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Technical Manual

Interface Board

Model 7201NET

for the operation with the power line supervision board 7515

ENGLISH

Version: 03.00   –   18.02.2005

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Valid for Devices 7201NET with FIRMWARE   Version: **03.xx**

Version number (Firmware / Manual)

THE FIRST TWO DIGITS OF THE VERSION NUMBER OF THE TECHNICAL MANUAL AND THE FIRST TWO DIGITS OF THE FIRMWARE VERSION MUST **COMPLY WITH EACH OTHER**. THEY INDICATE THE FUNCTIONAL CORRELATION BETWEEN DEVICE AND TECHNICAL MANUAL.

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

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Homepage: http://www.hopf.com

E-Mail: info@hopf.com

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.

Safety regulations

The safety regulations and observance of the technical data serve to ensure trouble-free operation of the device and protection of persons and material. It is therefore of utmost importance to observe and compliance with these regulations.

If these are not complied with, then no claims may be made under the terms of the warranty and no liability will be assumed for any ensuing damage.

Safety of the device

This device has been manufactured in accordance with the latest technological standards and approved safety regulations

The device should only be put into operation by trained and qualified staff. Care must be taken that all cable connections are laid and fixed in position correctly. The device should only be operated with the voltage supply indicated on the identification label.

The device should only be operated by qualified staff or employees who have received specific instruction.

If a device must be opened for repair, this should only be carried out by employees with appropriate qualifications or by *hopf* Elektronik GmbH.

Before a device is opened or a fuse is changed all power supplies must be disconnected.

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

The safety may be impaired when the device does not operate properly or if it is obviously 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 Specification

- Data output via : RS232c (V.24), RS422c (V.11), TTY (20 mA passive)
- Baud rate : 150 - 19200 Baud, TTY (max. 2400 Baud)
- Different output strings selectable via DIP switch (e.g. output UTC time)
- Output of the internal clock status in the status byte of the data string
- Potential free RS232- and RS422 interface

2 Functional Description

The micro processor of the interface board 7201 receives the information about the system time and mains frequency and time of up to 4 mains frequency measuring boards 7515 via the _hopf_ 7001 system bus.

The received time can be put out via one of three interfaces. Cyclic outputs of the data (e.g. put out data every minute) can be set by means of a DIP switch. Baud rate, word length, the number of stop bits and the parity mode can also be set by means of DIP switches.

Also the source (mains frequency measuring board) and various other data strings can be set by means of DIP switches.

Possible settings by means of DIP-Switch SW3 (see diagram in the appendix)

switch 6	switch 7	source of data
on	on	board 7515 no.: 1
on	off	board 7515 no.: 2
off	on	board 7515 no.: 3
off	off	board 7515 no.: 4

3 Hardwareconfiguration of the Board 7201

3.1 Selection of Interfaces

The board is equipped with 3 serial interfaces:

RS232c (V.24), RS422 (V.11), TTY (20mA-passive)

In case of a set cyclic data output the data string appears at all serial outputs. The data request via the RxD lines may come only from one input. For this particular case the board can be configured by means of DIP switch 3 switch 1 between input TTY or RS232/RS422.

DIP-Switch 3 Switch 1

on	serial input RS232 and RS422 active
off	serial input TTY active

The RS232- and RS422 interfaces are equipped with a potential isolation.

To limit the current it is possible to cascade a pre-resistance (680 Ohm) into the TTY interface. Here bridge 1 for the input and bridge 2 BR2 for the output must be opened (see position drawing in the appendix).

3.2 Handshakelines (RS232c only)

The RS232c-interface of the board is equipped with normed handshake lines, which can be activated or deactivated depending on the use, selectable by means of DIP switch 3 switch 2.

DIP-Switch 3 Switch 2

on	RTS ⇔ CTS handshake active
off	RTS ⇔ CTS handshake not active

The RS232 control lines RTS can be used alternatively as a second pulse. For this the handshake switch must be activated.

