Industriefunkuhren

hopf Elektronik GmbH

Technical Manual

Slave Clock Control Board for System 7001RC

Model 7406RC

ENGLISH

Version: 02.03 – 29.11.2010

Valid for Devices 7406RC with FIRMWARE from Version: **02.00**
and REMOTE-SOFTWARE from Version: **02.00**

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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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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 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. 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

CE

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 = Communautés Européennes = 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 Slave Clock Control Board 7406RC

RC Function Board 7406RC is a Slave Clock Control Board for controlling two lines (clock chains) with **clocks operating on a pole-changing pulse basis** or **DCF77 time code clocks**.

It is designed for the central *hopf* clock **System 7001RC** in eurocard size with a 4HP/3U front panel.

- After the once-only set-up of the clock equipment the system operates **maintenance-free**.
- The pulse output of the two lines is monitored so that, in the event of a fault or pulse failure, an **error message** can be transmitted.
- In the event of a fault in pole-changing mode, the **current time of the slave clocks is stored**, such that after the fault has been removed or when the equipment is re-started, the last-transmitted time is available and the slave clocks are re-set independently.
- The **pulse lengths** are adjustable in pole-changing operational mode.
- A **constant voltage supply source external** to the system 7001RC can be connected to RC Function Board 7406RC, to control and supply power to the slave clocks (see ***Chapter 9 Technical Data***).
- RC Function Board 7406RC can synchronise self-setting **DCF77 time code clocks** with the DCF77 data telegram via the line cables. If these clocks have a power supply independently from the System 7001RC they continue to run whilst there is a fault (DCF77 data telegram failure).
- The **summertime/wintertime changeover points** are executed in conjunction with RC Function Board 7406RC.
- The time basis of the lines can be transmitted in **local time** or **UTC time**.
- Due to its **hot-plug capability**, the Board can be removed from and re-connected to the running 7001RC system at any time and at any point, without affecting the function of other system boards. However, to provide the power supply to slave lines, it can be fixed to a connection slot in system 7001RC by means of additional internal wiring.
- Slave Clock Control Board 7406RC is configured via the *hopf* System 7001RC **display / keyboard** or via *hopf*_**RC remote software**.
- Monitoring for insufficient line voltage

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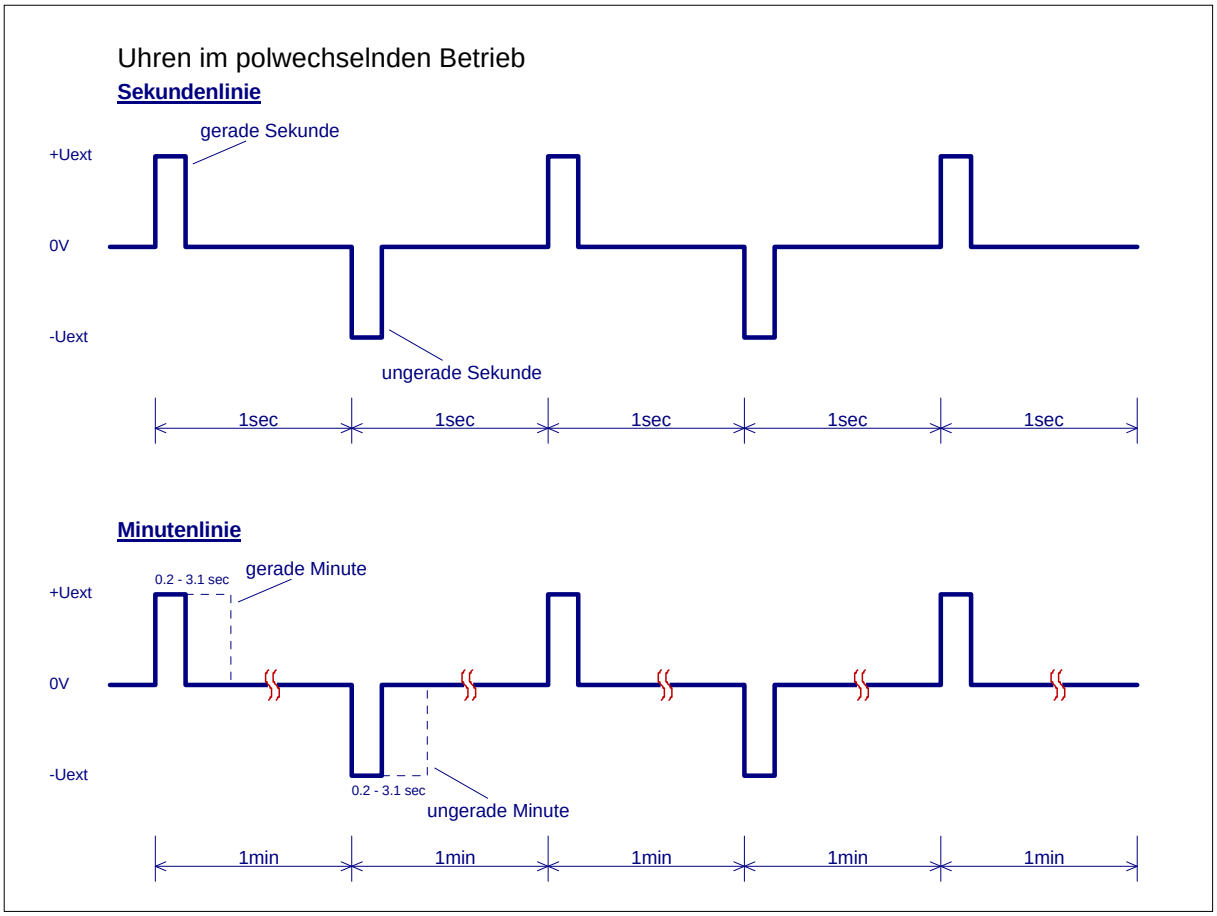
2 Clocks in Pole-Changing Pulse Operation

