

Industriefunkuhren



---

**Technical Manual**

IRIG-B Output Board

**Model 7266 Master and  
Model 7266 Slave**

ENGLISH

Version: 01.06 – 07.08.2007

---

Valid for Devices 7266 with FIRMWARE Version: 01.xx



## **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 DECIMAL POINT IN THE VERSION NUMBER INDICATE CORRECTIONS OF ONLY MINIMAL IMPORTANCE IN THE FIRMWARE / DESCRIPTION AND ARE OF NO SIGNIFICANCE FOR THE FUNCTION.

## **Downloading Technical Descriptions**

All current descriptions of our products are available free of charge via our homepage on the Internet.

Homepage: <http://www.hopf.com>

Direct link to the technical descriptions: <http://www.hopf.com/manuals>

## **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. 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 = 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.

<b>Contents</b>	<b>Page</b>
<b>1 General description of functions</b> .....	<b>7</b>
<b>2 IRIG-B Format</b> .....	<b>7</b>
2.1 IRIG-B Standard 200-98 .....	7
2.1.1 IRIG-B Output .....	8
2.1.2 Format categories IRIG-Bxxx.....	8
2.2 IRIG-B Extensions.....	8
2.2.1 IRIG IEEE 1344-1995 .....	8
2.2.2 AFNOR NFS 87-500 .....	8
<b>3 Hardware</b> .....	<b>9</b>
3.1 Board 7266 Master.....	9
3.1.1 Front Panel 3U/4HP .....	9
3.1.2 Board Configuration .....	10
3.1.3 VG-Strip Connector 64-pole (DIN 41612).....	12
3.2 Board 7266 Slave.....	13
3.2.1 Front Panel 3U/4HP .....	13
3.2.2 Board Configuration .....	13
3.2.3 VG-Strip Connector 64-pole (DIN 41612).....	13
<b>4 Description of Hardware</b> .....	<b>14</b>
4.1 Settings on the Board 7266 Master.....	14
4.1.1 Bus 6000/7001 Selection .....	14
4.1.2 Control of the 2. Digital Output D2 (IRIG/PPS/DCF77-Pulse).....	14
4.1.3 Selection of 'UTC'/'Local Time' in the IRIG String .....	14
4.1.4 Switch Binary Seconds of the Day on/off in the Data String .....	14
4.1.5 Mode Setting (AFNOR/IRIG-B) .....	14
4.2 Settings of the Board 7266 Slave.....	15
4.3 Signal Output .....	15
4.3.1 Signals at the Front Panel.....	15
4.3.2 Signals at the VG-Strip Connector 64-pole (DIN 41612).....	15
<b>5 Technical Data</b> .....	<b>16</b>
<b>6 Glossary</b> .....	<b>17</b>



# 1 General description of functions

Serial output of time information with the 7266 board is in IRIG format. There are varying IRIG time codes which differ as to the repeatability frame and the number of bits transmitted. They are identified by means of the attachment of a letter in alphabetical order A, B, C, D etc.. The most frequently used time frame is the IRIG-B Code. A choice of hardware interfaces and data formats is available on the board 7266 master. The slave board 7266 can be used to duplicate the signals from the master board 7266.

## 2 IRIG-B Format

### 2.1 IRIG-B Standard 200-98

The IRIG-B format consists of one time code with 74 bits and has a repeatability rate of one second. The bit frame is 10 msec. The rating of a bit is displayed by a pulse amplitude modulation and is shown in multiples of a millisecond.