DIP-Switch 3 Switch 3

on	RTS as second pulse with V.24 level
off	RTS as control line for RS232

> ⚠ If operating the board via RS422/TTY-interface DIP-switch 3 switch 2 must be in the **off** position.
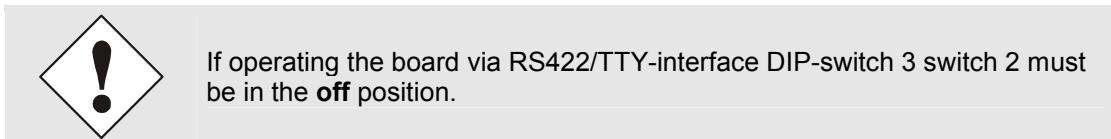
3.3 Pin Allocation

3.3.1 The RS232c-Interface

25-pole Sub-D-connector in the front panel pin no.:	signal designation	96-pole VG-strip pin no.
2	TxD (transmit data)	2a
3	RxD (receive data)	3a
4	RTS (ready to send)	4a
5	CTS (clear to send)	5a
7	0 Volt (GND)	7a

3.3.2 The TTY-Interface (passive)

25-pole Sub-D-connector in the front panel pin no.:	signal designation	96-pole VG-strip pin no.
7	0 Volt (GND)	7a
9	+ output	9a
10	- output	10a
24	+ input	11c
25	- input	12c

3.3.3 RS422-Interface

25-pole Sub-D-connector in the front panel pin no.:	signal designation	96-pole VG-strip pin no.
7	0 Volt (GND)	7a
11	TxD	11a
12	TxD *	12a
22	RxD	9c
23	RxD *	10c

* inverted signal

4   Selection of the Transmission Format by DIP Switch 1

Setting the baud rate, word length, parity mode and stopbits for the data traffic is carried out by means of the DIP switch SW1. The selected configuration then applies to all three interfaces.

For information about the possible settings of the DIP switches please see the diagram in the appendix.

4.1   Output UTC or CEST/CET

This setting is valid only if the system time is put out in the selected string. The NET time is not converted to UTC.

Switch1	meaning
on	output UTC via interface
off	CEST/CET via interface

4.2   Setting the Word Length

switch 2	meaning
on	8-data bit
off	7-data bit

4.3   Setting the Parity-Mode of the Transmission

switch3	switch 4	meaning
on	on	no parity bit
on	off	no parity bit
off	on	parity even
off	off	parity odd

4.4   Setting the Stopbits

switch 5	meaning
on	1-stopbit
off	2-stopbit

4.5   Setting the Baudrate

switch 6	switch 7	switch 8	baudrate
on	on	on	150 Baud
on	on	off	300 Baud
on	off	on	600 Baud
on	off	off	1200 Baud
off	on	on	2400 Baud
off	on	off	4800 Baud
off	off	on	9600 Baud
off	off	off	19200 Baud

5   The Putout Data String

The received time, or the time synchronized by power line, difference time and frequency can be put out via the interfaces in a data string informing about the internal status of the clock. The desired output point of time, the string structure and the used control characters can be selected by means of the DIP-switch SW2.

Possible Settings by DIP-Switch SW2 (see diagram in the appendix)

Second advance is calculated for the system time only.

switch 1	second advance
on	switched on
off	switched off

switch 2	ETX on the second change **only if 'with control characters' was active**
on	with ETX on the second change
off	without ETX on the second change

switch 3	switch 4	switch 5	data string output
off	off	off	*hopf* NetTime A
on	off	off	*hopf* Net Time B
off	on	off	Data String KIA
on	on	off	ABB Network Manager
x	x	on	free

switch 6	control characters STX/ETX
on	transmit with control characters
off	transmit without control characters

switch 7	switch 8	transmission point of time
on	on	transmit every second
on	off	transmit on the minute change
off	on	transmit on the hour change
off	off	free

5.1   Data Format of the Serial Transmission

The data are transmitted in the ASCII format as BCD values using the following special characters:

$0D	= CR (carriage return)
$0A	= LF (line feed)
$02	= STX (start of text)
$03	= ETX (end of text)

In every data string the output of the control characters CR and LF can be swopped by means of **DIP-switch 3 switch 8**. **DIP switch 2 switch 6** can be used to suppress the output of the control characters STX and ETX.

6 Data Strings

6.1 *hopf* Net Time A

The control characters STX and ETX are transmitted only if DIP-Switch 2 is set to output "with control characters" only (DIP-Switch 2 switch 6 = on). Otherwise there are no control characters. In case of the setting "ETX delayed" the last character (ETX) is transmitted on the next second change.

