

# MASTER CLOCK SYSTEM

TECHNICAL & USER MANUAL



# Document Scope

This document describes the installation and programming of the following products:

Product Description	Item No.
Marine Master Clock 70000	3005050028
Marine Master Clock 70000L with Network Time Server	3005050029

## Revision Information

Rev.	Date	Author	Description
V1.0	26.05.2013	SEN	Final
V1.1	13.04.2013	SEN	Updated 1717en13 to 1717en16
V1.2	25.07.2013	SEN	Added doc.A100K11451 cable calculation. New rev. of cable connection diagram A100K10836
V1.3	16.06.2015	SEN	Masterclock; Protection changed to IP-22, page 8
V1.4	25.11.2015	SEN	Updated cable connection diagram A100K10836
v1.5	12.05.2016	SEN	Updated cable connection diagram A100K10836
v1.6	24.08.2016	SEN	Updated A100K10836 , changes on term.block 6
V1.7	13.11.2018	HKL	New manual versions 1717en19 - 1795en03 - 9539en14
V1.8	17.6.2019	HKL	Power supply 50/60 Hz

## Related Documentation

For further information, refer to the following documentation:

Doc.no.	Documentation
A100K10836 Rev.02	Autocad dwg cable connection diagram
A100K10838	Autocad dwg dimension drawing 70000 & 70000L

**Note:** Autocad drawings and datasheets are available for all slave clocks

# Contents

## **1. User Manual Marine Master Clock**

Document: 1717en19.doc

Date: 2017-12-22

51 Pages

## **2. Technical Manual Wired DCF Time Code-Clock**

Document: 1785en03.doc

Date: 2009-11-04

5 pages

## **3. Option Ethernet Marine Master Clock**

Document: 1795en03

Date: 2014-05-08

11 Pages

## **4. Technical Specification Marine Master Clock**

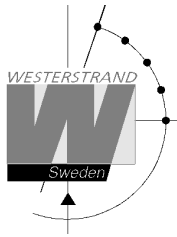
Document: 9539en14

Date: 2018-08-15

5 Pages

## **5. Cable Connection**

- Cable Connection Diagram  
Document: A100K10836 (1 Page)
- Cable Calculation  
Document: A100K11451 (1 Page)
- Dimensions Drawing  
Document: A100K10838 (1 Page)



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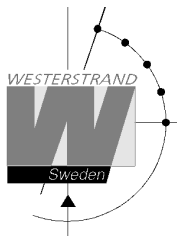


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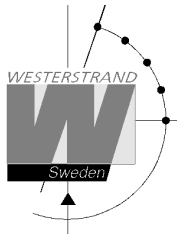
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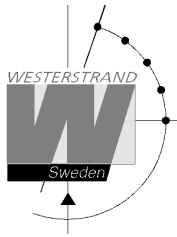
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## Technical specifications

### General

Crystal Frequency:	4,915200 MHz.
Accuracy:	0,1 sec./24 hours (at +20°C).
Microprocessor:	HD6412394.
Connection voltage:	90 - 264V 50/60 Hz and. 24 V DC -5% +20 %.
Max ripple (24V DC):	0,7V RMS.
Power consumption:	65 W (max)
Ambient temperature:	Between 0° C and +50°C.
Relative humidity:	Max. 85% non-condensing.
IP rating:	IP20
Weight:	5.6 kg.
CE-Approval, EMC:	Emission acc. to EN61000-6-3, Immunity acc. to. EN61000-6-2.

### Slave Clock output

#### *Output 1, 2 and 3:*

Impulse system:	1/1 minute, 1/2 minute, second, Time Code (TC)
Type of time:	LT, UTC
Impulse length:	Minute 0.1-9.9 sec. Second 0.1-1 sec.

#### *Output 4:*

Impulse system:	2-wire: 1/1 minute, 1/2 minute, second, Time Code (TC). 3-wire for Forward/Reverse movement: 1/1-minute alt. 1/2-minute.
Type of time:	LT, UTC
Impulse duration:	Minute 0.1-9.9 sec. Second 0.1-1 sec.
Maximum load / output:	2A (The output is equipped with short circuit protection that resets automatically.)
Total load all outputs:	2.5A

### Relay output

Relay outputs:	2 closing potential-free contacts.
Max. load/relay output:	24 V 6A.
Total load relay outputs:	12A
Program memory:	100 years (EEPROM)
Number of control functions:	800.

### Alarm output

Number of outputs:	2 Changeover potential-free contacts.
Type of alarms	
Output no. 1 (general alarm):	Overload / short circuit, synchronisation alarm
Output no. 2 (power alarm):	Power failure alarm

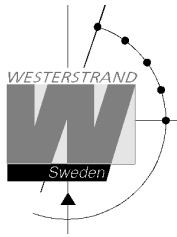
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## General description

Westerstrand Marine Master Clock is the ideal solution for distribution of both Local and UTC time on board ships.

The Master Clock is equipped with several outputs and inputs for control of Slave Clocks as well as distribution of time to computers and other equipment needing correct time. The four Slave Clock outputs can be individually programmed for different types of clocks. External radio receivers / time synchronisation sources can be connected when higher accuracy is needed.

For control and regulation of various energy consumers such as electrical striking plates, buzzers for pause signalling etc, the master Clock has a built in yearly programmer with two relay outputs.

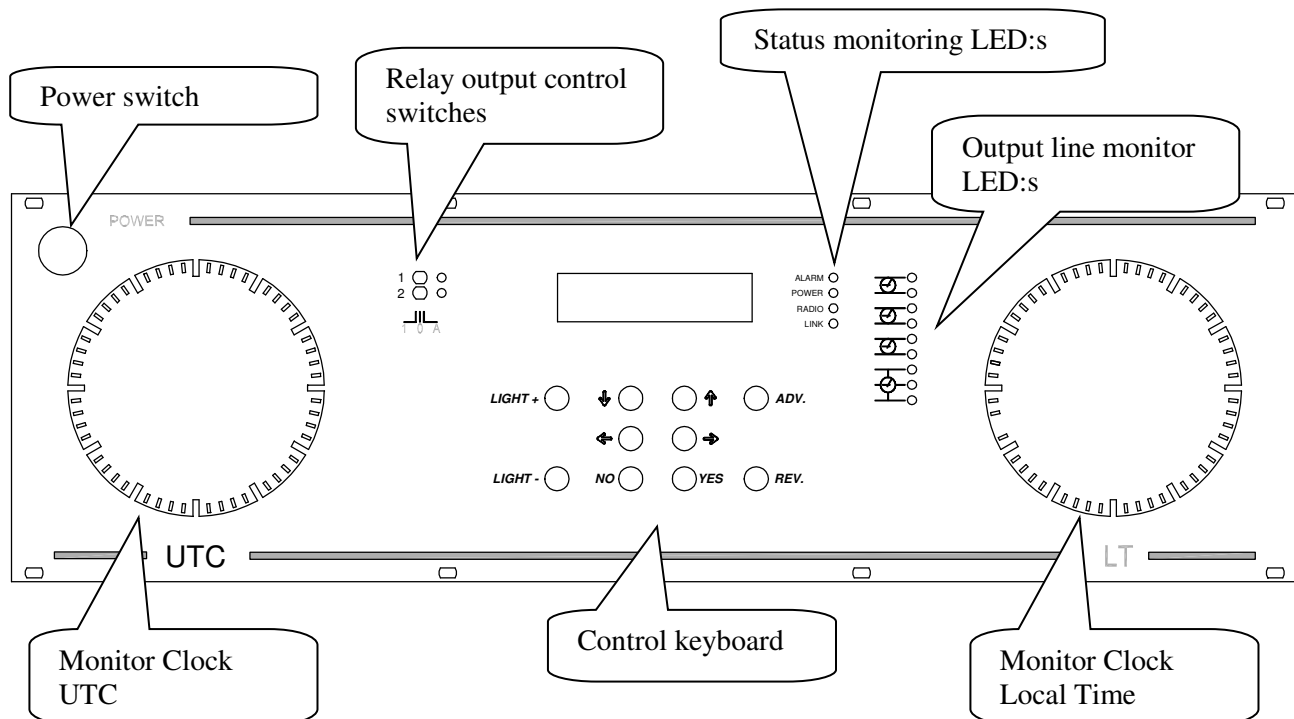
The Master Clock is equipped with 10 buttons and a 2 x 16 character LCD. To facilitate the change of time zone two of the buttons are dedicated for this purpose. A light dimmer makes it possible to adjust the background illumination to the surrounding light level.

The front mounted power switch is an all pole switch and controls both AC and DC power.

Position IN = Power ON.

Position OUT = Power OFF.

## Front panel description



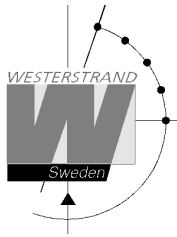
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### Keyboard

<b>LIGHT+</b>	Increase LED backlight level
<b>LIGHT-</b>	Decrease LED backlight level
<b>↑↓</b>	Select function / Change and scroll
<b>←</b>	Move left / Cancel / Leave programming mode
<b>→</b>	Move right
<b>NO</b>	Decline
<b>YES</b>	Accept / Enter programming mode
<b>ADV.</b>	Advance Local Time
<b>REV.</b>	Reverse Local Time

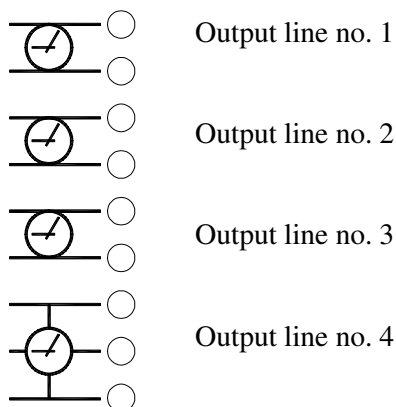
### Relay output control switches

<b>1</b>	Always ON
<b>0</b>	Always OFF
<b>A</b>	Automatic position, ON/OFF according to program.

### Status monitoring LED:s

<b>Alarm</b>	An alarm has occurred, for instance short circuit on one of the output lines.
<b>Power</b>	Power is ON.
<b>Radio</b>	Indicating signal coming from an external radio receiver.
<b>Link</b>	Indicating Ethernet LAN connection. (option)

### Output line monitoring LED:s



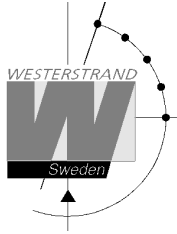
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## Installation

The Marine Master Clock is intended for stand, cabinet, wall or desk mounting.

1. Mount the Master Clock.
2. Make sure that all analogue slave clocks shows the same time, for instance 12.00.
4. Before connecting the slave clock lines, check the wires for short circuit, faulty connections etc.
5. Connect the slave clock lines.
6. Connect the signal line/lines (to relay contacts).
7. NOTE! For connection of signals etc., mixed voltages must not be used.  
Therefore, choose either 230VAC or, for example 24VAC for connection to the relays.
8. Connect, if included, other accessories/options such as radio synchronisation, RS232 etc.
9. Connect the supply voltage and press the power switch.
10. Proceed to "Start up procedure" page 9.

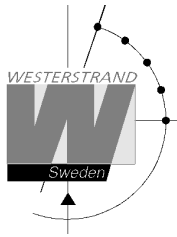
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## Programming

### 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 Time Base module is in operation it shows date and time in the display.  
This is called *running mode* in this documentation.

MON 26 SEP 2016  
U10:11:35 L12:11

MON 26 SEP 2016  
U10:11:35 L12:11

SET UTC

SET LT

SLAVE CLOCK

ALARMS

WEEK PROGRAM

DATE PROGRAM

DISPLAY PROGRAM

TEMPORARY PROGR.

GROUP → PERIODE

SPEC.-FUNCTIONS

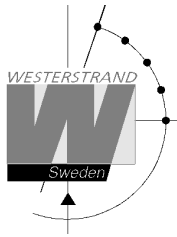
- |                              |     |
|------------------------------|-----|
| 1- Select function           | ↑↓  |
| 2- Enter programming mode    | YES |
| 3- Move sideways             | ← → |
| 4- Change/scroll             | ↑↓  |
| 5- Accept                    | YES |
| 6- Cancel / Leave prog.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

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## Start up procedure

1. Start up questions (this page)
2. Output configuration / Setup (page 10)
3. Enter time of Slave Clocks (page 12)

STARTING

LANGUAGE  
ENGLISH?

When the Master Clock 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.

