illustration 22, and Illustration 23). After consultation with OPTRONIC AG, the OPM500 auxiliary ports can be used to supply external devices. OPS500 and OPM500 are equipped with a temperature monitor, in order to detect a possible system overheat condition. Therefore, the temperature is measured at selected locations within the OPS500 and OPM500. The monitoring reacts as soon as the temperature at the selected positions rises above 55 degree celsius. There exists only an indirect relation between this limit and the maximum allowed ambient temperature of 40 degree celsius, the D500 is specified for. The monitoring ensures, that the D500

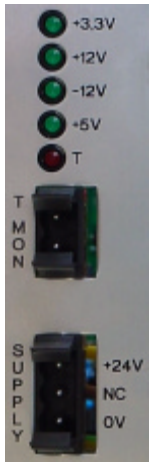

Illustration 25: OPS500 LEDs, temperature monitoring and 24V input

Illustration 24: OPM500 LEDs and temperature monitoring

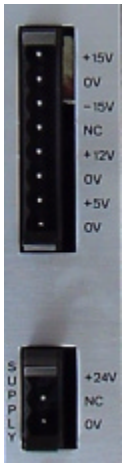

Illustration 23: OPM500 test ports and 24V input

electronics isn't damaged by overheating, and not that the ambient temperature is in the allowed range. If the temperature is in the allowed range, the red LED named **T** is off and the open collector output at connector **T MON** is leading (refer to Illustration 25 and Illustration 24). When the system is overheated, LED **T** is on and the open collector output at connector **T MON** is not leading.

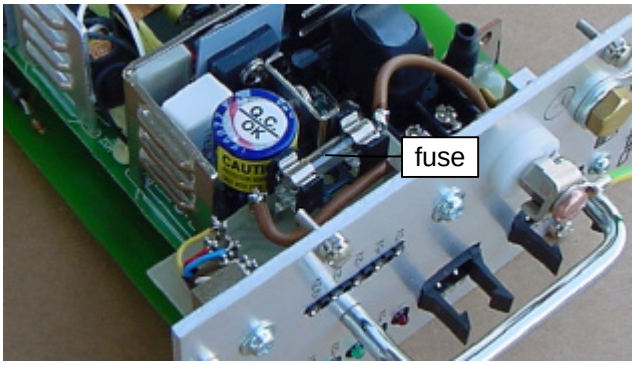

Illustration 29: exchangeable fuse of the OPS500

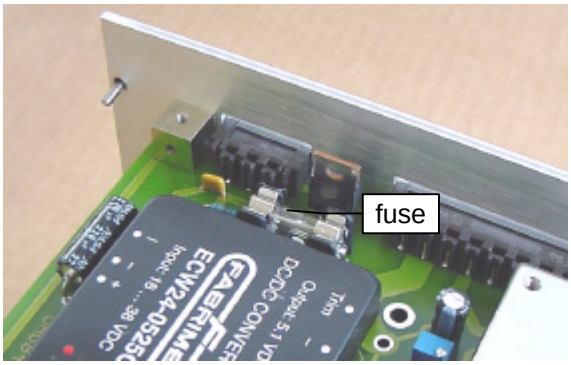

Illustration 28: exchangeable fuse of the OPM500 (variant 1)

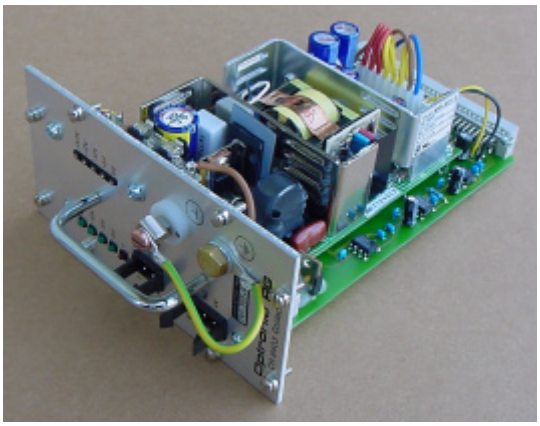

Illustration 30: interior view of the OPS500

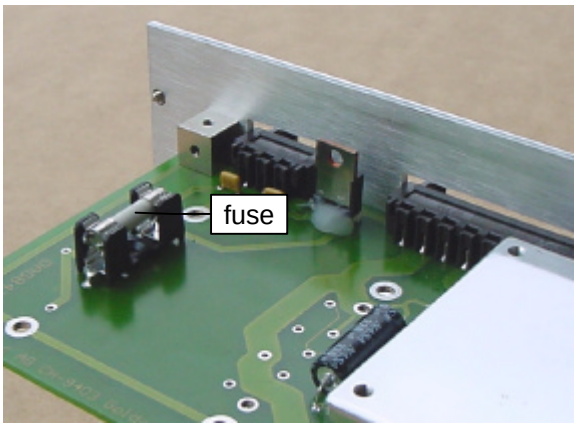

Illustration 26: exchangeable fuse of the OPM500 (variant 2)

