QWTIME III MASTER CLOCK
**User Manual**

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# User Manual
# Mini Central

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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 Hz  and. 24 V DC -5% +20 %. |
| Max ripple (24V DC): | 0,7V RMS. |
| Power consumption: | 108 W (max) |
| Ambient temperature: | Between 0° C and +40°C. |
| Relative humidity: | Max. 85% non-condensing. |
| Housing: | 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. |

## Slave Clock output

| | |
|---|---|
| Impulse outputs total: | 6 |
| Impulse voltage: | 24V DC |
| Impulse system: | 1/1 minute, 1/2 minute, second, Time Code (TC) |
| Type of time: | LT, NT, UTC |
| Impulse length: | 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: | 4A |

## Sync. sources

| | |
|---|---|
| Type of source: | DCF77, GPS, RDS, MSF, TC, Minute impulse |

## 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: | 1 changeover potential-free contact. |
| Type of alarms: | Overload / short circuit, synchronisation alarm |

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## LAN connection

Protocols supported:                        NTP version 1, 2, 3 and RFC 1305, RFC5905
(For time distribution)                      SNTP, RFC 1769
Other supported protocols:               SNMP v1 Enterprise MIB (RFC 1155 - 1157), HTTP
Transport protocol:                          TCP/IP
IP-address assignment:                     Dynamic, using DHCP, or fixed IP-address
Compatibility:                                 Ethernet version 2/IEEE 802.3
Ethernet:                                       Supports 10/100BASE-T (RJ45) connections
Device Management:                        Web-Based (requires web browser)

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# General description

The Mini Central forms a combination of a quartz master clock with 6 different impulse outputs (amplifiers) for control of slave clocks, and a year programmer with 2 outputs for controlling different energy consumables such as electrical striking plates, buzzers for pause signalling etc.

In case of power failure the built in Real Time Clock keeps the internal time updated. (the outputs are set to position OFF). Connected Slave Clocks are automatically corrected by rapid impulsing when power returns and the outputs resume their positions (ON/OFF) which were previously programmed (with a 10 second switching delay between the different outputs. Entered data's are stored for at least 100 years.

The Mini Central have pre-programmed fixed public holidays and summer/winter time correction (daylight saving). The clock offers full flexibility with regard to programming working days between holidays, public holidays to weekdays, holiday periods etc.

A total of 800 control functions can be programmed over 2 outputs. Repeating daily functions on a certain output only requires 1 control function.

The Mini Central is most flexible as all parameters such as type of impulse system, impulse length, etc. can be set individually for each output.

For connection to a LAN (Ethernet Local Area Network) the Mini Central is equipped with a network device. The network device can be used for remote control, programming of relay outputs, alarm distribution, supervision and for distribution of correct time. The unit can be configured to work as a NTP server or NTP client.

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LED-indication
for relay ON

Relay output
switches

Manual ON (1)
Manual OFF (0)
Automatic position (A)

1
2

1 0 A

ALARM
POWER
RADIO
LINK

Indication for alarm
Indication for power
Indication for radio signal
Indication for network link

Indication for outgoing
slave clock pulses

MINI CENTRAL

Connection space

Ethernet (RJ45)
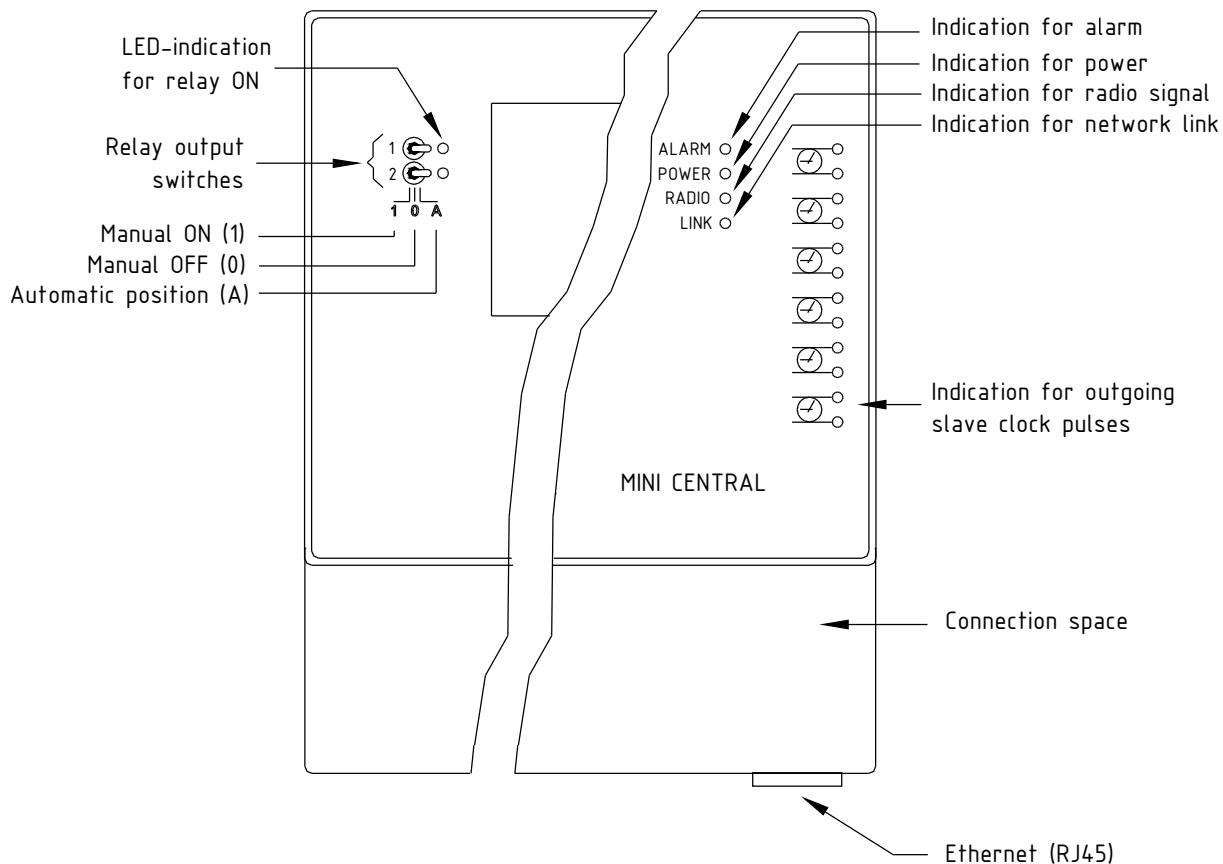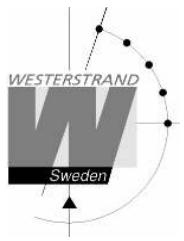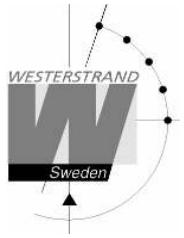
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# Installation

The Mini Central 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 signal line/lines (to relay contacts).
    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.
5.  Connect, if included, other accessories/options such as radio synchronisation, Ethernet etc.
6.  Connect the supply voltage.
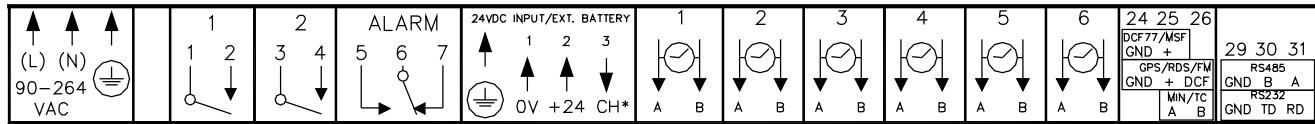
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# Calculation of cable area in time systems

## General

To make a time system with impulse operated analogue and digital slave clocks perform satisfactory, the cable from the Master Clock 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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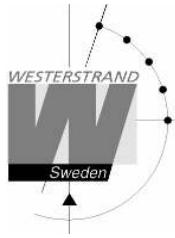
## Synchronisation input

### General

The Master Clock is equipped with a synchronisation input intended for connection to an external synchronisation source. The sync. source can be either a radio receiver type GPS, RDS, MSF, DCF77 or another Master Clock that transmits synchronisation pulses. The Master Clock is factory prepared for connection to a radio receiver. Detailed connection diagram for different radio receivers can be found in the separate manual delivered together with respectively receiver. If the Master Clock is going to be synchronised from another Master Clock it has to be reconfigured. See below.