SET UTC  
160926 10:11:00

Set, by using the arrows, the right UTC.  
Time format: Year, month, date, hour, minute, second.  
Set the time a minute in advance.  
Wait for the right time and synchronise using YES.

SET LT  
160926 12:11:00

Set, by using the arrows, the right Local Time.  
Time format: Year, month, date, hour, minute, second.  
Set the time a minute in advance.  
Wait for the right time and synchronise using YES.

MON 26 SEP 2016  
U10:11:35 L12:11

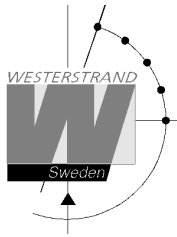
The Master Clock is now in running mode.

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### Output configuration / Setup

Each output can be individually configured regarding different parameters. The setup is done from the special function *Setup*. If the default setup is used no configuration is needed.

Default setup:

Slave Clock output no. 1	Impulse system:	1/1 minute
	Type of time: UTC	
	Impulse length:	2 sec.
Slave Clock output no. 2	Impulse system:	-----
	Type of time:	
	Impulse length:	
Slave Clock output no. 3	Impulse system:	-----
	Type of time:	
	Impulse length:	
Slave Clock output no. 4	Impulse system:	3-wire for Forward/Reverse, 1/1-minute.
	Type of time: Local Time	
	Impulse length:	2 sec.

Synchronisation source  
NMEA RS485 (NMEA 0183ZDA Time string)

RS232 output  
NMSE (NMEA 0183ZDA Time string)

RS485 output  
NMSE (NMEA 0183ZDA Time string)

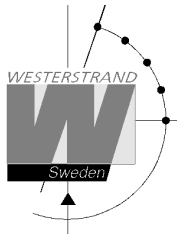
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### Set UTC when in operation

MON 26 SEP 2016  
U10:11:35 L12:11

Select function using ↓.

SET UTC

Enter the programming mode with YES.

SET UTC  
1609266 10:11:00

Set, by using the arrows, the right UTC.  
Time format: Year, month, date, hour, minute, second.  
Set the time a minute in advance.  
Wait for the right time and synchronise using YES.

SET UTC

Leave programming mode by pressing ← several times.

MON 26 SEP 2016  
U10:11:00 L12:11

The master clock is now back in running mode.

### Set Local Time when in operation

Remark: To do normal Time Zone adjustments use the buttons, **ADV** and **REV**.

MON 26 SEP 2016  
U10:11:35 L12:11

Select function using ↓.

SET LT

Enter the programming mode with YES.

SET LT  
160926 12:11:00

Set, by using the arrows, the right Local Time.  
Time format: Year, month, date, hour, minute, second.  
Set the time a minute in advance.  
Wait for the right time and synchronise using YES.

SET LT

Leave programming mode by pressing ← several times.

MON 26 SEP 2016  
U10:11:35 L12:11

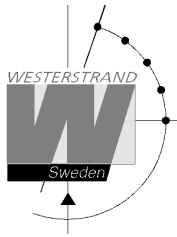
The master clock is now back in running mode.

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## Slave Clock

MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↓.
SLAVE CLOCK	Enter the programming mode with YES.
IMPULSE OUTPUT 1	Select output using ↑↓. Accept with YES.
IMPULSE OUTPUT 1 = 09:07 OFF	IMPULSE OUTPUT 1 = 09.07? (Example) If the slave clocks connected to impulse output 1 shows 09:07 answer YES, if not, set the time shown by the slave clocks.
IMPULSE OUTPUT 1 = 09:07 OFF	Turn ON impulse output 1 by using ↑↓.
IMPULSE OUTPUT 1 = 09:07 ON	Accept with YES
SLAVE CLOCK	Leave programming mode by pressing ← several times.
MON 26 SEP 2016 U10:11:35 L12:11	The master clock is now back 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 Master Clock will wait until correct time corresponds with the slave clocks.

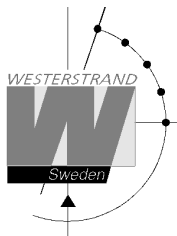
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## Time zone adjustment

To change Local Time zone two buttons are used. The buttons are named ADV and REV.  
To advance the Local Time slave clocks to a new time zone press button ADV.

Example:

MON 26 SEP 2016  
U10:11:35 L12:11

Press button ADV.

LOCAL TIME ADJ.  
60m ?

Use the default value or change by pressing ADV.  
Accept with YES.

LOCAL TIME ADJ. !

The Local Time slave clocks will now advance 60 minutes.

MON 26 SEP 2016  
U10:11:35 L13:11

When the correction is finished the display is automatically returned to running mode.

To reverse the Local Time slave clocks to a new time zone press button REV.

Example:

MON 26 SEP 2016  
U10:11:35 L12:11

Press button REV.

LOCAL TIME ADJ.  
- 60m ?

Use the default value or change by pressing REV.  
Accept with YES.

LOCAL TIME ADJ. !

The Local Time slave clocks will now be adjusted as below:  
1 Min forward clock's stop 60 min  
0,5 Min F/B clock's: Reverse 60 Min  
TC Clock's: 11 hours forward

MON 26 SEP 2016  
U10:11:35 L11:11

When the correction is finished the display is automatically returned to running mode.

Remark: To interrupt a time zone adjustment in progress press button ← and YES.

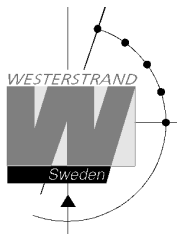
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## Alarms

This function is used to display and erase the different alarms in the master clock.

ALARMS- DISPLAY

To show the alarms

ALARMS- ERASE

To erase the alarms

### Example 1, display alarms

MON 26 SEP 2016  
U10:11:35 L12:11

Select function using ↑↓ .

ALARMS

Accept with YES.

ALARMS- DISPLAY

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

09AUG 15:52  
NO RADIO 30

The alarm is displayed.  
Press ↑↓ to see next alarm.  
Return to running mode press ←.

ALARMS- DISPLAY

←.

ALARMS

←.

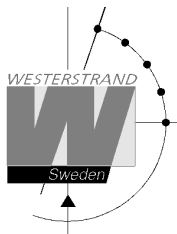
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### Example 1, erase alarms

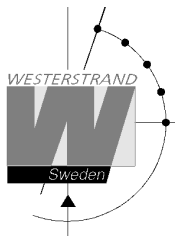
MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↑↓.
ALARMS	Accept with YES.
ALARMS- ERASE	Press NO until the wished function is shown. Accept with YES.
09 AUG 15:52 NO RADIO	The alarm is displayed. Press YES to erase the alarm.
ERASE?	Accept with YES.
ALARMS- ERASE	Return to running mode press ←.
ALARMS	←.
MON 26 SEP 2016 U10:11:35 L12:11	

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# MARINE MASTER CLOCK

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### Alarm list

The following alarms are available

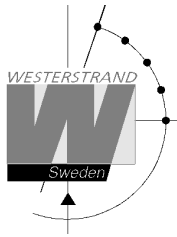
Type of alarm	Alarm code	Indication	Reason for alarm	Action
<b>NO RADIO</b>	30	Red alarm LED lit. General alarm relay activated.	The Master Clock has not been synchronised within the alarm limit.	Check the external synchronisation source. If no external source is used inactivate the alarm. See special function/ setup sync. source page 36.
<b>UF LOW</b>	52	Red alarm LED lit. General alarm relay activated.	Impulse voltage below alarm limit.	Remove connected clocks and clear the alarm. If OK, check clocks and wiring.
<b>SHORT CIRCUIT</b>	53	Red alarm LED lit. Common alarm relay activated.	Short circuit on impulse amplifier.	Remove short circuit. If OK, clear the alarm.
<b>CURRENT LOW</b>	61	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 1 is below alarm limit.	Check output connections. If OK, clear the alarm.
<b>CURRENT LOW</b>	62	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 2 is below alarm limit.	Check output connections. If OK, clear the alarm.
<b>CURRENT LOW</b>	63	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 3 is below alarm limit.	Check output connections. If OK, clear the alarm.
<b>CURRENT LOW</b>	64	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 4 is below alarm limit.	Check output connections. If OK, clear the alarm.
<b>CURRENT HIGH</b>	71	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 1 is above alarm limit.	Check output load. If OK, clear the alarm.
<b>CURRENT HIGH</b>	72	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 2 is above alarm limit.	Check output load. If OK, clear the alarm.
<b>CURRENT HIGH</b>	73	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 3 is above alarm limit.	Check output load. If OK, clear the alarm.
<b>CURRENT HIGH</b>	74	Red alarm LED lit. General alarm relay activated.	Impulse current on output no. 4 is above alarm limit.	Check output load. If OK, clear the alarm.
<b>CURRENT HIGH</b>	75	Red alarm LED lit. General alarm relay activated. (Remark: Alarm 75 is only used in a 3-wire Forward/Reverse system.)	Impulse current on output no. 4 is above alarm limit.	Check output load. If OK, clear the alarm.

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## Week Program & Date Program

Using these two functions, programming of the outputs is made.

### Concept description

<b>Program</b>	<p>A "program" refers to programming an output to a certain time. The word program represents a single time event and several programs are defined as a <i>group</i> of programs.</p> <p>For example: output 2 switches on every working day (Monday-Friday) at 8.00.</p>
<b>Week program</b>	<p>A week program is a program, which is repeated every week. You can for each program choose for which days of the week it shall be valid:</p> <p>Individual or block programming.</p> <p>M = Monday T = Tuesday W = Wednesday T = Thursday F = Friday S = Saturday S = Sunday</p>
<b>Date program</b>	<p>A date program is a program, which is valid for a specific date.</p>
<b>Group</b>	<p>A group of programs, signal events.</p>
<b>Type of signals</b>	<p>There are some different kinds of signals, depending on how the relay output is to be used.</p>
<b>ON/OFF</b>	<p>Is used when a longer lasting switching ON is required, e.g. for controlling fans, door locks, lighting etc.</p>
<b>01s</b>	<p>Is used when a short pulse is required, e.g. for bells/buzzers.</p> <p>Pulse duration selectable from 1-99 seconds.</p>
<b>Astr.</b>	<p>Astr. (Twilight) is a function which closes/opens a predestined relay at sunrise resp. sunset. Which day and month of the year it is, and where the Time Central programmer is located geographically, define the time of the sunrise resp. sunset. The sunrise resp. sunset are calculated in the software of the Y8 module. The geographic position of the Time Central is entered at starting up. A map indicating latitude (°north) and longitude (°east) is enclosed.</p>
<b>Mask</b>	<p>A program that is repeated f. ex every hour is easily entered by the use of mask program.</p> <p>XX.15.00 ; the program is repeated every hour att minute 15.</p> <p>08.XX.00 ; the program is repeated every minute between 08.00 and 09.00.</p> <p>XX.XX.00 ; The program is repeated every minute.</p>

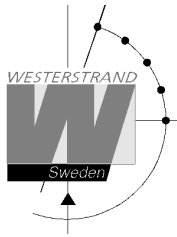
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To simplify programming 3 sub menus are used:

WEEK PROGRAM  
**NEW** GROUP A

To enter new programs.

WEEK PROGRAM  
**ERASE** GROUP A

To erase a separate existing program.

WEEK PROGRAM  
**CHANGE** GROUP A

To change existing programs.

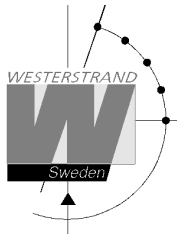
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### Week Program, example 1 (New program)

Example: Outputs No. 2 shall switch on Monday – Friday at 09.00 and off at 17.00.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**NEW** GROUP A

Select new program using YES.

WEEK PROGRAM  
NEW GROUP **A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 2** ON  
----- 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 2 **ON**  
----- 08:00:00

State type of signal using  $\uparrow\downarrow$ .

OUTPUT 2 ON  
**MTWTF--** 08:00:00

State the days the program shall function using  $\uparrow\downarrow$ .  
Move to the right using  $\rightarrow$ .

OUTPUT 2 ON  
MTWTF-- **09:00:00**

State the time of the program using  $\uparrow\downarrow$ .

Move to the right using  $\rightarrow$ .

Accept using YES.

If the program is approved the text "Program saved" is displayed quickly.

OUTPUT 2 OFF  
MTWTF-- 17:00:00

Continue with programming OFF for the same output or leave programming by pressing  $\leftarrow$  several times.