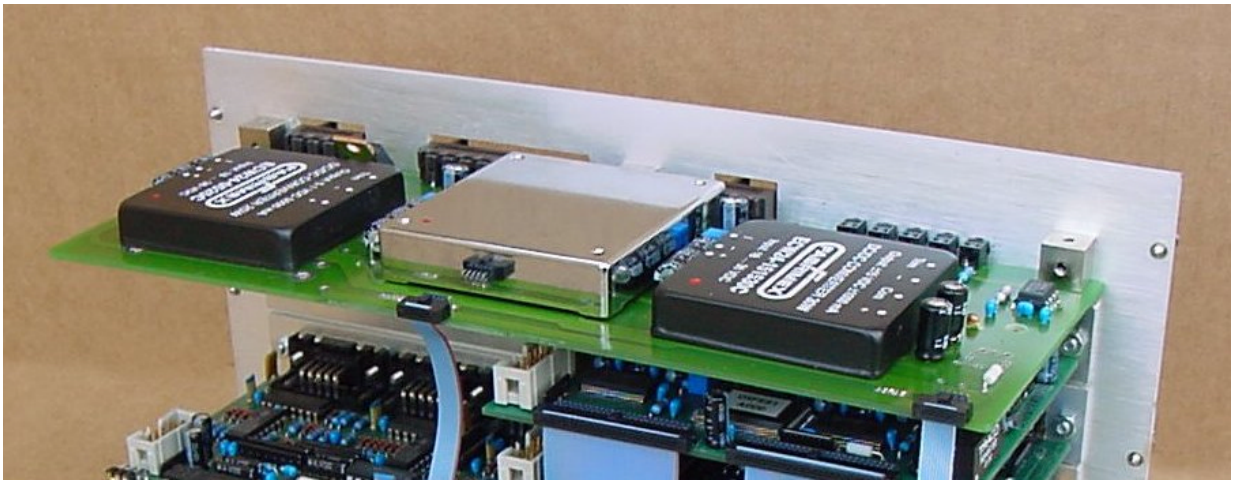

Illustration 27: interior view of the OPM500

Each D500 is delivered with a bridge circuit between the electrical zero point (connector) and the protective earthing (connector) (refer to Illustration 21). Disconnect this bridge only if *both* connectors are wired otherwise (following the corresponding DIN standard). Inside the D500, the protective earthing is connected with the housing.

7.1 OPS500 and OPM500 Variants

OPS500 and OPM500 are available in various variants. Refer to the following two tables for an overview:

Name	Description
OPS511	without auxiliary ports for voltage inspection, and without exchangeable fuse
OPS512	with auxiliary ports for voltage inspection, and with exchangeable 6.3A fuse

Name	Description	Fuse
OPM511	Voltages (maximum current): +/-15V (1A)	2A
OPM512	Voltages (maximum current): +12V (4A)	5A
OPM513	Voltages (maximum current): +5V (5A)	2A
OPM514	Voltages (maximum current): +/-15V (1A), +12V (4A)	6.3A
OPM515	Voltages (maximum current): +/-15V (1A), +5V (5A)	4A
OPM516	Voltages (maximum current): +/-15V (1A), +12V (4A), 5V (5A)	8A

8 Single-Board Computer OMC500

The PC compatible 6U CompactPCI single board computer OMC500 is equipped with all common PC interfaces, and additionally offers extensions that are important for industry applications:

- CompactFlash slot for the application of durable CompactFlash cards and compatible storage media.
- IDE interface for the application of mass storage media, e.g. hard disks (connection over the CompactPCI connector).
- Floppy interface for the application of a diskette drive, used for data exchange and software maintenance (connection over the CompactPCI connector).
- Parallel port, e.g. to connect a local printer.
- Tow serial ports (RS232C).
- Interface for a CRT.
- Interface for PS/2 keyboard and PS/2 mouse.
- 10/100Mbit/s Ethernet interface (RJ45, auto-sense) for integration into a network.
- TFT Interface for the connection of a digital flat screen (connection over the CompactPCI connector).
- PROFIBUS-DP Interface for fieldbus connection.
- Two additional timers with high resolution for more software flexibility.
- Four digital inputs and four digital outputs, all of them electrically isolated.
- Watchdog to check the correct functionality of the D500 hardware and software.
- Nine LEDs for status indication.
- Efficient CompactPCI bus for the communication with other CompactPCI boards.
- PC/104 (ISA) bus for PC/104 expansion boards.

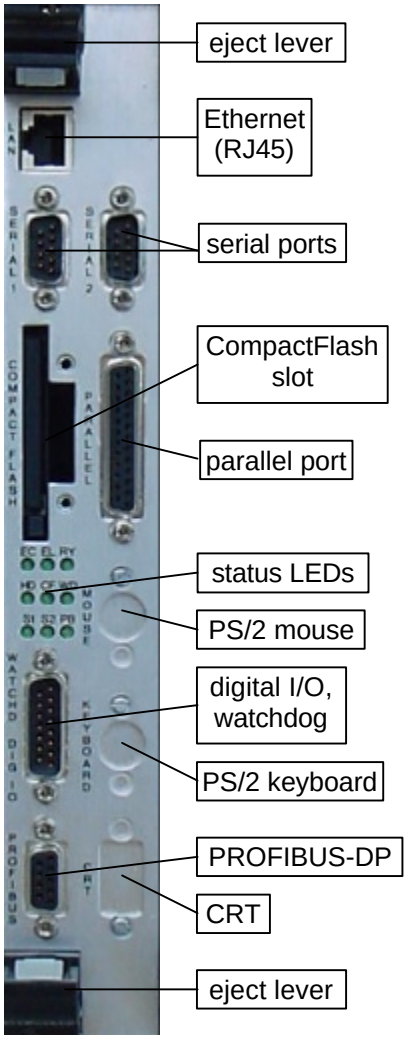

Illustration 31: exterior view of the OMC500

OPTRONIC AG delivers the OMC500 with 16, 32 or 64MByte of main memory (DRAM). The respective size depends on the application. Beside this, a 128KByte nonvolatile memory (NVRAM) is available on the board, that is used to store data that must be maintained when power is turned off. By standard, OAGLinux is used for the D500. This Linux kernel based operating system is very stable and flexible, and is designed for the needs of modern industrial applications. It offers all nowadays desirable possibilities, for example remote monitoring and easy integration into an existing network. The deployed BIOS is PC compatible, whereby any operating system available for the PC architecture can be used in principle. OPTRONIC AG currently only supports OAGLinux.