### Synchronisation from another Master Clock

1. Turn off power.
2. Open the Master Clock by loosening the four screws holding the front panel. Lift the panel and set the jumpers B1-B3 according to the instruction below.
3. Remount the front panel and turn on the power again.
4. Set the sync. source parameter by using the special function *SETUP/SYNC.SOURCE* .
5. Connect the sync. pulses to screw terminal 25 and 26.
6. Set the master clock to correct time +/- 30 sec.
7. When the synchronisation pulses have been accepted by the master clock the colon (:) between hours and minutes in the display starts to flash.
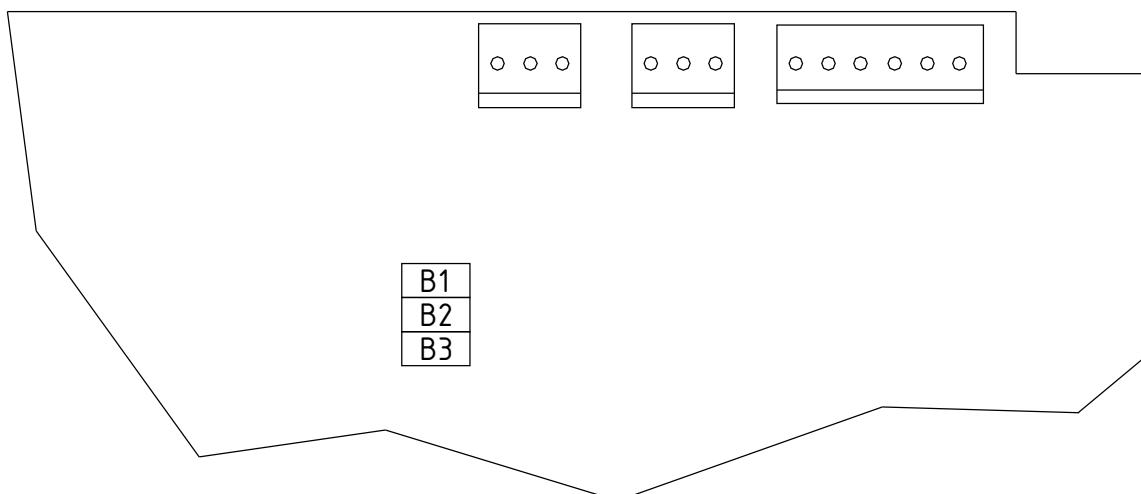


| | B1 | B2 | B3 | |
|---|---|---|---|---|
| PREPARED FOR RADIO RECEIVER | | X | X | FACTORY DEFAULT |
| PREPARED FOR SYNCH. PULSE FROM ANOTHER MASTER CLOCK | X | | | |

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# Serial port RS232/RS485

## General

The Master Clock has a serial port for connection to a PC or other similar equipment. The serial port is factory set to RS232. If RS485 connection is used the Master Clock has to be reconfigured according to the instruction below.
Please see section *SPECIALFUNKTION/SETUP/SERIAL PORT* for details about type of interface, protocol, baudrate etc.

## Connection via RS232

Example:

**Master Clock     External equipment DTE  (9-polig D-sub)        (25-polig D-sub)**

```
GND (29) ------------------------------------------------ 5 ------------------ 7
TD   (30) ------------------------------------------------ 2 ------------------ 3
RD   (31) ------------------------------------------------ 3 ------------------ 2
                                              ⌐ 1          ⌐ 7
                                              ├ 4          ├ 8
                                              └ 6          └ 20
                                              ⌐ 7          ⌐ 4
                                              └ 8          └ 5
```

## Connection via RS485

1. Turn off power.
2. Open the Master Clock by loosening the four screws holding the front panel. Lift the panel and set the cabling according to the instruction below.
3. Remount the front panel and turn on the power again.
4. Enter the special function setup/serial port and change the setting to RS485.
5. Connect the RS485 signal to screw terminal 29, 30 and 31.

**RS232**



**RS485**

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# Alarm relay output

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

| General alarm | 5 - 6 | 5 - 7 | | |
|---|---|---|---|---|
| Normal mode, no alarm | Open | Closed | | |
| Overload/short circuit alarm | Closed | Open | | |
| Synchronisation alarm | Closed | Open | | |

Alarm relay

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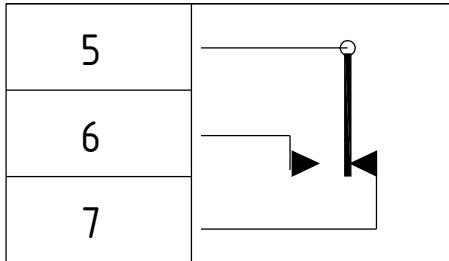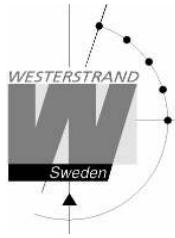
# Programming

## General

Using 6 buttons and a 4-row 20-character display carries out all programming.
Programming is self-instructive and to simplify the dialogue Yes/No questions are used.

## Running mode

When the Master Clock 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.

```
140818  09:07:00  LTs
1 12:00    4 12:00
2 12:00    5 12:00
3 12:00    6 12:00
```

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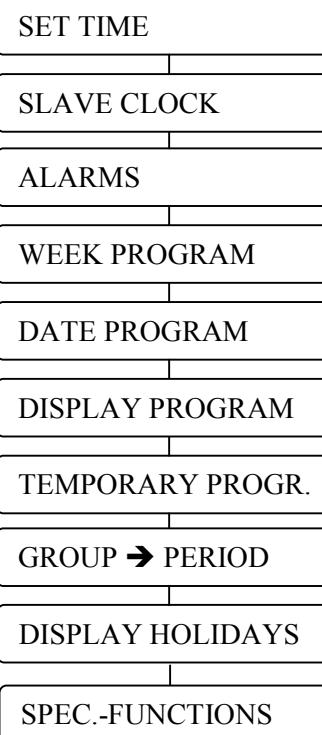
SET TIME

SLAVE CLOCK

ALARMS

WEEK PROGRAM

DATE PROGRAM

DISPLAY PROGRAM

TEMPORARY PROGR.

GROUP ➜ PERIOD

DISPLAY HOLIDAYS

SPEC.-FUNCTIONS

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# Start up

| 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.

| COUNTRY DEU? |
|---|

Press **NO** until correct country code occurs.
For Germany, select DEU. Accept with YES.

| POSITION 007E 052N |
|---|

Now the question: POSITION 007E 052N.
Accept using **YES** or change to other position. See section **Week Program & Date Program** function **Astr** for more details.

| SET TIME 140818  09:07:00 |
|---|

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.

| 140818  09:07:00  LTs<br>1 12:00    4 12:00<br>2 12:00    5 12:00<br>3 12:00    6 12:00 |
|---|

The Master Clock is now in running mode.

To start the Slave Clock outputs use function SLAVE CLOCK.
See section **Programming / Slave Clock** for details.

**Remark**
The Slave Clock outputs are as default configured to send out polar reversing minute impulse. If other impulse systems are required the configuration can be changed. See section **Programming / Spec.-functions / Setup / Setup Impulse output** for details.

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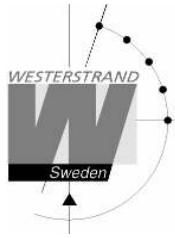
# Set time when in operation

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

Select function using ↓.

```
SET TIME
```

Enter the programming mode with YES.

```
SET TIME
140818  09:07:00
```

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.

```
140818  09:07:00  LTs
1 12:00    4 12:00
2 12:00    5 12:00
3 12:00    6 12:00
```

The master clock 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 start and stop the Slave Clock outputs and to enter the time that the slave clocks are showing. This is useful if, by some reason, the master clock and the slave clocks should show different times. When the slave clock time has been entered, the master clock 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.

```
140818  09:07:00  LTs
1 12:00     4 12:00
2 12:00     5 12:00
3 12:00     6 12:00
```
Select function using ↓.

```
SLAVE CLOCK
```
Enter the programming mode with YES.

```
SLAVE CLOCK       1
```
Select slave clock output using ↑↓, accept using YES.

```
SLAVE CLOCK       1
= 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       1
= 09:07        OFF
```
YES.

```
SLAVE CLOCK
= 09:07        ON
```
**YES.**

```
SLAVE CLOCK       2
```
Continue with the next output or leave programming mode by pressing ←
several times.

```
140818  09:07:00  LTs
1 09:07     4 09:07
2 09:07     5 09:07
3 09:07     6 09:07
```
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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# Alarms

The master clock 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. Alarm relay activated. | The radio receiver is not working. | Check the radio receiver. If OK, clear the alarm. |
| **UF LOW** | Red alarm LED lit. Alarm relay activated | Impulse voltage below alarm limit. | Check the load on the impulse output. If OK, clear the alarm. |
| **SHORT CIRCUIT** | Red alarm LED lit. Alarm relay activated | Short circuit on impulse output | Remove the short circuit. If OK, clear the alarm. |
| **CURRENT LOW** | Red alarm LED lit. Alarm relay activated | 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. Alarm relay activated | 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. Alarm relay activated Works only if the master clock is equipped with batteries for running reserve. | By some reason the power to the master clock has been switched off. | Check the mains. If OK, clear the alarm. |

* One of the relay output can be used as an alarm relay. This function is as default disabled but can be enabled via SPECIAL FUNCTION/ SETUP/ ALARM  RELAY/YES.

