QWTIME III IMPULSE AMPLIFIER
User Manual

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User Manual
Impulse Amplifier WDP-AMP

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# Technical specifications

Crystal Frequency:	4,915200 MHz.
Accuracy:	0,1 sec./24 hours (at +20°C).
Microprocessor:	HD6412394.
Max. load impulse output:	Minute 1A, second 0,5A. (The output is equipped with short circuit protection which resets automatically.)
Impulse duration:	Minute 2 sec. selectable 0.1-9.9 sec.
	Seconds 0.5 sec. selectable 0.1-1 sec.
Impulse memory: (in sync. mode)	72 hours (impulse memory with rapid impulsing after power failure).
Connection voltage:	230 V 50 Hz -5% +10%
Power consumption:	30 VA.
Ambient temperature:	Between 0°C and +40°C.
Relative humidity:	Max. 85% non-condensing.
Case:	IP 65, light grey plastic (Polystyrol) with transparent protection cover.
CE-Approval, EMC	Emission acc. to EN61000-6-3, Immunity acc. to. EN61000-6-2.
Art. numbers:	123314-00 (230V AC)
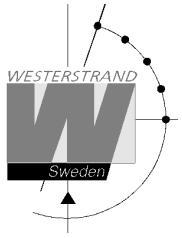
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General description

The WDP-AMP is an electronic quartz Impulse Amplifier for operating and control of analogue and digital Slave Clocks. The impulse amplifier is intended for amplification of polar reversing impulses or hard wired DCF Time Code, TC. and it can work in sync. or slave mode.
The unit is equipped with electronic fuse and transient protection. The electronic fuse is tripped in case of overload on the impulse output. After resetting the alarm, the connected clocks are set to the correct time by rapid impulses.
In case of power failure the built in Real Time Clock keeps the internal time updated.
Connected Slave Clocks are automatically corrected by rapid impulsing when power returns.
Summer/winter time correction (daylight saving) is pre-programmed and, if the amplifier is used in sync. mode, the correction is done fully automatic.
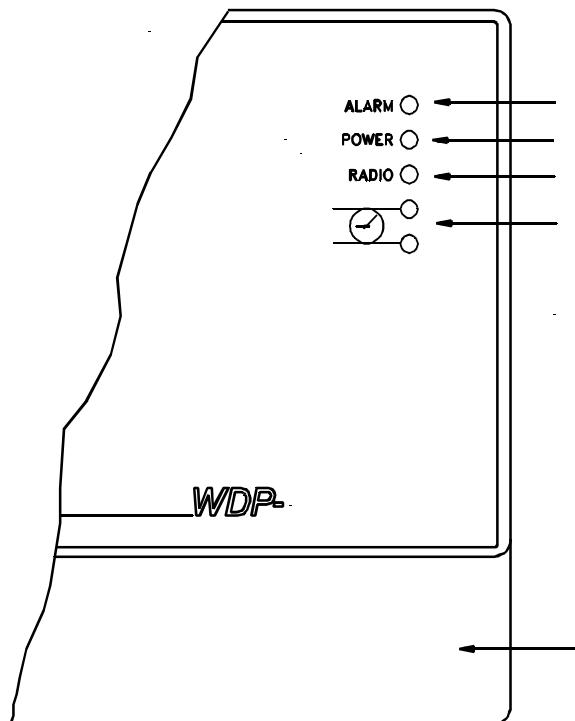
ALARM Indication for alarm
POWER Indication for mains voltage
RADIO Indication for synchronisation
Indication for outgoing minute impulse

WDP-

Connection space
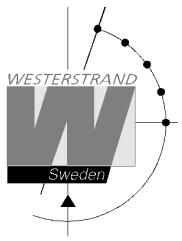
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Installation

The Impulse Amplifier is intended for wall mounting.

1. Screw in the upper fixing screw halfway and hang up the unit.
2. Screw in the two lower screws, accessible under the connection space cover.
3. Connect the slave clock lines.
4. Connect the supply voltage.