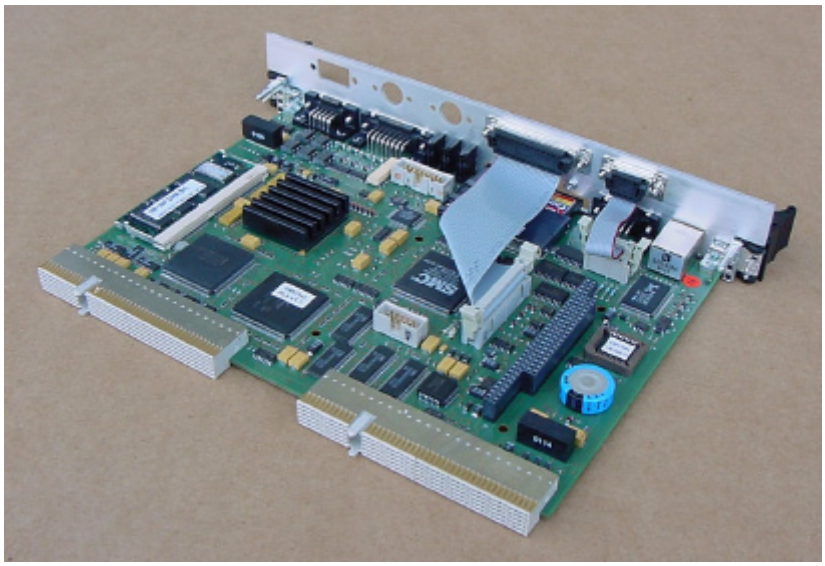

Illustration 32: interior view of the OMC500

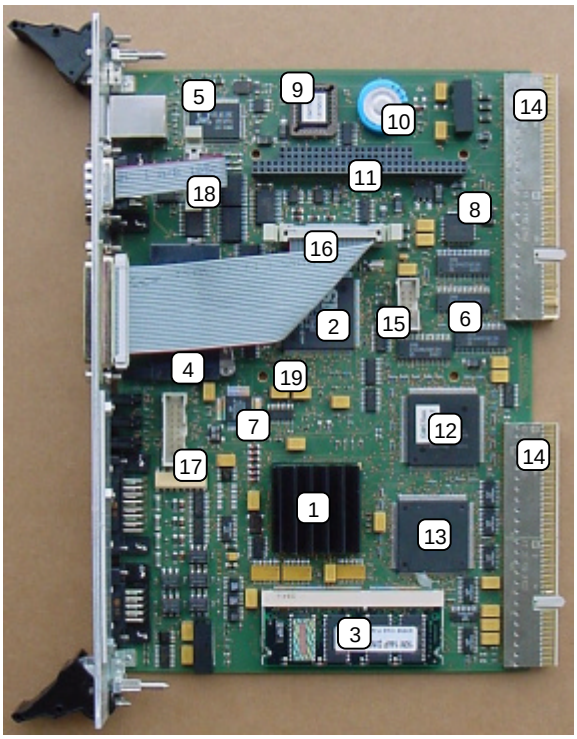

Illustration 34: top view of the OMC500

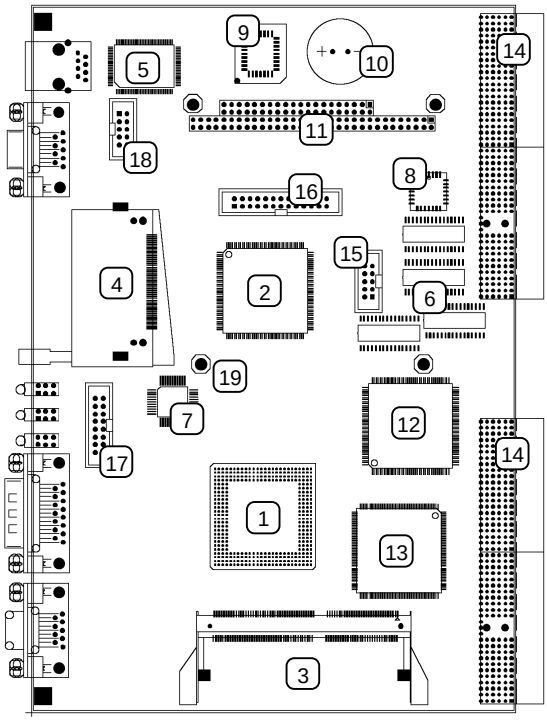

Illustration 33: construction of the OMC500

#	Description	#	Description
1	Processor (CPU)	2	PC I/O controller (IDE, real time clock, ...)
3	Main memory module (DRAM, up to 64MByte)	4	CompactFlash slot
5	10/100Mbit/s Ethernet controller	6	128KB of nonvolatile memory (NVRAM)
7	PROFIBUS-DP controller	8	two timers
9	BIOS IC (EEPROM/PROM)	10	capacitor to supply the real time clock
11	PC/104 bus	12	bridge for connection of the NVRAM, etc.
13	bridge for connection to CompactPCI bus	14	CompactPCI connector
15	connector for keyboard and mouse	16	connector for parallel port
17	connector for CRT	18	connector for second serial port
19	four mounting holes for PC/104 module		

As desirable for an industrial PC, the OMC500 is absolutely maintenance-free. Components with limited durability, for example fans, batteries or accumulators are not used:

- The power dissipation of the processor is very low. The application of a fan is not necessary, the processor is passively cooled.
- There is no need to configure the BIOS. There are no variable settings, and therefore an accumulator or a battery are not necessary.
- The 128KByte nonvolatile memory is built of a new type of memory chips, that doesn't loose data when power is turned off, without requiring a battery or an accumulator.
- In order to guarantee that the OMC500 does not loose current date and time when power is turned off, a large capacitor is available on the board, that is charged when the system is turned on. Depending on the electric charge of the capacitor, the clock is supplied for some days when power is turned off. (The capacitor is fully charged after some few hours of operation, and then can backup the clock for at least one week.) If your application makes use of date and/or time functionality, you should check and, if necessary, correct date and time after a longer equipment downtime.

8.1 LED Status Indication

The D500 LED status indication (refer to Illustration 35) serves to get a fast overview of the current state of the system. The following table provides information about the meaning of the nine LEDs:

EC: On, if the D500 is connected to an Ethernet network, and data is currently transferred.
EL: On, if the D500 is connected to an Ethernet network, and the electrical connection is established.
RY: On, if the OMC500 is supplied. The LED is off while the system is into reset state.
HD: On, if one of the mass storage devices connected to the IDE interface is accessed.
CF: On, if the CompactFlash card is accessed.
WD: Effigy of the watchdog signal that is available at connector **WATCHD DIGIO** (refer to chapter 8.2). The LED is on, if the D500 is ready.
S1: This LED can be freely used by the D500 application.
S2: This LED can be freely used by the D500 application.
PB: On, if the PROFIBUS-DP interface is in state „Data_Exchange“ (please refer to the PROFIBUS specification of the PROFIBUS organization).

