Industriefunkuhren

hopf Elektronik GmbH

Technical Manual

LAN Board for System 7001RC

Model 7270RC

ENGLISH

Version: 02.00 – 12 Nov. 2004

Valid for Devices 7270RC with FIRMWARE Version: **02.xx**

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Version number (Firmware / Description)

THE FIRST TWO DIGITS OF THE VERSION NUMBER OF THE TECHNICAL DESCRIPTION AND THE FIRST TWO DIGITS OF THE FIRMWARE VERSION MUST **COMPLY WITH EACH OTHER**.

THE DIGITS AFTER THE POINT IN THE VERSION NUMBER INDICATE CORRECTIONS IN THE FIRMWARE / DESCRIPTION THAT ARE OF NO SIGNIFICANCE FOR THE FUNCTION.

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Symbols and Characters

Operational Reliability

Disregard may cause damages to persons or material.

Functionality

Disregard may impact function of system/device.

Information

Notes and Information.

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Safety instructions

The safety instructions and technical data serve to provide fault-free operation of the equipment and the protection of people and material objects. Consequently, observance and compliance is absolutely essential.

Non-compliance renders any claim for guarantee or warranty void.

No liability is accepted for any consequential damage.

Equipment safety

This equipment was manufactured using state-of-the-art technology and in accordance with recognized safety regulations.

Mounting of the equipment must only be carried out by specialist, trained personnel. Care should be taken to ensure that all cables are laid and fixed correctly. The equipment may only be operated with the power supply voltage stated on the nameplate.

The equipment may only be operated by instructed personnel or skilled staff.

Repairs to opened units may only be carried out by appropriately trained specialist personnel or by ***hopf*** Elektronik GmbH.

The equipment must be disconnected from all voltage sources prior to working on an opened unit or changing a fuse.

If there are reasons to believe that faultless operational safety can no longer be guaranteed, the unit should be taken out of service and identified accordingly.

Safety may be impaired if, for example, the equipment does not function as specified or if it is visibly damaged.

CE-Conformity

This device fulfils the requirements of the EU directive 89/336/EWG "Electromagnetic compatibility" and 73/23/EWG "Low voltage equipment".

Therefore the device bears the CE identification marking (CE=Communauté Européenne)

CE = Communautes Europeénnes = European communities

The CE indicates to the controlling bodies that the product complies with the requirements of the EU directive - especially with regard to protection of health and safety for the operator and the user - and may be released for sale within the common markets.

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1 LAN Time Server - 7270RC with 10 or 10/100Base-T

The board 7270RC is an Ethernet **Local Area Network (LAN) board** and was developed as a **Network Time Server** (**NTS**), for the purpose of synchronizing computer networks.

It is designed for the ***hopf* 7001RC** central clock systems in European format with a 3U/4HP front panel.

Due to the highly precise system 7001RC time, the board can be used to synchronize both PC and SPS networks. The board can be installed at any desired point on the network.

The 7270RC LAN board is available with a 10 Base-T network interface. There is also an option for 10/100 Base-T (auto sensing).

The board supports the widely used **Network Time Protocol (NTP)** as well as the special industry Ethernet protocol **SINEC H1**. As such, it can replace a SINEC H1 time transmitter.

By means of its Hot-Plug facility, the board can at any time be removed from and reconnected to any point on an operating system 7001RC, without affecting the function of other system boards.

The 7270RC LAN board is configured via the keyboard of the ***hopf*** system 7001RC, or using remote software. Remote configuration of the 7270RC LAN board network settings can be carried out via Ethernet using Telnet.

2 NTP / SNTP

Data communication in a LAN requires a uniform, continuously increasing and synchronous time in each computer. **Network Time Protocol (NTP)** is used worldwide to synchronize computers across a network. Up until version 3.xx NTP protocol was also identified as **XNTP**.

NTP:

NTP has the effect that the clocks in a network always have the same reference time source and are "soft"-adjusted (without a leap). Since **UTC (Coordinated Universal Time)** is a continuously increasing time, this is used as the time base and is fed into one point on the network. For this purpose, any network computer can be defined as the **Network Time Server** (**NTS**) from which all the other computers **(Clients)** are synchronized. In most cases, the **time accuracy** of the **time server** is controlled in a highly precise manner by a radio-controlled clock.

The 7270RC LAN board is a network time server. It supports **NTP Versions 1, 2, 3 and 4**.

SNTP:

Alongside the standard version of NTP protocol there is also a simpler version: **SNTP (Simple Network Time Protocol)**. SNTP uses the same data structure as NTP for network packages, however it uses simpler algorithms for time synchronization and therefore the accuracy achieved is less.

The 7270RC LAN board provides full support for SNTP (Simple NTP).

