Technical Description

Master Clock Board with two Synchronous Clocks
7405

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1 Functions of the Master Clock Board

Up to 2 synchronous clocks can be driven with the master clock board 7405. A synchronous line is a parallel connection between clockworks with stepping motor drive. On every minute change the board releases a pole alternating direct current pulse of defined duration.

In even minutes forward voltage to output line x + and in odd minutes forward voltage to output line x -.

The board is equipped with a failure and trouble supervision, i.e. once the clock system is set the unit runs maintenance free and adjusts the synchronous clocks automatically after a voltage failure.

DCF77- and GPS-synchronised clock systems recognise the summer- / wintertime changeovers and carry them out.

Block diagram
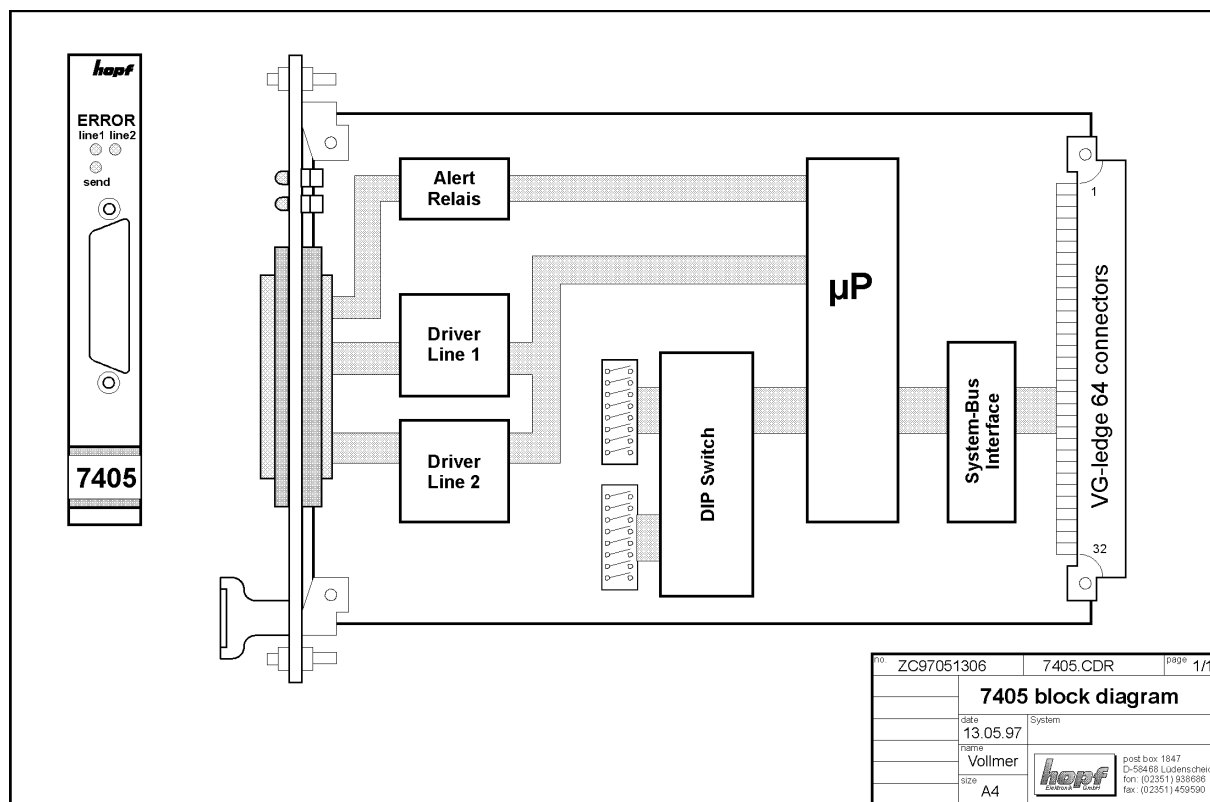
2 Operating Modes

The board 7405 can either drive 2 minute synchronous lines or 1 minute and 1 second synchronous line, but in minute/second operation the two pulse outputs appear as one line.