Data string structure

Character No.	Meaning	Hex-Value
1	STX (start of text)	$02
2	Status (internal clock status)	$30-39, $41-46
3	day of the week	$31-37
4	tens hour	$30-32
5	unit hour	$30-39
6	tens minute	$30-35
7	unit minute	$30-39
8	tens second	$30-35
9	unit second	$30-39
10	tens day	$30-33
11	unit day	$30-39
12	tens month	$30-31
13	unit month	$30-39
14	tens year	$30-39
15	unit year	$30-39
16	CR (carriage return)	$0D
17	LF (line feed)	$0A
18	tens frequency	$30-39
19	unit frequency	$30-39
20	1/10 frequency	$30-39
21	1/100 frequency	$30-39
22	1/1000 frequency	$30-39
23	CR (carriage return)	$0D
24	LF (line feed)	$0A
25	NET time tens hour	$30-32
26	NET time unit hour	$30-39
27	NET time tens minute	$30-35
28	NET time unit minute	$30-39
29	NET time tens second	$30-35
30	NET time unit second	$30-39
31	CR (carriage return)	$0D
32	LF (line feed)	$0A
33	difference time sign	$30, $31
34	difference time unit hour	$30
35	difference time tens minute	$30-35
36	difference time unit minute	$30-39
37	difference time tens second	$30-35
38	difference time unit second	$30-39
39	1/10 difference time	$30-39
40	1/100 difference time	$30-39
41	1/1000difference time	$30-39
42	CR (carriage return)	$0D
43	LF (line feed)	$0A
44	ETX (end of text)	$03

6.1.1 Signs in the Statusbyte of the Difference Time

The difference time "system time - NET time" can be either positive or negative. The tens digit in the hour signalizes the sign of the difference time.

Part of the Data String	Sign	Difference Time (hh:mm:ss.msec)
...(CR)(LF)**0**00000123(CR)(LF)...	positive	+00:00:00.123 h
...(CR)(LF)**1**02345456(CR)(LF)...	negative	-00:23:45.456 h

6.1.2 Difference Time

The difference time is limited to 00:59:59.999 hours.

6.1.3 Status- and Day of the Week Nibble

The second and the third ASCII characters contain the status and the day of the week. The status is decoded binarily.

Structure of these characters:

	b3	b2	b1	b0	meaning
status nibble:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (ST-WT-ST)
	x	x	0	x	wintertime (WT)
	x	x	1	x	summertime (ST)
	0	0	x	x	time/date invalid
	0	1	x	x	crystal operation
	1	0	x	x	radio operation
	1	1	x	x	radio operation (high accuracy)
day of the week nibble	0	x	x	x	CEST/CET
	1	x	x	x	UTC time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

6.1.4 Example of a Transmitted Data String

(STX)C3123456030196(CR)(LF)49998(CR)(LF)123456(CR)(LF)100000123(CR)(LF)(ETX)

negative difference

radio operation (high accuracy)
wintertime, no announcement
It is Wednesday the 03.01.1996 - 12:34:56 o'clock
actual frequency = 49,998 Hz
net time = 12:34:56
difference time (system ⇨ net time) = -123 milliseconds
( ) ASCII-control characters e.g. (STX)

6.2   *hopf* Net Time B

The control characters STX and ETX are transmitted only if DIP-Switch 2 is set to output "with control characters" only (DIP-Switch 2 switch 6 = on). Otherwise there are no control characters. In case of the setting "ETX delayed" the last character (ETX) is transmitted on the next second change.

