

Technical Description

LAN board
7270



Safety information

The Safety Instructions and Technical Data serve to ensure trouble-free operation and protection of operating personnel and equipment. Strict compliance with these instructions is therefore necessary.

Failure to comply with these Safety Instructions will VOID the Warranty and any claims made under its terms.

Further no liability will be assumed by **hopf** Elektronik GmbH, for ensuing consequential damages, resulting from non-compliance.

Safety of the Devices

This instrument has been manufactured in accordance with the latest technological standards and acknowledged safety regulations.

The instrument should only be operated and maintained by properly trained and qualified technical personnel.

Please ensure that all cable connections are laid and fixed in position correctly. The instrument should only be operated with the supply voltage indicated on the identification plate. Note that multiple input power options exist (factory installed).

If an instrument must be opened for repair, this should only be carried out by technicians or engineers with corresponding qualifications or by **hopf** Elektronik GmbH company, or its representatives.

If the maintenance work requires the opening of a device or if a fuse needs changing, the device must first be disconnected from all power supplies.

If there are reasons to believe that the operational safety can no longer be guaranteed the device must be taken out of service and labeled accordingly.

The safety may be impaired when the device does not operate properly or if it is obviously damaged. Contact your local **hopf** Elektronik GmbH representative for required action.

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1 General information

The 7270 LAN board is a Network Time Server (*abbr.* NTS) for **hopf** GPS and DCF77 19" or ½ 19" (3HE) racks - System 7001, 6842 and 6855.

It can be used for synchronizing the PC or SPS networks with the accurate time and can be installed at any point in the network.

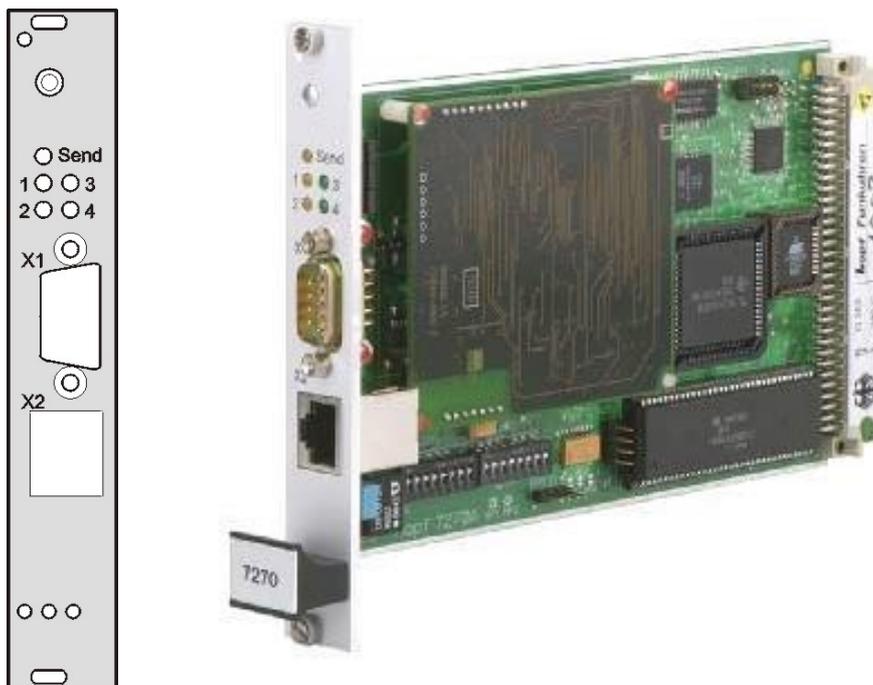
The 7270 LAN board is available with network interface 10 Base-T or 10/100 Base-T.

The board supports the world wide used time protocol NTP as well as the special industrial Ethernet protocol SINEC H1.

The configuration of the 7270 LAN board is via the keypad of the **hopf** System 7001, 6842 or 6855. A remote control configuration of the network setting of the 7270 LAN board via Ethernet with Telnet is possible as well as remote control via SNMP.

