

4 – Channel - Year Time Switch

TR 644 – DCF 77 EIB

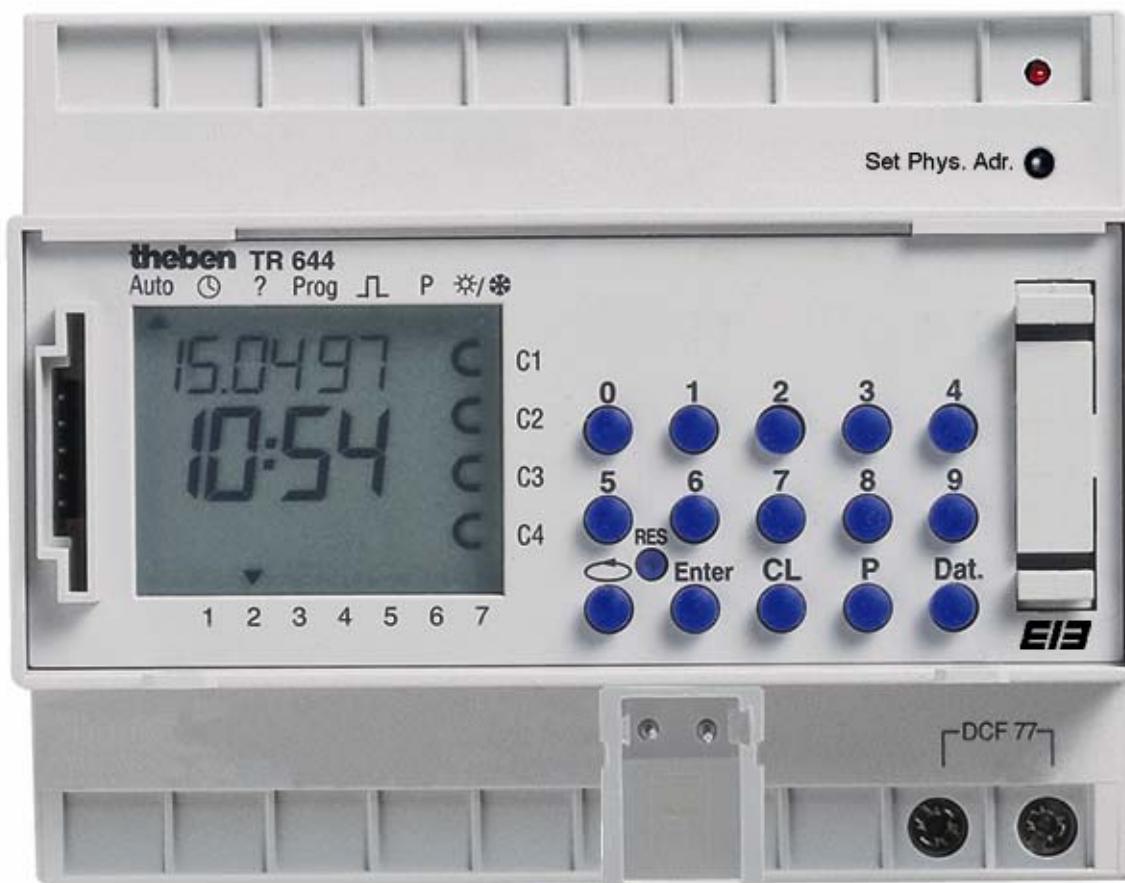


Table of Contents

4 - Channel - Year Time Switch.....	
TR 644 – DCF 77 EIB	1
1 Operational Characteristics.....	3
2 Technical Data.....	5
2.1 Dimensional Drawing / Connection Diagram	6
3 Application Programs.....	7
3.1 Selection in the product database	7
3.2 Application program "scene with switching, value, priority"	8
3.3 Application program "switching, value, send time and date"	11
3.4 Application "switching, value, temperature, receive time and date"	14
4 Additional Expert Information.....	18
4.1 HVAC Functions (Heating, Ventilation, Air Conditioning)	18
4.2 Communication of the TR 644 with bus	18
4.3 Bus synchronisation	18
4.4 Program review	19
5 Further Literary References.....	19