In pole-changing operation, lines transmit every second for second lines and every minute for minute lines, alternately a positive or negative voltage pulse with the set pulse length.



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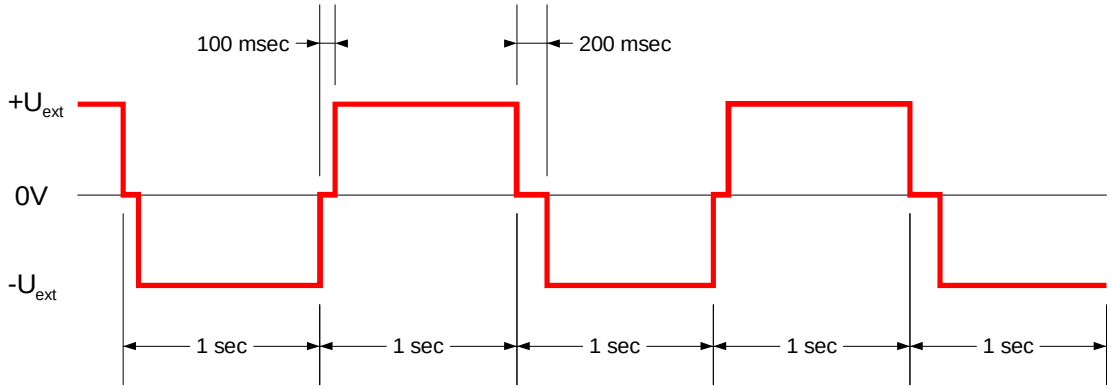
3 DCF77 Time Code Clocks

In DCF77 time code operation, lines transmit a DCF77 time code signal, changing pole on every second change. The DCF77 time code signal is coded according to the period of the zero volt position, 100msec (= logic 0) and 200msec (= logic 1).

Pulse form for DCF77 time code clocks



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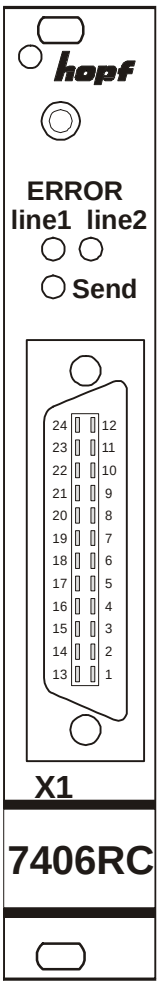
4 RC-Function Board 7406RC Design

Board 7406RC has a 3U/4HP front panel for 19” systems with the following components:

4.1 Front Panel Components



4.1.1 LED Status

Description	Function
line1	Fault LED for line 1
line2	Fault LED for line 2
send	Bus communication LED

4.1.2 Pin Assignment of the 24-pin Delta-Ribbon Socket

Pin No.:	Function
1, 13 *	+Uext, external line voltage supply source
9, 21 *	+U, additional external line voltage supply source
2,10,14,15,22	GND, external line voltage supply source (GND_LU)
3	Relay (normally open contact)
4	Relay (normally closed contact)
16	Relay (common contact)
5 / 17	Monitoring inputs line 1: positive / negative
6 / 18	Pulse outputs line 1: positive / negative
7 / 19	Monitoring inputs line 2: positive / negative
8 / 20	Pulse outputs line 2: positive / negative
11	RxD, serial interface reception line
12	GND, serial interface
23	Not in use
24	TxD, serial interface transmission line

* An external line voltage supply source must not be connected if an internal line voltage supply source is already connected to the slot.

