

Quasar interface board

User's manual

Version 1.3

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QUASAR INTERFACE BOARD USER'S MANUAL
VERSION 1.3, OCTOBER 2009

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Attention! It is not recommended to use this product on physical lines without lightning protectors.

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1. Introduction

The Quasar family is an advanced E1 interface board for PCI/PCI-express based servers. It is designed to transmit data from E1 TDM channels to the system memory in DMA mode. The Quasar interface board has 2-, 4- or 8-channel configurations.

The product is supplied with Zaptel/DAHDI Linux module for 2.6.x kernels. Quasar, along with the Asterisk software can be widely used in the field of telecommunication varying from legacy telephony to VoIP and ISP data services.

The key features

- ✓ **Up to 8 E1 ports**
- ✓ **Low latency hardware TDM cross-connector, 256x256 timeslots DMA mode**
- ✓ **Automatic E1 reference clock source selector**
- ✓ **E1 long-haul receiver with the adaptive attenuation control (up to -40db)**
- ✓ **PCI 2.2 3V or 5V slots, or PCI-e**

Order codes

Quasar-8PMC	8 E1 channels, PMC form factor
Quasar-4PMC	4 E1 channels, PMC form factor
Quasar-2PMC	2 E1 channels, PMC form factor
Quasar-8PCI	8 E1 channels, PCI form factor
Quasar-4PCI	4 E1 channels, PCI form factor
Quasar-8PCX	8 E1 channels, PCI-express form factor
Quasar-4PCX	4 E1 channels, PCI-express form factor



2. Internal structure

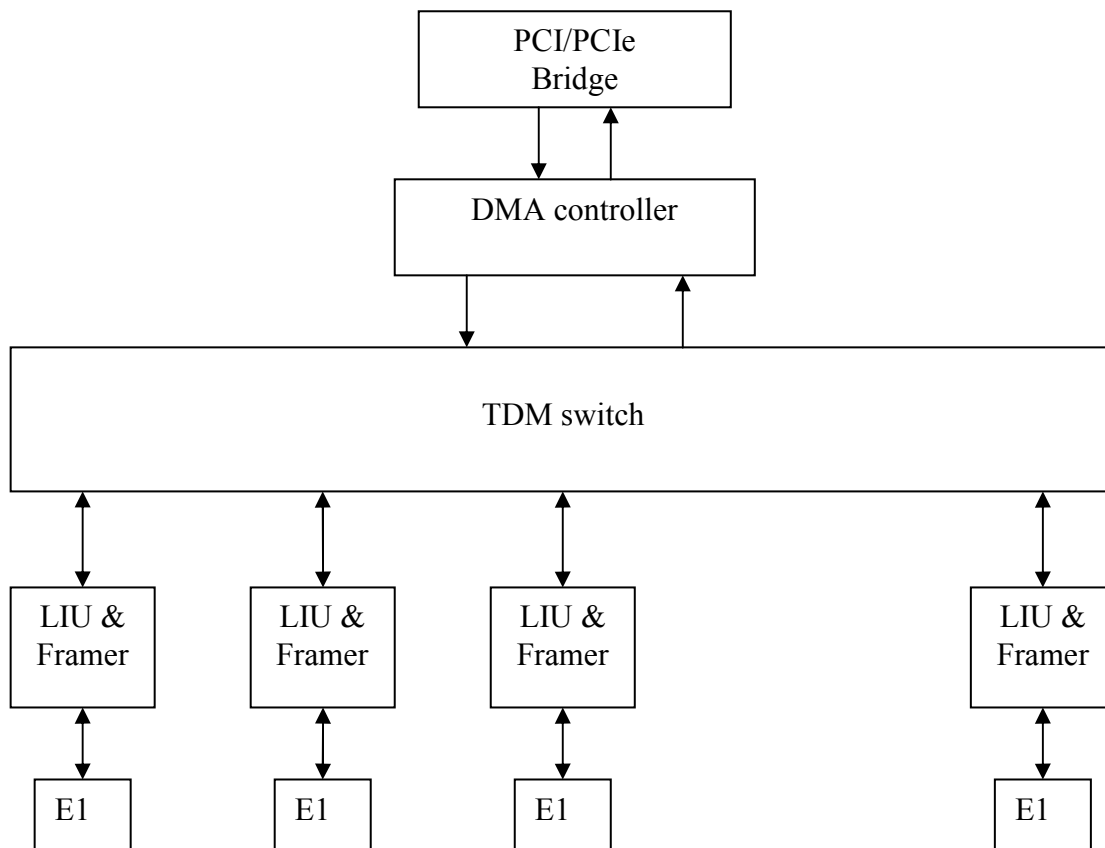
Quasar consists of the following functional blocks (see figure):

