Ethernet adapter 4xGbE

with bypass

CR-702

User manual

Ver 1.0

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Developer and manufacturer: LLC Parabel

Office 313, Demakova str 23/5, Novosibirsk, Russia

http://www.parabel.ru

Email: info@parabel.ru

Phone/fax: +7-383-2138707

Attention! The device cannot be used with communication lines having no lightning proofness and running outside the limits of one building

Content

1.INTRODUCTION

The CR-702 is a 4 port PCI-express Ethernet adapter with a built-in bypass relay. The adapter can be used, for example, to connect test equipment or for server redundancy purposes.

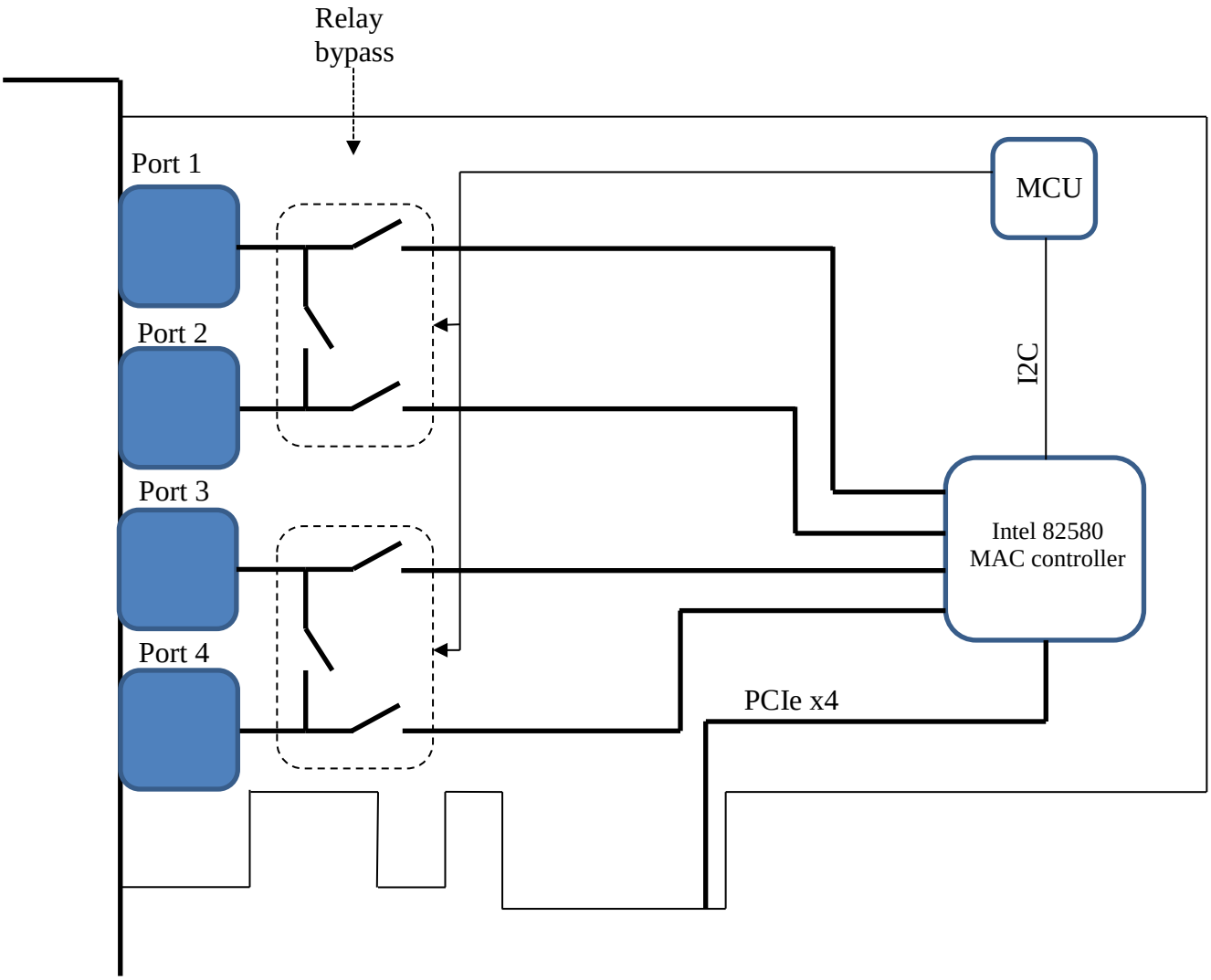
On the system side, the adapter is software compatible with the Intel 82580 Quad Port Adapter and uses its driver with patches applied. Pairs of ports 1-2 and 3-4 are connected via bypass. The ports of each pair can be switched to each other or to the 82580 MAC controller.