4.1.3 LED Functions

SEND LED	Description
Flashing	Normal case indicating access to the internal bus. Board 7406RC is correctly integrated into the system 7001RC.
Permanently on	Fault on Board 7406RC.
Permanently off	Board 7406RC is not ready for operation.

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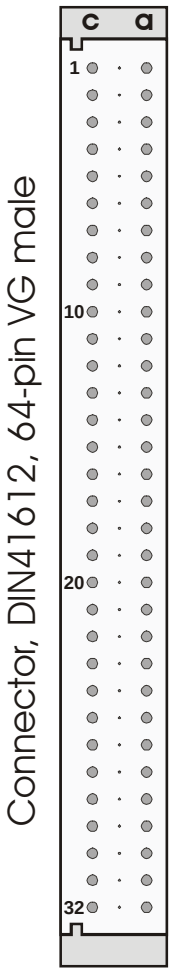
ERROR line 1 / 2	Description
Permanently on	Fault detected in the line (see ***Chapter 7 Faults and Causes of Faults***).
Permanently off	Line is ready for operation.

4.2 VG-Ledge 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	XOUT			**10**
11	R1CC			**11**
12	R1CNC			**12**
13	R1CNO			**13**
14	OERR			**14**
15	1ERR			**15**
16	2ERR			**16**
17	1SCK			**17**
18	XTST			**18**
19	GND_LU		GND_LU	**19**
20	VG20		VG20	**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	AR0UT		ARIN	**27**
28				**28**
29				**29**
30				**30**
31	GND		GND	**31**
32	+5V DC		VCC / 5Volt	**32**

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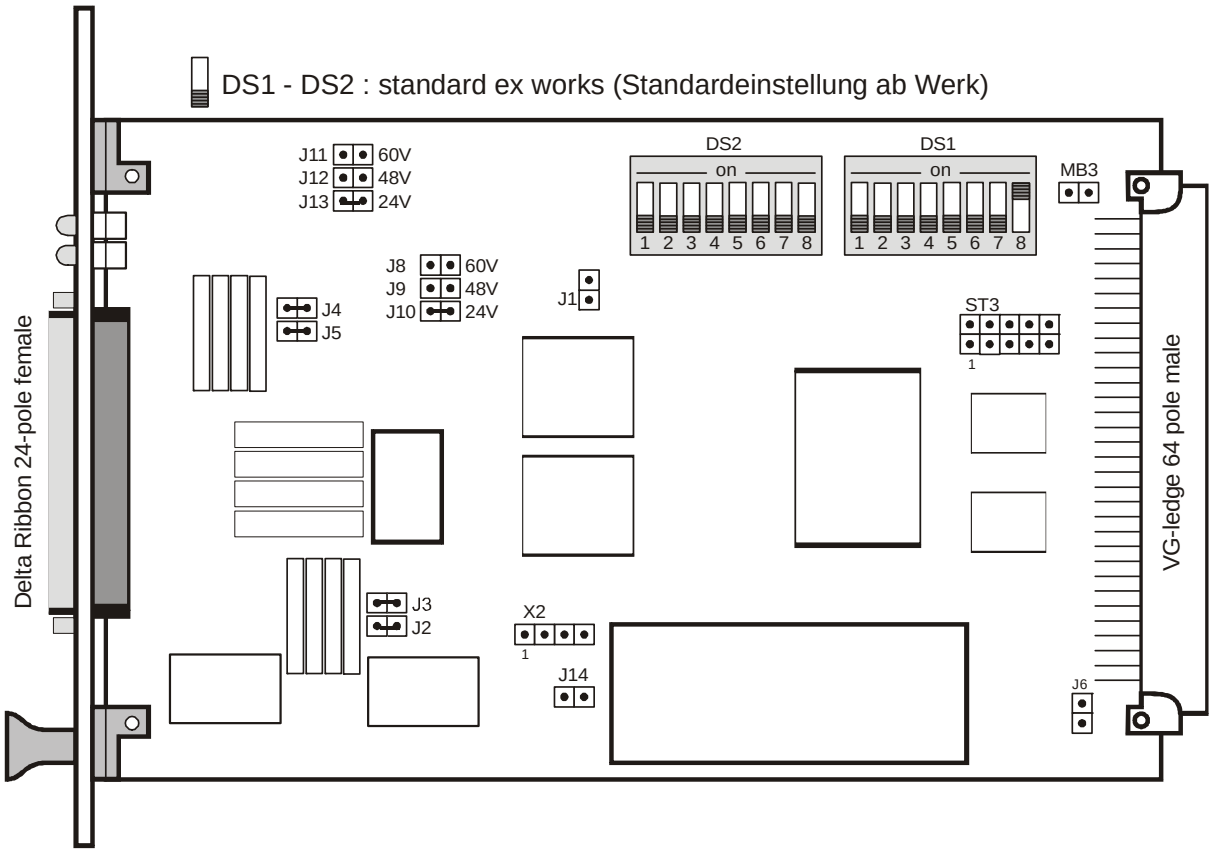
4.3 7406RC Board Assembly Overview