2 Hardware

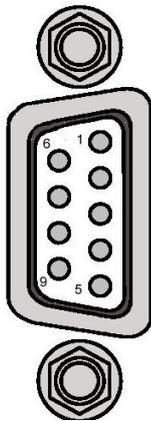
2.1 Front panel components



LEDs (the significance of the LED is dealt with in section 4)

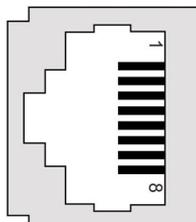
	Send	<i>yellow</i>	indicates the status of the bus communication
	1	<i>yellow</i>	indicates the synchronization status of the time telegram for Ethernet protocols
	2	<i>yellow</i>	indicates the presence of the time telegram for Ethernet protocols
	3	<i>green</i>	LAN Interface Diagnosis LED in combination with LED1 and LED2
	4	<i>green</i>	indicates connection to the network

X1 (9-pole SUB-D connector)



Pin no.	Allocation
1	Minute pulse of defined length (potential free)
2	Receiving cable RxD1 (RS232)
3	Transmission cable TxD1 (RS232)
4	free
5	GND
6	+12 V DC, max. 100mA (to GND1)
7	reserved
8	reserved
9	GND1 (potential free) for minute pulse

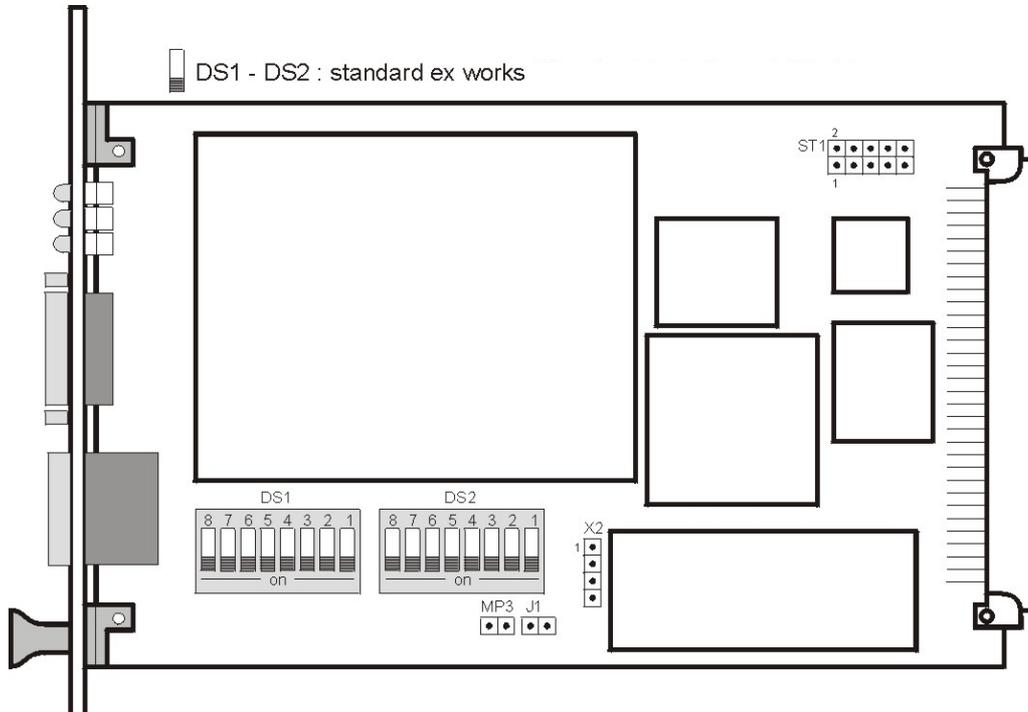
X2 (RJ-45 bush, with shield, 10/100 Base-T connector)



Pin no.	Allocation	
1	positive transmission line	Tx+
2	negative transmission line	Tx-
3	positive receiving line	Rx+
6	negative receiving line	Rx-
4, 5, 7, 8	unassigned	