LIU & Framer – G703 transceiver chip and G704 framer

TDM switch – E1 timeslots cross connector (256x256 timeslots)

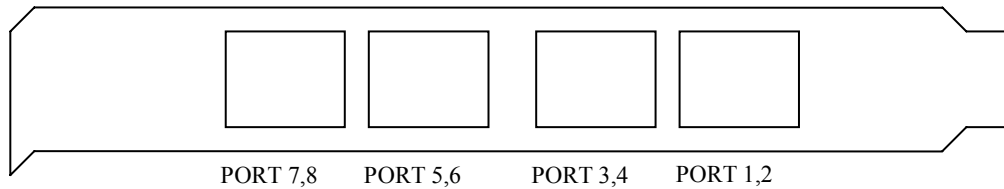
DMA controller – for passing data between PCI bus and TDM switch

PCI bridge - bridge chip for PCI/PCIe bus



3. Installation

The Quasar's face panel and pinout table are given below.

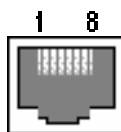


Port\Pin	1	2	3	4	5	6	7	8
Port 1,2	TX1+	TX1-	RX1+	TX2+	TX2-	RX1-	RX2+	RX2-
Port 3,4	TX3+	TX3-	RX3+	TX4+	TX4-	RX3-	RX4+	RX4-
Port 5,6	TX5+	TX5-	RX5+	TX6+	TX6-	RX5-	RX6+	RX6-
Port 7,8	TX7+	TX7-	RX7+	TX8+	TX8-	RX7-	RX8+	RX8-

Notes.

1. RX – receiver (input), TX – transmitter (output)
2. There are no ports 5,6,7,8 in the 4-channel configuration

Connector type is RJ-45



4. Software

4.1. Introducing

The Quasar operation depends on the following software components:

1. **Zaptel/DAHDI package.** It provides low-level procedures with telephone equipment. Supply of the package with Quasar is not obligatory. Download from the public resources is acceptable (see Useful links at the end of the User's Manual). The compatibility with original package is guaranteed, no patches needed.
2. **Driver quasar.ko.** It is a logical part of Zaptel/DAHDI package. This component provides Quasar specific functions. The driver is supplied in the source code presentation. The source code must be compiled before loading into a system. The corresponding software should be installed on the server.
3. **The configuration file** `/etc/zaptel.conf` (for Zaptel package) or `/etc/DAHDI/system.conf` (for DAHDI package). Several E1 parameters and used timeslots are specified in the file. The file is modified by a user with the help of any text editor, installed in the system. Configuration file syntax is out of scope of this document. Nevertheless, the commands, relative to Quasar, are presented here.
4. **The configuration utility** `ztcfg` (Zaptel) or `dahdi_cfg` (DAHDI). Based on the configuration file the utility transmits some parameters to the driver. After any changes in the configuration file, the utility should be restarted.

4.2. System requirements

Before the installation of the Quasar driver, the following software must be available in the system:

- Binutils, make and gcc compiler
- Kernel header files
- Zaptel or DAHDI package in the source codes

Attention: Learn Zaptel/DAHDI and Asterisk documentation before installation.

4.3. Installation

The Quasar driver is packed in the tar archive `/Quasar/driver/quasar-x.x.x.tar.bz2`, located on Quasar's CD. Drivers of version 3.0.0 and later work only with DAHDI package. As every version has its own requirements for driver installation, a user should strictly follow the instructions of README file packed in the same archive.

The final step of the driver compilation is load of `quasar.ko` module on a system. Before loading, please ensure that the Quasar board is successfully recognized by Linux PCI subsystem. To check it, run `lspci` utility. If the string

Network controller: Altera Corporation Device 2222

appears in the list of PCI devices on the screen, Quasar has been recognized, and the module can be loaded on a system.

The string **Module quasar.ko** in the module list provided by `lsmod` utility, as well as the module messages in the `/var/log/messages` file, confirm the successful load.