1 Operational Characteristics

The 4-channel-year time switch TR 644 - DCF 77 EIB is a series assembly product to be installed in panels. The connection to the EIB is made via bus connecting terminal. The time switch offers: 324 captive switching times for selectable daily, week and date instructions, impulse instructions, priority switching times, as well as 1 x circuits for vacation / holidays.

For each channel, additionally 9 further week programs with priority steps P1 to P9 and a temporarily limited permanent circuit can be programmed beside the normal week program. Likewise a random program can be activated. The period of a priority program is determined by input of a beginning and final date.

Priority Program

The programming of a priority program consists of:

1. input of switching times
2. determination of a beginning and final date

If the period of several priority programs overlaps, then always the program with the highest index is active. For example the week program P2 overrides the week program P1.

Random Program

The random program causes random on and off switching in the period from 10 to 120 minutes between one or more switching pairs (switch on and off time). For each channel the random program can be switched on manually via keyboard.

Function „1x“

The function " 1x " can be used for date-specific switching times and for priority periods. After the execution of the date-specific switching time, the switching time is deleted automatically at midnight in the clock. Likewise a priority period which was occupied with the function " 1x " was deleted after the operating time. However, the switching times in the clock, appropriate to the priority period, are preserved.

The function " 1x " can thus be used meaningfully with the programming of the time switch program for holidays and holiday programs as well as movable holiday programs.

The time synchronisation

The time synchronisation of the time switch can by choice be made by the DCF 77 - radio signal (antenna and power pack are necessary), by means of the bus via reception of a date and time message or automatically quartz-controlled.

Programming of the switching time programs

Complete switching time programming can be made directly on the device by means of key input or by the PC programming set Obelisk. The software runs under WINDOWS 9X, 2000, NT, XP. By clicking the mouse, the input of the different switching times takes place fast and simply.

The transfer of the program is made by an EEPROM memory module (OBELISK), which is read in afterwards at the PC's interface and afterwards is put and read into the time switch. This enables also fast copying of a switching program.

The software obelisk permits e.g.:

- to program switching time programs into an EEPROM memory module
- to select switching time programs from the EEPROM memory module
- to archive switching time programs on fixed disk in the PC
- to print out switching time programs in tabular form
- to copy sections from an available switching time program and to insert them into a new or already available program
- to define a new rule for the summer/winter time (if no DCF antenna is attached)

Other particularities of the TR 644 – DCF 77 EIB

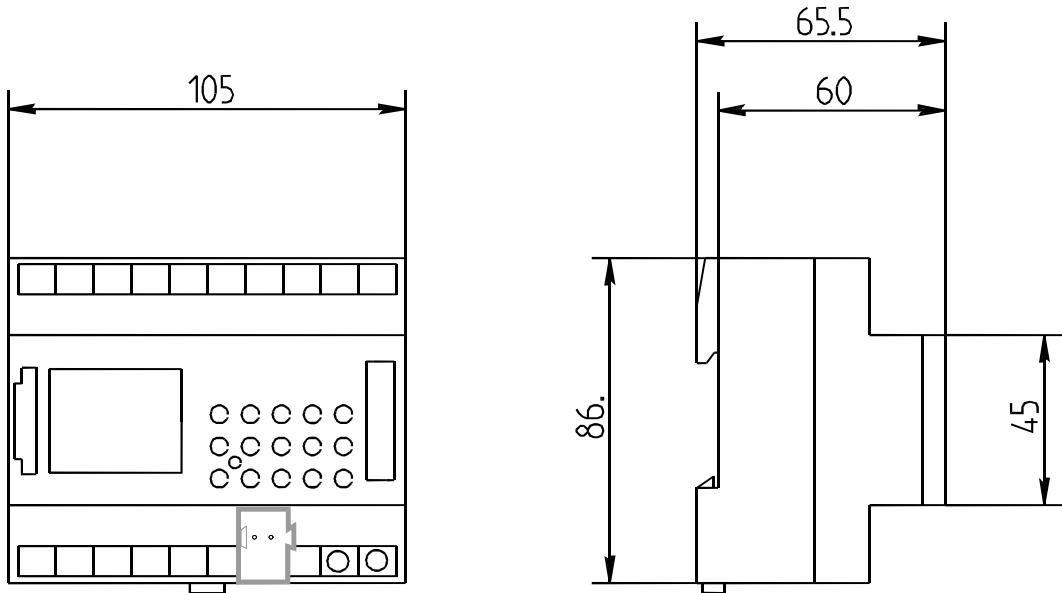
- When programming the switching times an ON and OFF command do not have to follow one another any more, e.g. similar switching commands can follow one another.