WEEK PROGRAM

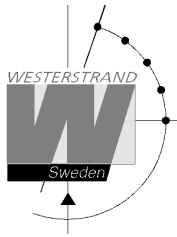
MON 26 SEP 2016  
U10:11:00 L12:11

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### Week Program, example 2 (Change program)

Example: A signal on output 1, Monday – Friday at 08.00, shall be changed to 08.15. Signal length is 5 seconds.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**CHANGE** GROUP A

Select change program using YES.

WEEK PROGRAM  
CHANGE **GROUP A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 2** 05S  
MTWTF-- 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 2 05S  
MTWTF-- 08:00:00

Step forward to the program, which is to be changed using NO and YES.

OUTPUT 2 05S  
MTWTF-- 08:**15**:00

Change the time to 09.15 using the arrows.  
Accept using YES.

WEEK PROGRAM

Leave the programming by pressing  $\leftarrow$  several times.

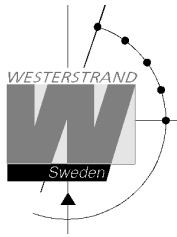
MON 26 SEP 2016  
U10:11:00 L12:11

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## Week Program, example 3 (Erase program)

Example: A signal on output 1, Fridays at 16.30 shall be deleted. Signal length is 5 seconds.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**ERASE** GROUP A

Select erase program using YES.

WEEK PROGRAM  
ERASE **GROUP A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 1** ON  
MTWTF-- 09:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 1 05S  
----F-- 16:30:00

Step forward to the program that is to be erased using NO and YES.  
Accept using YES.

WEEK PROGRAM

Leave the programming by pressing  $\leftarrow$  several times.

MON 26 SEP 2016  
U10:11:00 L12:11

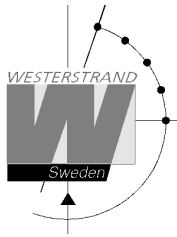
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### Week Program, example 4 (Astronomical function)

Example: Output No. 1 shall switch ON all sunset All days and switch OFF at sunrise.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**NEW** GROUP A

Select new program using YES.

WEEK PROGRAM  
NEW **GROUP A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 2** ON  
MTWTF-- 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 2 **ASTR**  
MTWTF--

State type of signal using  $\uparrow\downarrow$ .

OUTPUT 2 ASTR  
**MTWTF--**

State the days the program shall function using  $\uparrow\downarrow$ .  
Accept using YES.

If the program is approved the text "Program saved" is displayed quickly.

WEEK PROGRAM

Leave the programming by pressing  $\leftarrow$  several times.

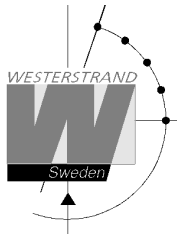
MON 26 SEP 2016  
U10:11:00 L12:11

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### Week Program, example 5 (Block program)

Example: Outputs No. 2 shall switch on Monday, Wednesday and Friday at 09.00.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**NEW** GROUP A

Select new program using YES.

WEEK PROGRAM  
NEW **GROUP A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 2** ON  
----- 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 2 **ON**  
----- 08:00:00

State type of signal using  $\uparrow\downarrow$ .

OUTPUT 2 ON  
**M-W-F--** 08:00:00

State the days the program shall function using  $\uparrow\downarrow$ .  
Move to the right using  $\rightarrow$ .

OUTPUT 2 ON  
M-W-F-- **09:00:00**

State the time of the program using  $\uparrow\downarrow$ .

Move to the right using  $\rightarrow$ .

Accept using YES.

If the program is approved the text "Program saved" is displayed quickly.

OUTPUT 2 OFF  
M-W-F-- 09:00:00

Continue with programming OFF for the same output or leave programming by pressing  $\leftarrow$  several times

WEEK PROGRAM

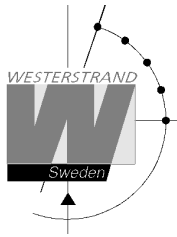
MON 26 SEP 2016  
U10:11:00 L12:11

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## Week Program, example 6 (Mask program)

Example: Outputs No. 2 shall switch on for 5 seconds every hour at minute 15, all days in the week.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

WEEK PROGRAM

Enter programming mode using YES.

WEEK PROGRAM  
**NEW** GROUP A

Select new program using YES.

WEEK PROGRAM  
NEW **GROUP A**

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

**OUTPUT 2** ON  
----- 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 2 **05S**  
----- 08:00:00

State type of signal using  $\uparrow\downarrow$ .  
05S = Pulse with 5 seconds length.

OUTPUT 2 05S  
**MTWTFSS** 08:00:00

State the days the program shall function using  $\uparrow\downarrow$ .  
Move to the right using  $\rightarrow$ .

OUTPUT 2 05S  
MTWTFSS **\*\* :15:00**

State the time of the program using  $\uparrow\downarrow$ . \*\* = every hour.  
Move to the right using  $\rightarrow$ .  
Accept using YES.

If the program is approved the text "Program saved" is displayed quickly.

WEEK PROGRAM

Leave programming by pressing  $\leftarrow$  several times.

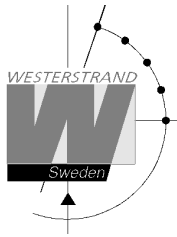
MON 26 SEP 2016  
U10:11:00 L12:11

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### Date Program, example (New program)

Example: Outputs No. 1 shall switch on the 1st of August at 12.00.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

DATE PROGRAM

Enter programming mode using YES.

DATE PROGRAM  
**NEW**

Select new program using YES.

**OUTPUT 1 ON**  
AUG 01 08:00:00

Select output using  $\uparrow\downarrow$ . Move to the right using  $\rightarrow$ .

OUTPUT 1 **ON**  
AUG 01 08:00:00

State type of signal using  $\uparrow\downarrow$ .

OUTPUT 1 ON  
**AUG 01** 08:00:00

State the date the program shall function using  $\uparrow\downarrow$ .  
Move to the right using  $\rightarrow$ .

OUTPUT 1 ON  
AUG 01 **12:00:00**

State the time of the program using  $\uparrow\downarrow$ .  
Move to the right using  $\rightarrow$ .  
Accept using YES.

If the program is approved the text "Program saved" is displayed quickly.

OUTPUT 1 OFF  
AUG 01 12:00:00

Continue with programming OFF for the same output or leave programming by pressing  $\leftarrow$  several times.

DATE PROGRAM

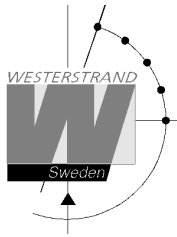
MON 26 SEP 2016  
U10:11:00 L12:11

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## Display Program

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

DISPLAY PROGRAM

Enter display program using YES.

DISPLAY PROGRAM  
GROUP **A**

Select program group using  $\uparrow\downarrow$ , accept with YES.

GROUP A  
OUTPUT **ALL**

Select output to be displayed using  $\uparrow\downarrow$ , accept with YES.

OUTPUT 2 ON  
MTWTF-- 08:00:00

Step forwards alt. Backwards using  $\uparrow\downarrow$ .

DISPLAY PROGRAM

Leave the function display program by pressing  $\leftarrow$  several times.

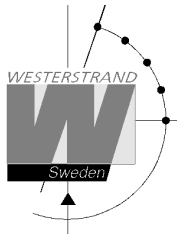
MON 26 SEP 2016  
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### Temporary Program, example

Example: Outputs No. 2 shall switch on immediately 15.35.00 and turn off according to normal week program. The temporary program will automatically be erased when the event has been effected.

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using ↑↓.

TEMPORARY PROGR.

Enter programming mode using YES.

**OUTPUT 2 ON**  
15:35:00

Select output using ↑↓. Move to the right using →.

OUTPUT 2 **ON**  
15:35:00

State type of signal using ↑↓.  
Accept using YES

OUTPUT 2 ON  
**15:35:00**

Accept using YES or change the time of the program using ↑↓.

TEMPORARY PROGR.

Leave the programming by pressing " several times.

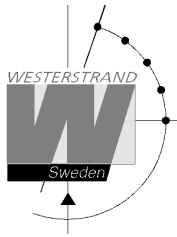
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### Group => Period

Each program group can be associated to one or several *time periods*. A time period can consist of one or several dates. Maximum 99 time periods can be used. Program group **A** is as default associated to a time period covering the complete year, 1/1-31/12.

Example:

A school has one group of programs that are used during the school season and another used during school holidays. School season = Group **A**, School holidays = Group **B**.

The school holidays are at the following dates: 1/5, 10/6-15/8, 23/9 and so on...

MON 26 SEP 2016  
U10:11:00 L12:11

Select function using  $\uparrow\downarrow$ .

GROUP => PERIOD

Enter programming mode using YES.

GROUP **B**  
1:\_\_\_\_\_ - \_\_\_\_\_

Select group of programs using  $\uparrow\downarrow$ , accept using YES.

GROUP B  
1:**MAY01** - \_\_\_\_\_

State the date when the period shall begin.  
Move to the right using  $\rightarrow$ .

GROUP B  
1:MAY01 - **MAY01**

State the date when the period shall end.  
Accept with Yes.

GROUP B  
2:\_\_\_\_\_ - \_\_\_\_\_

Continue with next time period.

GROUP B  
2:**JUN07** - \_\_\_\_\_

GROUP B  
2:JUN07 - **AUG15**

Accept with YES.

GROUP => PERIOD

Continue with next time period or leave  
programming by pressing  $\leftarrow$  several times.

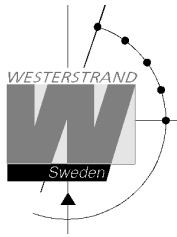
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## Spec.-Functions

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

MON 26 SEP 2016 U10:11:35 L12:11	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 Master Clock.
LANGUAGE	Language selection.
SETUP	Setup / configuration of the different impulse system, type of synchronisation etc.
DISPLAY FORMAT	Display format in running mode.
SOFTWARE VERSION	Present software version.
DEFAULT LT ADJ.	Default value used when pressing button ADV or REV.
SPEC.-FUNCTIONS STATUS	Return to running mode press ←.
MON 26 SEP 2016 U10:11:35 L12:11	

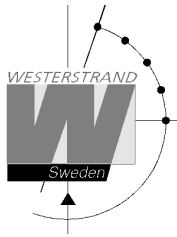
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### Status

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

Example:

Check the status of the synchronisation source receiver.

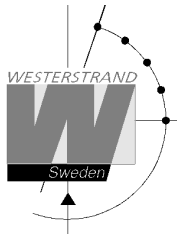
MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS STATUS	Accept with YES.
STATUS SYNC.SOURCE	Press NO until wished input/output is shown. Accept with YES.
NMEA RS485 60% 14OCT 19:59:00	The Master Clock has accepted 60% of the synchronisation messages. Last reception was 14/10 19:59:00.
STATUS SYNC.SOURCE	Return to running mode press ←.
SPEC.-FUNCTIONS STATUS	←
SPEC.-FUNCTIONS	←
MON 26 SEP 2016 U10:11:35 L12:11	

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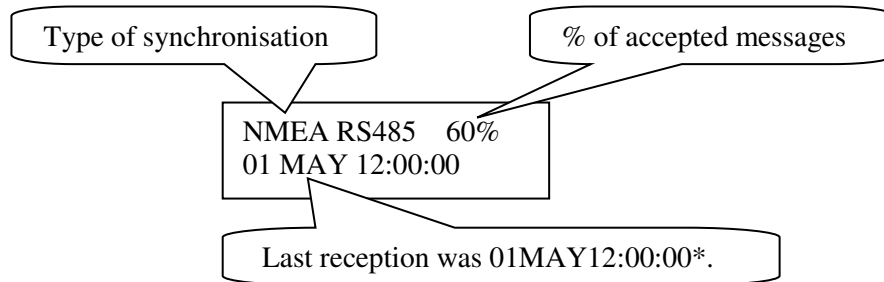
Internet:: <http://www.westerstrand.se>  
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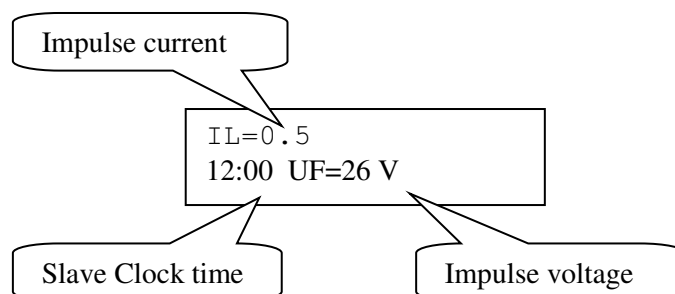
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## Status sync. source



\*Remark: For W-GPS the marked position always shows the actual second. This information is updated every other second.