2.1 Operation as 2 Independent Minute-Synchronous Lines

DIP-switch SW0; switch 2 = off   ⇨   2 independent minute-synchronous lines

Both lines of the board are used to drive minute-synchronous clock chains. The board covers two line-numbers in the system.

2.2 Operation as Minute- and Second-Synchronous Line

DIP-switch SW0; switch 2 = on   ⇨   synchronous line 2 with second pulses

The 2nd line of the board is used for driving second lines. In this setting the board appears as only one line-number in the system. In case of a failure the seconds are altered only within a minute

2.3 Operation with 12/24 Hour Output

DIP-switch SW0; switch 1 = on   ⇨   24 hour operation
DIP-switch SW0; switch 1 = off   ⇨   12 hour operation

In this setting the output of the minute pulse is *day correct.* When setting the clock the pulse output is either 12 or 24 hours per day (meant for the operation with mechanical time displays). Synchronous clocks are not continued *day correctly.*

2.4 Stop at Summer-/Wintertime Changeover

DIP-switch SW0; switch 3 = on   ⇨   1 hour - stop at SZ ⇨ WZ
DIP-switch SW0; switch 3 = off   ⇨   11/23 hour forerun at SZ ⇨ WZ

When this function has been activated the minute lines wait for an hour after the changeover from summer- to wintertime.

2.5 Operation with Date Correct Output

DIP-switch SW0; switch 4 = on   ⇨   date correct output
DIP-switch SW0; switch 4 = off   ⇨   12 hour operating

In this setting the minute pulses are put out date correctly. I.e. in months with less than 31 days the missing pulses for the 31st day are put out in fast forward at the end of the month (for the operation with check clocks). Seconds are not put out date correctly.

3 Synchronous Line Number and Board Addressing

The setting should only be carried out by trained service personnel (board addressing of the system see appendix A).

Up to 8 synchronous lines can be run in one clock system simultaneously. A mixed instrumentation with minute- and second-synchronous lines is possible.

Depending on the operating mode (minute/minute or minute/second) the board is run as one or two synchronous clock chains and addressed in the master clock dialogue of the system 7001.

☞   **_Please note :_**   DIP-switch SW0 is needed for the synchronous line selection of the board.

The switches 5 to 8 select the synchronous line number. A board is always set to the next free line.

	DIP-switch position SW0				selected lines
	5	**6**	**7**	**8**	
	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

Below an example for a mixed instrumentation of a system 7001 unit.

Board	**DIP-switch position SW0**				**selected lines**
	5	**6**	**7**	**8**	
1	on	on	on	on	line 1 and 2 (only min)
2	on	on	off	on	line 3 with second line
3	on	on	off	off	line 4 and 5 (only min)
4	on	off	on	off	line 6 and 7 (only min)

Only with this line-combination the settings are possible!

☞   **_Please note :_**   In the system line-numbers must not overlap.

4 Synchronous Line Voltage and Supervision Equipment

The board can be run on different voltages. When a voltage for the supervision has been pre-selected by means of the DIP-switch SW1 switch 1 and 2.

DIP-switch position SW1		line voltage	supervision voltage
1	2		
on	on	12 volt	9 volt
on	off	24 volt	18 volt
off	on	48 volt	36 volt
off	off	60 volt	45 volt

If the voltage drops below the set supervision voltage the master clock board stops the output of pole alternating pulses. The failure indication relay closes (connection see appendix B) and the failure-LED in the front panel lights up.

The board now tries to recover the pulses missed because of the too low voltage until the line supervision has measured an adequate voltage at the supervision input.

5 Installation of a Clock System with Master Clock Function

The clock lines are connected to the 24-pole delta-ribbon connector of the master clock board (connector usage see appendix B). Please ensure the correct polarity clock connections. The supervision input of the used lines must be connected to the end of the synchronous clock chain.

Depending on the version of the line system the voltage supply for the lines may have to be connected in the front plug (see appendix A system configuration).