2 Technical Data

amount of channels:	4								
memory locations:	324 captive via EEPROM								
automatic program:	day, week, year and impulse program								
special program:	<ul style="list-style-type: none"> • Beside the standard week program, 9 further week programs can be inserted for each channel. These week programs can be recalled by specification of the beginning and final date. Ex.: week program no. 5 of 24.12 – 6.1.. • Date switching commands and 1x date switching commands can complete each week program. • Via priority ON and OFF instructions the switching program can be faded out by specification of the beginning and final date. • A random program is activatable. 								
manual direct access:	<ul style="list-style-type: none"> • temporary manual switching • permanent manual switching 								
entrances:	1 x DCF 77 for antenna								
programming:	Via 10-keyboard or with PC program Obelisk and memory card Obelisk								
shortest switching interval:	1 second								
switching accuracy:	1 second								
block formation:	free block formation of the week-days and channels								
summer-/winter program:	automatically or by the DCF 77- radio signal								
power supply:	is effected via bus voltage								
power absorption:	appr. 4 mA + BCU								
power accuracy:	1 sec./ day or radio exact								
power reserve:	> 1,5 years by environment-friendly Lithium cell								
allowed ambient temperature:	-5°C till +45°C								
protection type:	IP 20								
assembly:	on DIN-bus bar								
housing measurements:	45 x 105 x 60 mm (H/B/T) REG-width 6 TE								
accessories	<table> <tr> <td>antenna for DCF-reception</td> <td>907 0 220</td> </tr> <tr> <td>net component for DCF-reception</td> <td>907 0 221</td> </tr> <tr> <td>programming set Obelisk</td> <td>907 0 222</td> </tr> <tr> <td>memory card Obelisk</td> <td>907 0 223</td> </tr> </table>	antenna for DCF-reception	907 0 220	net component for DCF-reception	907 0 221	programming set Obelisk	907 0 222	memory card Obelisk	907 0 223
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programming set Obelisk	907 0 222								
memory card Obelisk	907 0 223								

2.1 Dimensional Drawing / Connection Diagram

Illustration 2-1



3 Application Programs

The following application programs for the room temperature controller RAM 710-EIB are available.

Application	Function
scene with switching, value and priority	<p>On each of the 4 channels you can choose between the following message types:</p> <ul style="list-style-type: none"> • switching message (1 Bit) • priority message (2 Bit) • dimming or value message (8 Bit) • cyclic sending selectable <p>You can implement a scene with up to 4 different message types with the 4th channel. At one switching time point, different types of actuators or actuator groups (switching/dimming/shutter actuators) can be triggered <u>at the same time</u>.</p>
switching, value, transmit time and date	<p>On each of the 4 channels you can choose between the following message types:</p> <ul style="list-style-type: none"> • switching message (1 Bit) • priority message (2 Bit) • dimming or value message (8 Bit) • cyclic sending selectable • date and time can be sent each minute, hour, day or on demand (via object time inquiry)
switching, value, temperature, transmit time and date	<p>On each of the 4 channels you can choose between the following message types:</p> <ul style="list-style-type: none"> • switching message (1 Bit) • priority message (2 Bit) • dimming or value message (8 Bit) • temperature message (16 Bit) • any message in the EIS 5 form (16 Bit) • cyclic sending selectable • time switch can be set synchronised via bus by receiving the time and date message