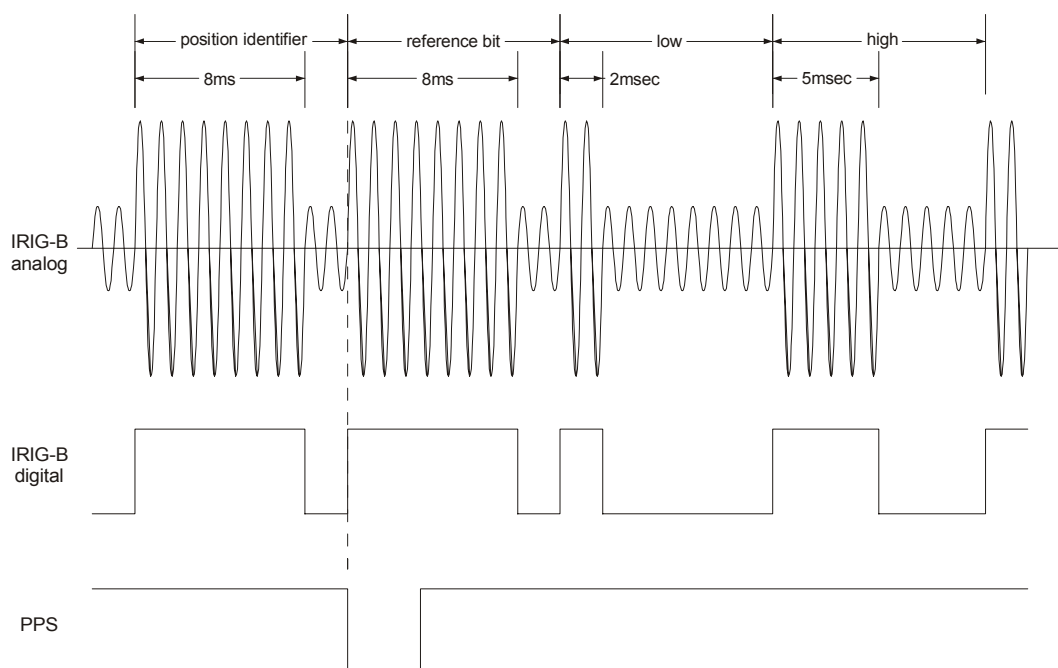
To synchronize to the beginning of a second a neutral logic status is required which is called the identifier.

- Logic 0 = 2 msec H-level
- Logic 1 = 5 msec H-level
- Identifier = 8 msec H-level

The 74 time code bits are divided into

- 30 bits for the BCD value of seconds, minutes, hours and the current day of year
- 27 bits for the input of control information
- 17 bits for the binary value of the current seconds of day

100 bit frames can be transmitted in one second. Unused bit frames are refilled with a logical zero.



### 2.1.1 IRIG-B Output

Serial output can be a TTL level or an analogue amplitude-modulated signal.

With analogue output the positive zero cycle of a sinus oscillation is modulated with the rising edge of the IRIG-B signal.

The rate of modulation for the signal information of H/L level should be between 3:1 and 6:1.

### 2.1.2 Format categories IRIG-Bxxx

Signal output can be digital or analogue and also with different data content. The variations are indicated by attaching a three-digit combination of figures.

The figures have the following meaning:

<b>Figure 1</b>	0	= digital output
	1	= analogue output via carrier
<b>Figure 2</b>	0	= no carrier
	1	= carrier 100 Hz
	2	= carrier 1000 Hz
<b>Figure 3</b>	0	= data content of complete time code with 74 bits
	1	= data content time information 30 bit + control information 27 bit
	2	= data content time information 30 bit
	3	= data content time information 30 bits + binary seconds of day 17 bit

e.g. **IRIG-B123** = analogue output, carrier 1000 Hz,  
= data content time information and binary seconds of day

## 2.2 IRIG-B Extensions

### 2.2.1 IRIG IEEE 1344-1995

This IRIG standard is based on IRIG Standard 200-1995. Fixed data such as year, time offset etc. are assigned to the 27 bits of the control information field.

It is compatible with IRIG-Standard downwards.

### 2.2.2 AFNOR NFS 87-500

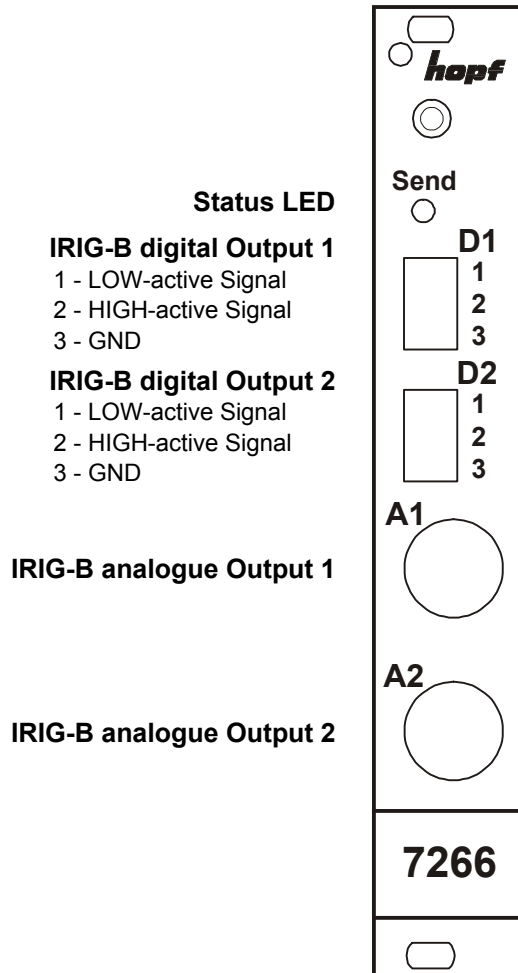
This IRIG standard has been laid down by the French institute for standards. It is based on Standard IRIG-B 200. Fixed data such as year, month etc. are assigned to the 27 bits of the control information field. The string is compatible with IRIG-Standard 200-1995 downwards.