The adapter has the following features:

- Form factor – PC card PCI-express x4
- 4 ports 100/1000 Base-T
- Controlled relay bypass
- Total line length (port 1 + port 2) 100 m during bypass operation, 100 m on each port with bypass off
- UDP, TCP and IP Checksum offload
- UDP and TCP Transmit Segmentation Offload
- Jumbo frames 9.5 KB
- Software support in Linux - modified driver for Intel 82580
- Configuration – hardware jumper, sysfs

2. ADAPTER STRUCTURE

The structure of the adapter is shown in the figure.



The device consists of the following functional blocks:

Ports 1-4. The ports are combined into two pairs - pair (1,2) has its own separate bypass, pair (3,4) has its own. Common bypass management.

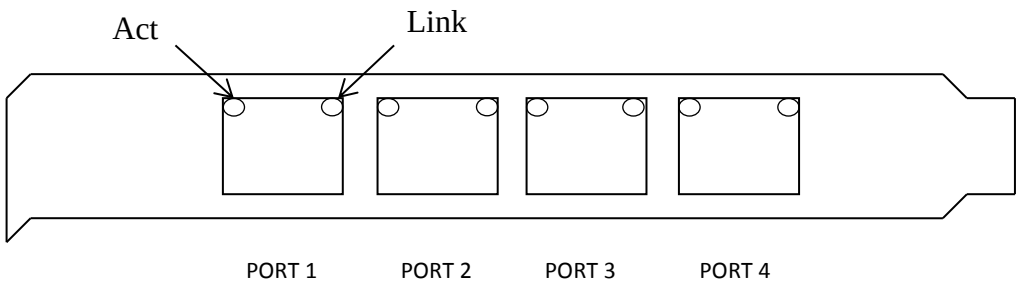
The relay bypass switches ports 1 and 2 “pin to pin” when there is no power supply to the board or when the watchdog timer is reset. Likewise for ports 3 and 4. If the relay bypass is enabled, the lines are completely isolated from the internal circuits of the adapter.

The Intel 82580 MAC controller receives captured traffic from all ports, buffers packets and delivers them to the server's PCI-express bus. Each controller port appears in the system as a separate network adapter with an independent configuration.

The **MCU** receives configuration information from the server software via the I2C bus and controls the bypass and watchdog timer.

3. CONNECTING THE ADAPTER BOARD

Below is the front panel of the CR-702 adapter and the port connection table.

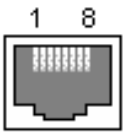


Pin	1	2	3	4	5	6	7	8
Pair	A+	A-	B+	C+	C-	B-	D+	D-

Notes.