Data String Structure

Character No.	Meaning	Hex-Value
1	(STX) Start of Text	$02
2	"R" ASCII R (ident. NET time)	$52
3	":" colon	$3A
4	tens hour	$30-32
5	unit hour	$30-39
6	":" colon	$3A
7	tens minute	$30-35
8	unit minute	$30-39
9	":" colon	$3A
10	tens second	$30-35
11	unit second	$30-39
12	(LF) line feed	$0A
13	(CR) carriage return	$0D
14	"D" ASCII D (ident. difference time)	$44
15	":" colon	$3A
16	+/- sign of difference	$2B/2D
17	hundred second	$30-39
18	tens second	$30-39
19	unit second	$30-39
20	"." point	$2D
21	1/10 second	$30-39
22	1/100 second	$30-39
23	1/1000 second	$30-39
24	(LF) line feed	$0A
25	(CR) carriage return	$0D
26	"F" ASCII F (ident. frequency)	$46
27	":" colon	$3A
28	tens frequency	$30-39
29	unit frequency	$30-39
30	"." point	$2D
31	1/10 frequency	$30-39
32	1/100 frequency	$30-39
33	1/1000 frequency	$30-39
34	(LF) line feed	$0A
35	(CR) carriage return	$0D
36	(ETX) end of text	$03

6.2.1 Example of a Transmitted Data String

(STX)R:12:34:56(CR)(LF)D+000.123(CR)(LF)F:50.002(CR)(LF)(ETX)

- It is 12:34:56 NET time
- difference to system time= +000,123 seconds
- actual frequency = 50,002 Hz
- ( ) ASCII-control characters e.g. (STX)

6.2.2 Difference Time for *hopf* Net Time B

The difference time is limited to +/-999.999.

6.3   Data String KIA

The control characters STX and ETX are transmitted only if the output "with control characters" has been set at DIP switch 2 (DIP-Switch 2 Switch 6 = on). Otherwise there are no control characters. In case of the setting "ETX delayed" the last character (ETX) is transmitted on the next second change.

Character No.	Meaning	Hex-Value
1	(STX) Start of Text	$02
2	"S" ASCII S (ident. system time/date)	$53
3	Status nibble high	$30-39, $41-46
4	Status nibble low	$30-39, $41-46
5	tens hour	$30-32
6	unit hour	$30-39
7	tens minute	$30-35
8	unit minute	$30-39
9	tens second	$30-35
10	unit second	$30-39
11	tens day	$30-33
12	unit day	$30-39
13	tens month	$30-31
14	unit month	$30-39
15	tens year	$30-39
16	unit year	$30-39
17	(LF) line feed	$0A
18	(CR) carriage return	$0D
Depending on connected boards 7515RC the string (character 19-28) will be repeated up to 4 times:		
19	"F" ASCII F (ident. frequency)	$46
20	mains no.	$31-39
21	tens frequency	$30-39
22	unit frequency	$30-39
23	"." point	$2E
24	1/10 frequency	$30-39
25	1/100 frequency	$30-39
26	1/1000 frequency	$30-39
27	(LF) line feed	$0A
28	(CR) carriage return	$0D
last character	(ETX) End of Text	$03

6.3.1 Status

	b3	b2	b1	b0	meaning
status nibble:	x	x	x	0	no announcement hour
	x	x	x	1	announcement (ST-WT-ST)
	x	x	0	x	wintertime (WT)
	x	x	1	x	summertime (ST)
	0	0	x	x	time/date invalid
	0	1	x	x	crystal operation
	1	0	x	x	radio operation
	1	1	x	x	radio operation (high accuracy)
day of the week nibble	0	x	x	x	CEST/CET
	1	x	x	x	UTC time
	x	0	0	1	Monday
	x	0	1	0	Tuesday
	x	0	1	1	Wednesday
	x	1	0	0	Thursday
	x	1	0	1	Friday
	x	1	1	0	Saturday
	x	1	1	1	Sunday

6.3.2 Example

(STX)SC5123456170205(CR)(LF) F150.002(CR)(LF) F249.997(CR)(LF) (ETX)

- It is Friday February the 17th 2005 at 12:34:56 o'clock
- radio operation, high accuracy
- wintertime (CET)
- no announcement hour ST-WT-ST
- actual frequency (board 7515 no.1) = 50,002 Hz
- actual frequency (board 7515 no.2) = 49,997 Hz
- (more boards 7515 are not implemented)
- ( ) ASCII control character e.g. (STX)

6.4 Data String ABB Network Manager

6.4.1 Specified Settings

Required settings for this string with **DIP switch 1**:

- local time
- 9600 baud
- no parity
- 7 data bits
- 2 stop bits

DIP switch 1 / switcher	1	2	3	4	5	6	7	8
	off	off	on	on	off	off	off	on

Required settings for this string with **DIP switch 2**:

- ABB Network Manager
- no second advanced
- no control characters
- without ETX at second change
- output every second

DIP switch 2 / switcher	1	2	3	4	5	6	7	8
	off	off	on	on	off	off	on	on

Required settings for **DIP switch 3 / switcher 8**:

- CR – LF:

DIP switch 3 / switcher	1	2	3	4	5	6	7	8
	x	x	x	x	x	x	x	on

6.4.2   Structure

Character No.	Meaning	Hex-Value
1	"T" ASCII T (ident. time)	$54
2	":" colon	$3A
3	tens year	$30-39
4	unit year	$30-39
5	":" colon	$3A
6	tens month	$30-31
7	unit month	$30-39
8	":" colon	$3A
9	tens day	$30-33
10	unit day	$30-39
11	":" colon	$3A
12	tens day of week [1]	$30
13	unit day of week [1]	$31-37
14	":" colon	$3A
15	tens hour	$30-32
16	unit hour	$30-39
17	":" colon	$3A
18	tens minute	$30-35
19	unit minute	$30-39
20	":" colon	$3A
21	tens second	$30-35
22	unit second	$30-39
23	"D" ASCII D (ident. time deviation)	$44
24	":" colon	$3A
25	+/- sign of difference	$2B/2D
26	hundreds second	$30-39
27	tens second	$30-39
28	unit second	$30-39
29	"." point	$2E
30	tenth second	$30-39
31	hundredth second	$30-39
32	thousandth second	$30-39
33	"F" ASCII F (ident. frequency)	$46
34	":" colon	$3A
35	tens frequency	$30-39
36	unit frequency	$30-39
37	":" point	$2E
38	tenth frequency	$30-39
39	hundredth frequency	$30-39
40	thousandth frequency	$30-39
41	(CR) carriage return	$0D
42	(LF) line feed	$0A

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[1] Day of the Week: 1 = Monday to 7 = Sunday

6.4.3 Example

T:05:02:17:06:12:34:56D+000.123F:50.002(CR)(LF)

- It is Saturday February the 17th 2005 at 12:34:56 o'clock
- difference to system time = +000,123 seconds
- actual frequency = 50,002 Hz
- ( ) ASCII control character e.g. (CR)

6.4.4 Difference Time for ABB Network Manager

The difference time is limited to +/-999.999.

7 Technical Data 7201

operating voltage:	+ 5V DC ± 5%
power consumption	approx. 300 mA
interfaces:	TTY-passiv / RS232c / RS422
data format:	ASCII
special designs:	soft and hardware alterations according to customer specifications are possible

> The **hopf** company withholds the right to technical alterations in soft and hardware at any time.

hopf Elektronik GmbH

SW1 - SW3 : Standardeinstellung ab Werk
SW1 - SW3 : standard ex works

Strombegrenzung (680R) TTYin
current limit (680R) TTYin

Strombegrenzung (680R) TTYout
current limit (680R) TTYout

SW1
1	Ausgabe UTC / MEZ
2	Wortlänge 8 Bit / 7 Bit
3, 4	Parity
5	Stop-Bit
6-8	Baudrate

SW1
1	output UTC / CET
2	word length 8 Bit / 7 Bit
3, 4	paritybit
5	stopbit
6-8	baudrate

SW2
1	Sekundenvorlauf
2	ETX zum Sekundenwechsel
3, 4	Datenstring
5	Uhrzeit / Datum
6	Senden mit Steuerzeichen
7, 8	Sendezeitpunkt

SW2
1	second advance
2	ETX at second change
3, 4	data string
5	time / date
6	send with control character
7, 8	point of transmit

SW3
1	RS232 u. RS422 / TTY
2	CTS handshake
3	RTS (sec. pulse / ctrl. line for RS232)
4, 5	programgroup select
6	board select
7	board select
8	CR/LF-switching

SW3
1	RS232 u. RS422 / TTY
2	CTS Handshake
3	RTS (Sek.Imp. / Steuerltg. für RS232)
4, 5	Programmgruppenwahl
6	Kartenauswahl
7	Kartenauswahl
8	CR/LF-Umschaltung

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