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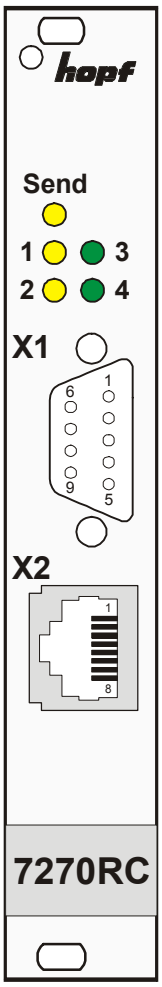
3 7270RC Function Board Design

The 7270RC has a 3U/4HP front panel for 19'' systems, with the following components.

3.1 Front Panel Components



LED	Colour	Function
Send	yellow	Bus communication
1	yellow	Synchronization status
2	yellow	Time telegram available
3	green	LAN Interface diagnostic LED
4	green	Network connection

SUB-D connector X1

RJ-45 socket X2

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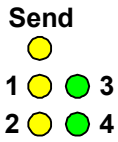
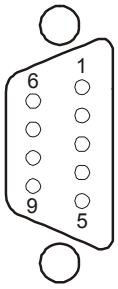
3.1.1 LEDs



LED	Colour	Function
Send	yellow	Signals the bus communication status (flashing⇨ 7270RC is integrated in the system 7001RC)
1	yellow	Signals the synchronization status of the time telegram for Ethernet protocols
2	yellow	Signals the availability of the time telegram for Ethernet protocols
3	green	LAN interface diagnostic LED in combination with LED1 and LED2
4	green	Signals network connection

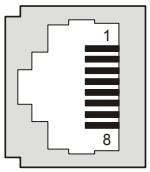
The meanings of the light diode states can be found in Chapter 4

3.1.2 9-Pin SUB-D Connector X1 Assignment



Pin No.	Assignment
1	minute pulse, Time period configurable (potential isolated/ GND1)
2	RxD1 (RS232)
3	TxD1 (RS232)
4	free
5	GND
6	+12V DC voltage (potential isolated/ GND1)
7	reserved
8	reserved
9	GND1 (electrically isolated)

3.1.3 RJ-45 Socket X2 Assignment



Pin No.	Assignment
1	Tx+
2	Tx–
3	Rx+
4	not assigned
5	not assigned
6	Rx–
7	not assigned
8	not assigned
9	not assigned

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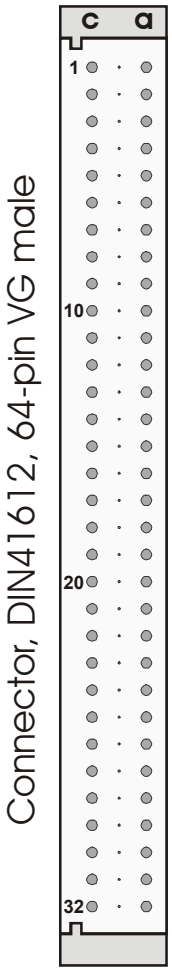
3.2 VG Connector Strip 64-pin (DIN 41612)



Connector, DIN41612, 64-pin VG male

Connector, DIN 41612, 64-pin VG male				
Pin	c		a	Pin
1				1
2				2
3				3
4				4
5				5
6				6
7				7
8				8
9				9
10				10
11				11
12				12
13				13
14				14
15				15
16				16
17				17
18				18
19				19
20				20
21	RES / System reset			21
22				22
23	SERI / System bus		SCLK / Bus pulse	23
24	KHZB / regulated 1kHz pulse		PPS / regulated 1Hz pulse	24
25	FROUT		FRIN	25
26				26
27	AROUT		ARIN	27
28				28
29				29
30				30
31	GND		GND	31
32	+5V DC		VCC / 5Volt	32