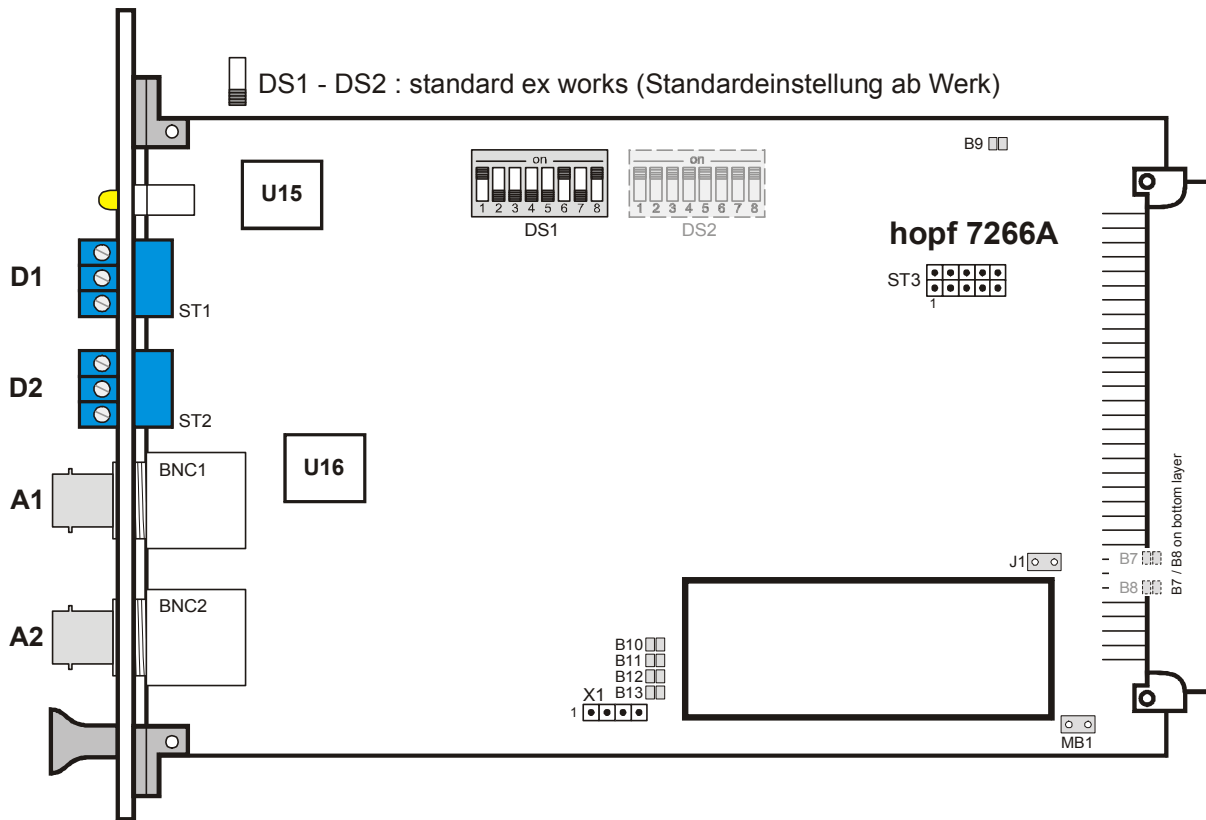
### 3 Hardware

#### 3.1 Board 7266 Master

##### 3.1.1 Front Panel 3U/4HP



### 3.1.2 Board Configuration



			def.	user
<b>Jumper J1</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Jumper MB1</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**B7-B8 on the bottom layer (B7-B8 auf der Bestückungsseite)**

			def.	user
<b>B7</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>B8</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

			def.	user
<b>B9</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
<b>B10</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>B11</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>B12</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>B13</b>	closed (zu)	only for factory use (nur für werksinterne Einstellungen)	<input type="checkbox"/>	<input type="checkbox"/>
	opened (offen)	only for factory use (nur für werksinterne Einstellungen)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