1. A,B,C,D – bidirectional twisted pairs
2. In the 10/100 standard, pair A is used for transmitting, pair B is used for receiving.
3. ACT/Link LED – indicator of link presence and packet reception and transmission

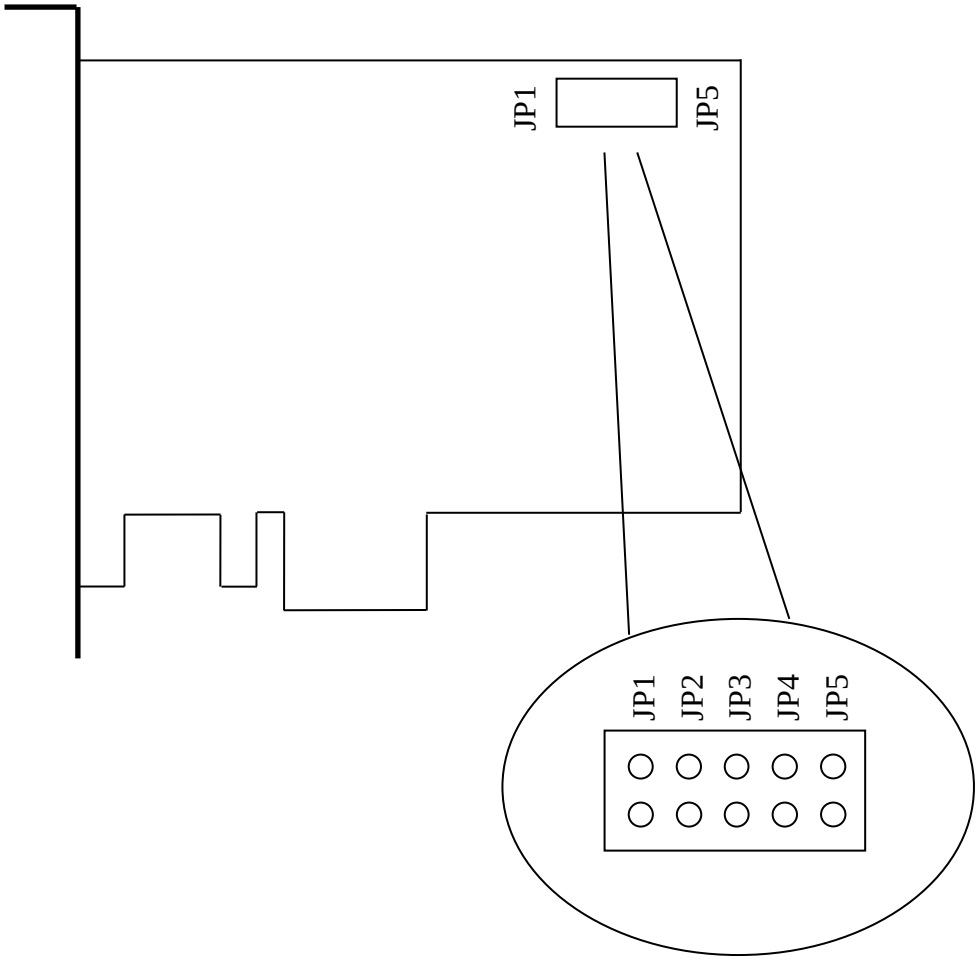
Type of connector used is RJ-45



4. CONFIGURATION AND OPERATING MODES

4.1. HARDWARE JUMPERS

Hardware jumpers are located on the adapter board, only JP1 is used.



If JP1 is closed (jumper installed), then the bypass is forced off, all ports are connected to the 82580 controller.

If JP1 is open (jumper removed), the bypass behavior is determined by the watchdog timer. If bypass is enabled, the ports are paired.

4.2. BYPASS

A bypass is required to maintain line integrity in the event of an adapter power off or software abnormal behavior. If the bypass is active, ports (1,2) are commuted to each other. It should be noted that the cable segments connected to connector 1 and 2 represent one line from one port of the end device to another. Therefore, in accordance with the standard, the length of segments 1 and 2 in total cannot exceed 100 m. The behavior of ports (3,4) is similar.

Bypass is enabled in any of the following cases:

- There is no power to the adapter
- Watchdog timer enabled (WDOG_enable = 1), its value = 0, JP1 - open.