When dimensioning the clock lines please consider the max. permissible line power (max. number of clockworks of the system).

standard = at 24 volt max. 2A complete line power to the system (1A every line with external voltage supply)

Important

internal power supply   bridge BR1 closed
external power supply   bridge BR1 open

5.1 Setting the Synchronous Clock Chain

To set clock-system 7001 with the transmitter DCF77 or GPS see Chapter "Antenna Installation".

You can also set the time by keyboard, when the reception is troubled. There must be a valid time in the display (crystal operation).

5.2 Menu Process to Set the Synchronous Clock

👉 ***Please note :*** If the board is run in the system 6855, the settings must be taken over from the description of the system 6855.

Pressing the key **"ENT"** displays the following start picture:

Start picture
```
SET: 1   SHOW: 2     INI: 3     MON: 4       S.-CLK: 5
PROG.-R: R    MASTER-R: M      INPUT 1-5: ,R ,M
```

Press key **"5"** for synchronous clock manipulation (S.-CLK).

Entry Picture
```
SLAVE-CLOCK MANIPULATIONS Y/N
```

Confirm request with **"Y"**.

The following picture is displayed:
```
NLI 1-8 / SYN.-CLOCK 1 - 8 - > <
R = RUN S = STOP I = IMPULS-TIME
```

Now press **"1"** for synchronous clock 1 or any other according number.

Entry picture
```
SLAVE CLK.1 : 12.34.56 . . 06.12.95 . . 03
ST = RUN      ->                 <
```

Explanation of the entry picture

The top line shows the actual synchronous clock time
here for example 12.34.56 h - 06.12.95

At the end of the line (here **"03"** = 0,3s) the duration of the pulse is shown.

The bottom line shows the state of the synchronous clock by **ST = STOP/RUN**

The time of the synchronous clock can be set anew in the entry picture. Therefore the clock line must be stopped with the order **STOP**.

Example

set the synchronous time to 12.30.25 h - 12.12.1995:
```
->12.30.25 . . 12.12.95<
```
"ENT"

Example

Setting the slave clock pulses:

I.05 "ENT" => setting the slave clock pulse to 0.5 sec.

I.10 "ENT" => setting the slave clock pulse to 1.0 sec.

In case of the minute lines the pulse time can be set between **I.02** (0.2 sec) and **I.32** (3.2 sec). In case of the second line the pulse time cannot be set!

The key **"BS/HO"** cancels the character entered last and key **"BR/DL"** takes you back to the system time.

6 Faults and Their Possible Causes

6.1 Line Error

By feeding the synchronous line back to the supervision inputs (pos. also bridges directly at the plug if the supervision should be turned off) the clock system recognises faults like short circuits or a cable break and indicates them by LED and relay. Missed pulses are made up for automatically by the clock system after the failure is cured.

6.2 Poling Error

The most common mistake is the wrong poling of clock works or the complete synchronous clock chain.

Effect:

Some clockworks or the complete clock line lag one pulse behind. Even if the line concerned stops, the disturbed clocks miss one pulse.

Repair:

Exchange the connections to the clocks/lines concerned

6.3 Voltage Failure

A short circuit or a cable break in parts of the installation can interrupt the output of pulses. When the fault is repaired the missed pulses are made up automatically.

6.4 Error Message

The relay just-release value informs of the following errors:

1. system is switched off or the mains unit has a defect
2. clock one on the board is disturbed
3. clock 2 on the board is disturbed
4. the synchronisation of the system is disturbed

Errors or faults in a synchronous clock are put out as a collective message via a relay. If there is no fault the relay is closed. The error message **"no synchronisation of the whole system "** can be added to the collective message by means of switch 3 in DIP-switch SW1.

DIP-Switch SW1; switch 3 = on ⇨   radio synchronisation-error message contained in collective message

DIP-Switch SW1; switch 3 = off ⇨   radio synchronisation-error message **not** contained in collective message

The system can be synchronised by either DCF77, GPS or by the serial data string DCF-slave from other **hopf** systems .