3.1 Selection in the product database

Manufacturer:	THEBEN AG
Product family:	time switches
Product type:	4-channel year time switch
Product name:	TR 644 EIB

Download the application from: <http://www.theben.de>

3.2 Application program "scene with switching, value, priority"

Function Characteristics

By choice, a switching, priority or value message can be sent on each of the channels 1 to 3. Additionally a scene with up to 4 types of message can be implemented on the 4th channel. Thus different types can be triggered by actuators or groups of actuators at one switching time (switching / dimming / shutter actuators). Example: The scene "end of workday" effects at the same time following instructions with different group addresses:

- light off
- lower heating
- close shutters
- alarm system armed

Additionally the possibility exists for suppressing the time switch program of the clock via the bus by control of a blocking object. Whether the blocking object has an influence on the transmission behaviour of the individual channel objects can be adjusted by parameters. If this is the case, uniquely a message can be released corresponding to the switching off/on instruction of the clock or no message may be released when setting the blocking object for each channel object.

Subsequently, no message is transmitted by the corresponding channel object. If the blocking object is again reset, the current status of the channel object is transmitted directly on the bus.

Attention!

Communication between bus coupler and time switch (and thus also processing the application program) is only effected when the clock is in the automatic mode. Possible actions, as long as the clock is not in the automatic mode, are retrieved when re-creating the automatic mode.

Communication objects

Object Name	Function	Type	Behaviour
channel <No> – switching no = 1,2,3	transmitting of a switching message, when the channel switches	1 Bit	transmit
channel 4 scenes-obj. 1 ..4			
channel <No> – value, no = 1,2,3 channel 4 scenes-obj. 1 ..4	transmitting of a value message, when the channel switches	8 Bit	transmit
channel <No> – priority no = 1,2,3 channel 4 scenes-obj. 1 ..4	transmitting of a priority message, when the channel switches	2 Bit	transmit
block	receiving a message blocking	1 Bit	receive

number of communication objects 8
max. amount of group addresses: 10
max. amount of associations 10

Parameter

Chart 1: Parameter on page „generally“

Description	Possible adjustments	Meaning
time for all objects, which are sending in cycles	appr. 2,5 min appr. 3 min. appr. 5 min. appr. 10 min. appr. 15 min. appr. 20 min. appr. 30 min. appr. 45 min. appr. 60 min.	Adjustment of the cycle time with which the message is transmitted repeatedly on the bus. This parameter applies to all objects, where the transmission behaviour "cyclic transmitting" is adjusted.
Is channel 4 to control a scene?	no yes	Adjustment if a scene function is to be implemented on channel 4.
How many objects is this scene to have?	2 objects 3 objects 4 objects	The parameter appears when a scene is to be controlled on channel 4. Adjustment, how many scene objects for channel 4 are to be produced. If channel 4 switches, messages are transmitted at the same time on the scene objects.