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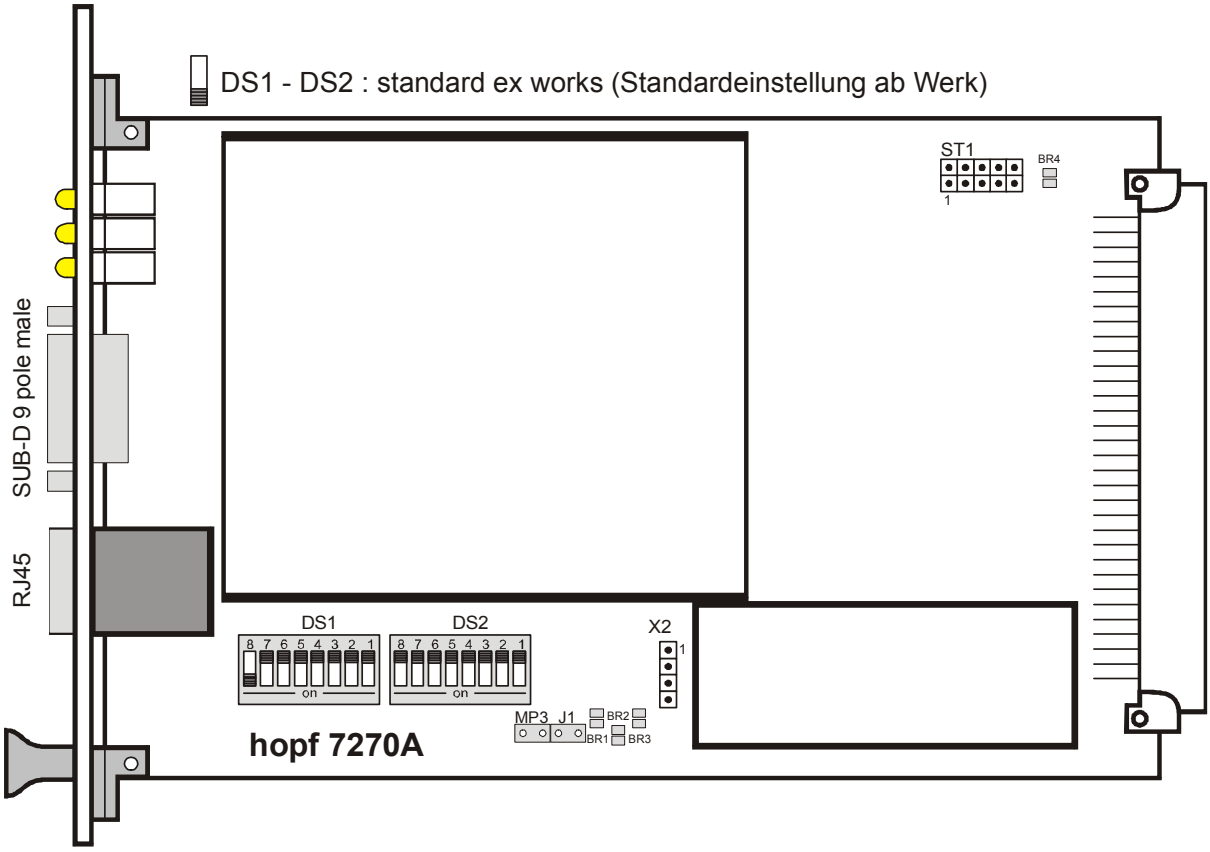
3.3 Overview of the 7270RC Components



Identification	Function
DS1	DIP switch: board number for unique identification in the system 7001RC
DS2	DIP switch, without function at present
ST1	Service connector / for ***hopf*** Elektronik GmbH only
X2	Diagnostic connector / for ***hopf*** Elektronik GmbH only
J1	Service jumper / for ***hopf*** Elektronik GmbH only
MP3	Operating voltage / measurement points (5V DC)

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4 Implementation of the Board 7270RC in the System 7001RC

All RC function boards are individually parameterized from the system 7001RC.

Every RC function board is uniquely identified via the board type and an assigned board number (1-31)

The following steps are necessary for implementation:

- Identification of the board numbers available
- Setting up of the board number with the DIP switch on the board 7270RC
- Installation of the board 7270RC in the system 7001RC
- Parameterization of the board 7270RC
- Activation of the board 7270RC via the system 7001RC

4.1 Identification of the Board Numbers available

The board numbers allocated so far can be displayed via the **SHOW ALL ADDED SYSTEM-BOARDS** menu. The board numbers that are not listed for this board type are available for the new board.

Boards that are available in terms of hardware, but which have not yet been activated via the system menu, are **not** listed in the **SHOW ALL ADDED SYSTEM-BOARDS** menu. (The "SEND" LED of these boards does not flash when in operation.)

In order to identify the set board number, these boards must be made available externally, in order to identify the set board number from the DIP switch setting.

4.2 Set the Board Number

In order to clearly identify the board in the system 7001RC, the board number must be defined via the DS1 DIP switch bank. The board number is set as Hex code on DS1. Switch 8 is the lowest value bit and switch 1 the highest value bit. The inscription on the DIP switch housing serves to identify switches 1-8. Board numbers from 1 to 31 can be setup, board numbers outside this range are not recognized by the system 7001RC.

Under no circumstances may two boards of the same type with the same board number be embedded in one system 7001RC. This leads to undefined errors on both boards.

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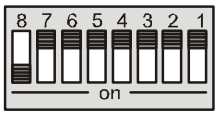
DS1



⇨ **Board 01**

SW1 Pos 8	SW1 Pos 7	SW1 Pos 6	SW1 Pos 5	SW1 Pos 4	Board number in the system 7001RC
on	off	off	off	off	1
off	on	off	off	off	2
on	on	off	off	off	3
off	off	on	off	off	4
on	off	on	off	off	5
off	on	on	off	off	6
on	on	on	off	off	7
off	off	off	on	off	8
on	off	off	on	off	9
off	on	off	on	off	10
on	on	off	on	off	11
off	off	on	on	off	12
on	off	on	on	off	13
off	on	on	on	off	14
on	on	on	on	off	15
off	off	off	off	on	16
on	off	off	off	on	17
off	on	off	off	on	18
on	on	off	off	on	19
off	off	on	off	on	20
on	off	on	off	on	21
off	on	on	off	on	22
on	on	on	off	on	23
off	off	off	on	on	24
on	off	off	on	on	25
off	on	off	on	on	26
on	on	off	on	on	27
off	off	on	on	on	28
on	off	on	on	on	29
off	on	on	on	on	30
on	on	on	on	on	31

4.3 Installation of a new Board 7270RC in the System 7001RC

In order to install a new board 7270RC, a free extension slot (slot with board connectors and VG strip installed in the system bus) must be available. This information can be obtained from the associated specific system drawing.