## Status impulse output

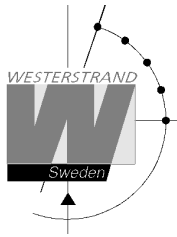


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### Language

With this function the language be selected.

Example:

MON 26 SEP 2016  
U10:11:35 L12:11

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 ←.

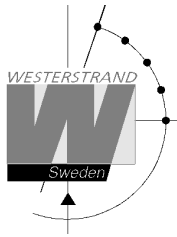
MON 26 SEP 2016  
U10:11:35 L12:11

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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 source alarm* to 1 hour. (Default setting is 12 hours.)

MON 26 SEP 2016  
U10:11:35 L12:11

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.

NMEA RS485  
AL.LIMIT --h -- m

Set, by using the arrows, the alarm limit to 1 hour (01h).

NMEA RS485  
AL.LIMIT 01h 00 m

Accept with YES

SETUP  
SYNC SOURCE

Return to running mode press ←.

SPEC.-FUNCTIONS  
SETUP

←

SPEC.-FUNCTIONS

←

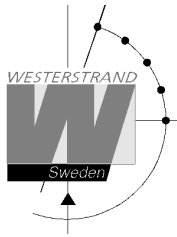
MON 26 SEP 2016  
U10:11:35 L12:11

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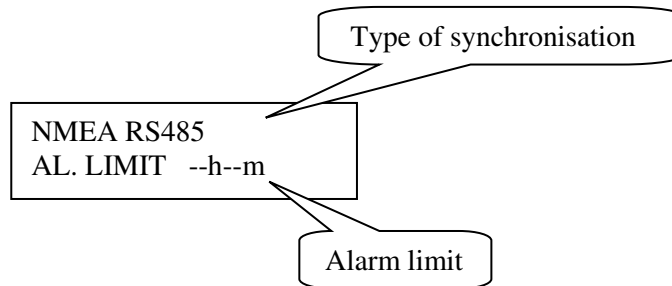
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### Setup sync. source

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

State type of external synchronisation. The following time sources can be selected:

NMEA RS485 (default)	Synchronisation using RS485 input and NMEA ZDA protocol.
NMEA RS232	Synchronisation using RS232 input and NMEA ZDA protocol.
W-GPS	Radio synchronisation GPS type Westerstrand.
DCF77	Radio synchronisation DCF77.
TC	Time code type hard wired DC
-----	No external synchronisation

### 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.

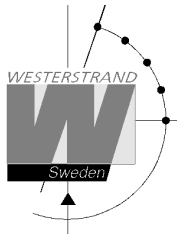
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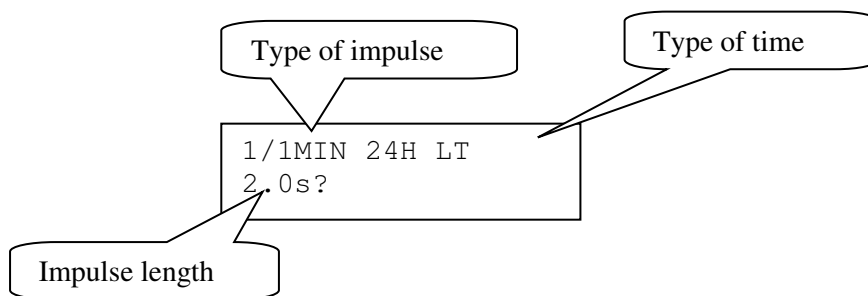
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## Setup impulse output

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

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.
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.
SEC-60S	: Polarised Second impulses with 60 seconds resetting.
1/2-SEC	: Polarised Second impulses with 60 seconds resetting.
TCmarine	: Time Code marine
TC-ext	: Time Code marine for TC-Clocks diameter 600-900 mm.
FW/RW	: 3-wire for Forward/Reverse, 1/1-minute.
FW/RW1/2	: 3-wire for Forward/Reverse, 1/2-minute.
1/1M-SS	: Polarised 1/1-minute impulse for analogue clocks with sweeping second hand. (2 seconds pulse length in normal mode and 0.5 seconds during correction)
1/2M-12B	: Clock signal to Telegraph Logger
-----	: No impulse system.

### Type of time

LT = Local Time.

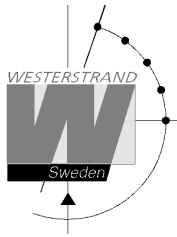
UTC = Universal Time Coordinated.

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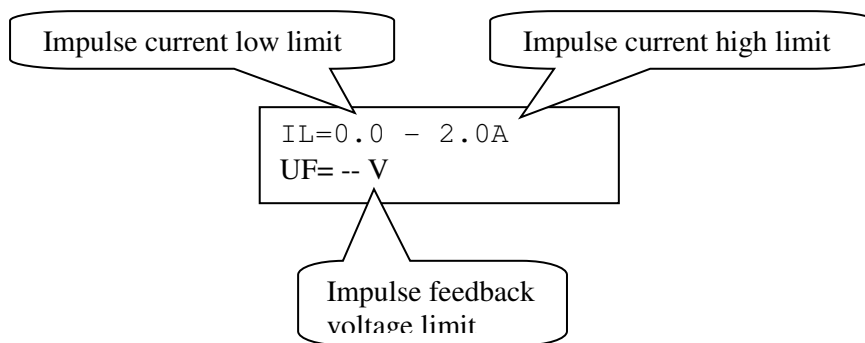
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### Impulse length

Configuration of impulse length.

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

### Alarm limits



### Impulse current low limit

Alarm limit for low current (minimum load). The minimum load can be set from 0A up to 2.0A.

### Impulse current high limit

Alarm limit for high current (maximum load). The maximum load can be set from 0A up to 2.0A.

### Impulse feedback voltage limit

Alarm limit for feedback impulse voltage.

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

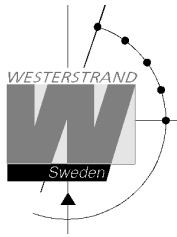
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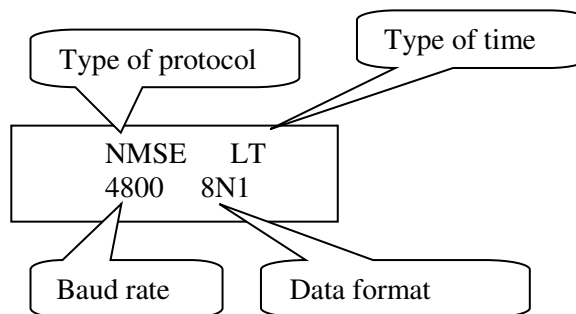
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### Setup RS232 and RS485/422 output / input

Below is a description of the different configuration parameters available in the setup menu for the **RS232 and RS485 input/ output**.

Please remark that if default settings are used no configuration is needed. The RS485/422 input protocol is always fixed to NMEA ZDA Time string and cannot be changed.



### Type of protocol

Name of the transmission / reception protocol used in the module. The following protocols are available.

NMEA output from Master Clock

NMMI: NMEA 0183, ZDA Time string, minute update, without hundreds of seconds  
NMSE: NMEA 0183, ZDA Time string, second update, without hundreds of seconds  
NMMC: NMEA 0183, ZDA Time string, minute update, with hundreds of seconds  
NMSC: NMEA 0183, ZDA Time string, second update, with hundreds of seconds

NMin NMEA 0183, ZDA Time string, (input to Master Clock)

Other protocols

1: General 2-way-communication protocol.  
2, 3, 5, 7, 16 etc.: Automatic time message protocols.

### Type of time

Type of time received or transmitted.

LT = Local Time.

UTC = Universal Time Coordinated.

### Baudrate

Available speeds: 300, 600, 1200, 2400, 4800, 9600 baud.

### Data format

Data format of message received or transmitted.

No. of data bits, 7 or 8.

Type of parity, none, odd or even.

---

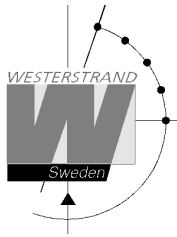
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No. of stop bits, 1 or 2.

Available formats:

7N1, 7N2, 7O1, 7O2, 7E1, 7E2, 8N1, 8N2, 8O1, 8O2, 8E1, 8E2,

### Protocol description

#### ZDA - Time & Date - UTC, Day, Month, Year and Local Time Zone

1	2	3	4	5	6	7

\$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx\*hh<CR><LF>

Field Number:

- 1) Universal Time Coordinated (UTC)
- 2) Day, 01 to 31
- 3) Month, 01 to 12
- 4) Year
- 5) Local zone description, 00 to +- 13 hours
- 6) Local zone minutes description, same sign as local hours
- 7) Checksum

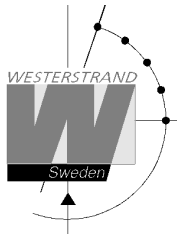
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## Protocol 2

The message has length 20 bytes according to:

STX F G W 20 YY MM DD HH MM SS ETX BCC

### F - Flag bits

7	=0
6	=1
5	=0
4	=0 Winter time, =1 summer time
3	=1 Synched from Radio source, e.g. DCF77
2	=1 Synched from timeserver
1	0 Type of time
OFF OFF	UTC
OFF ON	LOC
ON OFF	NOR

### Example:

Assume wintertime time, synched from radio source, synchronized from timeserver, local time:

Bits 6, 3, 2 and 0 are set: 0100 1101 = 4Dh = 'M'

G - UTC offset during wintertime from letter 'P' in 1/2 hour steps.

### Example:

Germany  $2 \times 1/2 = 1$  hour, so 'P'+2 = 'R'

W	Weekday	'1' Monday .. '7' Sunday
YY	Year	'00'..'99'
MM	Month	'01'..'12'
DD	Day of month	'01'..'31'
HH	Hour	'00'..'23'
MM	Minute	'00'..'59'
SS	Second	'00'..'59'
ETX	03h	
BCC	Exclusive or of bytes F..ETX	

The message is transmitted each second

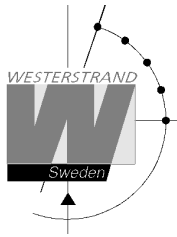
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## Protocol 3

At second 56 this message will be transmitted:

HH:MM:00 SP DD/MN/YY SP NNN SP W CR LF (25 bytes)

HH = Hour '00' - '23'.  
: = 3AH  
MM = Minute '00' - '59'.  
SP = Blank 20H.  
DD = Date '01' - '31'.  
/ = 2FH  
MN = Month '01' - '12'.  
YY = Year '00' - '99'.  
NNN = Daynumber '001' - '365' (3 bytes).  
W = Weekday '1' - '7'.  
CR = 0DH.  
LF = 0AH.

At second 60 (0) a synchronisation sign SUB (1AH) is transmitted.

Remark: The message transmitted at second 56 is *next* minute.

Example:

At 09:07:56 is a message transmitted. The time included in this message will be 09:08:00.

## Protocol 5

T:YY:MN:DD:WW:HH:MM:SS CR LF (24 bytes)

T = T  
: = 3AH  
YY = Year 00....99  
MN = Month 01....12  
DD = Day 01....31  
WW = Day of week 01....07  
HH = Hour 00....23  
mm = Minutes 00....59  
ss = Seconds 00....59  
CR = Carriage return 0Dh.  
LF = Line feed 0Ah.

The time message is sent out each minute or each second.

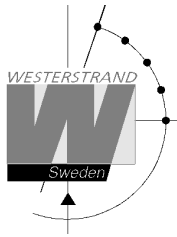
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### Protocol 7

STX WW VV YYYY MN DD HH MM SS F G BCC ETX (24 bytes)

STX = 02h (1 byte).

WW = Week number '01'-'53'  
VV = Weekday '01'-'07'  
YYYY = Year '2003-2099'  
MN = Month '01'-'12'  
DD = Day '01'-'31'  
HH = Hour '00'-'23'  
MM = Minute '00'-'59'  
SS = Second '00'-'59'

F = '0' Winter-time.  
= '1' Summer-time.

G = Offset to UTC for winter-time according to (1 byte):  
' ,' (2Ch) -2 hours, ' .' (2Eh) -1 hour, '0' (30h) 0 hour.

BCC = Checksum; Exclusive OR of bytes WW..F G in hexadecimal ascii format (2 bytes). Byte STX is NOT included!.