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| ALARMS- DISPLAY | To show the alarms |

| ALARMS- ERASE | To erase the alarms |

## Example 1, display alarms

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```
Select function using ↑↓ .

| ALARMS | Accept with YES. |

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

```
14AUG  15:52
NO RADIO
```
The alarm is displayed.
Press ↑↓ to see next alarm.
Return to running mode press ←.

| ALARMS- DISPLAY | ←. |

| ALARMS | ←. |

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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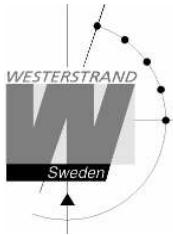
## Example 2, erase (clear) alarms

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

Select function using ↑↓ .

```
ALARMS
```

Accept with YES.

```
ALARMS- ERASE
```

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

```
14AUG  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
```

←.

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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# Week Program & Date Program

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

## Concept description

**Program**

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 *group* of programs.
For example: output 2 switches on every working day (Monday-Friday) at 8.00.

**Week program**

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:
Individual or block programming.
M = Monday
T = Tuesday
W = Wednesday
T = Thursday
F = Friday
S = Saturday
S = Sunday

**Date program**

A date program is a program, which is valid for a specific date.

**Group**

A group of programs, signal events.

**Type of signals**

There are some different kinds of signals, depending on how the relay output is to be used.

**ON/OFF**

Is used when a longer lasting switching ON is required, e.g. for controlling fans, door locks, lighting etc.

**01s**

Is used when a short pulse is required, e.g. for bells/buzzers.
Pulse duration selectable from 1-99 seconds.

**Astr.**

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 Master Clock 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 Master Clock is entered at starting up.
A map indicating latitude (Enorth) and longitude (Eeast) is enclosed.

**Mask**

A program that is repeated f. ex every hour is easily entered by the use of mask program. XX.15.00 ; the program is repeated every hour at minute 15.00
08:XX.00 ; the program is repeated every minute between 08.00 and 09.00.
XX.XX.00 ; The program is repeated every minute.

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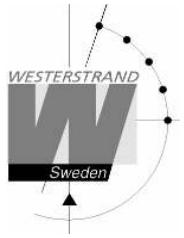
To simplify programming 3 sub menus are used:

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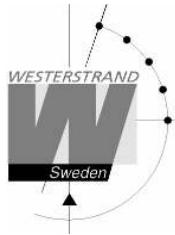
## Week Program, example 1 (New program)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓.

```
WEEK PROGRAM
```
Enter programming mode using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select new program using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select group of programs using ↑↓, accept using YES.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
Select output using ↑↓. Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
State type of signal using ↑↓.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
State the days the program shall function using ↑↓.
Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
State the time of the program using ↑↓.
Move to the right using →.
Accept using YES.
If the program is approved the text "Program saved" is displayed quickly.

```
NEW      GROUP A
OUTPUT 02    OFF
MTWTF-- 09:00:00
```
Continue with programming OFF for the same output or leave programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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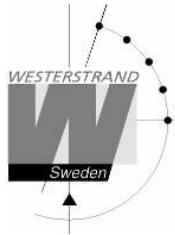
## Week Program, example 2 (Change program)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

Select function using ↑↓.

```
WEEK PROGRAM
```

Enter programming mode using YES.

```
CHANGE   GROUP A
*WEEK PROGRAM*
```

Select change program using YES.

```
CHANGE   GROUP A
*WEEK PROGRAM*
```

Select group of programs using ↑↓, accept using YES.

```
CHANGE   GROUP A
OUTPUT 02     ON
MTWTF-- 09:00:00
```

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

```
CHANGE   GROUP A
OUTPUT 02     ON
MTWTF-- 09:00:00
```

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

```
CHANGE   GROUP A
OUTPUT 02     ON
MTWTF-- 09:15:00
```

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

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

```
CHANGE   GROUP A
*WEEK PROGRAM*
```

Leave programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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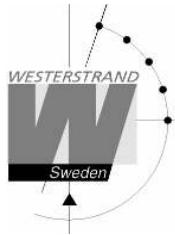
## Week Program, example 3 (Erase program)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

Select function using ↑↓.

```
WEEK PROGRAM
```

Enter programming mode using YES.

```
ERASE  GROUP A
*WEEK PROGRAM*
```

Select change program using YES.

```
ERASE   GROUP A
*WEEK PROGRAM*
```

Select group of programs using ↑↓, accept using YES.

```
ERASE   GROUP A
OUTPUT 01    ON
MTWTF-- 09:00:00
```

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

```
ERASE   GROUP A
OUTPUT 01    ON
----F-- 16:30:00
```

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

```
ARE YOU SURE?
----F-- 16:30:00
```

Accept using YES.

```
ERASE   GROUP A
*WEEK PROGRAM*
```

Leave programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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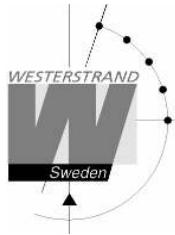
## Week Program, example 4 (Astronomical function)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓.

```
WEEK PROGRAM
```
Enter programming mode using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select new program using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select group of programs using ↑↓, accept using YES.

```
NEW      GROUP A
OUTPUT 02     ON
MTWTF-- 09:00:00
```
Select output using ↑↓. Move to the right using →.

```
NEW      GROUP A
OUTPUT 02     ASTR
MTWTF-- 09:00:00
```
State type of signal using ↑↓.

```
NEW      GROUP A
OUTPUT 02     ASTR
MTWTF-- 09:00:00
```
State the days the program shall function using ↑↓.
Move to the right using →.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Leave programming by pressing ← several times.

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## Week Program, example 5 (Block program)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓.

```
WEEK PROGRAM
```
Enter programming mode using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select new program using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select group of programs using ↑↓, accept using YES.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
Select output using ↑↓. Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    ON
MTWTF-- 09:00:00
```
State type of signal using ↑↓.

```
NEW      GROUP A
OUTPUT 02    ON
M-W-F-- 09:00:00
```
State the days the program shall function using ↑↓.
Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    ON
M-W-F-- 09:00:00
```
State the time of the program using ↑↓.
Move to the right using →.
Accept using YES.
If the program is approved the text "Program saved" is displayed quickly.

```
NEW      GROUP A
OUTPUT 02    OFF
M-W-F-- 09:00:00
```
Continue with programming OFF for the same output or leave
programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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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.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓.

```
WEEK PROGRAM
```
Enter programming mode using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select new program using YES.

```
NEW      GROUP A
*WEEK PROGRAM*
```
Select group of programs using ↑↓, accept using YES.

```
NEW      GROUP A
OUTPUT 02    05S
MTWTF-- 09:00:00
```
Select output using ↑↓. Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    05S
MTWTF-- 09:00:00
```
State type of signal using ↑↓.

```
NEW      GROUP A
OUTPUT 02    05S
MTWTFSS 09:00:00
```
State the days the program shall function using ↑↓.
Move to the right using →.

```
NEW      GROUP A
OUTPUT 02    05S
MTWTF-- **:15:00
```
State the time of the program using ↑↓. ** = every hour.
Move to the right using →.
Accept using YES.
If the program is approved the text "Program saved" is displayed quickly.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Leave programming by pressing ← several times.
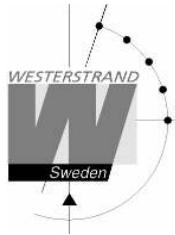
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## Date Program, example (New program)

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

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

Select function using ↑↓.

```
DATE PROGRAM
```

Enter programming mode using YES.

```
NEW
*DATE PROGRAM*
```

Select new program using YES.

```
NEW
OUTPUT 01    ON
AUG 01 12:00:00
```

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

```
NEW      GROUP A
OUTPUT 01     ON
AUG 01 12:00:00
```

State type of signal using ↑↓.

```
NEW
OUTPUT 01    ON
AUG 01 12:00:00
```

State the date the program shall function using ↑↓.
Move to the right using →.

```
NEW
OUTPUT 01    ON
AUG 01 12:00:00
```

State the time of the program using ↑↓.
Move to the right using →.
Accept using YES.
If the program is approved the text "Program saved" is displayed quickly.

```
NEW
OUTPUT 01    OFF
AUG 01 12:00:00
```

Continue with programming OFF for the same output or leave
programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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## Display Program

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

Select function using ↑↓ .

```
DISPLAY PROGRAM
```

Enter display program using YES.