If no free extension slot is available, this can usually be retrofitted. Please contact ***hopf*** Elektronik GmbH.

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4.4 Parametrize / Activating the Board 7270RC in the System 7001RC

The following steps are required to activate the board:

To avoid undesirable output behaviour of the board it is first parameterized and then activated by switching it into the monitoring system.

- In the **BOARD-SETUP** menu, sub-heading **ADD SYSTEM-BOARDS**, log on the newly installed board.
- In the **BOARD-SETUP** menu, sub-heading **SET SYSTEM BOARDS PARAMETER** parameterize the board. (***Chapter 5 Administration of the Board 7270RC***)
- In the **BOARD-SETUP** menu, sub-heading **SET SYSTEM BOARDS TO MONITORING-MODE OR IDLE-MODE** integrate the newly installed board into the monitoring system.

The menus:
- **ADD SYSTEM-BOARDS** and
- **SET SYSTEM BOARDS TO MONITORING-MODE OR IDLE-MODE**

can be consulted in the technical specification of the system 7001RC.

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5 Administration of the Board 7270RC

The 7001RC base system specification serves as the basis for configuration. The following will cover only the inputting of the values that can be found under the **BOARD-SETUP:4** menu heading.

In order for the system 7001RC to accept the newly configured parameters, is the configured menu and the following parameter menu of **SET SYSTEM-BOARDS PARAMETER** menu be confirmed by pressing the ENT key.

5.1 Input Functions for the Board 7270RC in the System 7001RC

The input and display functions of the board parameters are polled in the menu heading **BOARD-SETUP:4**

with ENT key ⇨ Main menu
with 4 key ⇨ Board setup
with N key ⇨ Scroll to menu heading:

```
 SET SYSTEM-BOARDS PARAMETER  Y/N
```

Select with key Y

Search for board to be parameterized with key N and select with key Y

Example:

```
 PARAMETER BOARD 03 OF 25  7270 NO.:04
STATUS:M/-  BOARDNAME:"ETHERNET" SET>Y/N
```

PARAMETER BOARD 03 OF 25 ⇨ board **03** of **25** implemented

7270 NR.: 04 ⇨ board type **7270RC** with board number **04**

STATUS: M (I)**/-** (E) ⇨ **M or I** = monitoring **or** no monitoring

⇨ **E or –** = without error operating **or** board error

BOARDNAME:"ETHERNET" ⇨ **ETHERNET** board name freely selected by customer

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5.1.1 Load Board 7270RC Network Parameters into System 7001RC

As a basic principle, the 7270RC LAN board can be parameterized via both the system 7001RC and the network.

The parameters displayed in the 7270RC system menu may vary from the actual parameters of the 7270RC if this was configured using a network configuration programme (e.g. TELNET).

5.1.1.1 LAN SETTINGS Menu Heading

When the board 7270RC is parameterized via the system 7001RC, the displayed values correspond to the actual values recorded on the board 7270RC. These values can be displayed directly and edited using the **"LAN SETTINGS"** function key 1.

5.1.1.2 RELOAD LAN SETTINGS FROM LAN BOARD Menu Heading

If, however, parameterization is carried out via the network, then the network parameters are not updated in the system. In this case, the system 7001RC can load the new settings from the 7270RC using the function **"RELOAD LAN SETTINGS FROM LAN BOARD"** key 2, in order that they may be displayed correctly in the system. During the process of loading, the old network parameters are overwritten in the system.

Whilst loading the network parameters the 7270RC is not available to operate in the ETHERNET for approx. 5 seconds.

Selection	Function	Comment
1	7270RC settings in the system	Standard
2	Load 7270RC settings from the LAN board into the system 7001RC	Only necessary if the board 7270RC was configured independently of the system 7001RC (e.g. with TELNET)

5.1.2 Enter IP Address

The selected board appears in the upper line with its board number and IP address. In order to configure a new IP address it is necessary to enter the complete set of 4 groups of numbers.

The IP address is entered in 4 groups of numbers that can be set from 000 to 255. They are separated by a dot (.). The entry must be made to 3 places (e.g.: 2 ⇨ 002). After the complete entry has been made correctly it should be confirmed by pressing the ENT key.

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The entry of an IP address >000.000.xxx.xxx< is **not permitted** on the board 7270RC.

This erroneous network parameterisation can lead to misbehaviour of the board 7270RC.

