## 3.14 Memory module PCD3.R600 for flash cards (FCs)

### 3.14.1 System overview

The PCD3.R600 is an I/O module for industrial Secure Digital (SD) flash card applications, for which it can be inserted into I/O slots 0…3 on a PCD3.Mxxxx. The SD cards can be removed with the power on.

The SD cards can be accessed in 3 different ways:

- Via Ethernet TCP/IP with FTP server
- With a browser via Saia PCD® web server
- With the Saia PCD® program, using a file system library
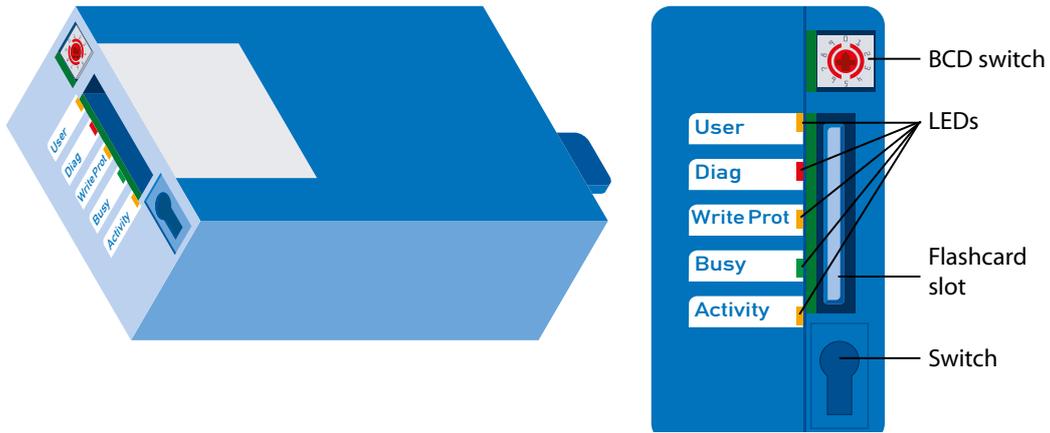


### 3.14.2 Technical data

| PCD3.R600 module | |
|---|---|
| Power consumption without SD flash card | 15 mA |
| Max. power consumption incl. SD flash card | 100 mA |
| Display | 5 LEDs |
| Operating mode setting | BCD switch |
| Card holder and detection switch | With label clip |
| **Required properties of SD flashcard (as tested by SBC)** | |
| Capacity supported | 128, 256, 512 MB, 1 GB |
| Technology | Single-level cell |
| Service life | 600,000 or more programming/deletion cycles |
| Data retention | 5 years or more |
| Operating temperature | -25 °C…+85 °C or better |
| MTBF | 1,000,000 hours or better |

### 3.14.3 Operation

The PCD3.R600 can only be inserted into I/O slot 0…3 on a PCD3.Mxxxx.
The module cannot be plugged into the extension modules (PCD3.C1xx, PCD3.C2xx
or PCD3.Txxx). Up to 4 PCD3.R600 units can be used in a PCD3 system.

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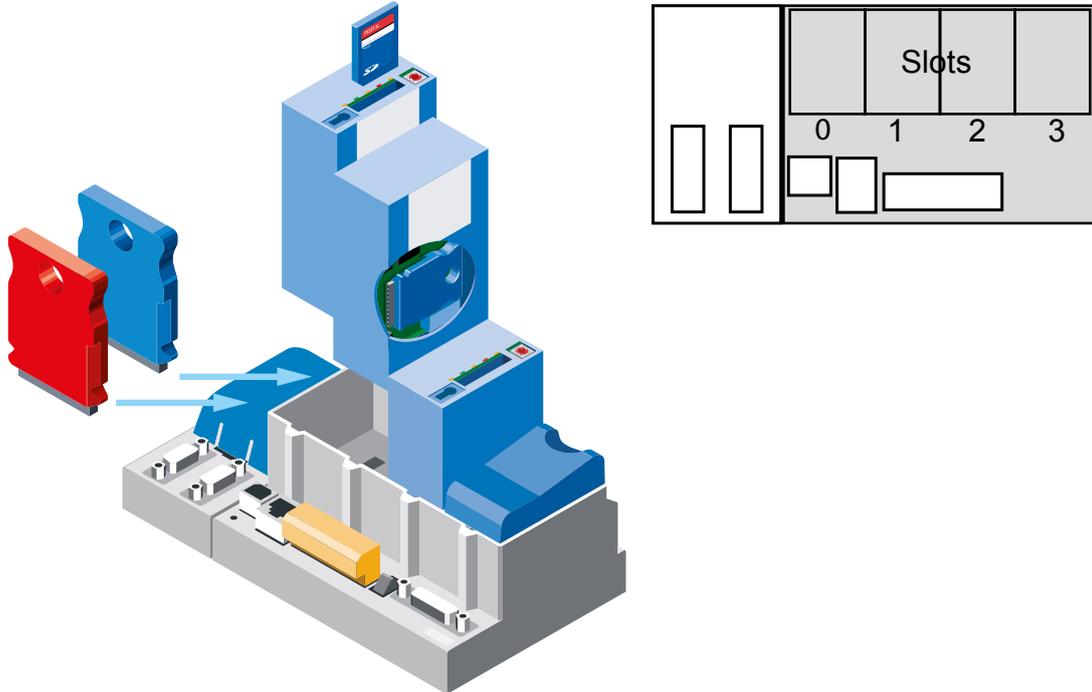