```
GROUP A       ALL
*DISPLAY PROGRAM*
```

Select program group using ↑↓, accept with YES.

```
GROUP A       ALL
*DISPLAY PROGRAM*
```

Select output to be displayed using ↑↓, accept with YES.

```
GROUP A       ALL
OUTPUT 02    ON
MTWTF-- 09:00:00
```

Step forwards alt. Backwards using ↑↓.

```
DISPLAY PROGRAM
```

Leave the function display program by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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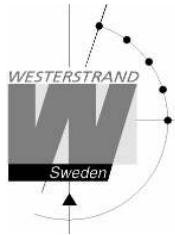
## Temporary Program, example

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.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓ .

```
TEMPORARY PROGR.
```
Enter programming mode using YES.

```
OUTPUT 02     ON
       09:00:00
```
Select output using ↑↓. Move to the right using →.

```
OUTPUT 02     OFF
       09:00:00
```
State type of signal using ↑↓.
Accept using YES

```
OUTPUT 02    OFF
       15:35:00
```
Accept using YES or change the time of the program using ↑↓.

```
TEMPORARY PROGR.
```
Leave the programming by pressing ″ several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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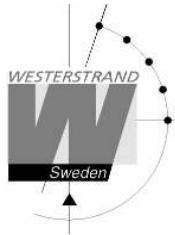
# Group => Period

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...

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
Select function using ↑↓ .

```
GROUP => PERIOD
```
Enter programming mode using YES.

```
GROUP A          (A)
```
Select group of programs using ↑↓, accept using YES.

```
GROUP B
02: MAY01-_____
```
State the date when the period shall begin.
Move to the right using →.

```
GROUP B
02: MAY01- MAY01
```
State the date when the period shall end.
Accept with Yes.

```
GROUP B
03: _____-_____
```
Continue with next time period.

```
GROUP B
03: JUN07-_____
```

```
GROUP B
03: JUN07-AUG15
```
Accept with YES.

```
GROUP => PERIOD
```
Continue with next time period or leave programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

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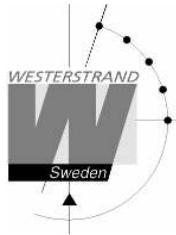
## Display Holidays

This function is used to display the public holidays that are stored.

Example:

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```

Select function using ↑↓ .

```
DISPLAY HOLIDAYS
```

Enter display program using YES.

```
DISPLAY HOLIDAYS
1:  01Jan
```

Scroll using ↑↓.

```
DISPLAY HOLIDAYS
```

Leave the programming by pressing ← several times.

```
140818 09:07:00 LTs
1 09:07  4 09:07
2 09:07  5 09:07
3 09:07  6 09:07
```
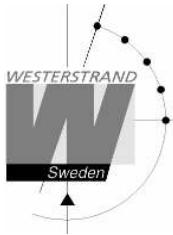
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# Spec.-Functions

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

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with YES. |
| SPEC.-FUNCTIONS<br>STATUS | Press NO until wished function is shown.<br>Accept with YES. |
| STATUS | Show status information of the different output/ input in the Master Clock. |
| 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. |
| HOLIDAYS | Change holidays. |
| DISPLAY FORMAT | Display format in running mode. |
| SOFTWARE  VERSION | Present software version. |
| SPEC.-FUNCTIONS<br>STATUS | Return to running mode press ←. |
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | |

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## Status

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

Example:
Check the status of the radio receiver.

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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.

```
DCF77          60%
13MAR   19:59:00
```

The radio receiver has accepted 60% of the radio messages.
Last reception was 14/10 19:59:00.

```
STATUS
SYNC.SOURCE
```

Return to running mode press ←.

```
SPEC.-FUNCTIONS
STATUS
```

←

```
SPEC.-FUNCTIONS
```

←

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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**Status sync. source**

| Type of synchronisation | | % of accepted messages |
|---|---|---|

```
DCF77        60%
01 MAY 12:00:00
```

Last reception was 01MAY12:00:00*.
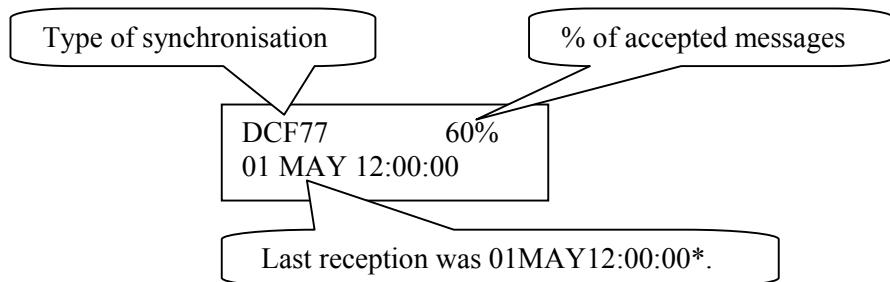
*Remark: The marked position always shows the actual second. This information is updated every other second.

**Status impulse output**
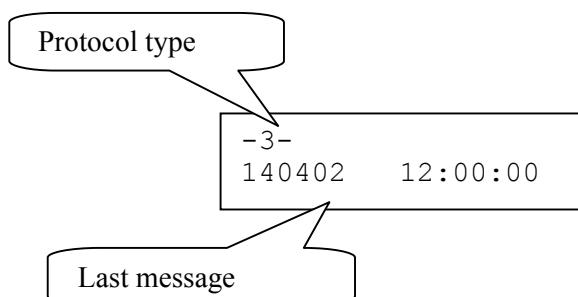
Impulse current

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

Slave Clock time        Impulse voltage

**Status RS232/RS485-port**

Protocol type

```
-3-
140402   12:00:00
```

Last message
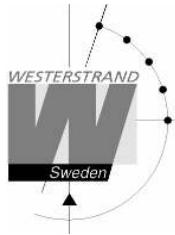
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**Status IP**

Work mode          Link indicator

```
        S   L A
192.168.1.10
```

Activity indicator

Present IP address
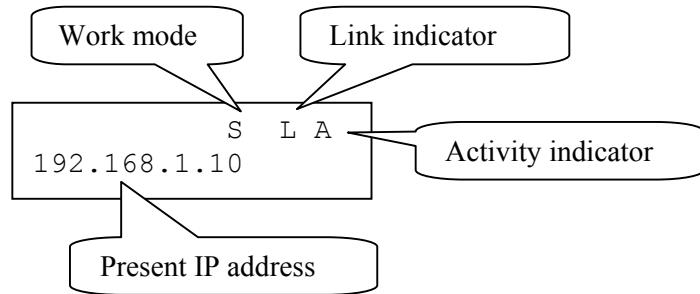

**Work mode**      S = Server. The Master Clock is configured to work as an NTP Time Server.
                   C = Client. The Master Clock is configured to work as an NTP Time Client.


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

**Activity indicator** A = The Master Clock is accessed via the network.

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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 Master Clock.
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

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with YES.<br>Press NO until wished function is shown. |
| SPEC.-FUNCTIONS<br>KEYLOCK | Accept with YES. |
| KEYLOCK     **OFF**<br>PASSWORD   -- | Change to keylock ON. |
| KEYLOCK     **ON**<br>PASSWORD   -- | Accept with YES. |
| KEYLOCK     ON<br>PASSWORD   -- | Accept with YES. |
| SPEC.-FUNCTIONS<br>KEYLOCK | Return to running mode press ←. |
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | |

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Example 2:
Activate keylock with password

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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 ←.

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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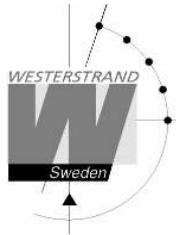
## Language

With this function the language be selected.

Example:

```
140818  09:07:00  LTs
1 09:07     4 09:07
2 09:07     5 09:07
3 09:07     6 09:07
```

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 ←.