Description	Function
ST3	Service connector
X2	Diagnosis connector
J14, J6	Service jumper
MB3, J1	Operating voltage measuring points (5 V DC)
J8, J9, J10	Voltage monitoring setting for line 1
J11, J12, J13	Voltage monitoring setting for line 2
J2, J3	Diagnosis jumper line 1
J4, J5	Diagnosis jumper line 2

4.3.1 Line Voltage and Monitoring Device Configuration

The lines of RC Function Board 7406RC can be operated with various voltages. For this purpose, jumpers 8-13 (see imprint) must be pre-set for voltage monitoring.

Jumper setting		Line voltage	Monitoring voltage
Line 1	Line 2		Line fault on insufficient voltage
J13	J10	24 V	18 V
J12	J9	48 V	36 V
J11	J8	60 V	45 V

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5 Implementation of the Board 7406RC 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 7406RC
- Installation of the board 7406RC in the system 7001RC
- Parameterization of the board 7406RC
- Activation of the board 7406RC via the system 7001RC

5.1 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.

5.2 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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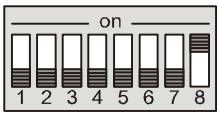
DS1



⇨ **Board 01**

DS1 Pos 4	DS1 Pos 5	DS1 Pos 6	DS1 Pos 7	DS1 Pos 8	Board number in the system 7001RC
off	off	off	off	on	1
off	off	off	on	off	2
off	off	off	on	on	3
off	off	on	off	off	4
off	off	on	off	on	5
off	off	on	on	off	6
off	off	on	on	on	7
off	on	off	off	off	8
off	on	off	off	on	9
off	on	off	on	off	10
off	on	off	on	on	11
off	on	on	off	off	12
off	on	on	off	on	13
off	on	on	on	off	14
off	on	on	on	on	15
on	off	off	off	off	16
on	off	off	off	on	17
on	off	off	on	off	18
on	off	off	on	on	19
on	off	on	off	off	20
on	off	on	off	on	21
on	off	on	on	off	22
on	off	on	on	on	23
on	on	off	off	off	24
on	on	off	off	on	25
on	on	off	on	off	26
on	on	off	on	on	27
on	on	on	off	off	28
on	on	on	off	on	29
on	on	on	on	off	30
on	on	on	on	on	31

5.3 Installation of a new Board 7406RC in the System 7001RC

In order to install a new board 7406RC, 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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5.4 Parametrize / Activating the Board 7406RC 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 6 Administration of the Board 7406RC***)
- 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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6 Administration of the Board 7406RC

The 7001RC base system manual 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.