2.2 Settings of DIP switch

Illustration of position of 7270 LAN board components



DIP switch block (**DS1**)

No.:	Status	Function
8	on / off	Activate/deactivate LAN configuration of the system
7	on / off	for 7001 / 68xx system bus specification
6, 5	on / off	configuration of the length of the minute pulse (in msec)
4...1	on / off	board identification (1...8)

DIP switch block 2 (DS2)

No:	Status	Function
8	on / off	reserved for <i>hopf</i> Elektronik, the setting must not be changed!
7	on / off	unassigned
6	on / off	unassigned
5	on / off	unassigned
4	on / off	unassigned
3	on / off	unassigned
2	on / off	unassigned
1	on / off	unassigned

Additional connectors, jumpers and bridges

	Function
ST1	<i>hopf</i> Elektronik service connector
X2	<i>hopf</i> Elektronik diagnosis connector
J1	<i>hopf</i> Elektronik service jumper
MP3	Operating voltage measuring points (5V DC)

2.3 Technical data

General	Euro board 160 x 100 mm (4TE) for 19" or ½ 19" (3HE) racks
Voltage supply Internal system voltage	5V DC ± 5%
Current (norm. / max.) with 10 Base-T Interface with 10/100 Base-T interface	1,5VA / 2VA 3,6VA / 4VA
Minute pulse ext. 12V DC voltage isolation	potential free, 12V DC / min. 20mA, max. 100 mA 12V DC, max. 100mA, potential free min. 1000V DC
Temperature range	0 - 50°C 0 - 70°C by restricted free wheeling characteristics
MTBF	> 150.000 h
Accuracy internal second at GPS internal second at DCF77	± 1 µsec ± 2 msec
Network interface Ethernet compatibility Protocols supported Accuracy Performance	10 Base-T or 10/100 Base-T Version 2.0 / IEEE 802.3 UDP, TCP, SNMP, ICMP, Telnet ± 0,1 msec, depending on network capacity

3.2 Input functions of System 7001

Up to eight 7270 LAN boards can be configured with the system 7001GPS/DCF77. Input and display functions are called up with the menu item **LAN = 6**. The start display appears:

```
SELECT LAN-BOARD NR. 1- 8   INPUT  --> _ <--
```

A figure between 1- 8 must be entered.

3.2.1 Input IP address

When the board number is entered (board identification) the display changes to the **SET** menu for the IP address.

```
BOARD --> 1 <-- IP-ADR. > 192.168.017.001 <
NEW INPUT WITH "Y"   > _
```

In the upper line the board identification appears as entered with the IP address which is currently set. In order to enter a new address the input (**Y**)es is required.

Now the IP address is entered in four groups of three decimal figures from 0 to 255, each with a point (.) to separate the groups of figures or three decimal figures. Input is in three digits (e.g.: 9 ⇨ 009). After the three figures have been entered a point (.) must set.

The IP address must be entered as follows, e.g.:

```
BOARD --> 1 <-- IP-ADR. > 192.168.017.001 <
NEW INPUT WITH "Y"   > 192.168.017.001 <
```

After the last group of figures there is a left arrow (<). Input is completed with (**ENT**)er. The new address is shown in the upper line. If there is an error during input, the menu is left and an error message will be shown.

Please Note: IF ANY OTHER FIGURE OR LETTER IS USED EXCEPT "Y" AND "BR" THE MENU ITEMS CONTINUE IN SEQUENCE FOR THE BOARD SET.

3.2.2 Input of gateway address

The next menu item to be shown is editing the gateway or router address.

```
BOARD --> 1 <-- GW-ADR. > 191.124.010.001 <
NEW INPUT WITH "Y"   > _
```

The gateway address can now be entered in the same way as the IP address in section 3.2.1.