123314-00
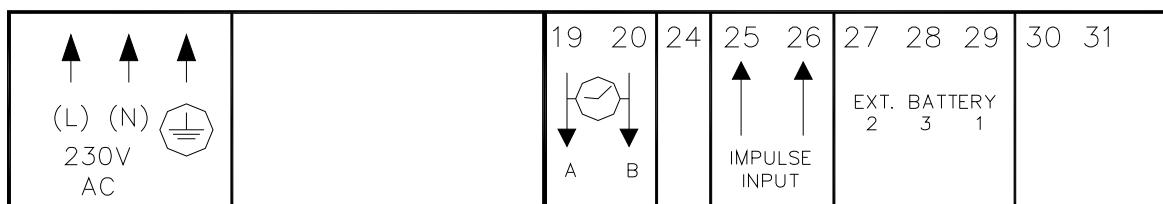
(L) (N) ⏚ 230V AC		19 20 A B	24	25 26 IMPULSE INPUT	27 28 29 EXT. BATTERY 2 3 1	30 31

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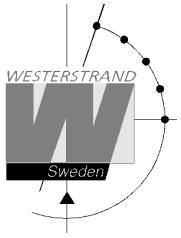
Calculation of cable area in time systems

General

To make a time system with impulse operated analogue and digital slave clocks perform satisfactory, the cable from the Impulse Amplifier to the Slave Clocks need to be dimensioned correctly.
A 10% voltage drop is allowed in the cable.
The length and area of the cable and also the current (load) on the cable affect the voltage drop.

Formula

A = l x I x k

A = Area [mm^2]
l = cable length [m]
I = current [A]
k = 0,015 [constant]

Power consumption

Impulse Slave Clocks

Analogue clocks minute $\leq$ 400 mm: 7,5 mA
Analogue clocks minute $\leq$ 900 mm: 15 mA
Analogue clocks minute + sweep seconds hand $\leq$ 400 mm: 25 mA
Digital Clocks: 4 mA

Time-Code (TC) Slave Clocks

Analogue clocks minute $\leq$ 400 mm:	14 mA
Analogue clocks minute $\leq$ 900 mm:	20 mA
Analogue clocks minute + sweep seconds hand $\leq$ 400 mm, indoor:	12 mA
Analogue clocks minute + sweep seconds hand $\leq$ 400 mm, outdoor:	20 mA
Analogue clocks minute + sweep seconds hand $\leq$ 900 mm:	27 mA

Example

A time system consists of 40 pcs. analogue clocks with diameter 300 mm.
The power consumption will then be 40 x 7,5 = 300 mA = 0,3A.
Cable length is 100 metres.

A = 100 x 0,3 x 0,015 = 0,45 mm^2

Choose a cable with an area of at least 0,45 mm^2.

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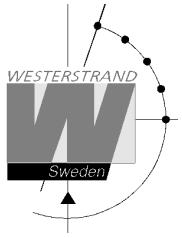
Synchronisation input

General

The Impulse Amplifier is equipped with a synchronisation input intended for connection to an external synchronisation source. The synchronisation source can be a Master Clock transmitting polar reversing impulses or hard wired DCF Time Code, TC.
The amplifier can work in either synchronisation (sync) or slave mode.

Glossary
Sync. mode: The Amplifier will continue to send out pulses even if the synchronisation source is defect.
Slave mode: The Amplifier will stop sending out pulses if the synchronisation source is defect.

The Impulse Amplifier is factory prepared for sync. mode.

Remark

When using sync. mode it is essential that the time and date is correctly entered when the Impulse Amplifier is started for the first time.
Entered time must not differ more than +/- 30 seconds compared to the time of the Master Clock.
The date information is used by the amplifier to do the summer/winter change.

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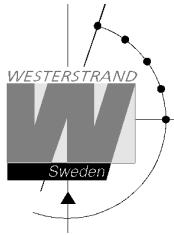
1. Programming

General

Using 6 buttons and a 2-row 16-character display carries out all programming.
Programming is self-instructive and to simplify the dialogue Yes/No questions are used.