6.1 Input Functions for the Board 7406RC 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  7406 NO.:04
STATUS:M/-  BOARDNAME:"LINIE   " SET>Y/N
```

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

7406 NR.: 04 ⇨ board type **7406RC** with board number **04**

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

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

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

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6.2 Input Parameter Byte 01

Parameter Byte 01 is shown on the top line with the currently set values.

For the purposes of manipulation, the individual bits of the new byte are to be entered on the second line using **"0"** and **"1"**. The complete Parameter Byte must always be recorded and confirmed with the **ENT** key.

The bits of the Parameter Byte are numbered in descending order:

Bit 7	**Hour Mode Slave Line 1**
0	12 hour operation
1	24 hour operation
Bit 6	**Slave Lines (SL) 2 as minute or second lines**
0	Minutes (SL1) + Seconds (SL2)
1	Minutes (SL1) + Minutes (SL2)
Bit 5	**Summertime/ Wintertime changeover**
0	Stop (1h)
1	Update display
Bit 4	**Hour Mode Slave Line 2**
0	12 hour operation
1	24 hour operation
Bit 3	**No function at present** For compatibility reasons these bits should always be set to **0**.
Bit 2	
Bit 1	
Bit 0	

6.2.1 Bit7/Bit4 - Slave Line 1/2 in 12 or 24 Hour Operation

For pole-changing pulse operation.

With this function, the two lines can control different clocks for pole-changing pulse operation in 12 or 24 hour operation.

- Analogue clocks usually 12 hour operation
- Digital clocks usually 24 hour operation

Slave Line 1:

Bit 7 = 0 ⇨ 12 hour operation

Bit 7 = 1 ⇨ 24 hour operation

Slave Line 2:

Bit 4 = 0 ⇨ 12 hour operation

Bit 4 = 1 ⇨ 24 hour operation

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6.2.2 Bit 6 – Slave Line 2 as Minute or Second Line

For pole-changing pulse operation.

In this mode the two lines of Board 7406RC are controlled as either:

- 2 separate minute lines or
- 1 minute and 1 second lines (for clocks with separate second line)

Bit 6 = 1 ⇨ 2 independent minute slave lines

Both lines are used to control minute slave clock chains.

The Board occupies **two line numbers** in the system.

Bit 6 = 0 ⇨ 1 minute line and 1 second line

The 2nd line of the Board is used to control the seconds' line.

With this setting Board 7406RC occupies only **one common line number** in the system.

6.2.3 Bit 5 - Summertime/Wintertime Changeover

For pole-changing pulse operation.

This function defines the behaviour of the lines on ST/WT changeover.

Bit 5 = 0 ⇨ 1 hour - stop (1h) on ST ⇨ WT changeover

The minute lines wait 1 hour after the changeover from summertime to wintertime.
The line is re-set on changeover from wintertime to summertime.

In order to prevent a data overrun, this function is automatically activated for the minute lines in 24 hour operation, irrespective of the parameter byte settings.

Bit 5 = 1 ⇨ Updating (11/23 h forerun) on ST ⇨ WT

The minute lines are always re-set after the ST/WT changeover.

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6.3 Input Parameter Byte 02

Parameter Byte 02 is accessed by pressing the **ENT** key after setting Parameter Byte 01.

Parameter Byte 02 is shown on the top line with the currently set values.

```
B.7406 NO.:03   OLD: BYTE 02 >11100000<
BYTE = BIT 7..0 NEW: BYTE 02 >~~~~~~~~<
```

For the purposes of manipulation, the individual bits of the new byte are to be entered on the second line using **"0"** and **"1"**. The complete Parameter Byte must always be recorded and confirmed with the **ENT** key.

The bits of the Parameter Byte are numbered in descending order:

```
BYTE 02 >7 6 5 4 3 2 1 0<
```

Bit 7	**Radio status fault signal**
0	In common signal
1	No radio status fault signal
Bit 6	**Pole-changing pulse operation / DCF77 time code**
0	DCF77 time code line
1	Clocks with pole-changing pulse operation
Bit 5	**Time basis of the line output**
0	UTC
1	Local time
Bit 4	**No function at present** For compatibility reasons these bits should always be set to **0**.
Bit 3	
Bit 2	
Bit 1	
Bit 0	

6.3.1 Bit 7 – Fault Signal with Synchronisation Status System 7001RC

Faults are signalled via the drop-out of the alarm relay and transmitted as a common signal. If no faults / errors are present the alarm relay is re-activated.

All faults are signalled via the 24-pin delta-ribbon socket (see ***Chapter 4.1 Front Panel Components***):

See ***Chapter 7 Faults and Causes of Faults*** for possible error messages.

The common signal can be extended with the fault signal *"No synchronisation of the complete system"* with Parameter Byte 02; Bit 7.

Bit 7 = 0 ⇨ Radio synchronisation included in common fault signal

Bit 7 = 1 ⇨ Radio synchronisation not included in common fault signal

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6.3.2 Bit 6 – Line Operating Modes

Function Board 7406RC can be configured to operate clocks with **pole-changing pulse operation** or **DCF77 time code** clocks.

Bit 6 = 1 ⇨ **For pole-changing pulse operation**

Bit 6 = 0 ⇨ **For DCF77 time code clocks**

In **DCF77 time code mode** 2 lines are available for the slave clocks.

6.3.3 Bit 5 – Line Time Basis

For pole-changing pulse operation and DCF77 time code mode.

The line output time for clocks is set up with the following function:

Bit 5 = 1 ⇨ **Local time output with any ST/WT changeover points**

Bit 5 = 0 ⇨ **UTC time output without ST/WT changeover points**

6.4 Input Parameter Byte 03

Parameter Byte 03 is shown on the top line with the currently set values.

For the purposes of manipulation, the individual bits of the new byte are to be entered on the second line using **"0"** and **"1"**. The complete Parameter Byte must always be recorded and confirmed with the **ENT** key.

The bits of the Parameter Byte are numbered in descending order:

Bit 7	**No function at present** For compatibility reasons these bits should always be set to **0**.
Bit 6	
Bit 5	
Bit 4	
Bit 3	
Bit 2	
Bit 1	
Bit 0	

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6.5 Pulse Time for Minute Lines 01 / 02

For pole-changing pulse operation.

The pulse time can be extended for slow-acting clockworks (e.g. due to large, heavy pointers). The pulse time can be adjusted between 0.2 and 3.0 seconds in steps of 0.1 seconds.

Pulse times that are too short on slow-acting clockworks can cause faulty time transfer on individual clocks in the line. For this reason the pulse time is adjusted for the slowest-acting clock in the line.

Pulse times 01 and 02 for minute lines are activated with the **ENT** key after Parameter Byte 03.