ETX = 03h (1 byte).

This message is sent out each second.

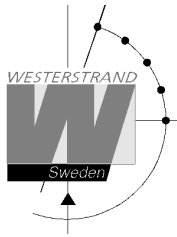
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### Protocol 16\*

STC HH MM SS DD MO MO YY HL HL ML ML ECT

Code	description	Hex value
STC	Start Transmission Character	02
H	Ten UTC hours	30-32
H	Unit UTC hours	30-39
M	Ten UTC minutes	30-35
M	Unit UTC minutes	30-39
S	Ten UTC seconds	30-35
S	Unit UTC seconds	30-39
D	Ten date UTC	30-33
D	Unit date UTC	30-39
MO	Ten month UTC	30-31
MO	Unit month UTC	30-39
Y	Ten year UTC	30-39
Y	Unit year UTC	30-39
HL	Ten LT hours	30-32
HL	Unit LT hours	30-39
ML	Ten LT minutes	30-35
ML	Unit LT minutes	30-39
ECT	End transmission character	03

\* Protocol 16M = Message transmitted each minute.

\* Protocol 16S = Message transmitted each second.

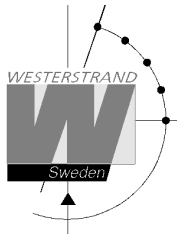
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### Setup special pulse

Relay output no. 2 can be dedicated to send out a special pulse. When this function is enabled the relay is activated every day for 5 seconds at 02.00 UTC.

Use the procedure below to enable the special pulse.

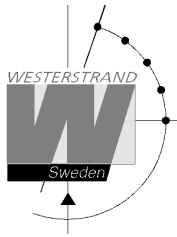
MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS SETUP	Accept with YES.
SETUP SPECIAL PULSE	Press NO until wished input/output is shown. Accept with YES.
SPECIAL PULSE NO ?	Change to using ↑↓.
SPECIAL PULSE YES ?	Accept with YES
SETUP SPECIAL PULSE	Return to running mode press ←.
SPEC.-FUNCTIONS SETUP	←
SPEC.-FUNCTIONS	←
MON 26 SEP 2016 U10:11:35 L12:11	

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### Setup NMEA LT

This function is valid only if the Master Clock is synchronised from an external NMEA source. Special function sync. source must be set to NMEA RS485 or NMEA RS232.

With this function it can be selected if the Master Clock should use the Local Time (LT) information included in the NMEA time message. The Master Clocks LT will be set to the nearest time with respect to the default value entered in the special function *DEFAULT LT ADJ.*

Example:

*DEFAULT LT ADJ* is set to 20 minutes. Local Time is 15:30.

1. Received LT is changed 5 minutes to 15:35, which is closer to 15:30 than 15:50;  
Master Clock LT will stay on 15:30.
2. Received LT is changed 10 minutes to 15:40, which is in the middle of 15:30 and 15:50;  
Master Clock LT will stay on 15:30.
3. Received LT is changed 15 minutes to 15:45, which is closer to 15:50 than 15:30;  
Master Clock LT will change 20 minutes to 15:50.

Default setting is NO, which means that the Local Time information is not used.

Use the procedure below to change the setting.

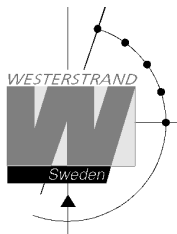
MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES.
SPEC.-FUNCTIONS SETUP	Press NO until wished function is shown. Accept with YES.
SETUP NMEA LT	Press NO until wished input/output is shown. Accept with YES.
NMEA LT NO ?	Change to using ↑↓.
NMEA LT YES ?	Accept with YES
SETUP NMEA LT	Return to running mode press ←.

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SPEC.-FUNCTIONS  
SETUP

←

SPEC.-FUNCTIONS

←

MON 26 SEP 2016  
U10:11:35 L12:11

### Software version

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

MON 26 SEP 2016  
U10:11:35 L12:11

Select function using ↓.

SPEC.-FUNCTIONS

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

SPEC.-FUNCTIONS  
SOFTWARE VERSION

Accept with YES.

MMC-A127  
11m

The software version is MMC-A127.  
11m = Uptime for this Master Clock.

SPEC.-FUNCTIONS  
SOFTWARE VERSION

Return to running mode press ←.

SPEC.-FUNCTIONS

←

MON 26 SEP 2016  
U10:11:35 L12:11

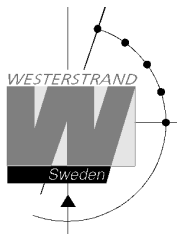
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Author: PM  
Date: 2017-12-22  
Page: 46 of 51

### Default LT adjust

This function is used to enter the default value used when pressing button ADV or REV.

Example:

Change default LT adj. from 60 minutes to 20 minutes.

MON 26 SEP 2016  
U10:11:35 L12:11

Select function using ↓.

SPEC.-FUNCTIONS

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

SPEC.-FUNCTIONS  
DEFAULT LT ADJ.

Accept with YES.

DEFAULT LT ADJ.  
60 m ?

Change to using ↑↓.

DEFAULT LT ADJ.  
20 m ?

Accept with YES.

SPEC.-FUNCTIONS  
DEFAULT LT ADJ.

Return to running mode press ←.

SPEC.-FUNCTIONS

←

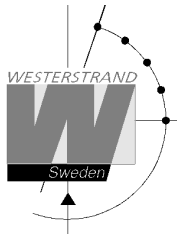
MON 26 SEP 2016  
U10:11:35 L12:11

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## User Manual

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### Display format

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

The following three formats can be selected:

MON 26 SEP 2016 10:11:00 LT	Format 1 LT = Local Time. UTC = Universal Time Coordinated.
MON 26 SEP 2016 U10:11:00 L12:11	Format 2 (Default) L = Local Time U = UTC
MON 26 SEP 2016 LT	Format 3, Used for test / fault finding.

Example:

MON 26 SEP 2016 U10:11:35 L12:11	Select function using ↓ .
SPEC.-FUNCTIONS	Accept with YES. Press NO until wished function is shown.
SPEC.-FUNCTIONS DISPLAY FORMAT	Accept with YES.
DISPLAY FORMAT -1- LT	Select, by using the arrows, the wished display format. Accept with YES.
SPEC.-FUNCTIONS DISPLAY FORMAT	Return to running mode press ←.
MON 26 SEP 2016 12:11:00 LT	

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## Programming form

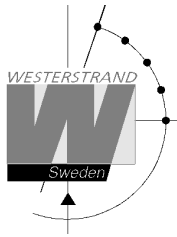
[illegible]

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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 master clock by switching the supply voltage off and on.

*After starting up the master clock, no impulses appear (to correct the slave clocks).*

- B1. The master clock awaits the time shown by the slave clocks. Impulses will be distributed when correct time = the time shown by the slave clocks.

*Relay outputs are programmed but nothing happens.*

- C1. The switch on the front panel is in position **0**. Correct position is **A**.
- C2. Check that the output is working when the switch is in position **1**.
- C3. Different program types have different priority. E.g. a programmed date program overrides a signal point in a week program.  
Priority order (1=highest, 3=lowest):  
1) Date program 2) Group 3) Week program

*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.
- D2. "Memory full"  
  
The master clock is out of memory, probably due to incorrect programming. Use week program for repetitive signals or group for a certain period. See the programming instructions in this manual.

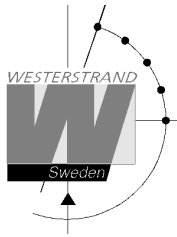
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### D3. “Exists”

The signal point is already programmed.

### D4. “Not programmed”

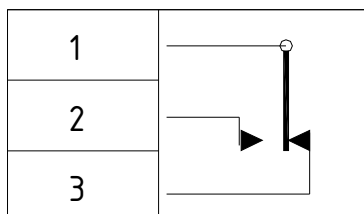
When trying to change a non-existing signal point.

## Alarm output

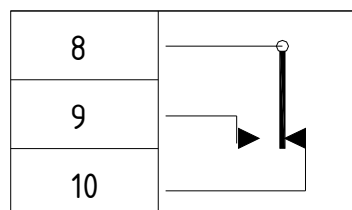
The Master Clock is equipped with two separate alarm relays. One relay for general alarm and one for power failure alarm. See alarm list on page 16 for details.

<i>General alarm</i>	1 - 2	1 - 3		
Normal mode, no alarm	Open	Closed		
Overload/short circuit alarm	Closed	Open		
Synchronisation alarm	Closed	Open		
<i>Power alarm</i>	8 - 9	8 - 10		
Normal mode, no alarm	Open	Closed		
Power failure alarm	Closed	Open		

General alarm relay



Power alarm relay



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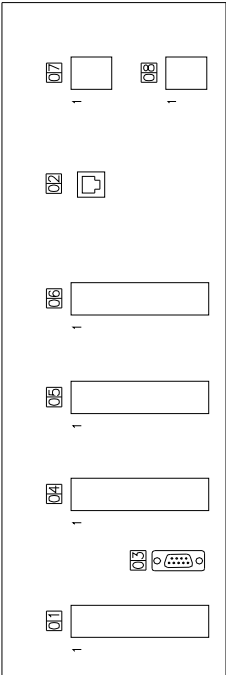
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E-mail: [info@westerstrand.se](mailto:info@westerstrand.se)

# Connection diagram

This publication is issued to provide outline information only. The Company reserves the right to alter without notice the specifications, design or conditions of supply of any product of service. Information on this publication supersedes all previous information.

Edition 7, connector 02 moved, 2016-10-10 PM  
 Edition 6, RS485 +/- switched, 2011-09-06 PM

**CONNECTION PLATE**



05 (2-WIRE)	
PIN NO.	SIGNAL
1	IMPULSE 4A
2	IMPULSE 4B
3	NO CONNECTION
4	IMPULSE 4A
5	IMPULSE 4B
6	NO CONNECTION
7	IMPULSE 4A
8	IMPULSE 4B
9	NO CONNECTION
10	IMPULSE 4A
11	IMPULSE 4B
12	NO CONNECTION

06		REMARK	
PIN NO.	SIGNAL		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

07	
PIN NO.	SIGNAL
1	+24
2	0V
3	PE

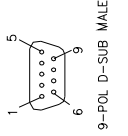
08	
PIN NO.	SIGNAL
1	L
2	N
3	PE

01		REMARK	
PIN NO.	SIGNAL		
1	CHASSIS GND		
2	-Rx RS485		
3	+Rx RS485		
4	CHASSIS GND		
5	-Tx RS485		
6	+Tx RS485		
7	NC		
8	GND		
9	+		
10	DCF		
11	+24		
12	0V		


04		REMARK	
PIN NO.	SIGNAL		
1	IMPULSE 1A		
2	IMPULSE 1B		
3	IMPULSE 1A		
4	IMPULSE 1B		
5	IMPULSE 2A		
6	IMPULSE 2B		
7	IMPULSE 2A		
8	IMPULSE 2B		
9	IMPULSE 3A		
10	IMPULSE 3B		
11	IMPULSE 3A		
12	IMPULSE 3B		

03		REMARK	
PIN NO.	SIGNAL		
2	Rx RS232		
3	Tx RS232		
5	GND RS232		

9-POL D-SUB MALE

02 (OPTION)	
PIN NO.	SIGNAL
1	RX+
2	RX-
3	TX+
6	TX-

RJ45

05 (3-WIRE)	
PIN NO.	SIGNAL
1	LT FORWARD
2	LT COMMON
3	LT REVERSE
4	LT FORWARD
5	LT COMMON
6	LT REVERSE
7	LT FORWARD
8	LT COMMON
9	LT REVERSE
10	LT FORWARD
11	LT COMMON
12	LT REVERSE

06		REMARK	
PIN NO.	SIGNAL		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

07	
PIN NO.	SIGNAL
1	ALARM RELAY OUTPUT
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

08	
PIN NO.	SIGNAL
1	L
2	N
3	PE

Designed by PM	Date 2016-10-10	Scale	Title/Name CONNECTION DRAWING
Owner Westerstrand Urfabrik AB	Drawing number 084550-00		
Edition 7			Sheet A3 1 (1)



# **WIRED DCF**

## **TIME CODE-CLOCK**

**Max. 400 mm in diameter  
for Time zone adjustment**

### **TECHNICAL MANUAL**



## General

Westerstrand analogue clock for wired DCF Time-Code from Marine Master Clock provides the possibility to create a time distribution system, with high accuracy and high reliability.