In the event that this state occurs, a permissible IP address must be set. When the input of parameters has been completed the board 7270RC needs a reset:

Making a reset:

- by disconnecting and the re-connecting the board 7270RC
- by a system reset (see manual of system 7001RC)
- or power of System 7001RC and restart

5.1.3 Enter Gateway Address

The next menu heading concerns editing the Gateway or Router address.

The Gateway address can now be entered in the same way as the IP address, as described in ***Chapter 5.1.2 Enter IP Address***.

The entry of a Gateway address >000.000.xxx.xxx< is **not permitted** on the board 7270RC.

This erroneous network parameterisation can lead to misbehaviour of the board 7270RC.

In the event that this state occurs, a permissible IP address must be set. When the input of parameters has been completed the board 7270RC needs a reset:

Making a reset:

- by disconnecting and the re-connecting the board 7270RC
- by a system reset (see manual of system 7001RC)
- or power of System 7001RC and restart

5.1.4 Enter Network Mask

The next menu heading is the editing of the network mask. The following input screen appears:

The network mask can now be entered in the same way as the IP address, as described in ***Chapter 5.1.2 Enter IP Address***.

Please see explanations about the network mask in ***Chapter 9 Glossary***.

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5.1.5 Enter Control Byte

The next menu heading to appear concerns the editing of the control byte. The control byte activates several functions with their corresponding parameters, such as, for example, time base, NTP protocol and SINEC H1 protocol.

```
B.7270 NR.:01 CONTROL-BYTE  00000010
         NEW CONTROL-BYTE  >~~~~~~~~<
```

The current control byte is shown on the upper line. The individual bits are entered on the second line using **"0"** and **"1"**. The complete control byte must always be entered and confirmed by pressing the **ENT** key.

The bits of the control bytes are numbered in descending order:

```
CONTROL-BYTE  >76543210<
```

Bit 7		Configuration of the board 7270RC via system 7001RC or network	
0		**Standard setting** LAN configuration is accepted by the system 7001RC	
1		**Network configuration of the 7270RC via LAN (e.g. TELNET)** The network configuration is not accepted by the system and is not displayed.	
Bit 6		**NTP / SINEC H1 protocol output**	
0		NTP	
1		SINEC H1	
Bit 5	**Bit 4**	**SINEC H1 MAC or Broadcast Address**	
		Address	Hexadecimal
0	**0**	MAC Addresses 1	09 00 06 03 FF EF
0	**1**	MAC Addresses 2	09 00 06 01 FF EF
1	**0**	Broadcast Address	FF FF FF FF FF FF
1	**1**	Broadcast Address	FF FF FF FF FF FF
Bit 3	**Bit 2**	**SINEC H1 transmission interval**	
0	**0**	1 sec.	
0	**1**	10 sec.	
1	**0**	60 sec.	
1	**1**	60 sec.	
Bit 1	**Bit 0**	**Time base for NTP and SINEC H1 protocol**	
0	**0**	Local time with any ST/WT changeover times	
0	**1**	Local standard time	
1	**0**	UTC (default for NTP)	
1	**1**	Local standard time, but with ST/WT time status	

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5.1.5.1 Bit 7, Board 7270RC Configuration via System 7001RC or Network

Bit 7 is used to select whether the 7270RC LAN board is parameterized via the system 7001RC or via the network.

As standard, Bit 7 is set to "**0**".and configuration of the board 7270RC is carried out via the system.

Configuration can certainly be carried out via the network; however the settings are overwritten as soon as 7270RC parameters are modified via the system 7001RC.

When Bit 7 is set to **"1"**, changes to the parameters may only be made via the network. In this setting, no configuration takes place via the system 7001RC; however the time information is forwarded from the system 7001RC to the board 7270RC so that synchronization of the LAN can continue.

See also ***Chapter7 Remote Configuration of the Network Parameters via LAN***.

5.1.5.2 Bit 6, NTP / SINEC H1 Protocol Output

The board supports **NTP (Network Time Protocol)** and the special industry Ethernet protocol **SINEC H1** and can, as such, replace a SINEC H1 time transmitter.

When Bit 6 is set to "**0**", NTP protocol is transmitted.

When Bit 6 is set to "**1**", SINEC H1 protocol is transmitted.

5.1.5.2.1 Protocol output dependent on system status

SINEC H1

As soon as the system 7001RC has a valid time, SINEC H1 is synchronized from the board 7270RC with stratum 1. At the same time, SINEC H1 is also synchronized in the system status **"quartz"**. This means that even if only a manually input time is available to the system, for example, SINEC H1 is synchronized in the same way as if the system were synchronous.

NTP

The settings in ***Chapter 5.1.7.2 Bit 0, NTP Time Stamp Output dependent on System Status*** should be observed for the NTP output, dependent on the system status.

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5.1.5.3 Bit 5/4, SINEC H1 MAC or Broadcast Address

The required SINEC H1 MAC or broadcast address is configured with Bit 5/4.