The bypass is turned off in any of the following cases:

- JP1 closed
- Watchdog timer disabled (WDOG_enable = 0)
- Watchdog timer enabled (WDOG_enable = 1), its value !=0

5. SOWTWARE

The CR-702 adapter driver is designed for Linux OS and is based on Intel driver for 82580 series adapters with patches applied by Parabel. Driver installation comes down to unpacking and compiling it. The adapter watchdog timer is configured through the sysfs subsystem files. Further in the text, the listed issues are considered in more detail.

5.1. INSTALLING THE DRIVER

The driver is supplied in an archive of the form

igb-5.5.2-cr702.tgz

To install it, you need to unpack the archive, install development tools on the system (**binutils, gcc, make** - if not available), a package with kernel headers. After unpacking the archive, go to the src directory and run the **make** command. If there are no errors, the result of the work will be the **igb.ko** module. It must be installed in the system with the **make install** command. If the system has a standard igb.ko module loaded (without patches), it must be unloaded **rmmod igb**. Before loading the module, you can make sure that the PCI subsystem has recognized the adapter. The list of devices can be displayed with the **lspci** command, the list should contain the lines:

01:00.0 Ethernet controller: Intel Corporation 82580 Gigabit Network Connection (rev 01)

01:00.1 Ethernet controller: Intel Corporation 82580 Gigabit Network Connection (rev 01)

01:00.2 Ethernet controller: Intel Corporation 82580 Gigabit Network Connection (rev 01)

01:00.3 Ethernet controller: Intel Corporation 82580 Gigabit Network Connection (rev 01)

The driver is loaded with the **modprobe igb** command. The driver with the patch supports both the CR-702 adapter and the standard 82580 adapter. The patch is automatically activated when the CR-702 adapter is recognized.

5.2. CONFIGURING DEVICE VIA SYSFS

После загрузки драйвера, в директории **/sys/class/cr702/cr702-0** появятся файлы с конфигурацией адаптера:

Info	A text file in a readable form with summary information. Only reading.
WDOG_enable	Enable watchdog (1), disable (0) After a cold start, the field value is 0. Read/write.
WDOG_counter	0..255 - value of the watchdog timer. If watchdog is enabled, the counter is decremented every second until it becomes 0. Read/write.

Info file

```
Firmware ID : CE
Firmware rev : 1
HW jumpers 00
WDOG enabled: True
WDOG counter: 0
```

where

Firmware ID – microcontroller firmware identifier, always the same

Firmware rev – microcontroller firmware version

HW jumpers – status of hardware jumpers JP1-JP5

WDOG enabled – indicates whether the watchdog timer is enabled

WDOG counter – current watchdog value

5.3. WATCHDOG TIMER

The logic for working with the watchdog timer is as follows.

1. After the start, the application software writes the watchdog period to the timer

   echo “10”> / sys / class / cr702 / cr702-0 / WDOG_counter

   In this example, 10 seconds.

2. Enables timer

   echo “1”> / sys / class / cr702 / cr702-0 / WDOG_enable

3. From this moment on, WDOG_counter is decremented once a second, the software must update it cyclically. When the software behaves abnormally, WDOG_counter reaches 0 and the bypass is turned on.

The WDOG_counter period can take values 1..255 seconds.

For a more accurate detection of abnormal situations, the cycle that updates the timer can include a check for connectivity or the presence of other important services.

For example:

```
#! /bin/sh
WDOGPATH=/sys/class/cr702/cr702-0/WDOG_counter
test -r $WDOGPATH || exit 1
while :;
do
   ping -c 1 8.8.8.8
   if [ "$?" = "0" ]; then
      echo "10" > $WDOGPATH
      echo "Resetting watch dog..."
   fi
   sleep 5
done
```

If the connection to the DNS service 8.8.8.8 is lost, the bypass will turn on.

5. SCOPE OF SUPPLY

- Adapter board
- CD with user’s manual
- Certificate of warranty
- Packing box

The set weight is not over 0.5 kg.