The clock is intended for connection to a 2-wire bus which combines power supply and serial Time-Code. A built in microprocessor receives the Time Code, reads the position of the hands, and sets the clock to correct time. The Time-Code, built up according to the DCF-format, contains information about year, month, day hour and minute. At each minute shift seconds are synchronised as well. The transmission speed is 1 bit/second. 24VDC power supply for the built in electronics is combined with the Time-Code.

The clock is intended for time zone adjustment from a Marine master clock.

## Installation

Connect Time code to time code input, connection movement.

The hands will step forward to 12 position and wait there for correct time message.

The speed is approx. 1 step/sec. When an accepted Time message the hands will step forward to correct time.

If the Marine master clock sends out a special time message (Time zone adjustment), the hands will step forward rapidly to correct time.

The speed of the hands is 10 steps/ sec.

## Synchronisation

When the clock has received and accepted a correct time code message, the hands will step forward rapidly.

If the Marine master clock sends out a special time message (Time zone adjustment), the hands will step forward rapidly to correct time. The speed of hands is 10 steps/ sec.

Automatic feedback control of the hands at 12:00 and 00:00.

If the time code would disappear, the clock continues by means of the built-in quartz crystal.

During a power failure, the clock is temporarily stopped. After the restoration of power the hands steps forward to the 12.00-position and waits, for a Time-Code to be received.





## Technical data

Art.no	113160-20,113160-22,113163-20,113163-22
Connection	2-wire
Connection voltage	24VDC combined with serial Time-Code
Type of time code	DCF-format with Time zone adjustment.
Microcontroller	PIC16F628
Temperature range	-20°C to +50°C
Power consumption	20 mA. (113160-20,113160-22) 30 mA. (113163-20,113163-22)

---

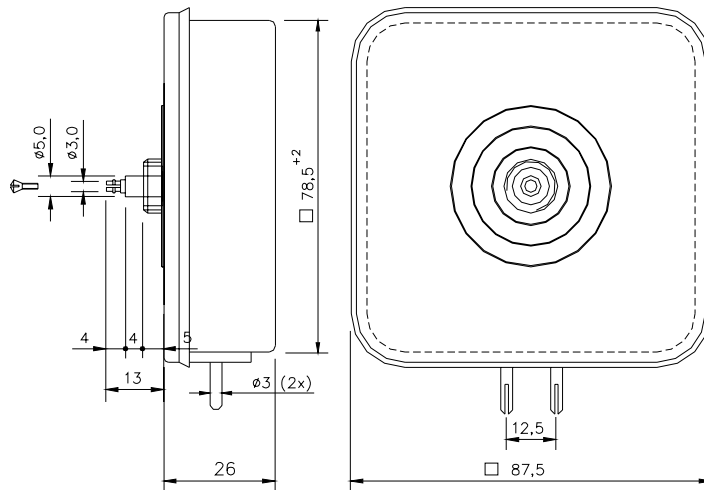
### WESTERSTRAND URFABRIK AB

Box 133  
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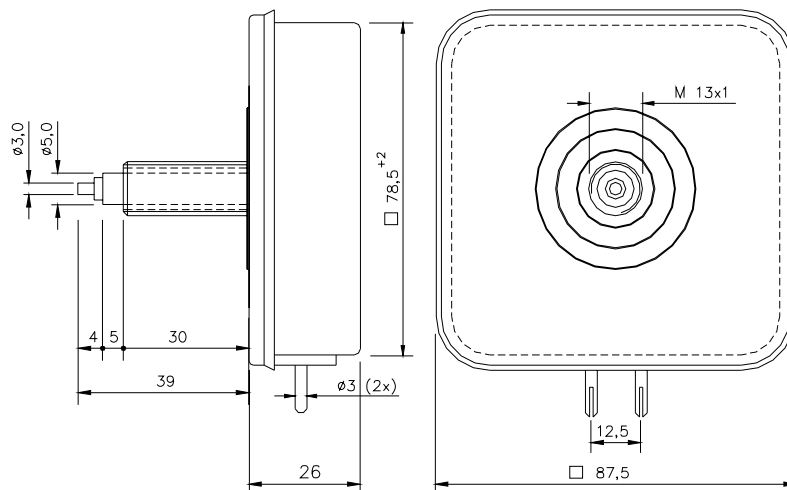
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Internet: <http://www.westerstrand.se>  
E-mail: [info@westerstrand.se](mailto:info@westerstrand.se)

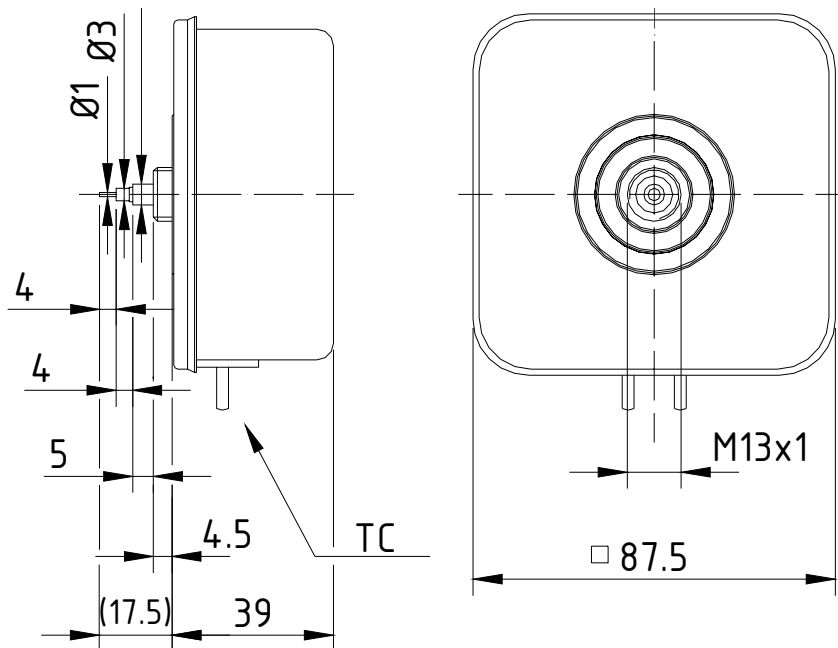
## 113160-20



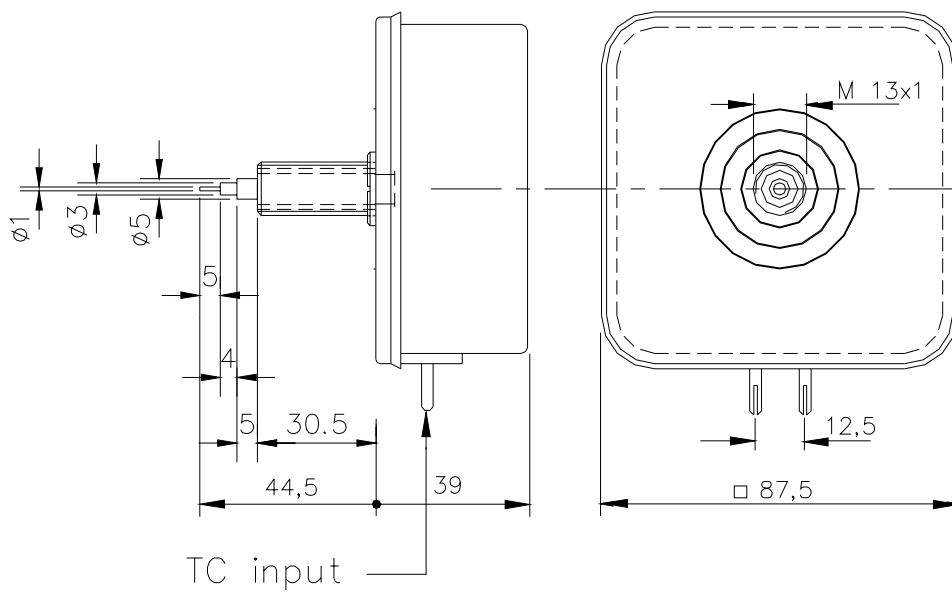
## 113160-22

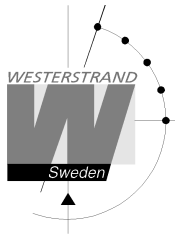


**113163-20**

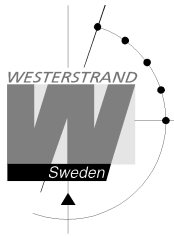


**113163-22**





# **Option Ethernet Marine Master Clock**



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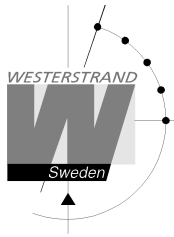
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## General

The Ethernet module makes it possible to connect a Master Clock to a LAN (Ethernet Local Area Network). The module can be built into a Marine Master Clock.

The module can be used for Master Clock remote control, programming of relay outputs, alarm distribution, supervision and for distribution of correct time. The module can be configured to work as a NTP server or NTP client.

For transmission of correct and accurate time the NTP (Network Time Protocol) is used. NTP is a part of the protocol family UDP/IP.

When using the Ethernet module for time distribution the Master Clock can act as a NTP primary server or as a NTP client.

Units connected to the LAN, supporting NTP, can receive correct time from the Master Clock via the network module.

Included with the Ethernet module is NyToP, Westerstrand NTP-client for Windows 98/NT/2000/XP/Vista.

For remote control and relay programming the windows based application software QW3Control can be used. The QW3Control is an option.

To configure the different parameters such as IP-address, work mode etc. a normal WEB-browser is used.

### Link indicator

The front panel of the Marine Master Clock has a Link indicator LED.

Link indicator      LED ON = Link activated. The Master Clocks is connected to a network.  
                         LED OFF = No link activated. The Master Clock is not connected to a network.

## Technical data

Art. no.:	123384-00
Supported protocols: (For time distribution)	NTP version 1, 2 and 3, RFC1305 SNTP, RFC 1769
Other supported protocols:	FTP (RFC 959) HTTP
Transport protocol:	TCP/IP
IP-address assignment	Dynamic, using DHCP, or fixed IP-address
Compatibility:	Ethernet version 2/IEEE 802.3
Ethernet:	Supports 100BASE-T (RJ45) connections
Ambient temperature:	-20°C up to +55°C
Device Management:	Web-Based (requires web browser)
NTP client software:	NyToP , freeware, manual 1672
Application software:	QW3Control art. no. 123396-00, manual 1739

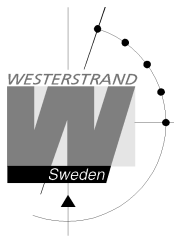
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## Configuration

Most of the configuration parameters are set via an external PC by using a **Web-browser**, but some of the settings can also be done from the Master Clock.

The following parameters can be set from the Master Clock by using the special function *setup*.

- IP address

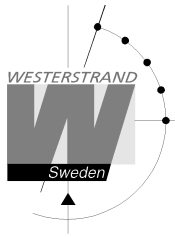
The following parameters can be viewed from the Master Clock by using the special function *status*.

- IP address

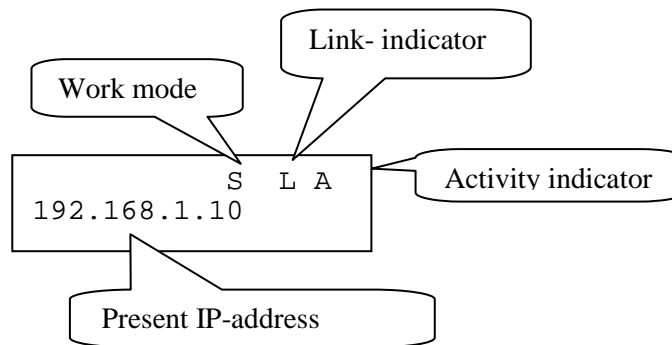
Example:

Give the module IP-address 192.168.1.66

MON 14 OCT 2007 09:07:00 LT <sub>w</sub>	Select function by using ↓ .
SPEC.-FUNCTIONS	Accept using YES. Press NO until wished function is displayed.
SPEC.-FUNCTIONS SETUP	Accept using YES.
SETUP IP	Press NO until the text IP is displayed. Accept using YES.
IP 192.168.001.066?	Set, by using the arrows, the IP-address 192.168.001.066. Accept using YES.
SETUP IP	Return to running mode by using ←.
SPEC.-FUNCTIONS SETUP	←
SPEC.-FUNCTIONS	←
MON 14 OCT 2007 09:07:00 LT <sub>w</sub>	



## Status IP



**Work mode** S = Server. The Master Clock works as a NTP time server.  
C = Client. The Master Clock works as a NTP time client.