Illustration 35: OMC500 status indication

8.2 Watchdog Signal

The OMC500 is equipped with a special watchdog circuit for monitoring the correct functionality of the hardware and software. On the one hand, the actual system state is announced by the status LED **WD** (refer to Illustration 35), on the other hand it is available as open collector output at the connector with name **WATCHD DIGIO** (refer to Illustration 36; in the following called output WD). A leading connection, respectively a turned on LED, thereby indicates that the system works correctly. When the system is turned on, LED **WD** is off at first and output WD is not leading. After about one minute, the D500 is booted up and the application is started. If the system runs error-free, LED **WD** should now be statically on and output WD should be leading. If the application detects that data in the 128KByte nonvolatile memory is corrupt, LED **WD** starts flashing in one second cycles (300ms on and 700ms off) and output WD is leading and non-leading synchronously. In this case, the D500 is not ready. The maximum latency of the watchdog circuit is 200ms, i.e. LED **WD** is turned off and output WD gets non-leading not later than 200ms after an error occurred. *To guarantee a secure operation of the complete machine, it is absolutely necessary that output WD is included into the emergency cutout circuit!*

Illustration 36: OMC500 watchdog

8.3 CompactFlash Cards

Normally, CompactFlash cards are used as storage media for the D500 operating system and application. Together with the possibilities of the operating system OA-GLinux, organization and maintenance of the software is very flexible and easy. Nowadays, CompactFlash cards are available in various sizes up to the Gigabyte range, and it can be read from and written to with any standard PC or laptop. Therefore, you need a CompactFlash to PC Card adapter, which you can order from OPTRONIC AG (refer to Illustration 38 and Illustration 37). The usage of several CompactFlash cards for one D500 makes software replacement easy and secure.

Illustration 38: CompactFlash card and CompactFlash to PC Card adapter

Illustration 37: CompactFlash to PC Card adapter with installed CompactFlash card

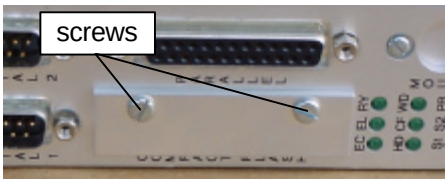

Illustration 41: covered CompactFlash slot

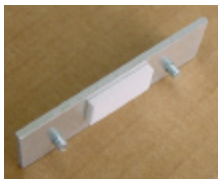

Illustration 39: cover plate

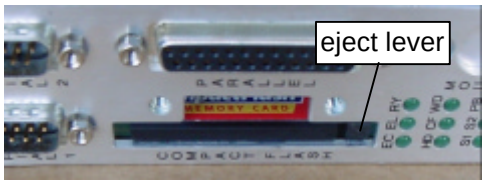

Illustration 40: CompactFlash slot without cover plate

To replace the CompactFlash card, please proceed as follows:

1. Loose the two screws of the CompactFlash slot cover plate by use of a screw driver. (refer to Illustration 41). The screws cannot be unscrewed completely, to prevent them from getting lost. (see Illustration 39).
2. Remove the cover plate in front of the CompactFlash slot.
3. Carefully press the eject lever into the OMC500, until the dead stop is reached (refer to Illustration 40). For example, use a larger screw driver for this purpose. Because of the leverage effect, the CompactFlash card is lifted some millimeters out of the slot (see Illustration 43).
4. Pull the CompactFlash card completely out of the slot (refer to Illustration 42).
5. Insert the new CompactFlash card into the slot, and press it into the OMC500 until the dead stop is reached. Thereby, the eject lever is shifted back forward (refer to Illustration 40).
6. Remount the cover plate in front of the CompactFlash slot (see Illustration 41).

Illustration 43: partially pulled out Compact-Flash card

Illustration 42: removed CompactFlash card

8.4 Modifying the Main Memory Configuration

The OMC500 can be equipped with 16, 32, or 64MByte main memory. The configuration can be changed by exchanging the main memory (refer to Illustration 33, Illustration 34, and Illustration 45), together with the BIOS IC (refer to Illustration 33, Illustration 34, and Illustration 46). OPTRONIC AG offers appropriate conversion kits. In order to remove the old BIOS IC, a special removing tool for PLCC chips (refer to Illustration 44) is necessary, that is also part of the conversion kit.

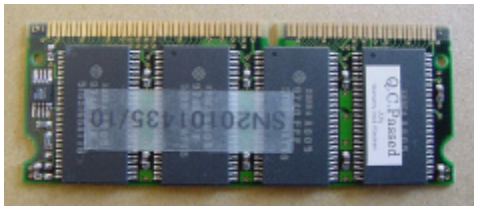

Illustration 45: main memory module

Illustration 46: BIOS IC

Illustration 44: PLCC removing tool

8.4.1 Exchanging the Main Memory Module

In order to remove the old main memory module, place the OMC500 in front of you, so that you look at the module as shown in Illustration 47. Now, press outwards the two metal handles, the module is fixed with. (see arrows in Illustration 47). As shown in Illustration 48, this is best done with the nails of both thumbs. The module jumps out of the retainer (refer to Illustration 49) and can be removed completely.

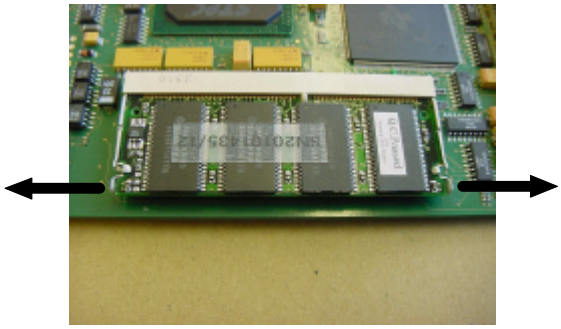

Illustration 47: removing the main memory module: both metal handles must be pressed outwards in direction of the arrows

Illustration 48: removing the main memory module: pressing outwards the metal handles with the nails of the thumbs

Now, insert the new module into the retainer up to the dead stop (see Illustration 49) and press it in direction of the green printed circuit board until it snaps into both metal handles, as it is show in Illustration 50. A notch at the module contacts prevents that it is inserted in the wrong direction.