**Data access**
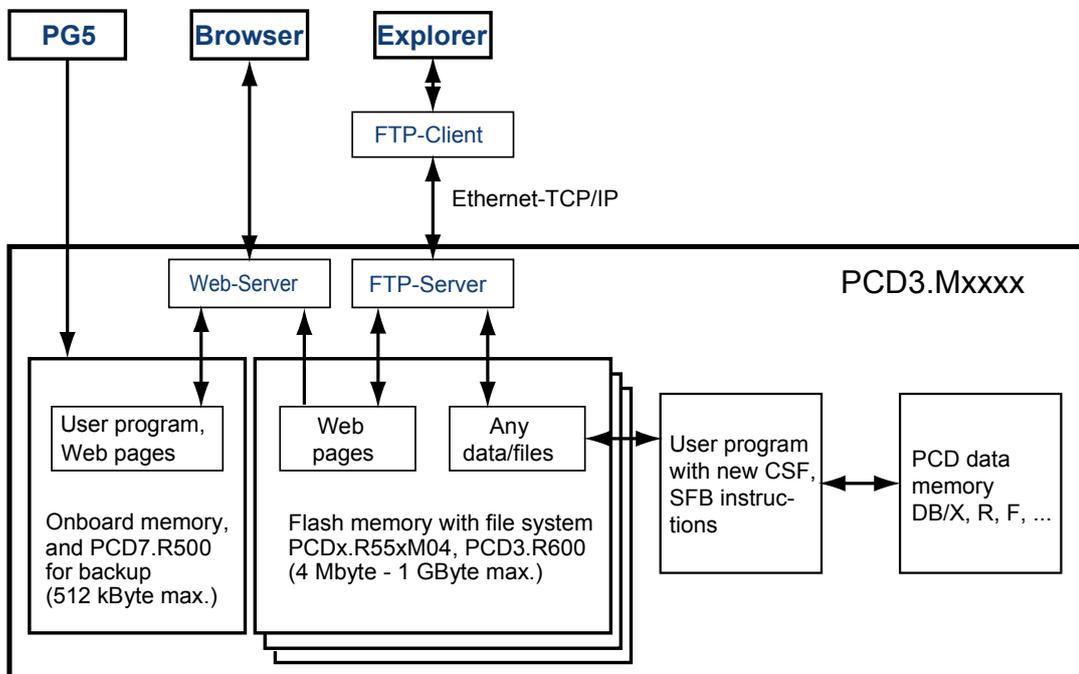


FTP server and file system access can only be achieved with the plug-in flash
memory module. Access via FTP server is only possible via the Ethernet TCP/IP
interface.

Due to predetermined requirements SBC uses its own file system.

Based on the predefined requirements, SBC uses its own file system. The SBC file system is embedded in a FAT (PC compatible file system) framework, to make the restricted processes when used in a commercial SD card reader/writer visible with standard PC tools. The SBC file system is called SBCNTFS.FFS.

Individual files within SBCNTFS.FFS can be accessed with a software tool for PCs provided by SBC.

As 10% of the SD card capacity is reserved for the FAT, this extraction PC tool can be copied there. This allows data stored in the SBC file system to be accessed quickly on any PC with a standard SD card reader. The SBC PC tool can also make copies of SBCNTFS.FFS on any drive. Any remaining FAT storage space can be used to save documentation or for other purposes.

The PCD3.R600 can be used for PCD3 program backup in the same way as the PCD7.R500. The PCD3 program backup is written to the file backup.sei in a specified area and identified as a hidden read-only file in the FAT.

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Apart from the SBCNTFS.FFS and backup.sei files, files in the FAT area cannot be accessed when the SD card is inserted into the PCD3. During formatting, a file is written to the FAT area containing the properties of the SD card. Data access is faster with a commercial SD card reader/writer than with a PCD3.