Bit 5	Bit 4	Address	Hexadecimal
0	**0**	MAC addresses 1	09 00 06 03 FF EF
0	**1**	MAC addresses 2	09 00 06 01 FF EF
1	**0**	Broadcast address	FF FF FF FF FF FF
1	**1**	Broadcast address	FF FF FF FF FF FF

These Bits have no meaning when the NTP protocol is used.

5.1.5.4 Bit 3/2, Transmission Interval for SINEC H1 Protocol

The required transmission interval for SINEC H1 protocol is configured with Bit 3/2.

Bit 3	Bit 2	SINEC H1 Transmission Interval
0	**0**	1 sec.
0	**1**	10 sec.
1	**0**	60 sec.
1	**1**	60 sec.

These Bits have no meaning when the NTP protocol is used.

5.1.5.5 Bit 1/0, Time Base for NTP and SINEC H1 Protocol

The selection of the time base for the NTP or SINEC H1 protocol takes place with Bit 1/0.

Bit 1	Bit 0	Time Base for NTP and SINEC H1 Protocol
0	**0**	Local time with any ST/WT changeover times
0	**1**	Local standard time
1	**0**	UTC (default for NTP)
1	**1**	Local standard time, but with ST/WT time status

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5.1.6 Enter Parameter Byte 01

Parameter byte 01 is shown on the upper line with the currently set values.

```
B.7270 NO.:01   OLD: BYTE 01 >00000000<
BYTE = BIT 7..0 NEW: BYTE 01 >~~~~~~~~<
```

In order to make a change, the individual bits of the new byte are entered on the second line, using **"0"** and **"1"**. The complete parameter byte must always be registered and confirmed by pressing the **ENT** key.

The bits of the parameter byte are numbered in descending order:

```
BYTE 01 >76543210<
```

Bit 7		LAN Interface Module Update
0		**Standard setting**
1		Service setting, may only be activated by agreement with ***hopf*** Elektronik GmbH.
Bit 6		**Currently without a function**
0		For compatibility reasons this bit should always be set to "**0**".
Bit 5	**Bit 4**	**Pulse length for minute pulse on 9-pin SUB-D connector X1 Pin 1**
0	0	10 msec
0	1	100 msec
1	0	500 msec
1	1	1000 msec
Bit 3, 2, 1, 0		**Currently without a function**
0		For compatibility reasons these bits should always be set to "**0**"

5.1.6.1 Bit 7, for Updating the LAN Interface Module

It may occasionally be required to update the firmware status of the LAN interface module. For this purpose, Bit 7 should be set to **"1"** to enable an update of the LAN interface module to be carried out. Whilst this setting is being made, the 7270RC does not receive network parameters or the system time from the system 7001RC.

For this reason it is not possible to synchronize the LAN whilst this setting is being made.

This update may only be carried out in agreement with ***hopf*** Elektronik GmbH, since improper use may cause the board 7270RC to function incorrectly.

After the update has taken place Bit 7 should be reset to **"0"**. (standard setting).

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5.1.6.2 Bit 6, (without Function at present)

Bit 6 is without a function at present.
For compatibility reasons this bit must always be set to **"0"**.

5.1.6.3 Bit 5/4, Minute Pulse Outputs on the 9-pin SUB-D Connector X1 Pin 1

An potential isolatedminute pulse can be tapped on the 9 pin SUB-D connector X1 Pin 1. The pulse length can be set in 4 steps:

Bit 5	Bit 4	Pulse Length
0	**0**	10 msec
0	**1**	100 msec
1	**0**	500 msec
1	**1**	1000 msec

The minute pulse is output via an "open collector" step with current limitation. In order to prevent rough edges on the minute pulse, a load resistor R_{Load} should be configured in accordance with the technical data (***Chapter 8 7270RC Technical Data***).

5.1.6.4 Bit 3/2/1/0, (without Function at present)

Bits 3, 2, 1 and Bit 0 are without a function at present.
For compatibility reasons these bits must always be set to **"0"**.

5.1.7 Enter Parameter Byte 02

Parameter byte 02 is shown on the upper line with the currently set values.

```
 B.7270 NO.:02   OLD: BYTE 01 >00000000<
 BYTE = BIT 7..0 NEW: BYTE 01 >~~~~~~~~<
```

In order to make a change, the individual bits of the new byte are entered on the second line, using **"0"** and **"1"**. The complete parameter byte must always be registered and confirmed by pressing the **ENT** key.

The bits of the parameter byte are numbered in descending order:

```
BYTE 01 >76543210<
```

Bit 7-1	Currently without a function
0	For compatibility reasons these bits should always be set to **"0"**.
Bit 0	**Synchronization of NTP**
0	In radio-controlled operation (default setting)
1	In radio-controlled and quartz operation

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5.1.7.1 Bit 7-1, (without Function at present)

Bits 7-1 are without a function at present. For compatibility reasons these bits must always be set to **"0"**.