Illustration 49: jumped out main memory module

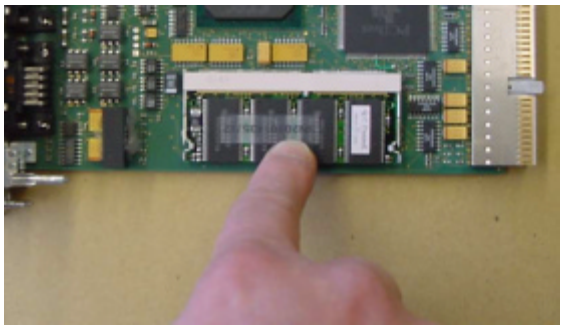

Illustration 50: inserting the main memory module: pressing the module into the retainer by use of the forefinger

8.4.2 Exchanging the BIOS IC

In order to remove the BIOS IC out of the PLCC socket (refer to Illustration 52), a removing tool for PLCC chips is needed, as it is show in Illustration 44. Apply the tool as shown in Illustration 51, so that both metal handles at the top of the tool are inserted into the recesses in the PLCC socket, up to the dead stop (see Illustration 52). Both metal handles are now located between BIOS IC and PLCC socket. Now, pinch the tool with light pressure and pull the IC out of the socket softly (refer to the arrows in Illustration 51).

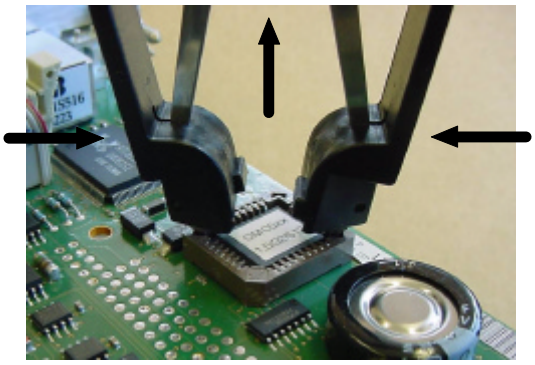

Illustration 51: operating the PLCC removing tool

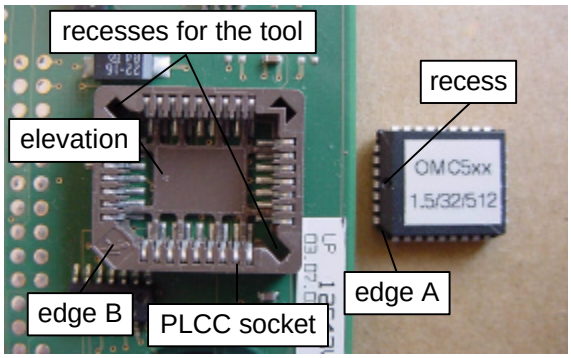

Illustration 52: PLCC socket and BIOS IC

Put the new BIOS IC onto the socket as planar as possible (see Illustration 54). Thereafter, press it softly into the socket by use of the thumb or the forefinger (refer to Illustration 53). Pay attention that the recess of the BIOS IC matches the elevation of the PLCC socket. Because an edge of the ICs is flatten (edge A in Illustration 52) and the socket accordingly has an bulge (edge B in Illustration 52), it is nearly impossible to insert the IC wrongly..

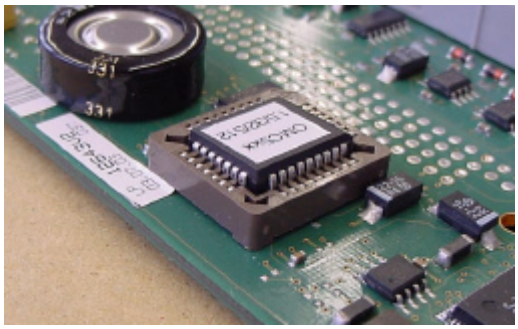

Illustration 54: inserting a new BIOS IC

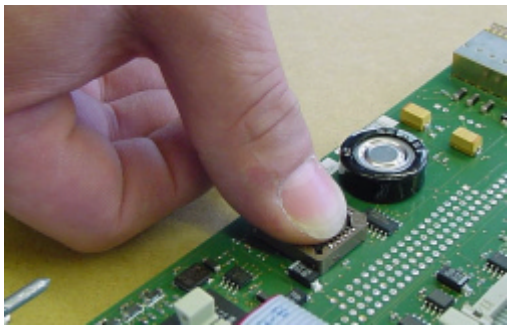

Illustration 53: press the BIOS IC into the socket

8.5 OMC500 Variants

Currently, the single board computer OMC500 is only available in configuration OMC511.

9 Base Interface OMI500, Interface Modules OIP500

The multi-functional base interface OMI500 offers various industrial-purpose interfaces. With it's front plane of variable width, it supplies up to eight slots for peripheral modules OIP500, and eventually an additional one for the add-on power supply module OPM500 (refer to Illustration 56, Illustration 57, and Illustration 55). Slots not occupied by OIP500s are covered by a plate that is fixed with two screws from outside (refer to Illustration 58), in order to protect the D500 from pollution, and to guarantee optimal electromagnetic compatibility (EMV). Data communication between OMI500 and OIP500s, as well as the main power supply of the OIP500s, is done over 50 wire flat ribbon cables, the so-called bus cables. The OPM500 additionally supplies a part of the OIP500s over 10 wire flat ribbon cables, the so-called add-on power supply cables. Two bus cables together build a bus system. Thus, two bus systems exists on a OMI500, whose positions in the following are named side A and side B. Each OIP500 slot in a OMI500 can be identified clearly, therefore. It's address is composed of the side (A or B), and the id of the level it is located (1 to 4). Because of symmetry, the interfaces supplied by the OMI500 are virtually assigned to level 0, and are also separated into side A and B.