Chart 2: Parameter on the pages „channel 1,2,3 and channel 4 – scenes-obj. 1,2,3 or 4“

Description	Possible adjustments	Meaning
object type	switching value priority	Adjustment whether a switching (1 bit), value (8 bits) or priority message (2 bits) has to be transmitted over the channel.
switching behaviour	clock on -> on / clock off -> off clock on-> off / clock off -> on	Parameter appears, if type of object "switching" is adjusted. Adjustment whether "0" - or "1"-message is transmitted, if the clock channel switches accordingly.
value when turning off the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment, which value is transmitted, if the clock channel switches off.
value when turning on the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment which value is transmitted, if the clock channel switches on.

priority value when turning off the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches off.
priority value when turning on the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches on.
sending behaviour	only when switching the clock send cyclically	Adjustment whether the message is transmitted only when switching the clock channel or cyclically on the bus

3.3 Application program "switching, value, send time and date"

Operational Characteristics

On each of the 4 channels you can choose between the following message types:

- switching message (1 Bit)
- priority message (2 Bit)
- dimming or value message (8 Bit)

For each channel cyclic transmitting can be selected, this is controlled by a common timer. Date and time-of-day can be transmitted each minute, each hour, each day or only on request. When interrogating a time via time inquiry the object (1-Bit), the status of the inquiry message is insignificant. Date and time-of-day are always transmitted together.

Attention:

Communication between bus coupler and time switch (and thus also processing the application program) takes place only, if the time switch itself is in the automatic mode (screen-display **auto**).

Communication Objects

object name	function	type	behaviour
channel <no> – switching no = 1,2,3 or 4	transmitting a switching message when the channel switches	1 Bit	send
channel <no> – value, no = 1,2,3 or 4	transmitting a value message when the channel switches	8 Bit	send
channel <no> – priority no = 1,2,3 or 4	transmitting a priority message when the channel switches	2 Bit	send
send time	transmitting a message "time" (EIS 3) with the components week-day and time corresponding to the parameter adjustment (each minute, each hour, each day or on demand)	3 Byte	semrd
semrd date	transmitting a message "date" (EIS 4) with the components week-day and time corresponding to the parameter adjustment (each minute, each hour, each day or on demand)	3 Byte	send
time inquiry	receiving a message „time inquiry“; after reception, time and date are sent on the bus;	1 Bit	receive

Max. amount of communication objects: 7

Max. amount of group addresses: 8

Max. amount of associations: 8

Parameter

Chart 3: Parameter on the pages „channel 1, 2, 3 or 4“

Description	Possible adjustments	Meaning
object type	switching value priority	Adjustment whether a switching (1 bit), value (8 bits) or priority message (2 bits) has to be transmitted over the channel.
switching behaviour	clock on -> on / clock off -> off clock on-> off / clock off -> on	Parameter appears, if type of object "switching" is adjusted. Adjustment whether a "0" - or "1"-message is transmitted, if the clock channel switches accordingly.
value when turning off the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment, which value is transmitted, if the clock channel switches off.
value when turning on the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment which value is transmitted, if the clock channel switches on.
priority value when turning off the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches off.
priority value when turning on the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches on.
sending behaviour	only when switching the clock send cyclically	Adjustment whether the message is transmitted only when switching the clock channel or cyclically on the bus.

Chart 4: Parameter on the page „cycle time for channel 1 – 4“

Description	Possible adjustments	Meaning
time for sending cyclically	ca. 3 min ca. 5 min ca. 10 min ca. 15 min ca. 20 min ca. 30 min ca. 45 min ca. 60 min	Adjustment of the cycle time with which the message is transmitted repeatedly on the bus. This parameter applies to all channels, where the transmission behaviour "cyclic transmitting" is adjusted.

Chart 5: Parameter on page "time/date"

Description	Possible adjustments	Meaning
sending of date and time	only on demand each minute each hour each day	Adjustment of the sending condition, when the message "date" and "time" is sent on the bus

3.4 Application "switching, value, temperature, receive time and date"

Operational Characteristics

This application offers the possibility to send on each of the 4 channels the following messages:

switching message (1-Bit)
 priority message (2-Bit)
 dimming or value message (8-Bit)
 temperature message (16-Bit)
 any message in the EIS 5 form (16-Bit)

Furthermore the time switch can receive time and date messages for temporal synchronisation. These time and date messages can for example be sent on the bus by a TR 644 with a DCF 77 reception and the application "switching, value, time and date transmit".