```
140818  09:07:00  LTs
1 09:07     4 09:07
2 09:07     5 09:07
3 09:07     6 09:07
```

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## Country

With this function the Country can be selected.
The following country codes are available:

| | | |
|---|---|---|
| ALG = Algeria | ESP-W | NLD = Netherlands |
| Au-EST | EST = Estonia | NOR = Norway |
| AuCSTN | FIN = Finland | NZL = New Zealand |
| AuCSTS | FRA = France | PHL = Philippines |
| Au-WST | FRO = Faroe Islands | POL = Poland |
| Au-TAS | GBR = Great Britain | PRT = Portugal |
| AUT = Austria | GRC = Greece | QAT = Qatar |
| BEL-1 | GRL = Greenland | OMN = Oman |
| BEL-2 | HKG = Hongkong | ROU = Romania |
| BEL-3 | HRV = Kroatia | RUS-M |
| BEL-4 | HUN = Hungary | SAU = Saudi Arabia |
| BGR = Bulgaria | IND = India | SGP = Singapore |
| BRA = Brazil | IRL = Ireland | SWE = Sweden |
| CAN-P | ISL = Iceland | SYR = Syria |
| CAN-M | ISR = Israel | TUR = Turkey |
| CAN-C | ITA = Italy | UAE = United Arab Emirates |
| CAN-E | JOR = Jordan | US-HAW |
| CHE = Schweiz | KWT = Kuwait | US-ALA |
| CYP = Cyprus | LTU = Lithuania | US-P |
| DEN = Denmark | LUX = Luxembourg | USA-M |
| DEU = Germany | LVA = Latvia | USA-C |
| EGY = Egypt | MEX = Mexico | USA-E |
| ESP = Spain | MLT = Malta | US-ATL |
| | MUS = Mauritius | VEN = Venezuela |
| | MYS = Malaysia | ZAF = South Africa |
| | | EUROPÉ = CET, without holidays |
| | | GLOBAL = UTC, without holidays |

Example:

```
 140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```
Select function using ↓ .

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

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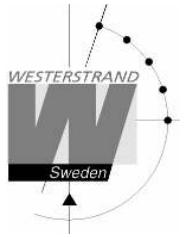
| SPEC.-FUNCTIONS<br>COUNTRY |
|---|

Accept with YES.

| COUNTRY<br>D49 ? |
|---|

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

| SPEC.-FUNCTIONS<br>COUNTRY |
|---|

Return to running mode press ←.

| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 |
|---|

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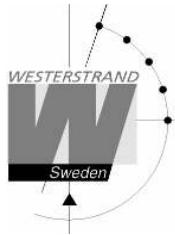
## Position

Enter the geographic position of the Master Clock.
This information is needed for the signal type "Astr." (Twilight), in order to make it possible for the software to calculate the time of sunset and sunrise.

Example:

```
140818  09:07:00  LTs
1 09:07     4 09:07
2 09:07     5 09:07
3 09:07     6 09:07
```

Select function using ↓ .

```
SPEC.-FUNCTIONS
```

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

```
SPEC.-FUNCTIONS
POSITION
```

Accept with YES.

```
POSITION
07E   052N
```

Press buttons ↓ and ↑ until requested longitude occurs.
Press →. State latitude. Accept with YES.

```
SPEC.-FUNCTIONS
POSITION
```

Return to running mode press ←.

```
140818  09:07:00  LTs
1 09:07     4 09:07
2 09:07     5 09:07
3 09:07     6 09:07
```
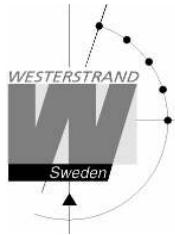
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## Setup

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

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with YES.<br>Press NO until wished function is shown. |
| SPEC.-FUNCTIONS<br>SETUP | Accept with YES. |
| SETUP<br>SYNC SOURCE | Press NO until wished input/output is shown.<br>Accept with YES. |
| DCF77<br>AL.LIMIT   --h -- m | Set, by using the arrows, the alarm limit to 1 hour (01h). |
| DCF77<br>AL.LIMIT  01h 00 m | Accept with YES |
| SETUP<br>SYNC SOURCE | Return to running mode press ←. |
| SPEC.-FUNCTIONS<br>SETUP | ← |
| SPEC.-FUNCTIONS | ← |
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | |

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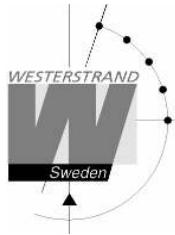
## Setup sync. source

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 │
                    └─────────────────────────┘
   ┌──────────────────────────┐
   │ DCF77                    │
   │ AL. LIMIT   12h00m       │
   └──────────────────────────┘
                    ┌─────────────────┐
                    │  Alarm limit     │
                    └─────────────────┘
```
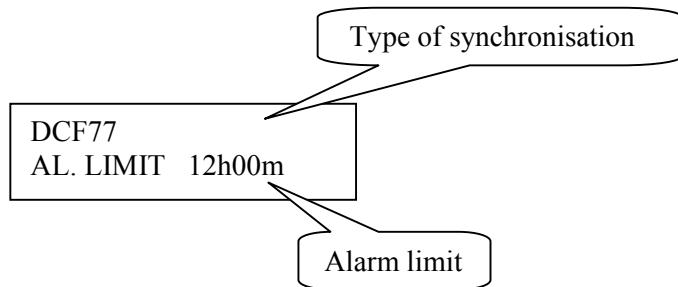
## Type of synchronisation
State type of external synchronisation. The following time sources can be selected:

| | |
|---|---|
| -------- | No external synchronisation. |
| DCF77 | Radio synchronisation DCF77. |
| GPS | Radio synchronisation GPS. |
| RDS | Radio synchronisation RDS. |
| MSF | Radio synchronisation MSF/RUGBY. |
| 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. |
| TC-POL | Polar reversing time code type hard wired DCF. |
| FMSF | Finnish FM time signal. |
| NTP CLIENT | The Master Clock is NTP client |

## 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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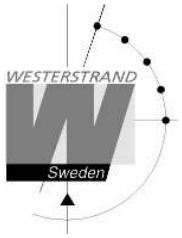
## Setup impulse output

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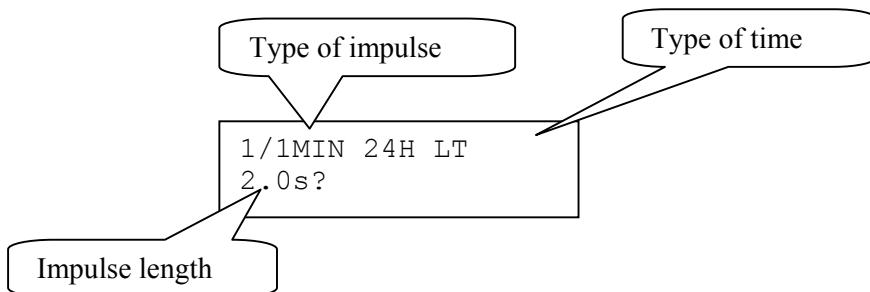
## Type of impulse
Selection of impulse type. The following types are available.

| | |
|---|---|
| 1/1M-24H | : Polarised 1/1-minute impulse with 24 hours resetting (default). |
| 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. |
| TC | : Hard wired DCF Time Code. |
| TC-POL | : Polarised hard wired DCF Time Code. |
| 1/1M-UP | : Non polarised (Uni-Polar) PPM synchronisation pulse. Pulse length 1 second. |
| SR2-58 | : (SR2, hourly correction 2-wired, with imp. correction on the 58th minute). |
| SR2-59 | : (SR2, hourly correction 2-wired, with imp. correction on the 59th minute). |
| SR3-58 | : (SR3, hourly correction 3-wired, with imp. correction on the 58th minute). |
| SR3-59 | : (SR3, hourly correction 3-wired, with imp. correction on the 59th minute). |
| ----------- | : No impulse system. |

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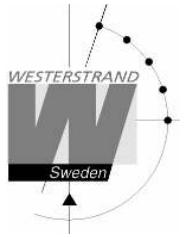
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**Impulse length**
Configuration of impulse length.

| | |
|---|---|
| 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
```

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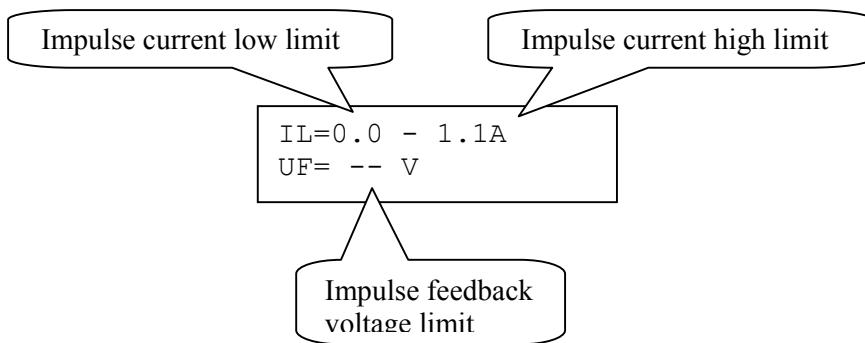
**Impulse current low limit**
Alarm limit for low current (minimum load). The minimum load can be set from 0A up to 1.1A.