6.5 Board in the Old System 7000

The board can be used in the old system 7000 (radioboard 7010) and also in the new system 7001. With regard to the operation of the control board 7010 as a clock board in the old system 7000 the **push button 4** has to be turned on by **DIP-Switch 1**. You can get the information about the handling of the master clock board in the old system from the description of the old master clock system.

DIP-Switch 1 push button 4 = on   ⇨ old system 7000 with radioboard 7010
DIP-Switch 1 push button 4 = off   ⇨ new system 7001 with radioboard 7015

6.6 Setting the Pulse Duration when Operating in the Old System 7000

The pulse duration for both clock lines (in the old system 7000) is adjusted by DIP-Switch 1 push button 5-8.

SW 5	SW 6	SW 7	SW 8	pulse time [msec]
on	on	on	on	200
on	on	on	off	300
on	on	off	on	400
on	on	off	off	500
on	off	on	on	600
on	off	on	off	700
on	off	off	on	800
on	off	off	off	1.000
off	on	on	on	1.200
off	on	on	off	1.500
off	on	off	on	1.800
off	on	off	off	2.000
off	off	on	on	2.200
off	off	on	off	2.500
off	off	off	on	2.800
off	off	off	off	3.000

7 Technical Data

voltage supply:	+ 5 V DC ± 5%
synchronous clock:	24 Volt - 1 A per line
voltage supply to system:	24 Volt - 0,5 A per line
	other voltage supplies on request
number of lines	max. 2
driver power	max. 50 synchronous clocks per line (24 volt / 20mA)

disturbance relay

contact load capacity :	24 V / 20 mA

extras

pulse supervision, fault indication, recoverable time-synchronisation after a voltage failure, automatic adjustment at daylight-saving- / and standard-time changeover

customising: hard- and software alterations available on request

Please note : The **hopf** company withhold the right to hard and software alterations.

8 Positionsaufdruck

SW0 - SW1 : standard ex works (Standardeinstellung ab Werk)