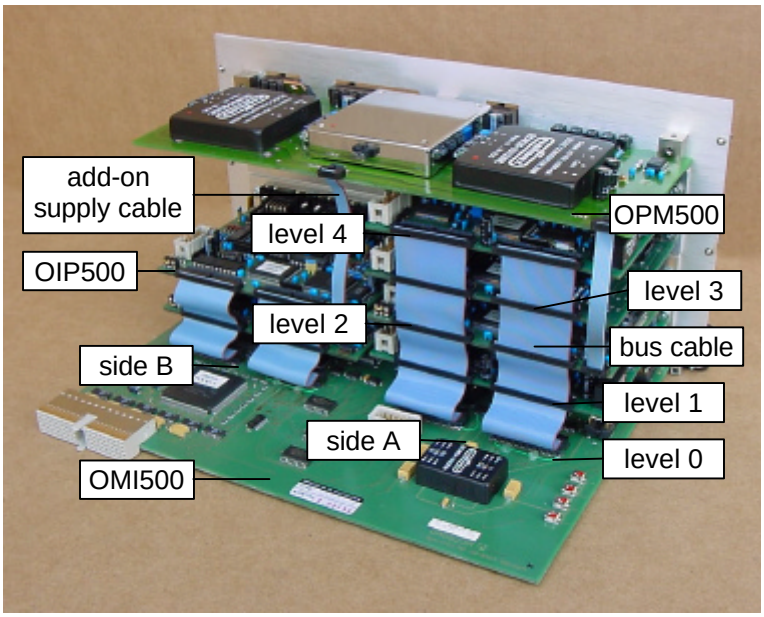

Illustration 56: interior view „wide" OMI500 equipped with six OIP500 and one OPM500

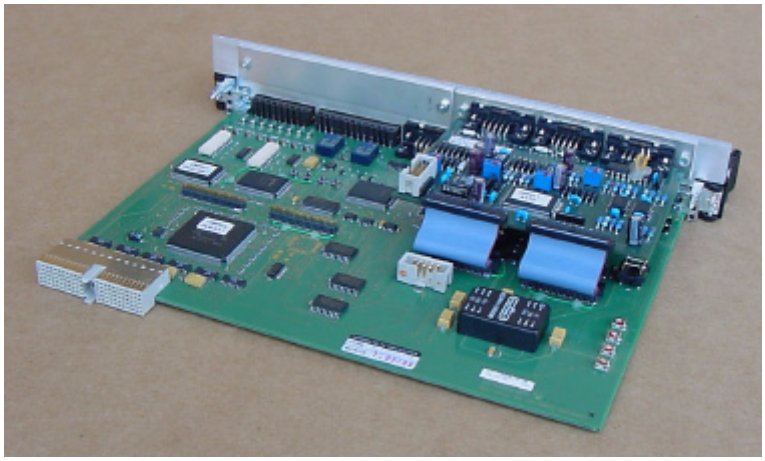

Illustration 55: interior view „narrow" OMI500 with one OIP500

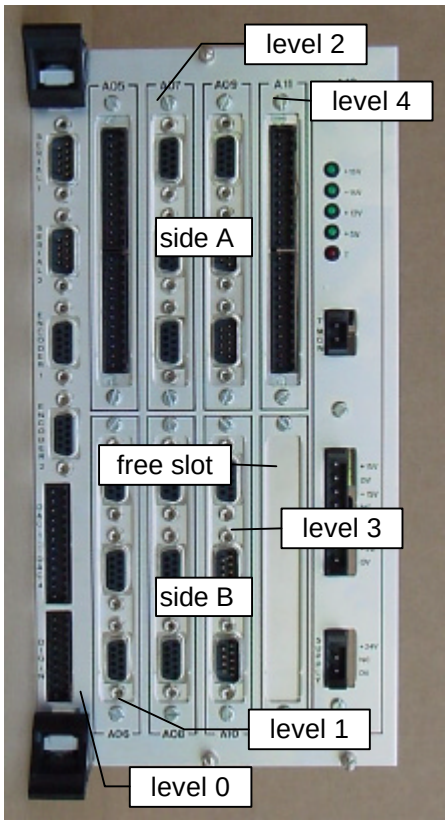

Illustration 57: exterior view „wide" OMI500 equipped with seven OIP500 and one OPM500

Illustration 58: cover plate for unused OMI500 slots

9.1 OMI500 Interfaces

Various industrial-purpose interfaces are located on the OMI500. These are two serial interfaces, two incremental encoder interfaces, four analog outputs and eight digital inputs (refer to Illustration 59).

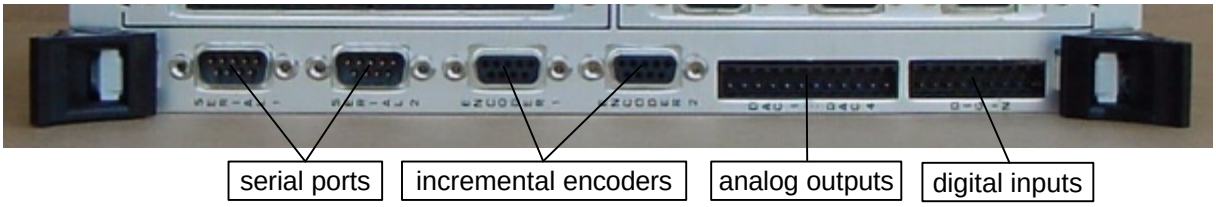

Illustration 59: OMI500 interfaces

The two serial ports can be configured very flexible. They support the following modes:

- RS232C
- RS422
- RS485
- Synchronous Serial Interface (SSI, used to connect an absolute encoder)

9.2 Bus Cables

The length of a bus cable and the number of connectors on it depend on the number of modules, the OMI500 is equipped with. OPTRONIC AG offers cables with 2, 3, 4, or 5 connectors (refer to Illustration 61). Connector 0 is plugged in on level 0, thus on the OMI500, connector 1 at the module on level 1, connector 2 at the module on level 2, and so on. Because of physical reasons, connector 0 is located on the other side of the bus cable than the others. There exist two types of bus cables: type 1 and type 2. They differ in the number of wires that lead from connector 0 to the other connectors. Type 1 has all wires connected to all connectors, at type 2, on each higher level one more wire is missing at the left side (refer to Illustration 61). If you look at the OMI500 from behind, as shown in Illustration 60, the bus cable of type 1 is located at the left side, and the one of type 2 right. Connector 0 is connected with one of the four bus cable strips on the OMI500 (refer to Illustration 62), the others with one of the strips of a OIP500. By use of the missing wires of the bus cable of type 2, the system automatically detects on which level a OIP500 is located.