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### 3.14.4 Displays and switches

The memory module is fitted with 5 LEDs:

| LED | Meaning |
|---|---|
| User | User LED, set by the user program with the base address of the module (SET = off; RES = on) |
| Diag | The diagnostic LED is turned on when the SD card is not "visible" (eg SD card is not formatted with FT16, poor "boot sector", or poorly plugged in). Once the SD card is inserted properly, it can take 5 seconds until the LED goes out |
| Write Prot | Active when a "write-protected" condition is detected (read-only SD switch, BCD switch or software) |
| Busy | Do not remove module when this LED is on. |
| Activity | Works as with a hard disk drive; flashes when data being processed |

**Setting of operating modes with the BCD switch:**

Behind the label clip is a 10-position BCD switch which can be turned with a #0 screwdriver.

| BCD position | Meaning |
|---|---|
| 0 | *normal read/write*** |
| 1 | Spare |
| 2 | Spare |
| 3 | Spare |
| 4 | Spare |
| 5 | *format*/** |
| 6 | Spare |
| 7 | Spare |
| 8 | Spare |
| 9 | *normal read only* |

\*       Starts after insertion; remove, then plug in again

\**      If the card itself is not write-protected (switch or software)

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- There must be a PC FAT file system (FAT16) on the card in order for the SD card to be formatted  with the SBC file system
- First, all FAT files are deleted, then the SBC file system is installed when the card is inserted and the BCD switch set to 5
- If the BCD switch is set to 0, the SBC file system (SBCNTFS.FFS) is installed if it is not already present and the card is empty, i.e. if a new card is installed, it does not have to be formatted with position 5.
- Not all flash cards have a "write-protect" switch
- The card is inserted into a so-called push-push socket (push to insert and remove)
- All operations apart from formatting are blocked when the label clip is removed
- Do not remove card when the "Busy" LED is on.

### 3.14.5  Flash card

The SD flash card is not part of the PCD3.R60x and has to be ordered separately.

The SD card must be of good quality (industry-standard, as tested by SBC). Other flash cards can also be used, but they will not be supported and are excluded from any warranty.

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To increase service life, the flash cards should not be more than 80% filled for pure read applications. For read/write applications, no more than 50% of the memory space should be used.

On the PCD3, a non-standard file system (SBC FS) is used. This means that the flash cards have to be formatted before being used for the first time. This happens automatically when a new FAT 16 flash card is inserted into the PCD3.R60x.

**Flash card handling**

The card is inserted into a so-called push-push socket (push to insert and remove), located under the label clip.
It can be removed without switching off the PCD3.

**To remove the label clip, first pull out the bottom end.**

A mechanism detects when the label clip is removed. Where necessary, any unsaved data will be saved to the flash card. The "Busy" LED will flash while this is happening.

*Inserting the flash card*

When inserting the flash card, press until you feel some resistance; you may hear a soft click. Ease off the pressure until the card is at the same height as the slot.

*Removing the flash card*

If the "Busy" LED is off, push the card into the module housing until you feel some resistance. Ease off the pressure until the card slides out.

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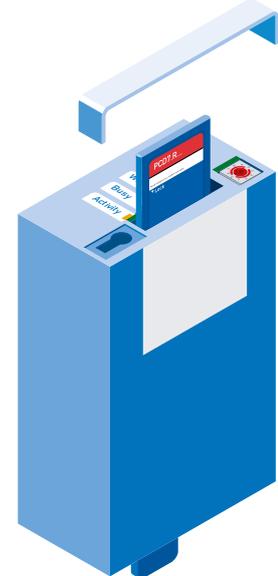
### 3.14.6  User program backup to the flash card

It is possible to back up the user program (see section 3.13.1) to the flash card in the PCD3.R60x.

The memory locations for the user program (to back up and restore) are queried in the following order:

1. M1 Slot
2. M2 Slot
3. I/O Slot 0…3
4. Onboard flash memory (where present)

**I/O bus functions**

Some states are detected by the user program.

| I/O bus offset | Write | Read | Meaning |
|---|---|---|---|
| +0 | User LED | BCD switch setting Bit 0 (lsb) | Position (non-inverted) of BCD switch |
| +1 | do not use | BCD switch setting Bit 1 | |
| +2 | do not use | BCD switch setting Bit 2 | |
| +3 | do not use | BCD switch setting Bit 3 (msb) | |
| +4 | do not use | /label clip present | 1 = removed |
| +5 | do not use | | - |
| +6 | do not use | /flash card present | 1 = card removed |
| +7 | do not use | SD write-protect switch | 1 = SD blocked/removed<br>0 = MMC or SD released |

### 3.14.7  Order details

| Order code | Description | Weight |
|---|---|---|
| PCD3.R60x | Base module for SD flash memory cards, for I/O slot 0…3 (flash card not included) | 60 g |
| PCD7.R-SD256 | SD flash memory card 256 MB | 2 g |
| PCD7.R-SD512 | SD flash memory card 512 MB | 2 g |
| PCD7.R-SD1024 | SD flash memory card 1,024 MB | 2 g |