The adjustment of any message in the EIS 5 form requires appropriate mathematical knowledge.

Communication objects

object name	function	type	behaviour
channel <no> – switching no = 1,2,3, 4	transmitting a switching message when the channel switches	1 Bit	send
channel <no> – value, no = 1,2,3, 4	transmitting a value message when the channel switches	8 Bit	send
channel <no> – priority no = 1,2,3, 4	transmitting a priority message when the channel switches	2 Bit	send
channel <no> – temperature, no = 1,2,3, 4	transmitting any 16-Bit number value (EIS 5), when the channel switches	2 Bytes	send
channel <no> – amount, no = 1,2,3, 4	transmitting a temperature message when the channel switches	2 Bytes	send
receive time	receiving a time message (EIS 3) with the components week-day and time	3 Byte	semrd
receive date	receiving the date message (EIS 4) with the components week-day, month and year	3 Byte	send

Max. amount of communication objects: 6

Max. amount of group addresses: 8

Max. amount of associations: 8

Parameter

Chart 6: Parameter on the pages „channel 1, 2, 3 or 4“

Description	Possible adjustments	Meaning
Function of channel 1	switching value priority temperature 16-Bit-value = (S*0.01*(M1+M2)* 2 ^{exp.})	Adjustment if a switching, (1 Bit), value (8 Bit) or priority message (2 Bit) is to be sent over the channel.
switching behaviour when turning off the clock	to send off-message to send on-message	Parameter appears, if type of object "switching" is adjusted. Adjustment whether a "1" – or "0"-message is transmitted, when the clock channel turns off.
switching behaviour when turning on the clock	to send on-message to send off-message	Parameter appears, if type of object "switching" is adjusted. Adjustment whether a "1" – or "0"-message is transmitted, when the clock channel turns on.
value when turning off the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment, which value is transmitted, if the clock channel switches off.
value when turning on the clock	0 ... 255	Parameter appears, if type of object "value" is adjusted. Adjustment which value is transmitted, if the clock channel switches on
priority value when turning off the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches off.
priority value when turning on the clock	priority inactive priority off priority on	Parameter appears, if type of object "priority" is adjusted. Adjustment which priority value is transmitted, if the clock channel switches on.

temperature value when switching off the clock	5 °C ... 15 °C... 30 °C	Parameter appears, if type of object "temperature" is adjusted. Adjustment which temperature value will be sent, when the clock channel turns off. Expert info: The temperature value is sent in the EIS 5 – form with fixed specified exponents 3;
temperature value when switching on the clock	5 °C ... 21 °C... 30 °C	Parameter appears, if type of object "temperature" is adjusted. Adjustment which temperature value will be sent, when the clock channel turns on.
when switching off		Parameter appears, if type of object "16-Bit-value" is adjusted. Adjustment which 16-Bit value will be sent, when the clock channel turns off.
sign (S)	+1 -1	The number value will be sent in the EIS 5-form and is calculated according to the following formula: $16\text{-Bit-Wert} = (S*0.01*(M1+M2)* 2^{exp.})$ Example: S = +1 M1 = 0 M2 = 255 exp = 0 16-Bit-value = (+1*0.01*(0+255)* 2^0.) 16-Bit-value = 2,55
mantissa (M1)	0 256 512 768 1024 1280 1536 1792	
mantissa (M2)	0 ... 255	
exponent (exp)	0 ... 15	
when switching on		Parameter appears, if type of object "16-Bit-value" is adjusted. Adjustment which 16-Bit value will be sent, when the clock channel turns on.
signs (S)	+1 -1	The number value will be sent in the EIS 5-form and is calculated according to the following formula: $16\text{-Bit-Wert} = (S*0.01*(M1+M2)* 2^{exp.})$ Example: S = -1 M1 = 256 M2 = 88 exp = 3 16-Bit-value = (-1*0.01*(256+88)* 2^3.) 16-Bit-value = -6880
mantissa (M1)	0 256 512 768 1024 1280 1536 1792	
mantissa (M2)	0 ... 255	
exponent (exp)	0 ... 15	

sending behaviour	only when switching the clock send cyclically	Adjustment whether the message is transmitted only when switching the clock channel or cyclically on the bus.
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Chart 7: Parameter on the page „cycle time for channel 1 – 4“