```
B.7406 NO.:01 LINIE 01 PULSE >0,2<SEC
               NEW PULSE >~,~<SEC
```

The selected line number 01 or 02 and the associated currently set pulse time are displayed on the top line.

The pulse time is re-entered on the second line (between 0.2 sec and 3.0 sec). The pulse time entered must be confirmed by pressing the **ENT** key.

The pulse time of the **second lines** is not adjustable; this is fixed at 0.2 sec.

6.6 Menu Procedure for Setting Lines

For pole-changing pulse operation.

The slave line time and the RUN/STOP status of the individual lines can be checked and re-set in the main menu SPECIAL-BOARD-TIME:5.

```
B.7406 NO.:01 BOARDNAME:"LINIE   "  Y/N
```

Use key **N** to search for the Board 7406RC to be manipulated and select with the **Y** key.
The following image appears on the display:

```
B.7406 NO:02  BOARDNAME:"LINE 4-5"L:1/2
ST:R T:12.56.56 NEW ST:~ NEW T:~~.~~.~~
```

1st Row:
Selected Board **7406RC**, Number **02**, Name " **LINE 4-5** "

L:1/2 ⇨ Input and display of the Slave Line number of this Board 7406RC

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2nd Row:

ST	⇨	Display status of the selected slave line (**R** = Run und **S** = Stop)
T:12.56.56	⇨	Current time of the selected line
NEW ST:~	⇨	Set the status of the selected line with the **R** and **S** keys; confirm with the **ENT** key.
		S = Stop ⇨ The whole line is stopped (the line time ceases to run in the system 7001RC)
		R = Run ⇨ The whole line is started and is set to the system time using the line time displayed.
NEW T: ~~.~~.~~	⇨	Set the new line time (**00.00.00** – **23.59.59**); confirm with the **ENT** key.

To set the slave lines to the current time (e.g. on first installation or after maintenance work) the slave line time must be re-entered. Care should be taken to ensure that all clocks connected to the line are displaying the same time (e.g. 12.00.00). This time is then entered under **NEW T:**.

The line is automatically re-started after the new slave line time has been re-entered, even if the line has previously been stopped.

6.7 Setting the DCF77 Time Code Clocks

DCF77 time code clocks are self-setting clocks. In order to set the clocks, a DCF77 data telegram is required, which is transmitted via the line cables.

The DCF77 time code clocks set themselves automatically as soon as the DCF77 time telegram has been successfully read in. The DCF77 time telegram and power supply are transmitted via the cable lines.