**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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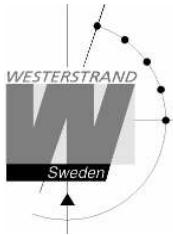
**Setup RS232/485 port**

```
        ┌─────────────────┐           ┌─────────────────┐
        │ Type of protocol │           │   Type of time  │
        └─────────────────┘           └─────────────────┘

              ┌──────────────────────┐
              │  -3-      LT          │
              │  1200     7E1         │
              └──────────────────────┘

        ┌─────────────────┐           ┌─────────────────┐
        │    Baudrate     │           │   Data format   │
        └─────────────────┘           └─────────────────┘
```
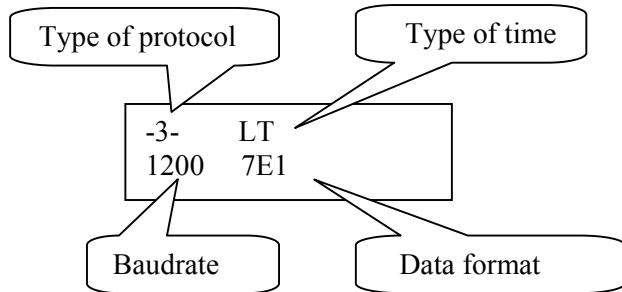
**Type of protocol**
Name of the transmission / reception protocol used in the module. The following protocols are available.

| | |
|---|---|
| 1 | : General 2-way-communication protocol. |
| 2, 3, 5 and 7 | : Automatic time message protocols. |
| NMMI | :NMEA 0183, ZDA Time string, transmitted every minute. |
| NMSE | :NMEA 0183, ZDA Time string, transmitted every second. |

**Type of time**
Type of time received or transmitted.

LT = Local Time.
NT = Normal Time (winter time).
UTC = Universal Time Coordinated.

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**Baudrate**

Available speeds:
300, 600, 1200, 2400, 4800, 9600, 19200, 38400 baud.


**Data format**
Data format of message received or transmitted.
No. of data bits, 7 or 8.
Type of parity, non, odd or even.
No. of stop bits, 1 or 2.

Available formats:
7N1, 7N2, 7O1, 7O2, 7E1, 7E2, 8N1, 8N2, 8O1, 8O2, 8E1, 8E2,

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## Protocol description

## 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 Synced 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 x 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 = Carrige return 0Dh.
LF = Line feed 0Ah.
```

The time message is sent out each minute or each second.
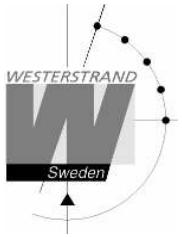
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### Protocol 7

```
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.


### NMEA

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

```
        1        2  3  4     5  6  7
        |        |  |  |     |  |  |
$--ZDA,hhmmss,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
```

NMMI        :NMEA 0183, ZDA Time string, transmitted each minute.
NMSE        :NMEA 0183, ZDA Time string, transmitted each second.

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## Setup IP

This function can be used to give the Master Clock an IP address if it is equipped with option Ethernet.
Please note that IP address as well as all other network parameters can be configured via an external PC using Telnet. See separate manual for this.

Example:
Give the Master Clock IP address 192.168.1.100.

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with YES.<br>Press NO until wished function is shown. |
| SPEC.-FUNCTIONS<br>SETUP | Accept with YES. |
| SETUP<br>IP | Press NO until the text IP is shown.<br>Accept with YES. |
| IP<br>**192**.168.013.199 | Set the first digit group of the IP address using ↑↓.<br>Move to the right using →. |
| IP<br>192.**168**.013.199 | Continue with the second digit group. Change digits using↑↓.<br>Move to the right using →. |
| IP<br>192.168.00**1**.199 | Continue with the third digit group. Change digits using↑↓.<br>Move to the right using →. |
| IP<br>192.168.13.**100** | Continue with the fourth digit group. Change digits using↑↓.<br>Accept with YES. |
| SETUP<br>IP | Return to running mode press ← ← ←. |
| 140818  09:07:00  LTs<br>1 09:07    4 09:07<br>2 09:07    5 09:07<br>3 09:07    6 09:07 | |

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## Software version

This function shows the software version for the Master Clock.

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

Select function using ↓ .

```
SPEC.-FUNCTIONS
```

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

```
SPEC.-FUNCTIONS
SOFTWARE VERSION
```

Accept with YES.

```
MICE2-A102
123864-00        11m
```

The software version is MICE2-A102.
11m = Uptime for this Master Clock.

```
SPEC.-FUNCTIONS
SOFTWARE VERSION
```

Return to running mode press ←.

```
SPEC.-FUNCTIONS
```

←

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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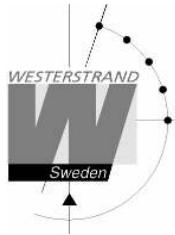
## Holidays

Normal public holidays are pre-programmed and the following year's public holidays are calculated automatically at the turn of the year.

There are two different types of holidays:
- Holidays with *fixed date;* holidays that is appearing at the same date year after year.
- Holidays with *variable date;* holidays that is changing date from year to year.

It is possible to change the existing, pre-programmed holidays.
- *Fixed date holiday* can be inserted (NEW) or deleted (ERASE).
- *Variable date holidays* can be *enabled* or *disabled.* Disabled means that the holiday is deactivated until it is manually enabled again.

**Fixed holidays**

Example of fixed holidays:
JAN01 New Year's day
DEC25 Christmas day
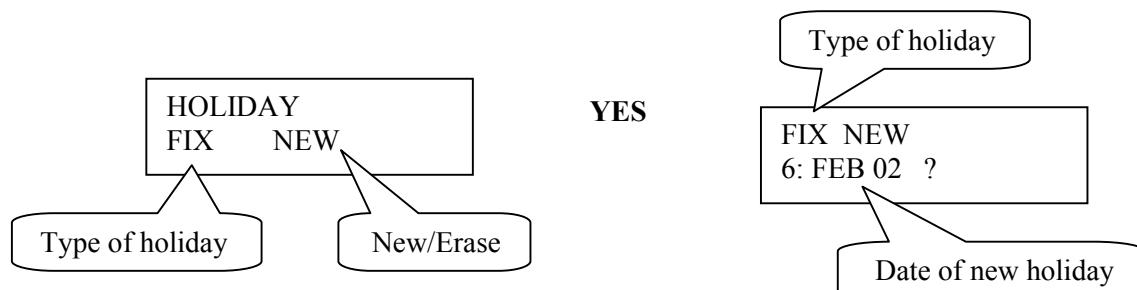
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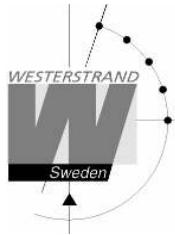
**Variable holidays**

Example of variable holidays:
Good Friday
Easter Monday

Holiday abbreviations used

| Language English | | Language French | | Language German | |
|---|---|---|---|---|---|
| EAST. TH | Easter Thursday | | | | |
| GOOD FR | Good Friday | | | | |
| EAST. MO | Easter Monday | | | | |
| ASCENS. | Ascension | | | | |
| COR CH | Corpus Christi | | | | |
| PENT. MO | Pentecost Monday | | | | |
| PRAY DAY | Pray Day | | | | |
| JOH. EVE | | | | | |
| JOH. DAY | | | | | |
| ALL ST. | All Saints Day | | | | |
| WED NOV | Bank holiday | | | | |
| MO MAY | Bank holiday | | | | |
| MO JUN | Bank holiday | | | | |
| MO AUG | Bank holiday | | | | |
| MO OCT | Bank holiday | | | | |

```
┌─────────────────┐          ┌──────────────────────┐
│ HOLIDAY         │   YES    │ VARIABLE             │
│ VARIABLE        │          │ GOOD FR    ON ?      │
└─────────────────┘          └──────────────────────┘
      │                            │          │
 ╭────────────╮            ╭──────────────╮ ╭──────────────────╮
 │ Type of    │            │ Holiday name │ │ Enable / Disable │
 │ holiday    │            ╰──────────────╯ ╰──────────────────╯
 ╰────────────╯
```
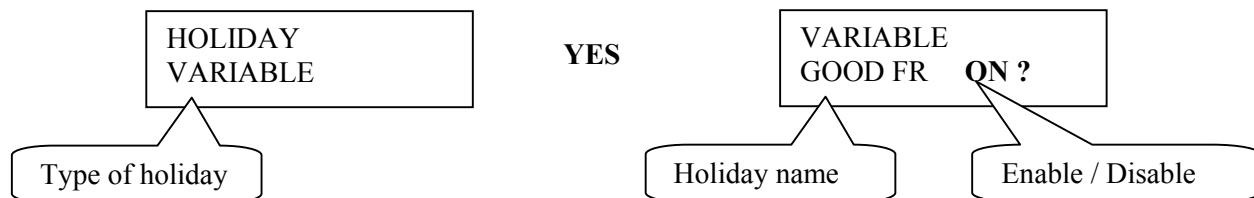
**Enable/disable**
OFF = This holiday is disabled (not used)
ON = This holiday is enabled (used)

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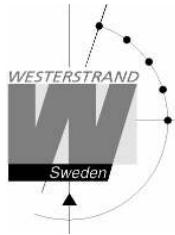
### Holidays, example 1, insert a new fixed holiday

Insert January 25 as a new fixed holiday.