Description	Possible adjustment	Meaning
cycle time for channel 1-4	ca. 3 min ca. 5 min ca. 10 min ca. 15 min ca. 20 min ca. 30 min ca. 45 min ca. 60 min	Adjustment of the cycle time with which the message is sent repeatedly on the bus. This parameter is applied for all channels where the sending behaviour is adjusted "cyclic sending".

4 Additional Expert Information

4.1 HVAC Functions (Heating, Ventilation, Air Conditioning)

The TR 644 is also in the position to control an individual room controller time-dependent through HVAC telegrams.

For this purpose, HVAC operation modes such as auto, comfort, standby, Economy mode, frost protection and heat protection can be sent to a room thermostat.

HVAC operation modes can be generated by using the object type "value" with following settings:

Operation mode	Value
Auto	0
Comfort	1
Standby	2
Night	3
Frost protection	4

4.2 Communication of the TR 644 with bus

The transfer of data between TR 644 and the EIB bus coupler takes place only if the clock is in the automatic mode. Reason: In all other modes, data which are to be transferred, can be modified and thus not all current data could get on the bus. If a switching command takes place when the clock is not in the automatic mode, it is retrieved upon return to the automatic mode.

4.3 Bus synchronisation

As already described, the time switch can receive (with the application "switching, value, temperature, time and date reception") time and date messages (ICE 3, 4) for temporal synchronisation.

However, during this so-called bus synchronisation the following points are to be considered:

- Two time windows are available daily between 1:58:44h and 2:13:00h as well as between 2:58:44h and 3:13:00h within which the clock is ready to receive time and date messages.
- Outside these two time windows the clock is only ready once to receive time and date messages independently.
- Another possibility is the execution of a so-called manual sender call. By this means, a time window is opened for 14 minutes by pressing the key Dat for 3 seconds. Within this time window, the clock is again ready to receive time and date messages (as often as required). After this time window, the clock is ready only once to receive time and date messages on its own.

- Furthermore it has to be taken into consideration that in case deviation of a weekday by +/- 1 day the date is also in the time message with regard to the weekday set on the clock. Time messages with a deviation of more than one weekday are not accepted. If no weekday is available in the time message, this is however accepted. The use of time messages without specification of the weekday is not recommended, as problems can occur with a daily transfer.
- If the clock is synchronized additionally by a DCF signal, then a synchronization is blocked via the bus.

Recommendation!

If an absolute synchronisation between certain clocks is required in the EIB system, a synchronization should be made by the DCF signal. During this procedure in particular the transmission times of the bus are omitted (e.g. via several couplers). Each TR 644 EIB therefore possesses an appropriate DCF entrance.

4.4 Program review

If the time or the date is modified (via keyboard entry, via radio or bus synchronisation), a review takes place in the clock. That means in order to avoid switching times being skipped and thus not executed, the clock calculates its switching status again. If the clock detects a modification of the switching conditions, then these are transmitted. However, with this in principle favourable procedure the following points are to be considered:

- As manual switchings (circuit anticipations) are not in the switching time memory, manual switching can be lost under certain conditions by the review.
- In addition impulses from the past are not detected by the review.

Furthermore the review is effected:

- after resets
- after programming
- after deleting or modifying switching times
- after summer/winter time switching

5 Further Literary References

- operating instruction TR 644 - DC77 EIB
- manual of the PC programming software OBELISK