Running mode

When the Impulse Amplifier is in operation it shows date and time in the display.
This is called *running mode* in this documentation.
LTs = Local Time summer.
LTw = Local Time winter.

```
MON  14 MAR 2011
 10:11:00   LTw
```

1- Select function	↑↓	
2- Enter programming mode	**YES**	
3- Move sideways	← →	
4- Change/scroll	↑↓	
5- Accept	**YES**	
6- Cancel / Leave prog. mode	←	

```
MON  14 MAR 2011
 10:11:00   LTw
```

```
SET TIME
```

```
SLAVE CLOCK
```

```
ALARMS
```

```
SPEC.-FUNCTIONS
```
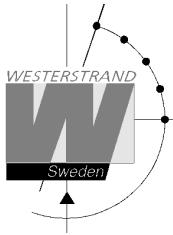
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Start up

STARTING

When the Impulse Amplifier is connected for the first time correct/requested language has to be entered. Press **NO** until requested
language occurs in the display e.g. English. Accept with YES.

LANGUAGE ENGLISH?

COUNTRY FIN   ?

Press **NO** until correct country code occurs.
For Finland, select FIN. Accept with YES.

SET TIME 110314 09:07

Set, by using the arrows, the right time format i.e. year, month, day and hour but a few minutes in advance.
Wait for the right time and synchronise using **YES**.

SLAVE CLOCK **= 12:00**   OFF

Now the question: SLAVE CLOCK 12.00?
If the Slave Clocks show 12.00, answer **YES**, if not set the time shown by the slave clocks. Accept using **YES**.

SLAVE CLOCK = 12:00   **ON?**

Accept using **YES**.

MON 14 MAR 2011 09:07:00 LTw

The Impulse Amplifier is now in running mode.

NOTE!   If a slave clock runs out by a minute, its cabling must be pole changed and
   the slave clock to be corrected manually.

NOTE!   If the time of the slave clocks is ahead of correct/present time the Impulse Amplifier
          Programmer will wait until correct time corresponds with the slave clocks.

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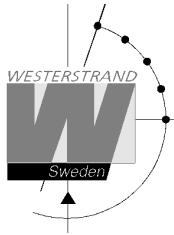
Set time when in operation

|	
MON 14 MAR 2011 09:07:00 LTw	Select function using ↓.
SET TIME	Enter the programming mode with YES.
SET TIME 110314 10:13	Set, by using the arrows, the right time. Format; year, month, day and hour but a few minutes in advance. Wait for the right time and synchronise using YES.
SET TIME	Leave programming mode by pressing ← several times.
MON 14 MAR 2011 10:13:00 LTw	The Impulse Amplifier is now back in running mode.

Summer to winter (Day light saving)

Resetting between summer and wintertime is fully automatic and does not need programming.

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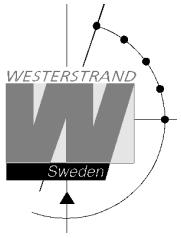
Slave Clock

This function is used to enter the time that the slave clocks are showing.
This is useful if, by some reason, the Impulse Amplifier and the slave clocks should show different times.
When the slave clock time has been entered, the Impulse Amplifier will automatically adjust the slave clocks to correct time.
Please note that before using this function make sure that all connected slave clocks are showing the same time.
If any of the slave clocks are showing a divergent time this clock must be manually adjusted to the same time as the other clocks.

The impulses to the slave clocks are temporarily stopped when entering this function.

|	
MON 14 MAR 2011 09:07:00 LTw	Select function using ↓.
SLAVE CLOCK	Enter the programming mode with **YES**.
SLAVE CLOCK = **09**:07 OFF	SLAVE CLOCK = 09.07? (Example) If the slave clocks shows 09.07 answer YES, if not, set the time shown by the slave clocks.
SLAVE CLOCK = 09:**07** OFF	**YES.**
SLAVE CLOCK = 09:07 **ON?**	**YES.**
SLAVE CLOCK	Leave programming mode by pressing ← several times.
MON 14 MAR 2011 09:07:00 LTw	The Impulse Amplifier is now back in running mode.
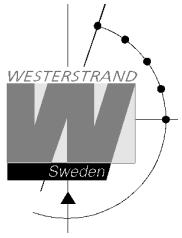
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Alarms

The Impulse Amplifier is equipped with several supervision facilities to detect functional disturbances. When a functional disturbance is detected the following will happen:

• Red alarm LED is lit.
• Alarm relay* is activated.
• An alarm message is displayed in function ALARM.