5.1.7.2 Bit 0, NTP Time Stamp Output dependent on System Status

When Bit 0 is set to **"1"**, NTP synchronization takes place via stratum 1 independent of the radio ("**r**", "**R**") or quartz ("**C**") system status; the system 7001RC only needs to have a valid time. Radio synchronization of the system 7001RC is not required in this setting. This means that if the system only has a manually input time available, NTP is synchronized in the same way as when it is synchronous.

Bit 0	NTP synchronization under system status	System Status	Output 7270RC NTP	NTP Reception Status
0	• Radio-controlled operation **"R"** (default setting)	Not valid "**-**"	No time / Stratum 0	Stratum 16
		Quartz operation "C"	**No time / Stratum 0**	**Stratum 16**
		Radio reception "**r, R**"	System time / Stratum 1	Stratum 1
1	• Radio-controlled operation **"R"** • Quartz operation **"C"** (The radio status for NTP is simulated)	Not valid "**-**"	No time/ Stratum 0	Stratum 16
		Quartz operation "C"	**System time / Stratum 1**	**Stratum 1**
		Radio reception "**r, R**"	System time / Stratum 1	Stratum 1

NTP servers that are synchronized with the 7270RC are not able to identify whether the radio status is simulated or not. In this way, time deviations arising in this mode due to drift in the quartz operation (independent clock) or manual setting of the time/date (even incorrect but plausible time/date) are accepted by the server.
In this simulation mode, a **time leap with radio synchronous status** occurs on a manual time/date entry and subsequent synchronization.

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6 LED Status and Error Codes

There are 5 LEDs for status or error messages on the front panel.

6.1 Send LED

SEND LED	Description
Flashing	Normal case. Access to the internal bus is displayed. The board 7270RC is correctly connected to the system 7001RC.
Permanently off	The board 7270RC is not ready for operation
Permanently lit	Error on the board 7270RC

6.2 Network Status LEDs 1-4

LED 1	LED 2	LED 3	Funktion
Lit	Off	Off	**Synchronization** of LAN possible with board 7270RC.
Off	Flashing	Off	**No synchronization** of LAN possible with board 7270RC e.g.: • system 7001RC not synchronised, • or board 7270RC is not implemented, it becomes no time information from system 7001RC.

LED 4	Funktion
Lit	Network connection is **correctly** via RJ45
Off	Network connection is **incorrect** via RJ45

LED 1-4	Funktion
al off ⇨ al lit ⇨ initial flashing	**RESET**-behaviour of board 7270RC with on it following initialising. (duration about 5 second)
different flashing of al LEDs	**Error behaviour** (continuous)

Telnet configuration mode:
LED 3 of board 7270RC is flashing into the configuration mode.
e.g. with **Telnet** or through **system 7001RC**.

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7 Remote Configuration of the Network Parameters via LAN

The network parameters of the 7270RC LAN board can also be configured via LAN using a **TELNET**-compatible programme via **TCP Port 9999**. The setting of the time base for the corresponding NTP or SINEC H1 output protocol can only be carried out via the system 7001RC.

In order to use remote configuration via Telnet it is recommended to prevent configuration via the system keyboard of the radio-controlled clock. This is described in ***Chapter 5.1.5.1 Bit 7, Board 7270RC Configuration via System 7001RC or Network***.

When configuration is carried out via the network, the parameters of the 7270RC LAN board are not updated on the system display (see ***Chapter 5.1.5.1 Bit 7, Board 7270RC Configuration via System 7001RC or Network***).

Starting of Telnet terminal program with a pc which is connected over LAN with the board 7270RC.

Exsample for input of windows operating aystem.

```
C:\>telnet 192.100.100.010 9999
```

telnet	command for starting Telnet terminal program
192.100.100.010	IP-adress of board 7270RC (exsample)
9999	TCP Port number (fixed)

After activate the Telnet terminal program the salve explained LAN- configuration menu is staring of board 7270RC.

Telnet configuration mode:
LED 3 of board 7270RC is flashing into the configuration mode.
e.g. with **Telnet** or through **system 7001RC**.

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8 7270RC Technical Data

General	European board 160 x 100 mm (3U/4HP)
Power input	
Internal system voltage Vcc	5V DC ± 5% via system bus
Output	
with 10 Base-T interface	typically 1.5VA / max. 2VA
with 10/100 Base-T interface	typically 3.6VA / max. 4VA
Minute pulse	• High active • Potential isolated/ GND1 • Short-circuit proof • Constructed as current generator: Pulse voltage V_{pulse} = 12V DC Current limitation I_{pulse_max} = 30mA R_{load} < 680 Ohms
12V DC voltage on 9-pin SUB-D connector Pin 6	• 12V DC • $I_{max.}$ = 100mA, • Potential isolated/ GND1
Electrical isolation	min. 1000V DC
Temperature range	0 - 50°C
MTBF	> 285,000 hours
Operating types	Ethernet for NTP
	Ethernet for SINEC H1 LAN Bus (as alternative to SINEC H1 time transmitter)
Ethernet compatibility	Version 2.0 / IEEE 802.3
Supported protocols	NTP (RFC 1305) Version 1, 2, 3, 4, SNTP (RFC 2030) SINEC H1 TELNET, TFTP TCP/IP, UDP, ICMP

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9 Glossary

Network IP Address

An IP address consists of a 32 bit value, which is divided into four 8 bit numbers. In its standard format, 4 sets of decimal numbers (in the range 0...255) are separated from each other by a dot (*Dotted Quad Notation*).