DIP-Switch					
<b>DS1</b>	<b>1</b>	on	<b>Bus 7001 / 6000</b> Bus 7001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		off	Bus 6000	<input type="checkbox"/>	<input type="checkbox"/>
	<b>2 3</b>	on on	<b>Mode, only output D2 (Modus, nur Ausgang D2)</b> IRIG-B	<input type="checkbox"/>	<input type="checkbox"/>
		on off	DCF77 pulse	<input type="checkbox"/>	<input type="checkbox"/>
		off on	PPS	<input type="checkbox"/>	<input type="checkbox"/>
		off off	IRIG-B	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>4</b>	on	<b>free (frei)</b>	<input type="checkbox"/>	<input type="checkbox"/>
		off		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>5</b>	on	<b>free (frei)</b>	<input type="checkbox"/>	<input type="checkbox"/>
		off		<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>6</b>	on	<b>IRIG-B local / UTC time base (UTC Zeitbasis)</b> IRIG-B local	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		off	UTC time base	<input type="checkbox"/>	<input type="checkbox"/>
	<b>7</b>	on	<b>switch on seconds of day (tagessekunden einschalten)</b> switch off binary seconds of day (ausschalten)	<input type="checkbox"/>	<input type="checkbox"/>
		off	switch on binary seconds of day (einschalten)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<b>8</b>	on	<b>IRIG-B IEEE 1344-1995 / AFNOR NFS 87-500</b> IRIG-B IEEE 1344-1995	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		off	AFNOR NFS 87-500	<input type="checkbox"/>	<input type="checkbox"/>

**DIP-Switch DS2:** not in use at present (wird zur Zeit nicht benutzt)

### 3.1.3 VG-Strip Connector 64-pole (DIN 41612)

Row a/c assigned!

Pin no.	ROW A		ROW B		ROW C	
	Signal	connection	Signal	connection	Signal	connection
1						
2						
3					IO01	
4					IO02	
5					ERRO	
6	IRIG Pulse In 1				IRIG Pulse Out 1	
7	RTN GND				RTN GND	
8	IRIG Pulse In 2				IRIG Pulse Out 2	
9	RTN GND				RTN GND	
10	IRIG SIN In				IRIG SIN Out	
11	GND A				GND A	
12						
13						
14						
15						
16						
17						
18						
19						
20						
21					RESB	
22					DCFT	
23	SCLK				SERI	
24	SECB				KHZB	
25	FRIN				FROU	
26						
27	ARIN				AROU	
28						
29						
30						
31	GND				GND	
32	VCC				VCC	

## 3.2 Board 7266 Slave

There are only the output functions from the master board 7266 available on the board 7266 slave. This board can not be used stand-alone. It can be used to duplicate the signals from the master board. Until eight slave boards can be connected behind a master board. The digital and analogue outputs have the same technical data as the master board.

### 3.2.1 Front Panel 3U/4HP

See *chapter 3.1.1 Front Panel 3U/4HP*, however without status LED.

### 3.2.2 Board Configuration

The are no settings necessary on the board 7266 slave.

### 3.2.3 VG-Strip Connector 64-pole (DIN 41612)

Row a/c assigned!

Pin no.	ROW A		ROW B		ROW C	
	Signal	connection	Signal	connection	Signal	connection
1						
2						
3						
4						
5						
6	IRIG Pulse In 1					
7	RTN GND					
8	IRIG Pulse In 2					
9	RTN GND					
10	IRIG SIN In					
11	GND A					
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31	GND				GND	
32	VCC				VCC	

## 4 Description of Hardware

### 4.1 Settings on the Board 7266 Master

The different functions of the board can be set via the DIP-switch DS1. The individual switches or switch combinations have the following functions:

#### 4.1.1 Bus 6000/7001 Selection

<b>SW1</b>	
on	operating mode System 7001
off	operating mode with base boards 6842 or 6855

#### 4.1.2 Control of the 2. Digital Output D2 (IRIG/PPS/DCF77-Pulse)

<b>SW2</b>	<b>SW3</b>	
on	on	output IRIG modes
on	off	output DCF77 pulse (only local time)
off	on	output PPS pulse
off	off	output IRIG modes

#### 4.1.3 Selection of 'UTC'/'Local Time' in the IRIG String

<b>SW6</b>	
on	local time is the basis for the data string
off	UTC is the basis for the data string



This setting is not valid for DCF77 pulse.

#### 4.1.4 Switch Binary Seconds of the Day on/off in the Data String

<b>SW7</b>	
on	binary seconds of day in the data string are switched off logical '0' bit frames are transmitted
off	binary seconds of day are transmitted in the data string

#### 4.1.5 Mode Setting (AFNOR/IRIG-B)

<b>SW8</b>	
on	IRIG-B IEEE 1344-1995 is emitted as serial string
off	AFNOR NFS 87-500 is emitted as serial string

Standard IRIG-B 200-1995 is included as subset in both modes.