4.4. E1 Ports Configuration

E1 ports are described in the files `/etc/zaptel.conf` (Zaptel) or `/etc/dahdi/system.conf` (for DAHDI package). The key word **span** defines parameters of the given port.

```
span = <span num>,<timing>,<LBO>,< framing>,<coding>[,crc4]
```

where

span_num – E1 port number (starting from 1)

timing – board hardware automatically selects source for the synchronization for its internal clock generator. Entering non-zero value will allow hardware to use the given span clock for synchronization. Span with smaller number has greater priority. If `timing=0`, port is E1 master.

LBO – value is ignored

coding – acceptable values are `hdb3` and `ami`.

framing – acceptable values are `ccs`, `cas`.

crc4 – CRC4 multiframe is allowed

4.5. HDLC data transmission

The Quasar board can be used not only for voice-communication link, but for E1 data transmission. Both the functions can be exercised with different channels, but one board. Note, package Zaptel/DAHDI should be compiled with HDLC subsystem support. This is determined with CONFIG_ZAPATA_NET (CONFIG_DAHDI_NET) parameter.

Each E1 port has 31 timeslots. The timeslots enumeration is global. Timeslots with numbers from TS1 to TS31 are referred to port 1, port 2 covers range from 32 to 62, and so on. To connect demanded E1 timeslots to the network interface, nethdlc keyword is used:

```
nethdlc=<S>-<E>
```

where

S –initial timeslot number

E – final timeslot

For example,

```
nethdlc=2-13
```

In the given configuration 12 timeslots of E1 port, starting from 2, will be configured as one data transmission channel.

To register timeslots, a comma can be also used. For example, the same group of timeslots can be written as:

```
nethdlc=2,3-13
```

The group of timeslots described with the nethdlc enumeration forms the network interface with hdlc0 name in the Linux network subsystem. hdlc1 corresponds to the next given command, then hdlc2 and so on. The data link protocol of this interface can be configured with the help of sethdlc command. For example, command

```
sethdlc hdlc0 cisco
```

specifies cisco-compatible hdlc protocol on the channel. For further information see sethdlc documents.

4.6. **ecfg** Utility

ecfg utility allows to adjust parameters of E1 interfaces. It also can be used as a simple E1 analyzer. **ecfg** enables both to adjust some parameters, which are not subject to the **zaptel**/**DAHDI** configuration utility, and to define E1 line quality.

ecfg uses **ioctl** calls to communicate with the actual hardware, special files for Quasar boards resides in the **/dev/quasar** directory.

The previous parameters adjusted by **ztcfg** (**dahdi_cfg**) are easily overridden with **ecfg**. But remember **ecfg** doesn't update information in **zaptel**/**DAHDI** internal structures. Use **ecfg** only when you have a clear idea of what you are doing!

4.6.1. The main configuration menu

To configure parameters of the physical ports (E1.1 - E1.8), the **ecfg** utility is launched with the following command line:

```
# ecfg -b M -i N [ENTER]
```

where

M – board number [0..], N – E1 channel number [0-7];

Physical ports are configured by means of modifying the parameters in hierarchical menus. When configuration completed, settings can be kept in a file. Configuration for E1 channel with number N on board M is kept in file **/etc/ecfg/quasar_M_N.cfg**.

When **ecfg** launched the main menu is printed on the screen, moreover, the information about software version, board and port numbers, status of the given E1 port is displayed.

```
Quasar monitor v.1.14 26/08/2008 Updates: http://parabel.ru/
PMC/chan=0/0, conf. file="/etc/ecfg/quasar0_0.cfg"
HW/FW/REV version=10/10/e, driver verision=2.0.3

Line status: LOS=On , AIS=Off
Frame status: LOF=On , Sa4..8=00000, RAIS=Off
CAS Multiframe: CAS LOM=Off, XYXX=0000
CRC4 Multiframe: CRC4 err=Off, LOC=On , E bit=On
Err counters: HDB3=0, FAS=0, CRC4=0
ABCD status: 00000000 00000000 00000000 00000000

1. Configuration >>
2. Status >>
3. Test >>
0. Quit
```

Press keys 1-9 to choose submenu, press key 0 to quit the submenu.

Other keys can be used to refresh status information.

4.6.2. E1 port settings

E1 clock and encoding parameters

Configuration/Line code - select HDB3 or AMI line code.