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with **YES**.<br>Press **NO** until wished function is shown. |
| SPEC.-FUNCTIONS<br>HOLIDAY | Accept with **YES**. |
| HOLIDAY<br>FIX | Press NO until the text HOLIDAY FIX is shown.<br>Accept with **YES**. |
| HOLIDAY<br>FIX     NEW | Press **YES** |
| FIX   NEW<br>6:**JAN**-- | Press buttons ↓ and ↑ until requested month occurs.<br>Move to the right using →. |
| FIX   NEW<br>6:JAN**25** | Press buttons ↓ and ↑ until requested day occurs.<br>Accept with **YES**. |
| FIX   NEW<br>7:----- | Leave this function by pressing ←. |
| HOLIDAY<br>FIX | ← |
| SPEC.-FUNCTIONS<br>HOLIDAYS | ← |
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | |
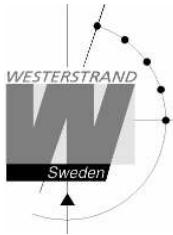
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### Holidays, example 2, erase fixed holiday

Erase the fixed holiday January 01.

```
140818  09:07:00 LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```
Select function using ↓ .

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

```
SPEC.-FUNCTIONS
HOLIDAY
```
Accept with **YES**.

```
HOLIDAY
FIX
```
Press NO until the text HOLIDAY FIX is shown.
Accept with **YES**.

```
HOLIDAY
FIX    ERASE
```
Press NO until the text FIX ERASE is shown.
Press YES.

```
FIX    ERASE
1:JAN01   ?
```
Press button ↑ until requested holiday occurs.
Accept with **YES**.

```
FIX    ERASE
1:JAN01 ERASE?
```
Accept with **YES**.

```
FIX    ERASE
1:JAN01 OK
```
The holiday Jan 01 is erased.

```
FIX    ERASE
2:MAY01
```
Leave this function by pressing ←.

```
HOLIDAY
FIX
```
←

```
SPEC.-FUNCTIONS
HOLIDAYS
```
←

```
140818  09:07:00 LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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### Holidays, example 3, disable a variable holiday

Disable holiday Good Friday.

| | |
|---|---|
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | Select function using ↓ . |
| SPEC.-FUNCTIONS | Accept with **YES**. |
| SPEC.-FUNCTIONS<br>HOLIDAY | Press **NO** until wished function is shown.<br>Accept with **YES**. |
| HOLIDAY<br>VARIABLE | Press NO until the text HOLIDAY VARIABLE is shown.<br>Accept with **YES**. |
| VARIABLE<br>EAST.TH OFF? | Press → until the text GOOD FR is shown. |
| VARIABLE<br>GOOD FR **ON**? | Change ON to OFF by pressing button ↑. |
| VARIABLE<br>GOOD FR **OFF**? | Accept with **YES**. |
| VARIABLE<br>EAST MO ON? | Press ←. |
| VARIABLE<br>SAVE ? | Accept with **YES.** |
| HOLIDAY<br>VARIABLE | Return to running mode press ← ← ←. |
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 | |

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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:

```
140818  09:07:00  LTs
1 09:07    4 09:07
2 09:07    5 09:07
3 09:07    6 09:07
```

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


Format 2, used for test / fault finding.

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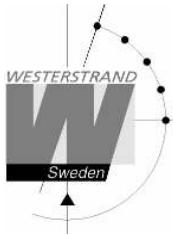
# Ethernet LAN interface

## Configuration

Most of the configuration parameters are set via an external PC by using a *Web-browser* or *Telnet*, 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

| |
|---|
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 |

Select function by using ↓ .

| |
|---|
| SPEC.-FUNCTIONS |

Accept using YES.
Press NO until wished function is displayed.

| |
|---|
| SPEC.-FUNCTIONS<br>SETUP |

Accept using YES.

| |
|---|
| SETUP<br>IP |

Press NO until the text IP is displayed.
Accept using YES.

| |
|---|
| IP<br>`192.168.001.066?` |

Set, by using the arrows, the IP-addess 192.168.001.066.
Accept using YES.

| |
|---|
| SETUP<br>IP |

Return to running mode by using  ← ← ←.

| |
|---|
| 140818  09:07:00  LTs<br>1 09:07     4 09:07<br>2 09:07     5 09:07<br>3 09:07     6 09:07 |

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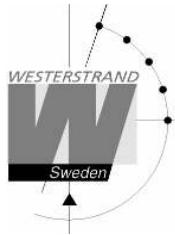
**Status IP**
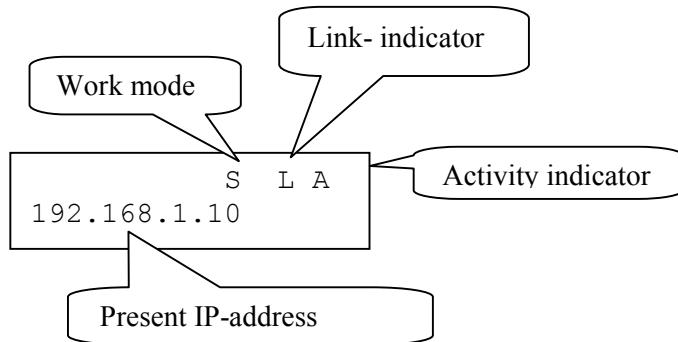


**Work mode**       S = Server. The Master Clock works as a NTP time server.
                    C = Client. The Master Clock works as a NTP time client.


**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.-FUNKTIONS / 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 = GPS, RDS, DCF etc.;
The Master Clock acts as a NTP server providing connected external clients with correct time.
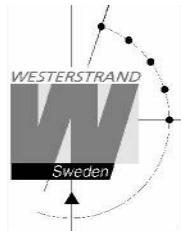
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# WEB browser

## 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.:
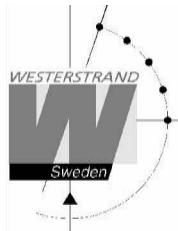
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## Status >>

Displays the Master Clock status. The status is automatically updated every 10th second.



The last line shows current firmware version, here HUR-A154.
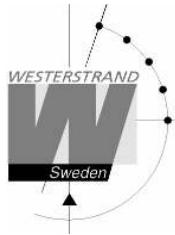
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**General >>**

Setgeneral parameters.



| | |
|---|---|
| **Name** | Symbolic name, maximum 48 characters<br>Example: Station Master Clock. |
| **Password** | Enter a new password. The password has to be repeated. |
| **Firmware** | Function to enable firmware download. |
| **Save** | Save parameters. |
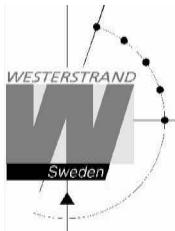
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## Network >>

Used to set the network parameters.



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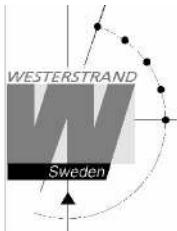
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### SNMP server
This function is used to enter the IP-address of the SNMP server.

## NTP >>
Used to set the NTP parameters.



### NTP mode
Select work mode of the network module:

| Server | The Ethernet module answers time request from clients. |
|---|---|
| Client/Server | The Ethernet module acts as both a NTP client and a NTP server. In the master clock sync. source NTP CLIENT was chosen. |

### Broadcast/Multicast Server

| --- | No broadcast/Multicast |
|---|---|
| Broadcast | Broadcast to IP=255.255.255.255 with selected interval is enabled. |
| Multicast | Multicast to IP=224.0.1.1 with selected interval is enabled. |

### DST info
Default is Off. DST info ON means that Day-Light-Savings information is included in the NTP message.

### MD5
MD5 is a security algorithm. Default is unchecked. When checked (=enabled), then also the NTP client/server must use MD5, else a NTP message is ignored.

### NTP server 1..5
This function is used if the Master Clock 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.

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Up to five different NTP servers can be entered. If the first one fails it will automatically go to the next one and so on.

**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 Master Clock. If 0 is chosen, then no check of the time is done.

**Help>>**

Used to view a pdf help file.

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## Program TELNET

This program is used for setting of parameters after the network controller has an IP address. Start a telnet session. Enter the IP address of the network controller. If the IP address is unknown it can be displayed by using the special function *status*.
Please note that if password is used the Telnet session will start with the question *Password:*
Please enter a valid password.