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7 Faults and Causes of Faults

Faults are signalled by the drop-out of the alarm relay and output as a common signal; a line ERROR is transmitted to the system 7001RC.

If no faults / errors are present the alarm relay is re-activated.

In the event of a fault, the last-transmitted line time is stored, so that the clocks can be re-set, automatically and without service intervention, after the fault has been removed.

The following faults are signalled:

- System 7001RC or Slave Clock Control Board 7406RC has failed or power supply unit is defective
- Fault on Line 1 or Line 2 (e.g.: failure of the external or internal line power supply, line cable disconnected or short-circuited, line voltage too low)
- System 7001RC failure reception status "FUNK" (RADIO) (system synchronisation is faulty)

7.1 Line Failure / Line Voltage Power Failure

A short-circuit or line break in parts of the installation can interrupt the pulse output.

By feeding back the slave line to the monitoring inputs, faults such as short-circuit, line voltage power supply failure, insufficient line monitoring voltage or line break in the clock equipment are identified and signalled via corresponding Error LED's and alarm relays.

Error LEDs lit as soon as a pulse can no longer be restored.
Error LEDs only go out after the fault has been removed and the next minute change has been completed.

- For clocks with pole-changing pulse operation:
  - In the event of one of the above-named faults, the Slave Clock Control Board stops the output of the pole-changing pulses. The alarm relay is activated and the "Error LED's" of the faulty line(s) are lit up on the front panel.
  - An attempt is made to make good the lost pulse until the line monitoring has measured sufficient voltage on the monitoring inputs.
  - After the fault has been removed, failed pulses are automatically made good, so that no additional clock setting is necessary.

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- For DCF77 time code clocks:
  - The alarm relay is activated and the corresponding "Error LED(s)" are lit up on the front panel. The lines are switched to a "backup power supply" optionally. In this way the DCF77 time code clocks can continue to run in quartz mode.

In the case of a short fall of the line voltage the DCF77 Time Code pulses are transmitted furthermore. The result is that some of the DCF77 Time Code Clocks are still running and other clocks which are further away are not running anymore.