3.2.3 Input of netmask

If any other figure or letter is entered except "Y" and "BR" the menu items continue in sequence for the board set. Editing of the netmask then appears as the next menu item. To calculate the netmask the number of bits for the host part is entered. The range is from **0... 31**. The following appears in the display:

```
BOARD --> 1 <-- NET MASC > 16 <
NEW INPUT WITH "Y" > _
```

A figure between **0...31** must be entered. The input is completed by pressing (ENT)er. The new netmask appears in the upper line. When an input error is made the menu item is left and an error message will be shown.

3.2.4 Input of control bytes

Various settings can be made with the control byte.

The control byte is entered via the following selection of commands:

```
BOARD --> 1 <-- CNTR-BYTE > 00000010 <
NEW INPUT WITH "Y" > _
```

After entering (Y)es a "0" or a "1" for the individual bits can be entered in the second line. The input is completed with (ENT)er. The new control byte appears in the upper line. When an input error is made, the menu item is left and an error message will be shown.

3.3 Control byte

Various functions can be activated via the control byte, e.g. time basis, NTP protocol, SINEC H1 protocol with corresponding parameter.

The bits indicate the following:

Bit 7 = 0 standard setting (Must not be changed!)

Bit 6 = 0 output of NTP protocol
1 output of SINEC H1 protocol

Bit 5/4 Configuration of the required SINEC H1 MAC address or Broadcast address

Bit 5	Bit 4		
0	0	MAC address 1	09 00 06 03 FF EF
0	1	MAC address 2	09 00 06 01 FF EF
1	0	Broadcast adr.	FF FF FF FF FF FF

When "NTP Protocol" is set the bits are irrelevant.

Bit 3/2 Configuration of the required transmission intervals for SINEC H1 protocol

Bit3	Bit2	
0	0	1 sec.
0	1	10 sec.
1	0	60 sec.
1	1	60 sec.

The bits are irrelevant with the setting "NTP Protocol".

Bit 1/0 Time basis for NTP and SINEC H1 Protocol

Bit1	Bit0	
0	0	Local time with any switchover times
0	1	Local standard time (CET)
1	0	UTC
1	1	Local standard time (CET) with details of summer and winter time in the time status

3.4 System bus setting

With switch **7** in the DIP switch block (**DS1**) a selection can be made between the bus of system 7001 and the bus of the boards (systems) 6855 / 6842. These settings should only be made by qualified staff.

DIP switch block 1 (**DS1**)

No.: 7	
on	Bus 7001
off	Bus 6855 / 6842

3.5 Setting the board identification

Two 7270 LAN boards can be addressed by the systems 6855, 6842 and eight 7270 LAN boards can be addressed by the system 7001GPS/DCF77. The board identification is set in DIP switch block (**DS1**) with the switches 1-4. These settings should only be made by qualified staff.

DIP switch block 1 (**DS1**)

no.: 4	no.: 3	no.: 2	no.: 1	Board no.:
on	on	on	on	1
on	on	on	off	2
on	on	off	on	3
on	on	off	off	4
on	off	on	on	5
on	off	on	off	6
on	off	off	on	7
on	off	off	off	8

3.6 Minute pulse

A potential free minute pulse of 12V DC is distributed on a 9 pole SUB-D connector. The length of the pulse can be adjusted in 4 steps. The pulse lengths are set via the DIP switch block (**DS1**) as follows:

N0.: 6	No.: 5	Pulse length
on	on	10 msec
on	off	100 msec
off	on	500 msec
off	off	1000 msec

The output is an "open emitter" with a current limiter to 20 mA. The external pull down load must be in a range of 120 to 600 Ohm.

Please Note: A RESISTOR GREATER THE 600 OHM WILL INCREASE THE RISE/FALL TIME OF THE PULSE.

3.7 Remote configuration of the network parameters via Telnet

The network parameters of the 7270 LAN board can also be configured via Ethernet with a **Telnet**- compatible programme via **TCP Port 9999**. The setting of the time basis for the corresponding output protocol NTP or SINEC H1 is only possible via a system keypad.

To use the configuration via Telnet the configuration via the system keypad of the radio-controlled clock should not be used. This is activated with **switch no.: 8** in the position **OFF** DIP switch block 2 (**DS2**).