The function ALARM is used to display and erase (clear) alarm messages.

Type of alarm	Indication	Reason for alarm	Action
NO RADIO	Red alarm LED lit.	The synchronisation signal is lost.	Check the incoming synchronisation signal. If OK, clear the alarm.
UF LOW	Red alarm LED lit.	Impulse voltage below alarm limit.	Check the load on the impulse output. If OK, clear the alarm.
SHORT CIRCUIT	Red alarm LED lit.	Short circuit on impulse output	Remove the short circuit. If OK, clear the alarm.
CURRENT LOW	Red alarm LED lit.	Impulse current below alarm limit.	Check the load on the impulse output. If OK, check that the alarm limit is correctly configured. If OK, clear the alarm.
CURRENT HIGH	Red alarm LED lit.	Impulse current above alarm limit.	Check the load on the impulse output. If OK, check that the alarm limit is correctly configured. If OK, clear the alarm.
POWER DOWN	Red alarm LED lit. Works only if the Impulse Amplifier is equipped with batteries for running reserve.	By some reason the power to the Impulse Amplifier has been switched off.	Check the mains. If OK, clear the alarm.
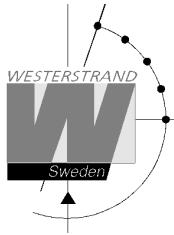
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| ALARMS- DISPLAY | To show the alarms |

| ALARMS- ERASE | To erase the alarms |

Example 1, display alarms

| MON 14 MAR 2011
09:07:00   LTw | Select function using ↑↓ . |

| ALARMS | Accept with YES. |

| ALARMS- DISPLAY | Press NO until the wished function is shown.
Accept with YES. |

| 09MAR 15:52
SHORT CIRCUIT | The alarm is displayed.
Press ↑↓ to see next alarm.
Return to running mode press ←. |

| ALARMS- DISPLAY | ←. |

| ALARMS | ←. |

| MON 14 MAR 2011
09:07:00   LTw | |
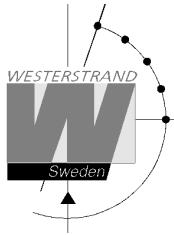
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Example 2, erase (clear) alarms

| MON 14 MAR 2011 09:07:00 LTw | Select function using ↑↓ . |

| ALARMS | Accept with YES. |

| ALARMS- ERASE | Press NO until the wished function is shown. Accept with YES. |

| 09MAR 15:52 SHORT CIRCUIT | The alarm is displayed. Press YES to erase the alarm. |

| ERASE? | Accept with YES. |

| ALARMS- ERASE | Return to running mode press ←. |

| ALARMS | ←. |

| MON 14 MAR 2011 09:07:00 LTw | |
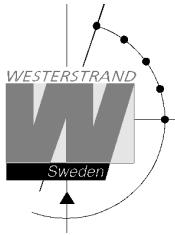
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Spec.-Functions

The special functions contain functions used during setup and configuration of the Impulse Amplifier.
If the default settings are used no configuration is needed.

MON 14 MAR 2011 09:07:00 LTw	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES.
SPEC.-FUNCTIONS STATUS	Press NO until wished function is shown. Accept with YES.
STATUS	Show status information of the different output/ input in the Impulse Amplifier.
KEYLOCK	Keylock and password function.
LANGUAGE	Language selection.
COUNTRY	Country selection.
POSITION	Selection of position for astronomical function.
SETUP	Setup / configuration of the different impulse system, type of synchronisation etc.
DISPLAY FORMAT	Display format in running mode.
SOFTWARE VERSION	Present software version.
SPEC.-FUNCTIONS STATUS	Return to running mode press ←.
MON 14 MAR 2011 09:07:00 LTw	
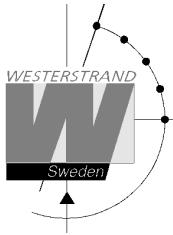
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Status

With this function each input/output status can be checked.