  - After the fault has been removed, the output of the DCF77 time telegram continues and voltage is supplied to the clocks again from the "standard power supply source".

7.2 Reverse Polarity

The most common fault is the reverse polarity of individual clockworks or the entire backup clock chain for pole-changing pulse operation.

Effect:

Individual clockworks or the entire clock line run one pulse (minute / second) behind. Even after the line concerned has been stopped the faulty clocks lack one pulse.

Removal:

- Stop the slave line via the 7001RC menu
- Reverse the connection(s) of the clocks (chain) concerned
- Set all clocks on this line to the same time (e.g. 12.00.00)
- Read off the time on the slave line and input in the menu as the new slave line time

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8 Firmware Update

The 7406RC Board can be updated with the latest software via the external serial interface (RS232) on the 24 pin delta-ribbon socket on the Slave Clock Control Board.

Contact *hopf* Elektronik GmbH if necessary!

9 Technical Data

General Data	
Board dimensions:	Eurocard 160 x 100 mm (4HP / 3U)
Number of slave lines:	max. 2
MTBF:	> 150,000 hours

Power Supply	
Internal system voltage V_{CC}:	5V DC ±5% via system bus
Line voltage (external):	24..60V / 1A per line
Line voltage (internal, optional):	24..60V / 500mA per line (other voltage power supplies on request)

Contact Power Rating	
Alarm relay:	24V / 20mA
Line changeover relay:	24..60V / 1A
Potential separation:	min. 1500V DC

Environmental Conditions		
Temperature range:	Operating:	0°C to +70°C
	Storage:	-30°C to +85°C

Signal Outputs	
Serial interfaces:	RS232 interface (without handshake) via 24-pin delta-ribbon socket X1 in the board front panel

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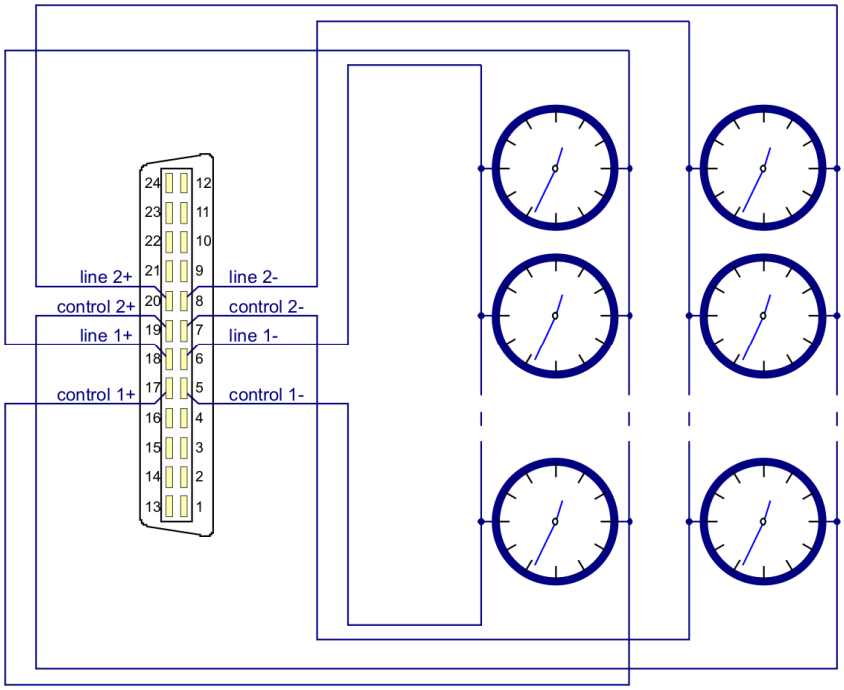
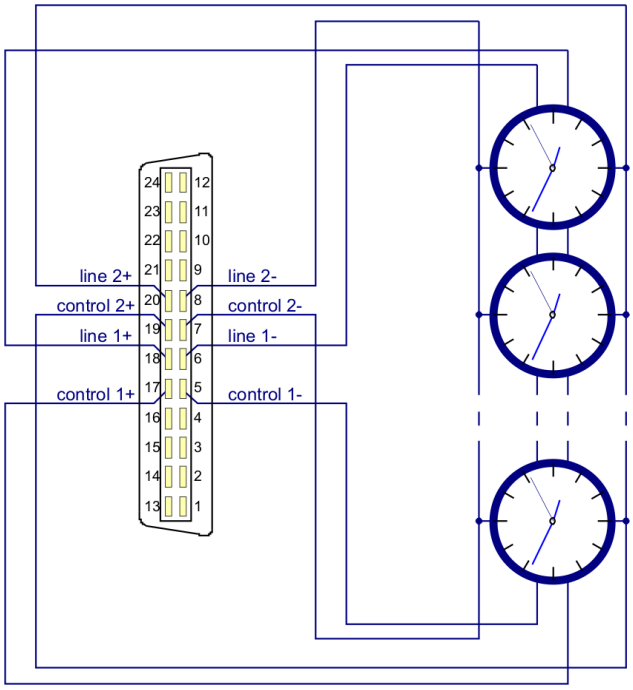
10 Appendix

10.1 Connection Examples for Two Minute Lines (with voltage monitoring)



10.2 Connection Example for Minute and Second Line (with voltage monitoring)



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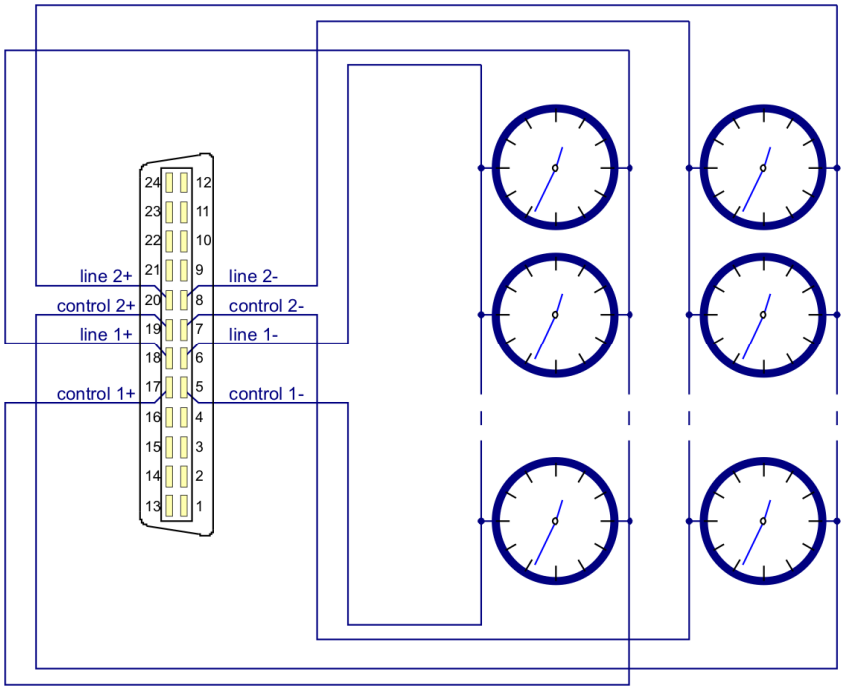
10.3 Connection Example for DCF77 Time Code Clocks (with voltage monitoring)



If pulse monitoring of the lines is **not** required, the corresponding pins can be shorted out directly on the 24-pin delta-ribbon socket.

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