Please Note: WITH REMOTE CONFIGURATION THE INFORMATION WHICH APPEARS IN THE SYSTEM DISPLAY OF THE RADIO-CONTROLLED CLOCK IS NOT UPDATED.

3.8 Remote monitoring via SNMP (read modus)

For further information regarding the set-up of applications with remote monitoring via SNMP please contact **hopf** Elektronik.

3.9 NTP

The 7270 LAN board is a network time server (Network Time Server, NTS). This supports **NTP versions 1, 2, 3 und 4**.

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

4 LED Status and error messages

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

Status of the **Send** LED:

LED flickers:	Standard, access to the internal bus is indicated
LED permanently on:	Error on the board
LED off:	Error on another board. No further bus access is possible.

Light-emitting diodes 1-4

Network status LEDs:

LED 1 permanently on:	Synchronization with the time signal, correct reception of time data. The system is radio-synchronized.
LED 1 flashes:	The time data string is being received. However the system is not radio-synchronized.
LED 1 off:	No time data string is being received.
LED 2 flashes:	Connection to the base board is not in order.
LED 2 off:	Connection has been set up.
LED 3 flashes:	Error in the Ethernet interface
LED 3 off:	Ethernet interface OK
LED 4 permanently on:	Network connection via the RJ45 connector is in order.
LED 4 off:	Network connection is faulty or cable is defective.

5 Glossary

Network IP address

An IP address is a 32-bit value divided into four 8-bit figures. The standard presentation is in 4 decimal digits (in the range 0...255) separated from each other with dots (*Dotted Quad Notation*).

Example: 192.2.1.123

The IP address consists of a leading network ID and then the host ID. In order to satisfy different requirements 4 common network classifications have been defined. Depending on the network classification the last one, two or three bytes define the host, while the remaining define the network (the network ID).

In the following text the "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 classification there are max. 127 different networks. This means that there are a very high number of host systems which can be connected (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 a maximum of 32768 networks. Each of these networks can be made up of up to 65534 host systems.

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 host systems can be connected.

Class D networks

The addresses of 224.xxx.xxx.xxx -239.xxx.xxx.xxx are used as multi-cast addresses.

Exceptions

- No address is permitted which sets the 4 highest valued bits at 1-1-1-1. (240.xxx.xxx.xxx - 254.xxx.xxx.xxx). These addresses are classified as **Class E** and are reserved.
- The host address where all the bits are set at "0" is used to address the network as a whole (e.g. with routing entries)
- The host part address where all bits are set at "1" is the broadcast address. This means that every station is being addressed.
- Network and broadcast addresses may not be used as host addresses.
 e.g. 192.168.0.0 indicates the whole network
 192.168.0.255 indicates the broadcast address

Broadcast address

The IP address is used for addressing all hosts in a network. As a rule this address corresponds to the network ID and the value 255 for each part of the host part of the IP address (e.g. 149.202.255.255 stands for all hosts in class B networks 149.202.0.0).

Gateway address

The gateway or router address is required to be able to communicate with other network segments. The standard gateway must be set to the router address which connects these segments. The address must be located within the local network.

Netmask

The netmask is used to divide up the IP addresses outside the network classifications A,B,C. By entering the netmask it is possible to indicate how many bits of the IP address are to be used as a network part and how many as a host part, e.g.:

Standard class A	8 Bit network	24 Bit Host part netmask	255.0.0.0
Standard class B	16 Bit network	16 Bit Host part netmask	255.255.0.0
Standard class C	24 Bit network	8 Bit Host part netmask	255.255.255.0

To calculate the netmask the number of bits for the host part is entered:

e.g.: netmask	Input host	Bits
255.255.255.128	(FF FF FF 80)	7
255.0.0.0	(FF 00 00 00)	24

MAC address

Media Access Control address is a non-changeable 8 Byte hardware address of a network board.

SINEC H1

Special Ethernet time protocol for industrial applications

NTP

Network Time Protocol, a network time protocol for synchronizing networks.

SNTP

Simple Network Time Protocol