Example:
Check the status of the synchronisation input.

MON 14 MAR 2011 09:07:00 LTw	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS STATUS	Accept with YES.
STATUS SYNC.SOURCE	Press NO until wished input/output is shown. Accept with YES.
1/1 MIN SYNC 99% 13MAR 19:59:--	The Impulse Amplifier has accepted 60% of the synchronisation pulses. Last synchronisation was 13/3 19:59.
STATUS SYNC.SOURCE	Return to running mode press ←.
SPEC.-FUNCTIONS STATUS	←
SPEC.-FUNCTIONS	←
MON 14 MAR 2011 09:07:00 LTw	
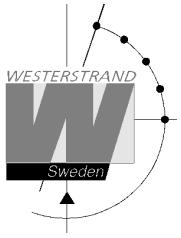
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Status sync. source
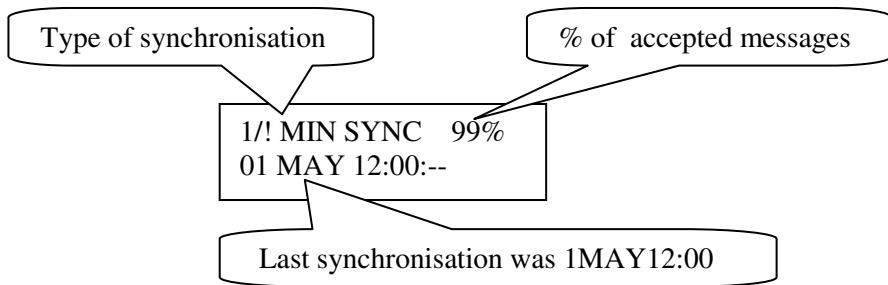
| Type of synchronisation | | % of accepted messages |

```
1/! MIN SYNC   99%
01 MAY 12:00:--
```

Last synchronisation was 1MAY12:00

Status impulse output
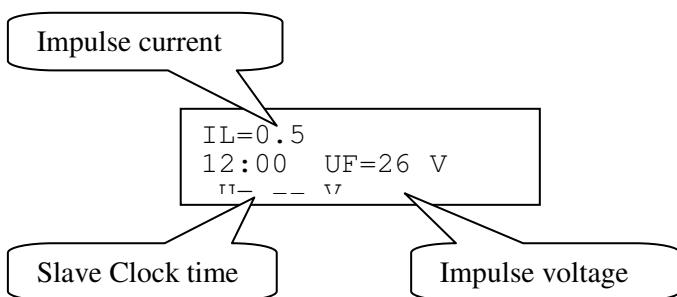
Impulse current

```
IL=0.5
12:00  UF=26 V
U=__ V
```

Slave Clock time

Impulse voltage
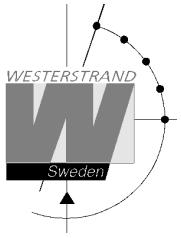
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Keylock

With this function it is possible to lock the keyboard. When activated the keylock will lock all buttons in the Impulse Amplifier.
There are two levels of keyboard protection.

1. Low level protection
       Keylock **ON**   : Keyboard locked, press ← YES to open.

2. High level protection
       Keylock with **Password** :   Keyboard locked, enter password to open.

Remark: "PASSWORD --" means that no password is used

Example 1:
Activate keylock without password

| MON 14 MAR 2011
09:07:00   LTw | Select function using ↓ . |

| SPEC.-FUNCTIONS | Accept with YES.
Press NO until wished function is shown. |

| SPEC.-FUNCTIONS
KEYLOCK | Accept with YES. |

| KEYLOCK   **OFF**
PASSWORD   -- | Change to keylock ON. |

| KEYLOCK   **ON**
PASSWORD   -- | Accept with YES. |

| KEYLOCK   ON
PASSWORD   **--** | Accept with YES. |

| SPEC.-FUNCTIONS
KEYLOCK | Return to running mode press ←. |

| MON 14 MAR 2011
09:07:00   LTw | |

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Example 2:
Activate keylock with password