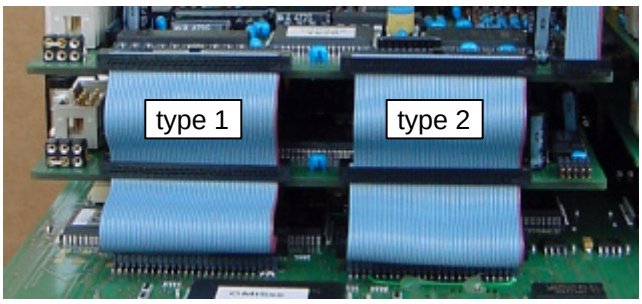

Illustration 60: bus cables attached at the OMI500

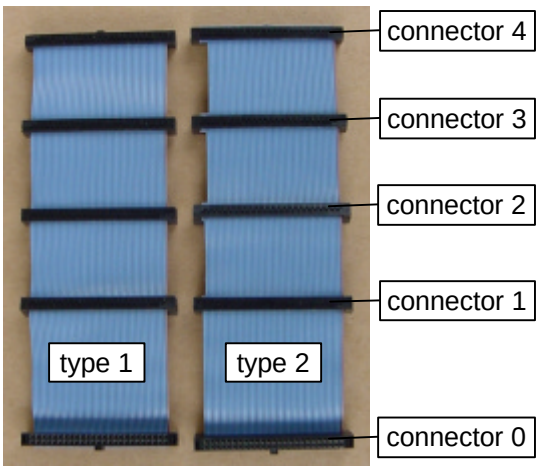

Illustration 61: two bus cables with five connectors for four OIP500s

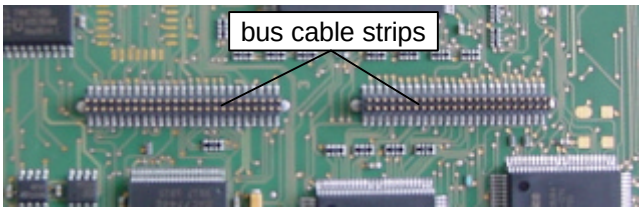

Illustration 62: two OMI500 strips

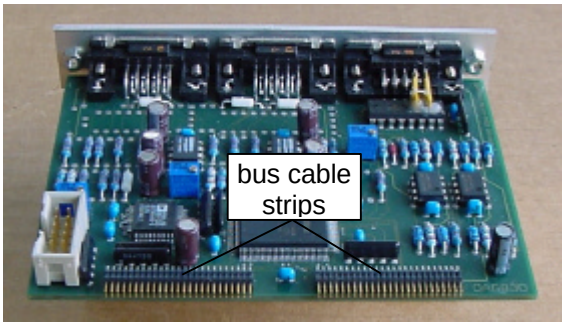

Illustration 63: OIP500 with two strips

9.3 Add-on Supply Cable

The minimum length of an add-on supply cable and the number of connectors on it depend on the number of OIP500s in the OMI500, that are supplied by the OPM500.

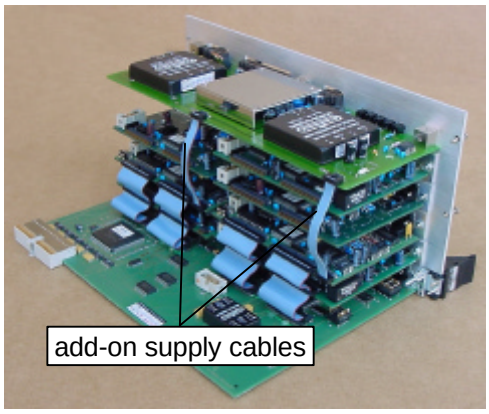

Illustration 64: OMI500 with two add-on supply cables

Illustration 65: add-on supply connectors of a OPM500 and four OIP500

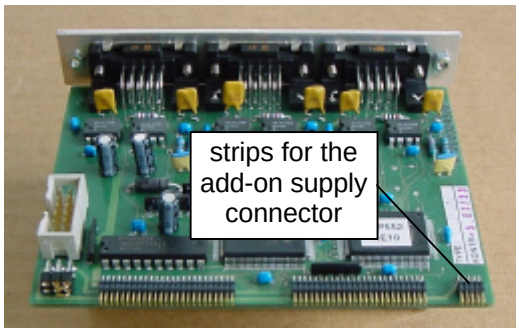

Illustration 66: OIP500 with strips for the add-on supply connector

Illustration 67: add-on supply cable with two connectors for one OIP500

OPTRONIC AG offers cables with 2, 3, 4, or 5 connectors (refer to Illustration 67 for a cable with two connectors). The cable is connected to the OPM500 and to each OIP500, that must be supplied by the add-on power supply (see Illustration 64 to Illustration 66).

9.4 Removal and Installation of an OIP500

The removal of an OIP500 can be done in few steps. You therefore need a special gripper that you can order from OPTRONIC AG (refer to Illustration 68). First, pull the OMI500 out of the D500 rack. Therefore, proceed as described in chapter 6.2. Place the removed OMI500 on an antistatic mat in front of you, so that you directly see at the bus cables. Starting from the top, disconnect both bus cables until you reach the OIP500 you want to remove. As shown in Illustration 69, use the gripper to pull out the connectors. A possible add-on power supply cable must be pulled out, too. Now, unscrew the two screws that fix the OIP500 at the front plane of the OMI500 (refer to Illustration 70).