**Link indicator** L = Link activated. The Master Clocks is connected to a network.  
= No link activated. The Master Clock is not connected to a network.

**Activity indicator** A = Showing the network traffic from / to the Master Clock.

## Work mode (NTP Server or Client)

The network module kan work in two different modes

### **Server:**

The Master Clock works as a NTP time server answering to NTP requests from NTP clients.

### **Client/Server:**

The Master Clock is both NTP client and NTP server.

The work mode is set from the Master Clock, SPEC.-FUNKTIONEN / SETUP / SYNC.SOURCE.

SYNC.SOURCE = NTP CLIENT

The Master Clock acts as a NTP-client receiving its time from an external NTP server.

SYNC.SOURCE = NMEA, GPS, etc.;

The Master Clock acts as a NTP server providing connected external clients with correct time.

---

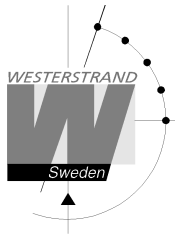
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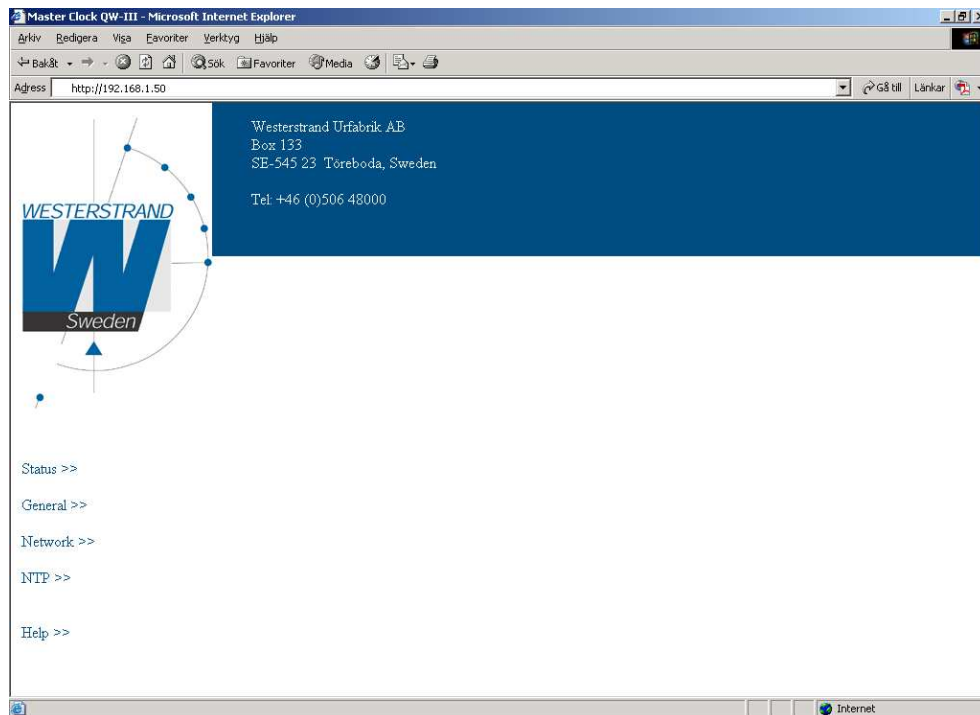
## WEB browser

### Login window

The Web interface requires a password. Always use user name *admin* and a valid password. Default password is *password*.



After login a function list is displayed.:

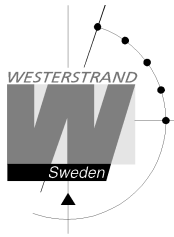


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## Status >>

Displays the Master Clock status. The status is automatically updated every 10<sup>th</sup> second.

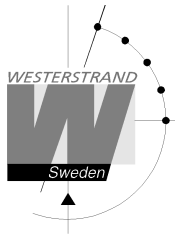


[Status >>](#)  
[General >>](#)  
[Network >>](#)  
[NTP >>](#)  
[Help >>](#)

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SE-545 23 Töreboda, Sweden  
Tel: +46 (0)506 48000

### Marine Master Clock

IP=192.168.3.11  
MAC=00-90-C2-D4-0F-F1  
NTP mode=Client+Server  
UTC offset=0 minutes  
UTC=2008-02-18 10:26:51.663  
LT=2008-02-18 10:26:51.663 Mon (Winter)  
Sync=7 (<=4 Not synched., >=5 Synched.)  
Number of timesettings=15  
Uptime=874 seconds  
Firmware=HUR-M109 (Feb 18 2008 10:49:26)



## General >>

To set general parameters.

Westerstrand Urfabrik AB  
Box 133  
SE-545 23 Töreboda, Sweden  
Tel: +46 (0)506 48000

**General**

Name

Password  repeat

Firmware Download ☒ Off ☐ On

Status >>  
General >>  
Network >>  
NTP >>  
Help >>

**Name** Symbolic name, maximum 48 characters  
Example: Station Master Clock.

**Password** Enter a new password. The password has to be repeated.

**Firmware** Function to enable firmware download.

**Save** Save parameters.

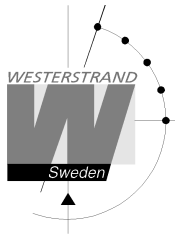
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## Network >>

Used to set the network parameters.

The screenshot shows the Westerstrand web interface. On the left is a sidebar with navigation links: Status >>, General >>, Network >> (highlighted in pink), NTP >>, and Help >>. The main content area has a blue header with company information: Westerstrand Urfabrik AB, Box 133, SE-545 23 Töreboda, Sweden, and Tel: +46 (0)506 48000. Below the header, the 'Network' section is active, showing settings for DHCP (Off), IP (192.168.4.50), Gateway (192.168.1.1), Subnetmask (255.255.240.0), and DNS (192.168.1.1). The 'SNMP Setting' section shows SNMP (Off) and SNMP server (192.168.14.1). At the bottom, there is a 'Save and restart' button and a note: 'Wait 15 seconds after [Save and restart], then press Refresh'.

## DHCP

With this function it is defined if the Ethernet modules should receive its IP-address automatically from a DHCP server or use the static IP-address.

## IP

This function is used to give the Ethernet module a static IP-address.

## Gateway

This function is used to enter a gateway IP-address.

## Subnetmask

This function is used to enter a subnetmask.

## DNS

This function is used to enter a name server IP-address.

## SNMP

With this code the SNMP functionality can be disabled/enabled.

## SNMP server

This function is used to enter the IP-address of the SNMP server.

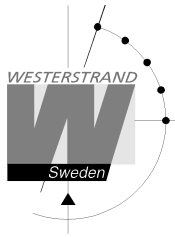
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## NTP >>

Used to set the NTP parameters.

### NTP mode

NTP mode is set from the Master Clock keyboard, special function SETUP/SYNC SOURCE. See page 5.

Server: The Ethernet module answers time request from clients.

Client/Server: The Ethernet module acts as both a NTP client and a NTP server.

### Broadcast/Multicast Server + Interval(s)

--- No periodic transmission of time. A client will ask for time.

Broadcast Transmit time periodic to IP=255.255.255.255

Multicast Transmit time periodic to IP=224.0.1.1

#### Client NTP clock

With periodic transmission client network clocks will show a new time quicker. Make sure the client clock has enabled broadcast/multicast, e.g. *NTP mode = Broadcast/Multicast*. Also *Country/Timezone = Local Time* must be selected in the client clock.

### Timebase

With this function the *type of time* transmitted in the NTP message is chosen. Default=UTC.

### NTP server 1..5

This function is used if the Time Central is receiving time from an external NTP Server and NTP mode Client/Server. The value entered can be either an IP-address or a name if the DNS server (name server) functionality is used. Server ip address is then the address of the external NTP Server.

### Interval(s)

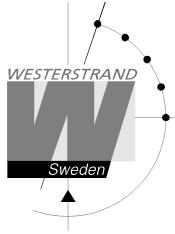
NTP client poll interval in seconds

This function is used if work NTP Client/Server is selected.

### Max. correction (s)

This function is used if the Ethernet module is configured as an NTP client

Enter max. correction in seconds. The time is compared with current time in the Time Central. If 0 is chosen, then no check of the time is done.



## Help>>

Used to view a pdf help file.

## Technical remark

When option Ethernet is mounted and synchronisation source NMEA RS485 is selected the RS485 output can only be used for transmission of NMEA ZDA time string with fixed baudrate (4800) and data format (8N1).

# Technical specification Marine Master clock

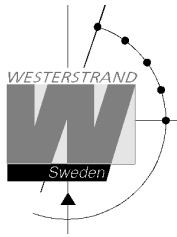


## General

The master clock has 6 buttons and one (2 line x 16 character) LCD. To facilitate time zone change there are 2 separate buttons for this purpose. The master clock also has a dimmer to adjust background illumination.

## Technical data

Crystal frequency:	4,915200 MHz.
Accuracy:	0,1 sek./24 hours (+20°C).
Microprocessor:	HD6412394.
Time memory:	30 days (Back-up with Super Capacitor)
Ambient temperature:	0° C to +50°C.
Relative humidity:	Max. 85% non-condensing.
Case:	19" case according to drawing 085811-00.
IP rating:	IP20
Weight:	5.0 kg.
CE-approval, EMC	Emission according to EN61000-6-3, Immunity according to EN61000-6-2.



## Outputs for slave movements \*:

Control clocks: Analogue display, with background illumination.

### Output 1:

Impulse system: 1/1 minute, 1/2 minute, second, 1/2 second, time code (TC)  
Type of time: LT, UTC  
Impulse length: Minute 0.1-9.9 sec.  
Second 0.1-1 sec.

### Output 2:

Impulse system: 1/1 minute, 1/2 minute, second, 1/2 second, time code (TC)  
Type of time: LT, UTC  
Impulse length: Minute 0.1-9.9 sec.  
Second 0.1-1 sec.

### Output 3:

Impulse system: 1/1 minute, 1/2 minute, second, 1/2 second, time code (TC)  
Type of time: LT, UTC  
Impulse length: Minute 0.1-9.9 sec.  
Second 0.1-1 sec.

### Output 4:

Impulse system: 2-wire, 1/1 minute, 1/2 minute, second, 1/2 second, time code (TC).  
3-wire for forward forward/back. 1/1-minute alt. 1/2-minute.  
Type of time: LT, UTC  
Impulse length: Minute 0.1-9.9 sec.  
Second 0.1-1 sec.

Max. load / output: 2A

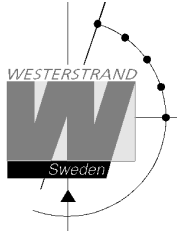
Total load all

outputs together: 2.5A

The outputs have short circuit protection that is restored automatically.

\*Analogue intelligent slave clocks connected to time code output receive the time code and steps to correct time by rapid impulses. The rapid impulses have a speed of approx. 10 steps /second. To step forward 11 hours takes approx. 1 minute and 10 seconds.





## Relay outputs

Number of outputs:	2 Changeover potential-free contacts.
Max load/relay output:	230 V 6A.
Program memory:	100 year (EEPROM).
Signal points:	800

### Special pulse output

Relay output no. 2 can be dedicated to send out a special pulse.

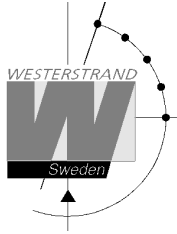
When this function is enabled the relay is activated every day for 5 seconds at 02.00 UTC.

### Telegraph Logger Clock signal

If one of the impulse outputs is configured to work as telegraph logger clock signal (1/2M-12B), then relay output no. 2 is used to send out a Counter C.W. signal and can not be used for other purposes.

## Alarm output

Number of outputs:	2 Changeover potential-free contacts.
Type of alarms	
Output no. 1 (general alarm):	Overload / short circuit, synchronisation alarm
Output no. 2 (power alarm):	Power failure alarm



## Serial ports

The Master Clock is equipped with two serial ports, one RS232 and one RS422/485.

Both ports can be used either as input or output for serial time messages.

If programmed as output the port can be used to send out time to external equipment such as computers etc.

If programmed as input the port can be used to synchronise the master clock with an external time source provided with RS232 or RS485 output. The purpose of this is to achieve higher accuracy.