MON 14 MAR 2011 09:07:00 LTw	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS KEYLOCK	Accept with YES.
KEYLOCK **OFF** PASSWORD – –	Change to keylock ON.
KEYLOCK **ON** PASSWORD – –	Accept with YES.
KEYLOCK ON PASSWORD **99**	Enter, by using the arrows, a 2-digit password. Accept with YES.
SPEC.-FUNCTIONS KEYLOCK	Return to running mode press ←.
MON 14 MAR 2011 09:07:00 LTw	
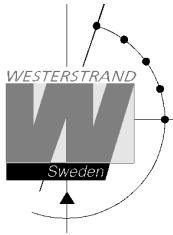
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Language

With this function the language be selected.

Example:

MON 14 MAR 2011
09:07:00 LTw

Select function using ↓ .

SPEC.-FUNCTIONS

Accept with YES.
Press NO until wished function is shown.

SPEC.-FUNCTIONS
LANGUAGE

Accept with YES.

LANGUAGE
ENGLISH?

Select, by using the arrows, the wished language.
Accept with YES.

SPEC.-FUNCTIONS
LANGUAGE

Return to running mode press ←.

MON 14 MAR 2011
09:07:00 LTw
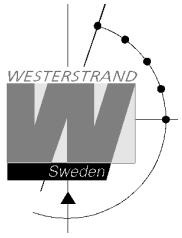
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Country

With this function the Country can be selected.

Example:

| MON 14 MAR 2011
09:07:00   LTw | Select function using ↓ . |

| SPEC.-FUNCTIONS | Accept with YES.
Press NO until wished function is shown. |

| SPEC.-FUNCTIONS
COUNTRY | Accept with YES. |

| COUNTRY
FIN ? | Select, by using the arrows, the wished country.
Accept with YES. |

| SPEC.-FUNCTIONS
COUNTRY | Return to running mode press ←. |

| MON 14 MAR 2011
09:07:00   LTw | |
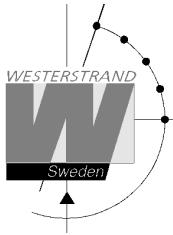
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Setup

With this function the different output and input can be configured. If the default setup is used no configuration is needed.

Example:
Set the alarm limit for *synchronisation alarm* to 1 hour. (Default setting is alarm disabled.)

MON 14 MAR 2011 09:07:00 LT	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS SETUP	Accept with YES.
SETUP SYNC SOURCE	Press NO until wished input/output is shown. Accept with YES.
1/1 MIN SYNC AL.LIMIT --h -- m	Set, by using the arrows, the alarm limit to 1 hour (01h).
1/1 MIN SYNC AL.LIMIT 01h 00 m	Accept with YES
SETUP SYNC SOURCE	Return to running mode press ←.
SPEC.-FUNCTIONS SETUP	←
SPEC.-FUNCTIONS	←
MON 14 MAR 2011 09:07:00 LT	

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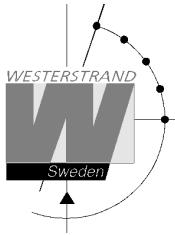
Setup sync. source

Below is a description of the different configuration parameters available in the setup menu for *sync. source*. Please remark that if default settings are used no configuration is needed.

```
                    ┌─────────────────────────┐
                    │  Type of synchronisation │
                    └─────────────────────────┘

  ┌──────────────────────┐
  │ 1/1 MIN SYNC         │
  │ AL. LIMIT   12h00m   │
  └──────────────────────┘

                    ┌──────────────┐
                    │ Alarm limit  │
                    └──────────────┘
```
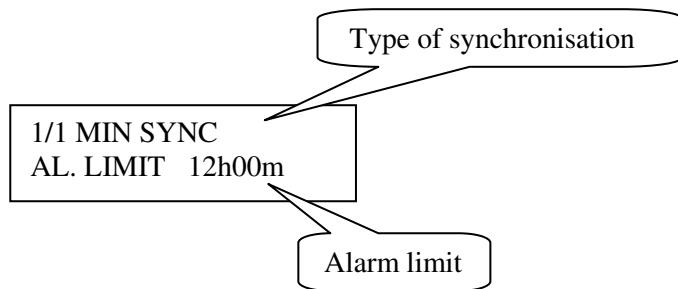
Type of synchronisation
State type of external synchronisation. The following time sources can be selected:

|	
--------	No external synchronisation.
1/1M SYNC	Polarised 1/1-minute impulse, sync.
1/1M SLAVE	Polarised 1/1-minute impulse, slave.
1/2M SYNC	Polarised 1/2-minute impulse, sync.
1/2M SLAVE	Polarised 1/2-minute impulse, slave.
TC	Time code type hard wired DCF.

Alarm limit
The configuration parameter *Alarm limit* specifies the time delay before the radio alarm is activated. Default setting is that the radio alarm is inactivated, AL.LIMIT --h--m.
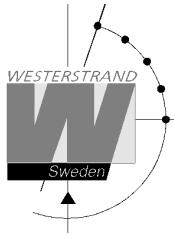
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Setup impulse output

Below is a description of the different configuration parameters available in the setup menu for *impulse output*. Please remark that if default settings are used no configuration is needed.

Impulse type

```
Type of impulse          Type of time

1/1MIN 24H LT
2.0s?

Impulse length
```
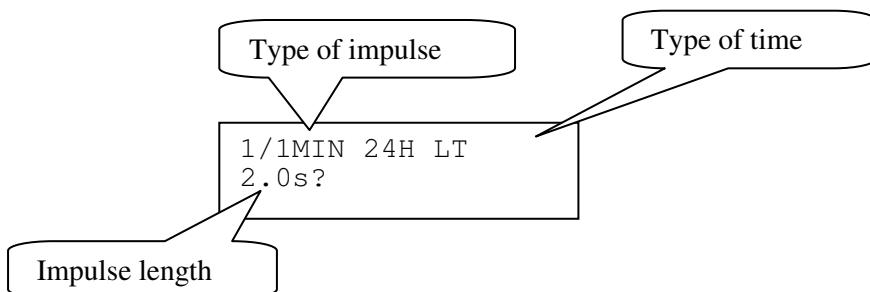
Type of impulse
Selection of impulse type. The following types are available.

1/1M-24H	: Polarised 1/1-minute impulse with 24 hours resetting.	
1/1M-12H	: Polarised 1/1-minute impulse with 12 hours resetting (default).	
1/2M-24H	: Polarised 1/2-minute impulse with 24 hours resetting	
1/2M-12H	: Polarised 1/2-minute impulse with 12 hours resetting.	
SEC-12H	: Polarised Second impulses with 12 hours resetting.	
TC	: Hard wired DCF Time Code.	
TC-POL	: Polarised hard wired DCF Time Code.	
-----------	: No impulse system.	

Type of time
LT = Local Time.
NT = Normal Time (winter time).
UTC = Universal Time Coordinated.
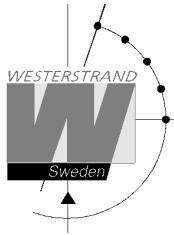
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Impulse length
Configuration of impulse length.

1/1 and 1/2 -minute impulse:	0.1s – 9.9 s.
Second impulses:	0.1 – 1.0 s.

Remark:
When selecting second impulses with pulse length > 0.5 seconds, the pulse length for rapid impulses is automatically adjusted to 0.5 seconds.