Telnet in Windows 2000

```
Microsoft (R) Windows 2000 (TM) version
5.00 (Build 2195)
Welcome to Microsoft Telnet-client
Telnet-client build 5.00.99203.1

Escape-sign is CTRL+¨

Microsoft Telnet> open 192.168.1.240
```

Press [?] + [Enter]. A help menu is shown:

```
D              Display data
G i*           Gateway
E d            Max correction in seconds, 0 no check
I d            NTP Client poll interval in seconds
N i*           Subnetmask
P c            Password
S c            NTP server
X 37/38*       HTTP OFF/ON
X 41/42        NTP timebase UTC/LT
X 43/44        MD5 OFF/ON
X 45/46        DLS info OFF/ON
X 47/48        Firmvare Download OFF/ON
X 51/52        Echo OFF/ON
X 54 i*        IP address: Static or DHCP fallback
X 55 i*        Name server
X 71/72*       IP address STATIC/DHCP
X 93           Quit without save
X 98           Save
X 99           Save and restart
W d   *        Workmode: 0 NTP server, 1 NTP Server+Client


d digit, c character, i IP address in dotted format,
*restart (x99) required.
```

**WESTERSTRAND URFABRIK AB**

| | | | |
|---|---|---|---|
| P.O. Box 133 | Tel. +46 506 48000 | Internet:: | http://www.westerstrand.se |
| SE-545 23 TÖREBODA | Fax. +46 506 48051 | E-mail: | info@westerstrand.se |

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### D Display data

Display data about the network controller:

```
HUR-A100
Westerstrand Urfabrik AB
http://www.westerstrand.se

UTC=2006-05-16  12:02:56.347 Tue
LT =2006-05-16  15:02:56.347 Tue (Summer)
NTP : Synchronized from MC,Server,UTC
Mode: ECHO HTTP:10080.

MAC=00-90-C2-CE-0B-46
IP=192.168.13.199 (Static)
Gateway=192.168.1.1
Subnetmask=255.255.240.0
DNS  server=192.168.1.1
```

The first line shows current program version in the network controller.

### G Gateway IP address

Example: Assume that the gateway IP address has the address 192.168.1.1:

```
(? help)  >G 192.168.1.1 [Enter]
(? help)  >X 99 [Enter]
```

Remark: If not used the gateway IP address must be set to 255.255.255.255.

### E Max. correction in seconds, 0 no check

This function is used if the Ethernet module is configured as an NTP client (work mode 1).
Enter max. correction in seconds. The time is compared with current time in the Master Clock. If 0 is chosen, then no check of the time is done.

### I NTP client poll interval in seconds

This function is used if work mode 1 (NTP Client) is selected.

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**N Subnet mask**

Example: Assume that the subnet mask is 255.255.240.0:

```
(? help) >N 255.255.240.0 [Enter]
(? help) >X 99 [Enter]
```

Remark: If not used the subnet mask must be set to 255.255.255.255

**P Password**

With this function it is possible to lock the network controller with a password. This is used to avoid unauthorised programming. The password can be up to 9 characters and the following characters can be used:
0 – 9, A – Z, a –z . Please note that the password is case sensitive.

Password examples:
```
Admin
123456789
B9x35r
```

The password code is set according to: >P [code], e.g.
```
(? help) >P Admin  [Enter]
(? help) >X 98 [Enter]
```

To disable the password function:
```
(? help) >P [Enter]
(? help) >X 98 [Enter]
```

**S NTP server**

This function is only used if the Master Clock is receiving time from an external NTP Server and Work mode W1 is selected. 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.

Example:
The Swedish National Testing and Research Institute, SP has two NTP time servers.
The Internet address for one of them is *ntp1.sp.se*.

```
(? help) >S ntp1.sp.se  [Enter]
(? help) >X 98 [Enter]
```

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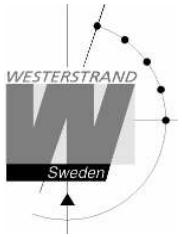
**X41/42 NTP time base UTC/LT**

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

Example: Send UTC

(? help) >X41 *[Enter]*
(? help) >*X 98 [Enter]*.


**X43/44 MD5 OFF/ON**

If the NTP client software NyToP is used the security of the transmission can be increased by the use of MD5 together with a private (secret) key.
MD5 (Message-Digest algorithm 5) is a widely used cryptographic hash function with a 128-bit hash value. MD5 must be enabled in both the Ethernet module and the NyToP software.

With this code the MD5 functionality can be disabled/enabled.

Example: Turn OFF MD5

(? help) >X43 *[Enter]*
(? help) >*X 98 [Enter]*


Example: Turn ON MD5

(? help) >X44 *[Enter]*
(? help) >*X 98 [Enter]*

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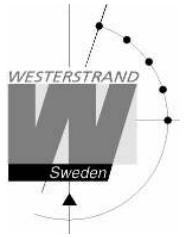
### X45/46 DLS info OFF/ON

With this function it can be decided to send summer/winter time information within the NTP message.

Example: Turn off  S/W information

```
(? help) >X45 [Enter]
(? help) >X 99 [Enter]
```

Example: Aktivate S/W information

```
(? help) >X46 [Enter]
(? help) >X 99 [Enter]
```

Remark: This function is only used in countries where the rules for daylight saving (DLS) is not defined in advance. It will also only work with NTP client software NyToP.
According to the NTP-standard it should not be any information about DLS included in the message. The time zone is decided locally in the NTP client.

### X47/48 Firmware Download OFF/ON

### X51/52 Local Echo OFF/ON

With this code the Telnets echo function can be turned off.

Example: Turn off Telnet echo for entered characters.

```
(? help) >X51 [Enter]
(? help) >X 99 [Enter]
```

Example: Turn on Telnet echo

```
(? help) >X52 [Enter]
(? help) >X 99 [Enter]
```

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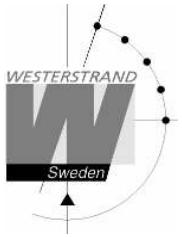
### X 54 Static IP address

This function is used to enter the module static IP-address.
When entering a new IP address, make sure to remember the new IP address!

Example: Assume a change from address 192.168.1.102 to address 192.168.1.134:

```
(? help)  >X 54 192.168.1.134 [Enter]
(? help)  >X 99 [Enter]
```

To remove the connection for the old IP address in your PC:
>ARP –D 192.168.1.101
Start a new telnet session with IP address 192.168.1.134

### X55 DNS Name server

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

Example: Assume that the DNS name server has the address 192.168.1.6:

```
(? help)  >X 55 192.168.1.6 [Enter]
(? help)  >X 99 [Enter]
```

### X71/72 Static IP-address/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 defined with function X54.

Example: Use static IP address:

```
(? help)  >X 71 [Enter]
(? help)  >X 99 [Enter]
```

Example: Receive IP address automatic from DHCP server:

```
(? help)  >X 72 [Enter]
(? help)  >X 99 [Enter]
```

Remark: If the module is set to receive IP address automatically and it doesn't receive an address it will automatically use the static IP-address (fallback).

### X 93 Quit and restart without save

Restart the network controller without saving new data.

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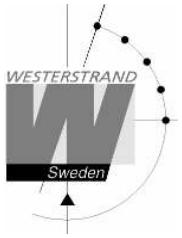
`(? help)` *>X 93 [Enter]*

## X 98 Save

Save data to memory.

`(? help)` *>X 98 [Enter]*

## X 99 Save and restart

Save data to memory. The network controller is restarted.

`(? help)` *>X 99 [Enter]*

## W Work mode

Select work mode of the network controller:
W 0        NTP Server.
W 1        NTP Client and server.

### NTP Server (work mode 0)

The network controller answers time request from clients.

### NTP Client (work mode 1)

Work mode W1 is selected and the Ethernet module act as both a NTP client receiving time from an external NTP Server and a NTP server.

## backspace Cancel input

Cancel the input of data. The data is displayed.
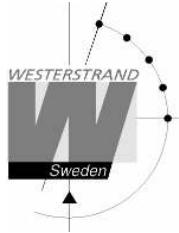
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# Relay programming form

| Function | Group | Output no. | Type of signal | Day/Date | Time |
|---|---|---|---|---|---|
| | | | | | |
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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 holiday overrides a signal point in a week program.
Priority order (1=highest, 4=lowest):
1) Date program   2) Holiday   3) Group   4) 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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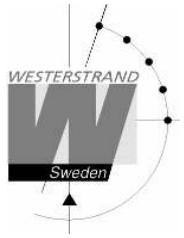
D3.    "Exists"

The signal point is already programmed.

D4.    "Not programmed"

When trying to change a non-existing signal point.

**RADIO**

*Radio synchronisation is not working (DCF)*

Check that the LED in the antenna is flashing in second's rhythm. The antenna should be mounted in the clear, with the arrow on the box aiming south. Check that the LED "Radio" on the master clock is flashing in second's rhythm.

Use special functions "Status/Sync. source" for information on the reception quality.

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