Configuration/Clock source – select internal or external clock source.

E1 port framing parameters

Configuration/Framing/Receive - turn on/off E1 framer on receiving. If “off” then the input data should be treated as raw G.703 unstructured stream.

Configuration/Framing/Xmit - turn on/off E1 framing on transmitting. If “on” then zero timeslot is used for frame alignment special data.

Configuration/Framing/RAI - turn Remote Alarm Indication on/off/ auto. If “auto”, then basic frame synchronization is lost, E1 framer will automatically transmit the RAI alarm signal to the far-end point. The transmission of this alarm signal ceases after the basic frame alignment.

Configuration/Framing/(Inter)National bits - set National & International bits (Sa4-Sa8, Si0, Si1).

E1 port multiframe parameters

Configuration/Multiframe/CRC4 multiframe - turn on/ off CRC4 multiframe.

Configuration/Multiframe/CAS - turn on/ off CAS multiframe.

Configuration/Multiframe/Remote CAS Alarm - turn CAS alarm (Y bit) “on”, “off”, “auto”.

Configuration/Multiframe/X1, X2, X3 – provides manual control of X1-X3 CAS multiframe bit state.

Configuration/Multiframe/ts16 ABCD(1-7)

Configuration/Multiframe/ts16 ABCD(8-15)

Configuration/Multiframe/ts16 ABCD(16-23)

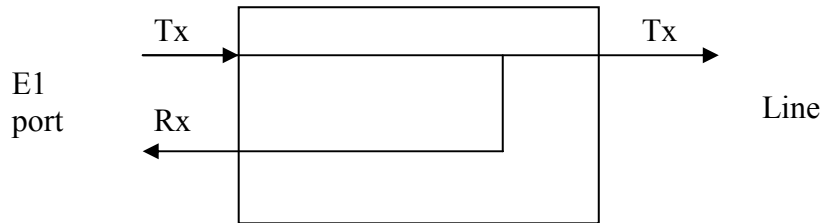
Configuration/Multiframe/ts16 ABCD(24-31) – allows to pass hex digit 0..f, which specifies ABCD nibble in the CAS multiframe for the given timeslot.

Status submenu

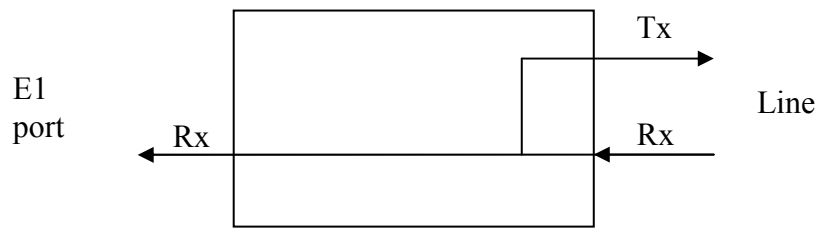
Status/Reset - reset statistics.

Test submenu

Test/Loopback/LLOOP - Turns on an internal loopback for the corresponding E1 port (Figure 4).



Test/Loopback/RLOOP - Turns on a remote loopback for the corresponding E1 port (Figure 5).



Test/Emu single LOF - inserts single framing violation error.

Test/Emu single LOC(CRC4) - inserts single CRC4 violation error.

Test/LOS – simulates LOS.

Test/AIS - simulates AIS error.

5. Quasar technical parameters

Parameter	Value
E1 connector type	RJ45, 8 pins
Cable type	120 Ohm, twisted pair
Nominal pulse voltage	3 V +/- 10%
Data transmission rate	2048 kbit/s +/- 50 ppm
Line Coding	AMI/HDB3
E1 signal attenuation	-40 дБ
Standards	ITU G.703, G.704, G.706, G.732, G.823
Pulse form	ITU G.703
Jitter	ITU G.823
Frame structure	ITU G.704
Bus and slot type	PCI 2.2, 33 Mhz, 5V or 3.3V or PMC IEEE P1386.1 or PCI-express
Device dimensions	170 x 120 x 20 mm
Ambient conditions	Temperature 5 to 50° C Humidity 80% at 25° C

6. Delivery

- Quasar board
- CD with driver and user's manual
- Guarantee card
- Cardboard box: L260x W170x H30 mm
- Weight is less than 0.5 kg

7. Useful links

<http://www.asterisk.org/download>