Switches **SW4**, **SW5** on **DS1** and also switches **SW1-SW8** on **DS2** have no function!

## 4.2 Settings of the Board 7266 Slave

The cabling of the individual slave boards behind a master board is factory made. In case of an additional installation an individual set-up instruction is provided.

There are no settings necessary on the board 7266 slave.

## 4.3 Signal Output

Signals are available at the front panel of the board as well as at the VG-strip.

### 4.3.1 Signals at the Front Panel

On the front panel (see *chapter 3.1.1 Front Panel 3U / 4HP*) the two digital outputs are identifiable as sockets D1/D2 and the two analogue outputs as BNC bushings A1/A2. Optionally the digital and/or analogue outputs can be supplied **potential isolated**.

For the load capacity of the outputs please refer to the technical data.

### 4.3.2 Signals at the VG-Strip Connector 64-pole (DIN 41612)

#### Board 7266 Master

The signals are also supplied not potential isolated at the VG-strip, parallel to the analogue and digital outputs in front panel. Up to eight slave boards 7266 can be connected to this outputs.

Further there are two more digital IRIG-B outputs at the VG-strip which can be used e.g. for the control of fibre optic transmissions (board 7247).

#### Board 7266 Slave

The outputs of the board 7266 Master are connected with the inputs of the board 7266 Slave via a strip cable (see *chapter 4.2 Settings of the Board 7266 Slave*).

## 5 Technical Data

Board dimensions	Euro board 100mm x 160mm, 4HP / 3U
Power supply	5V DC $\pm$ 5% (via system bus)
Charging rate	approx. 390 mA (Master) approx. 200 mA (Slave)
Temperature range	
Storage	-30° C to +85° C
Operation	0° C to +70° C
Humidity	95 %, not condensed
Standards	CE
Protection category	none
MTBF	> 450.000 hrs. (Master) > 600.000 hrs. (Slave)
Electrical features (on VG plug connector): Inputs / outputs	TTL compatible
<b>Load capacity of the analogue outputs:</b>	3 V <sub>ss</sub> to 50 $\Omega$ 5 V <sub>ss</sub> to 600 $\Omega$
<b>Load capacity of the digital outputs:</b>	
When operating as RS422 outputs:	32 RS422 Listener
as TTL outputs low active:	+40 mA
as TTL outputs high active:	-20 mA

Accuracy Board 7266	DCF77 System with 7015	GPS System with 7015	DCF77 System with 6855	GPS System with 6842	GPS System with 7020
PPS (7266) to PPS (Main-Board)	< $\pm$ 1 $\mu$ s	< $\pm$ 1 $\mu$ s	< $\pm$ 1 $\mu$ s	< $\pm$ 1 $\mu$ s	< $\pm$ 1 $\mu$ s
DCF77-Takt to PPS (Main-Board)	< $\pm$ 1 $\mu$ s jitter $\pm$ 0,2 $\mu$ s	< $\pm$ 1 $\mu$ s jitter $\pm$ 0,2 $\mu$ s	< $\pm$ 1 $\mu$ s jitter $\pm$ 0,2 $\mu$ s	< $\pm$ 1 $\mu$ s jitter $\pm$ 0,2 $\mu$ s	< $\pm$ 1 $\mu$ s jitter $\pm$ 0,2 $\mu$ s
IRIG-B (analogue/digital) to PPS (Main-Board)	offset -25 $\mu$ s jitter $\pm$ 5 $\mu$ s	offset +10 $\mu$ s jitter $\pm$ 2 $\mu$ s	offset -535 $\mu$ s jitter $\pm$ 5 $\mu$ s	offset $\pm$ 20 $\mu$ s jitter $\pm$ 2 $\mu$ s	offset $\pm$ 20 $\mu$ s jitter $\pm$ 2 $\mu$ s



## 6 Glossary

GPS	Global Positioning System
UTC	Universal Time Coordinated
GPS-UTC	Continuous world time without correction of the leap second
IRIG	Inter Range Instrumentation Group
AFNOR	Association francaise de normalisation
NTP	Network Time Protocol
3D	three dimensional determination of position, longitude, latitude and altitude
GHz	one billion Hertz
ppb	part per billion = $1E^{-9}$
ppm	part per million = $1E^{-6}$
msec	one thousandth second
$\mu$ sec	one millionth second