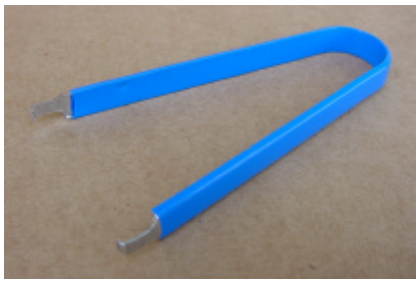

Illustration 68: special gripper for pulling out a connector

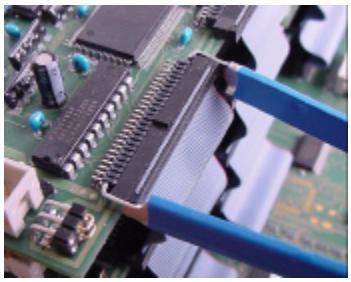

Illustration 69: pulling out a connector

In order to install an OIP500, proceed in the reverse order as described above. *Please be sure that you don't shift by one or several pins, when you plug in the connectors! A badly inserted cable can lead to damage of the hardware!*

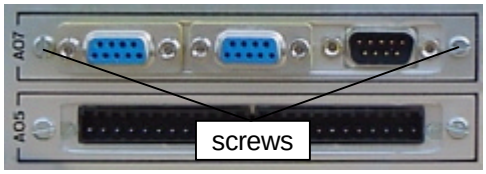

Illustration 70: two installed OIP500s

9.5 OMI500 Variants

The multi-functional base interface OMI500 is available in various variants. The following table gives an overview about the (most common) configurations with SSI interfaces:

Name	Description
OMI511	two 12V SSI absolute encoder inputs without monitoring two 5V/12V incremental encoder inputs without monitoring
OMI521	two 12V SSI absolute encoder inputs with monitoring two 5V incremental encoder inputs with monitoring
OMI522	two 12V SSI absolute encoder inputs with monitoring two 12V incremental encoder inputs with monitoring

The number of slots for OIP500 peripheral modules, and therefore the width of the OMI500, is not determined with the above given name.

9.6 OIP500 Types

By use of OIP500 peripheral modules, the D500 can be expanded very flexible. The following table gives an overview about the available modules:

Name	Description
OIP511	1 incremental encoder input, 4 analog inputs
OIP512	1 incremental encoder input, 2 analog inputs
OIP513	2 analog inputs
OIP521	16 digital inputs
OIP522	8 digital inputs, 8 digital outputs
OIP523	16 digital outputs
OIP531	8 analog outputs
OIP532	4 analog outputs
OIP541	3 5V incremental encoder inputs with monitoring
OIP542	3 12V incremental encoder inputs with monitoring
OIP543	3 5V incremental encoder inputs with monitoring, encoder supplied by OPM500
OIP544	3 12V incremental encoder inputs with monitoring, encoder supplied by OPM500
OIP551	2 12V SSI absolute encoder inputs with monitoring, encoder supplied by OPM500
OIP552	3 12V SSI absolute encoder inputs with monitoring, encoder supplied by OPM500
OIP553	2 12V SSI absolute encoder inputs with monitoring
OIP554	3 12V SSI absolute encoder inputs with monitoring
OIP561	Interbus

The encoders connected to the modules OIP543, OIP544, OIP551, and OIP552 are supplied by the add-on power supply module OPM500, the electronics on the modules by the OPS500. Illustration 71 to Illustration 74 show four modules as examples.

9.7 „Plug & Play“: Automatic Module Identification

The complete D500 hardware supports „Plug & Play“, i.e. the D500 operating system automatically detects the available hardware. The slot location of a OIP500 is detected by use of the missing wires at the bus cable of type 2. Additionally, each module is automatically identified by the system. It therefore provides a module and configuration specific identification code.

Illustration 72: OIP511

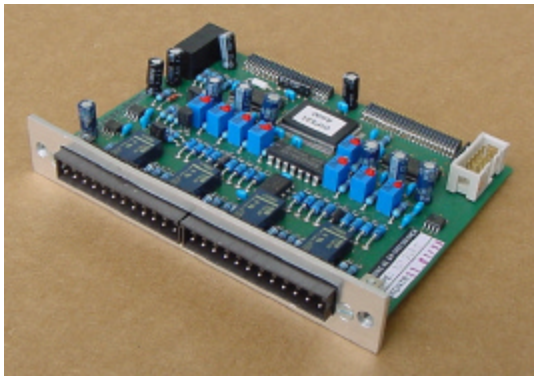

Illustration 71: OIP531

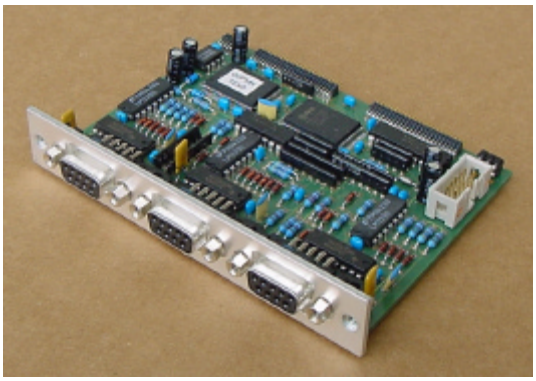

Illustration 73: OIP541

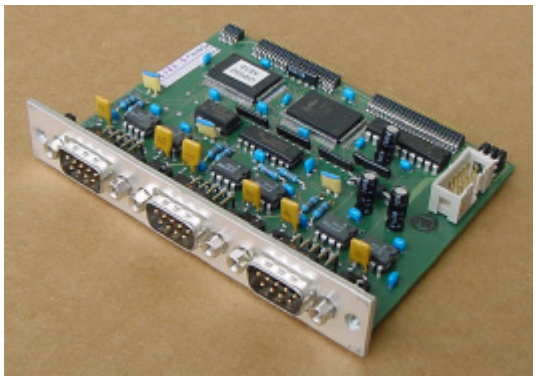

Illustration 74: OIP552