Example: 192.2.1.123

The IP address is made up of a Network-ID followed by a Host-ID. In order to cover different requirements, four common classes of network were defined. Dependent on the network class, the last one, two or three bytes define the Host whilst the first byte defines the network (Network-ID).

In the following text "**x**" stands for the Host part of the IP address.

Class A Networks

IP address 1.xxx.xxx.xxx to 127.xxx.xxx.xxx

In this Class there are max. 127 different networks. This facilitates the connection of a large number of devices (max. 16.777.216)

Example: 100.0.0.1, (Network 100, Host 0.0.1)

Class B Networks

IP address 128.0.xxx.xxx to 191.255.xxx.xxx

This Class consists of max. 32768 networks. Each of these networks can include up to 65534 devices.

Example: 172.1.3.2 (Network 172.1, Host 3.2)

Class C Networks

IP address 192.0.0.xxx to 223.255.255.xxx

These network addresses are the most common. Up to 256 devices can be connected.

Class D Networks

The addresses from 224.xxx.xxx.xxx to 239.xxx.xxx.xxx are used as multicast addresses.

Exceptions

- No address is permitted that sets the 4 most significant bits to 1-1-1-1 (240.xxx.xxx.xxx - 254.xxx.xxx.xxx). These addresses are identified as "Class E" and are reserved.
- When all bits are set to "**0**" in the host address, the network as a whole is addressed (e.g. for routing inputs).
- When all the bits in the host part address are set to "**1**", this is the broadcast address. This means that "every station" is addressed.
- Network and broadcast addresses may not be used as a host address

  e.g. 192.168.0.0 identifies the whole network
  192.168.0.255 identifies the broadcast address

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Broadcast Address

The broadcast address is an IP address that is used to address all hosts in a network. Generally, this address corresponds to the Network-ID and the value 255 for each byte of the host part of the IP address (e.g. 149.202.255.255 stands for all hosts in the Class B network 149.202.0.0).

Gateway Address

The Gateway or Router address is required in order to be able to communicate with other segments of the network. The standard Gateway must be set to the Router address that connects these segments. This address must be located within the local network.

Network Mask

In order to prevent unnecessary loading of the network, the number of computers in a network segment is limited. For this reason, networks are divided into several smaller networks, also known as sub-networks. The network mask serves to define the network and host parts of an IP address and is 32 bits (4 bytes) long. It is used to allocate IP addresses other than network Classes A, B and C. Inputting the network mask facilitates selection of the number of bits to be used for the IP address as a network part and the number to be used for the host part.

Each bit of the network mask that has the value 1 defines the network part in the IP address; when the network mask bit is 0 then the IP address bit belongs to the host part.

Examples of network masks for the different network classes:

- Standard Class A — Network mask 255.0.0.0
- Standard Class B — Network mask 255.255.0.0
- Standard Class C — Network mask 255.255.255.0

Network Class	Network Part	Host Part	Binary Network Mask	Decimal Network Mask
A	8 Bit	24 Bit	11111111.00000000.00000000.00000000	255.0.0.0
B	16 Bit	16 Bit	11111111.11111111.00000000.00000000	255.255.0.0
C	24 Bit	8 Bit	11111111.11111111.11111111.00000000	255.255.255.0

The network part (1) must be continuous. It may not contain zeros.

Example:

- 11111000 00000000... => ok
- 11111000 00100000... => error

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The following table shows the possible allocation of a Class C network in respect of the number of sub-networks and the available addresses per sub-network:

Net-works	Number of IP Addresses	Network Mask Address
1	256	255.255.255.0
2	128	255.255.255.128
4	64	255.255.255.192
8	32	255.255.255.224
16	16	255.255.255.240
32	8	255.255.255.248
64	4	255.255.255.252
128	2	255.255.255.254

Therefore, only the following values can be set for the host part of each of the 4 bytes:

Decimal	Binary
255	1111 1111
254	1111 1110
252	1111 1100
248	1111 1000
240	1111 0000
224	1110 0000
192	1100 0000
128	1000 0000
0	0000 0000

MAC Address

Media **A**ccess **C**ontrol - address is the unchangeable 8 byte hardware address of a network board.

SINEC H1

Special industry Ethernet time protocol

NTP

Network **T**ime **P**rotocol: a network time protocol for synchronizing networks.

SNTP

Simple **N**etwork **T**ime **P**rotocol

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