Alarm limits

Impulse current low limit

Impulse current high limit

```
IL=0.0 – 1.1A
UF= –– V
U= –– V
```

Impulse feedback voltage limit
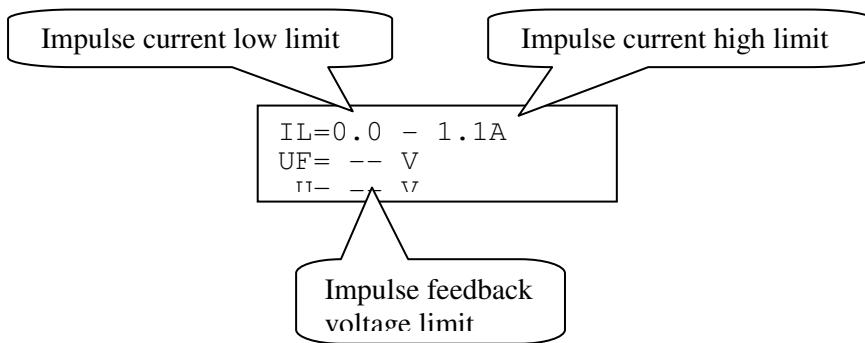
Impulse current low limit
Alarm limit for low current (minimum load). The minimum load can be set from 0A up to 1.1A.

Impulse current high limit
Alarm limit for high current (maximum load). The maximum load can be set from 0A up to 1.1A.

Impulse feedback voltage limit
Alarm limit for feedback impulse voltage.

––	: No limit (default).
01 - 99	: Limit in volts, V.
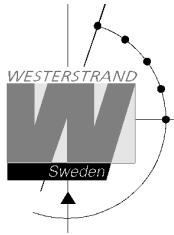
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Software version

This function shows the software version for the Time Base module.

|	
MON 14 MAR 2011 09:07:00 LTw	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS SOFTWARE VERSION	Accept with YES.
QW3-S188 123314-00 11m	The software version is QW3-S188. 11m = Uptime for this Impulse Amplifier.
SPEC.-FUNCTIONS SOFTWARE VERSION	Return to running mode press ←.
SPEC.-FUNCTIONS	←
MON 14 MAR 2011 09:07:00 LTw	
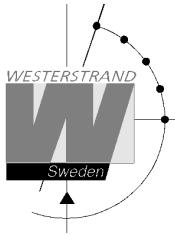
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Display format

With this function the display format in running mode can be selected.

The following two formats can be selected:

```
 MON  14 MAR 2011
 10:11:00   LTw
```

Standard format, default format.
LT = Local Time. (LTs when summer time)
NT = Normal Time (Winter time).
UTC = Universal Time Coordinated.

```
 110314  10:11:00
 LTw  0040X
```

Format 2, used for test / fault finding.

Example:

```
 MON 14 MAR 2011
 09:07:00   LTw
```

Select function using ↓ .

```
 SPEC.-FUNCTIONS
```

Accept with YES.
Press NO until wished function is shown.

```
 SPEC.-FUNCTIONS
 DISPLAY FORMAT
```

Accept with YES.

```
 DISPLAY  FORMAT
 STANDARD
```

Select, by using the arrows, the wished display format.
Accept with YES.

```
 SPEC.-FUNCTIONS
 DISPLAY FORMAT
```

Return to running mode press ←.

```
 MON 14 MAR 2011
 09:07:00   LTw
```

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Fault tracing

The display is blank

A.   The green LED "POWER" is light?

A1.   No.
A1A.   Check the supply voltage.
A1B.   Power supply wires connected correctly?

A2.   Yes.
A2A.   Restart the Impulse Amplifier by switching the supply voltage off and on.

After starting up the Impulse Amplifier, no impulses appear (to correct the slave clocks).

B1.   The Impulse Amplifier awaits the time shown by the slave clocks. Impulses will be distributed when correct time = the time shown by the slave clocks.

Alarm messages

D1.   "Short circuit"

          Excessive load on the impulse output. Check the slave clock wiring. Impulses are stored (memorised) during the alarm. When the fault is fixed, all the stored impulses are distributed by rapid impulsing.

Synchronisation

Synchronisation is not working

Check that the LED, marked with an antenna symbol, lights every time an impulse is received.
If not check the connections and if needed measure the incoming pulse with a DVM.
Use special functions "Status sync. source" for information on the reception quality.

Accepted reception is shown by a flashing colon (:) between hours and minutes in the display.

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