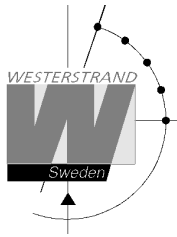
Protocol, data format and baud rate is selectable for respective serial port.

### Serial output

Baud rate (selectable):	300, 600, 1200, 2400, 4800, 9600, 19200 baud.
Data format (selectable)	7N1, 7N2, 7O1, 7O2, 7E1, 7E2, 8N1, 8N2, 8O1, 8O2, 8E1, 8E2
No. of data bits:	7 or 8.
Type of parity:	None, odd or even.
No. of stop bits:	1 or 2.
Selectable data format:	
Available protocols	- ZDA Time string, NMEA 0183 - Westerstrand protocol no. 2, 3, 5, 7 etc. (Automatic time message protocols)
Type of time (selectable):	UTC, LT

### Serial input

Baud rate:	4800 baud.
Data format:	8N1
Type of protocol:	ZDA Time string, NMEA 0183



## Power supply

The master clock has two inputs for power supply, one for AC, and one for 24V DC. As standard the DC-input is a direct connected input without galvanic isolation and no compensation for low input voltage. With option DC/DC the DC-input will be galvanic isolated and low / high input voltage is compensated automatically.

Supply voltage: 90 - 264V 50/60 Hz and 24VDC.

Option DC/DC:

(Galvanic isolated)

Input voltage: 19 - 36VDC

Output voltage: 23 – 30VDC (adjustable)

Isolation voltage: 1500V

Power consumption

AC: 65W

DC: 50W

## Options

DC/DC -converter

Ethernet LAN connection

GPS-receiver

Table model

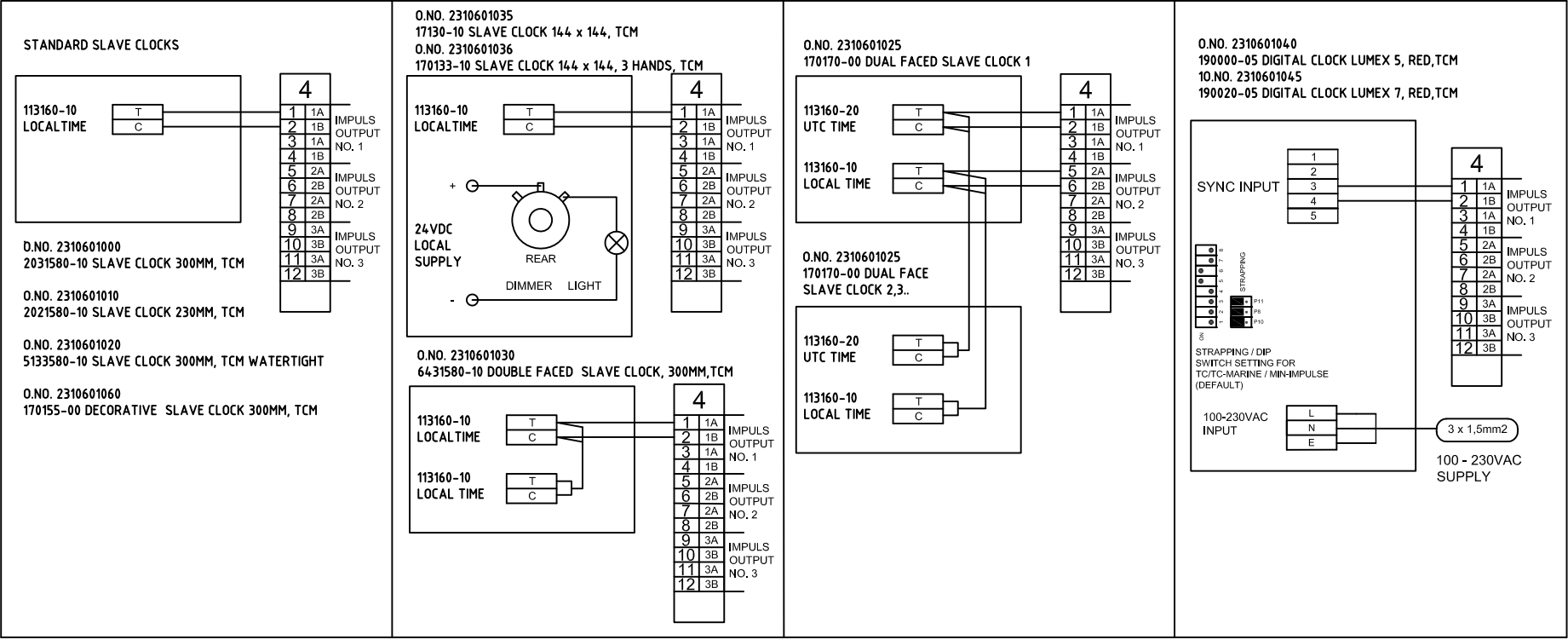
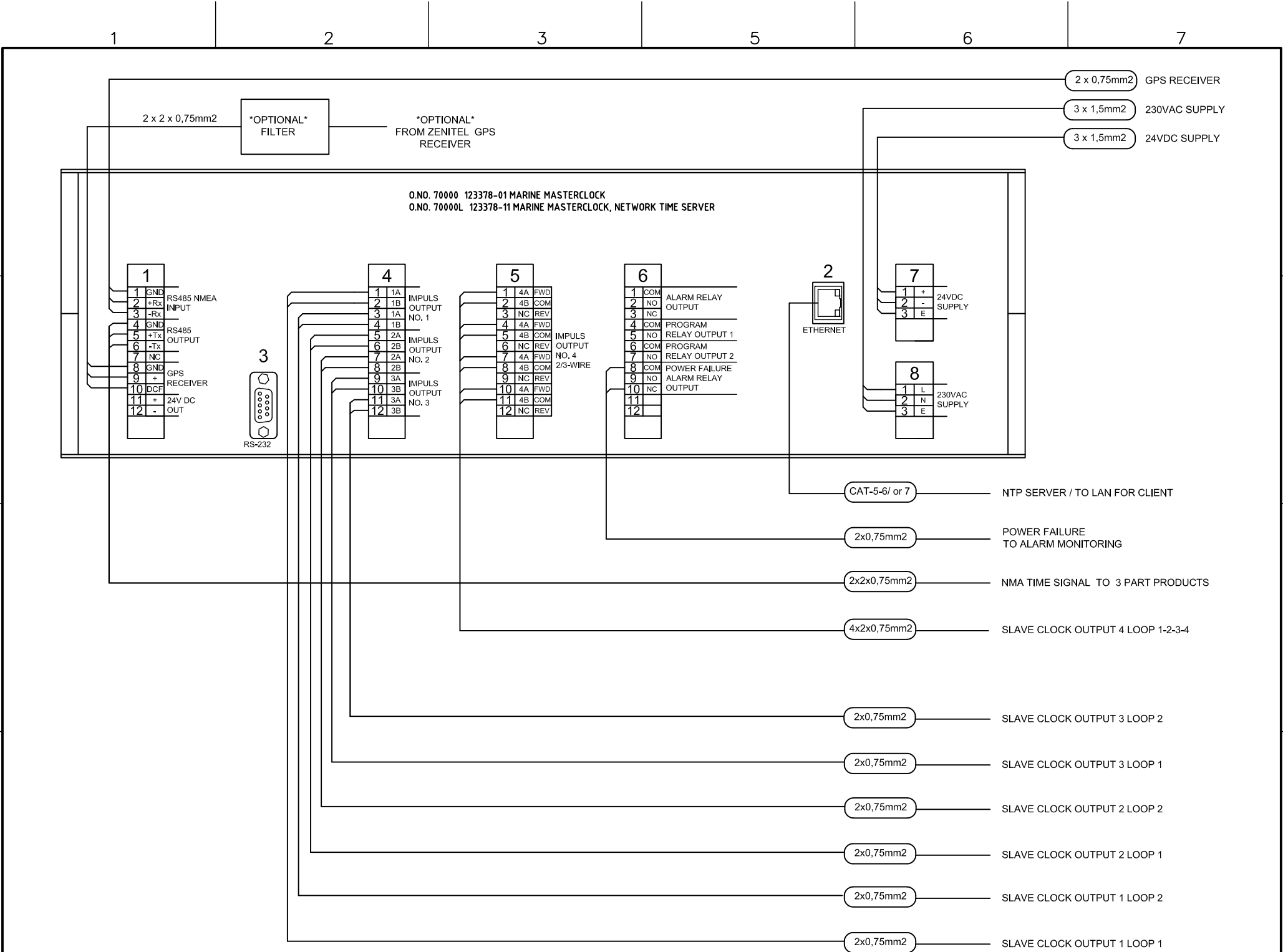
Software for time to computer, WINT

## Ethernet LAN (option)

Protocol: NTP according to RFC1305 and RFC1361, TCP/IP

Compatibility: Ethernet version 2/IEEE 802.3

Ethernet: Connection 100BASE-T (RJ45)




NOTE!  
TIMECODE SYSTEM:  
ALL CLOCKS IN ONE OUTPUT (LOOP1 & 2) CAN BE  
CONNECTED IN PARALLEL  
NON POLARITY DEPENDENT

DOUBLE FACED CLOCK WITH BOTH LOCAL AND UTC  
TIME MUST BE PROGRAMMED AND CONNECTED  
SEPARATE (DOUBLE FACED CLOCK 170170-00)

CABLE REQUIREMENTS:  
2 x 0,75mm2 < 50M  
2 x 1,5mm2 < 100M  
2 x 2,25mm2 < 150M  
2 x 3mm2 < 200M

CABLE CALCULATION:  
SEE DOCUMENT "CALCULATION OF CABLE AREA IN  
TIME SYSTEMS"

					<div>VINGTORSTENTOFON</div> <div>MASTER CLOCK SYSTEM Cable Connection Diagram TCM System 7000</div> <div>General drawing</div>	Prep.by SEN	Date 27.05.10	Project no. -	
04	24.08.16	Terminal block 6 changed				App. by -	Date -	Rev. by SEN	Rev.date 24.08.16
03	12.05.16	2310601036 slave clock 3 hands added				Dwg.no. A100K10836			Rev.no. 04
02	25.11.15	Connection for Lumex-5 and Lumex-7 added				Sheet 1/1	Scale -	Size A3	Unit -
01	25.07.13	Text changed in note!							
Rev.	Date	Revision text	Approved	Date					

# Calculation of Cable Area in Time Systems

## General

To make a time system with impulse operated analog and digital slave clocks that performs satisfactorily, the cable from the Master Clock to the Slave Clocks needs to be dimensioned correctly.

A 10% voltage drop is allowed in the cable.

The length and area of the cable and the current (load) on the cable affect the voltage drop.

## Formula

$$A = l \times I \times k$$

A = Area [mm<sup>2</sup>]

l = cable length [m]

I = current [A]

k = 0.015 [constant]

## Power Consumption

### Impulse Slave Clocks

Analog clocks minute  $\leq 400$  mm: 7.5 mA

Analog clocks minute  $\leq 900$  mm: 15 mA

Analog clocks minute + sweep seconds hand  $\leq 400$  mm: 25 mA

Analog clocks minute 3-wire F/R  $\leq 400$  mm: 10 mA

Digital Clocks: 5 mA

### Time-Code (TC) Slave Clocks

Analog clocks minute  $\leq 400$  mm: 14 mA (version with movement 113160-00)

Analog clocks minute  $\leq 400$  mm: 7 mA (version with movement 21634-00)

Analog clocks minute  $\leq 900$  mm: 20 mA

Analog clocks minute + sweep seconds hand  $\leq 400$  mm, indoor: 12 mA

Analog clocks minute + sweep seconds hand  $\leq 400$  mm, outdoor: 20 mA

Analog clocks minute + sweep seconds hand  $\leq 900$  mm: 27 mA

### Time-Code Marine (TCM) Slave Clocks

Analog clocks minute  $\leq 400$  mm: 20 mA

Analog clocks minute  $\leq 900$  mm: 20 mA

Analog clocks minute + sweep seconds hand  $\leq 400$  mm, outdoor: 27 mA

Analog clocks minute + sweep seconds hand  $\leq 900$  mm: 27 mA

## Example

A time system consists of 40 analog clocks with a diameter of 300 mm.

The power consumption will then be  $40 \times 7.5 = 300 \text{ mA} = 0.3 \text{ A}$

Cable length is 100 meters.

$$A = 100 \times 0.3 \times 0.015 = 0.45 \text{ mm}^2$$

Choose a cable with an area of at least 0.45 mm<sup>2</sup>.