BR1

SW1

on

1 2 3 4 5 6 7 8

J0

J9

B1

B2

SW0

on

1 2 3 4 5 6 7 8
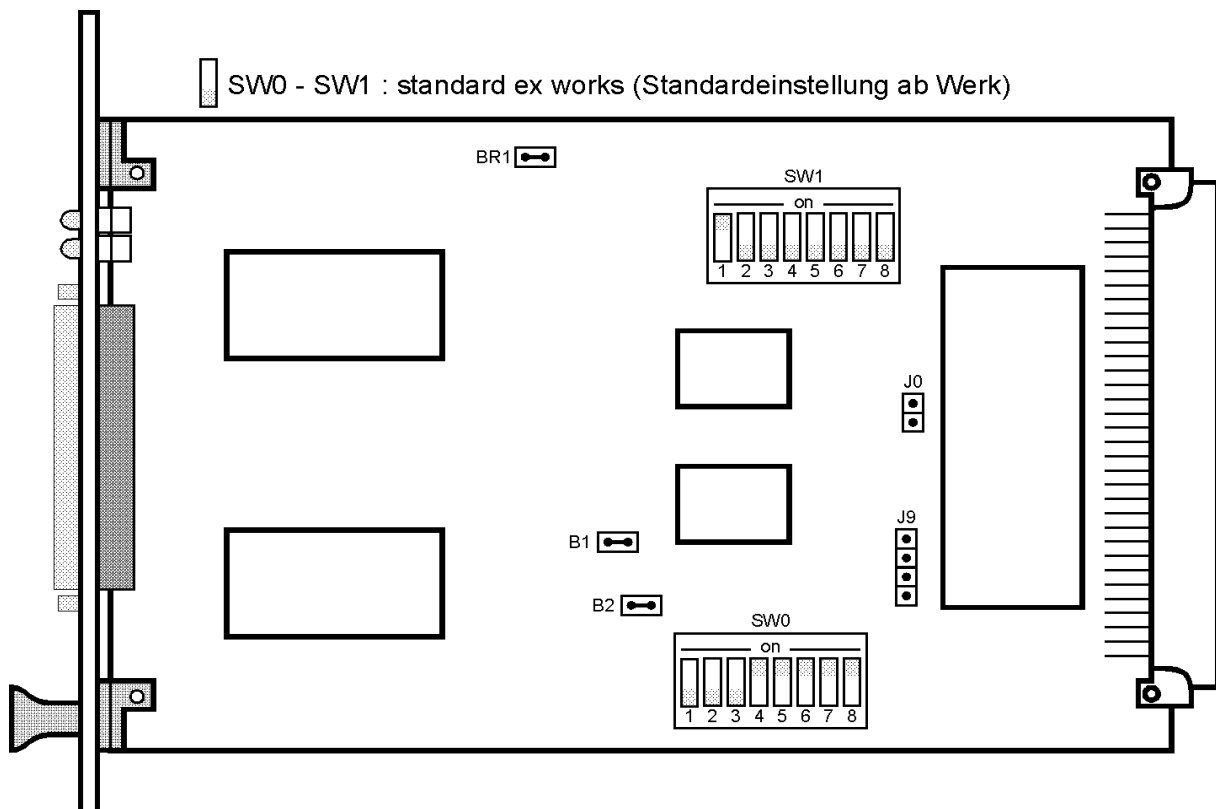
9 Appendix A

9.1 System Configuration and Board Addressing of the System

to be filled in by the tester: name: _____   date: _____

voltage supply internal   yes/no   _____ volt   _____ ampere

the following entries are possible:

function	used secondary line no.
minute/ minute	line: x,y
minute/second	line:z
minute/ minute date correct	line:x,y
minute/second date correct	line:z

Board 1
_____

Board 2
_____

Board 3
_____

Board 4
_____

Board 5
_____

Board 6
_____

Board 7
_____

Board 8
_____

Board 9
_____

Board 10
_____

Board 11
_____

Board 12
_____

Board 13
_____

Board 14
_____

Board 15
_____

Board 16
_____

10 Appendix B

10.1 Assignment of the 24 Pole Delta Ribbon Connector in the Front Panel

```
                    ┌─────────────┐
                    │ 24 │ │ │ 12 │
                    │ 23 │ │ │ 11 │
                    │ 22 │ │ │ 10 │
                    │ 21 │ │ │ 9  │
  line      2+      │ 20 │ │ │ 8  │  line      2-
  control   2+      │ 19 │ │ │ 7  │  control   2-
  line      1+      │ 18 │ │ │ 6  │  line      1-
  control   1+      │ 17 │ │ │ 5  │  control   1-
  common (c)        │ 16 │ │ │ 4  │  normaly close (nc)
                    │ 15 │ │ │ 3  │  normaly open (no)
  GND               │ 14 │ │ │ 2  │  GND
  +V        Linie   │ 13 │ │ │ 1  │  +V    input for external
                    └─────────────┘       line-voltage
```
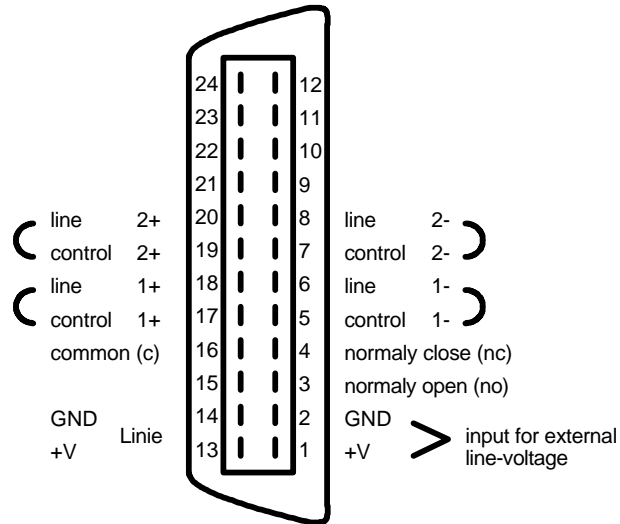
10.2 Connector with a small slave-clock-chain and return with both lines

Masterclock 7405

L2+ Out
L2- Out
L1+ Out
L1- Out
L1- Control
L1+ Control
L2- Control
L2+ Control