

MOUNTING AND INSTRUCTION MANUAL

Movements Models 192 / 192t
FU 192(t) • BU 192(t) • QU 192(t)



Certification of the producer

Standards:

All movements of Series 192 have been developed and produced in accordance with the EU-Standards 89 / 336 / EWG.

Applied Standards: EN 50081-1 EN 50082-2



References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without previous notice.
2. We do not answer for direct or indirect damages, which could occur when using this Manual.
3. Please read the instructions carefully and start the setting-up of the Series 192 only once you have correctly understood all information for the installation and operation.
4. The installation must be carried out by skilled staff only.

Content

1.	INTRODUCTION, OVERVIEW	4
2.	DIMENSIONS	4
3.	FIXING OF MOVEMENT	4
4.	MOUNTING AND STARTING-UP	5
4.1	STARTING-UP OF A COMPLETELY ASSEMBLED CLOCK WITH FU 192	5
4.2	MOUNTING OF HANDS AND STARTING-UP	5
4.2.1	Mounting of hands	5
4.2.2	Starting-up and check of the hand position	5
4.2.3	Mounting of Power Supply	5
4.3	FUNCTION OF THE OPERATING KEY (FIG. 5).....	6
4.3.1	FU / BU 192 (t) in normal operation.....	6
4.4	REMOTE CONTROL BY MEANS OF EXTERNAL KEY (FIG. 6).....	6
5.	SYNCHRONIZATION	7
5.1	SYNCHRONIZATION BY ANTENNA AD 192 (DCF-77kHz)	7
5.2	SYNCHRONIZATION BY ANTENNA AM 192 (WEST EUROPEAN TIME)	7
5.3	SYNCHRONIZATION WITH AD 192 (DCF) IN THE TIME ZONES MEZ+1 OR MEZ-1	7
5.4	SYNCHRONIZATION BY MEANS OF INTERNAL OR EXTERNAL KEY	8
5.5	SYNCHRONIZATION OF THE BU 192 BY MEANS OF SERIAL TELEGRAMS OVER IF 494.....	8
5.5.1	Synchronization by local time	8
5.5.2	Synchronization by UTC time	8
5.6	CONCEPT FOR SENDING AND RECEIVING SERIAL TELEGRAMS	9
6.	CASCADE	10
6.1	STARTING-UP OF CASCADED MOVEMENTS	10
6.2	MASTER MOVEMENT TIME SETTING WITH SERIAL TELEGRAMS.....	10
7.	SERIAL TELEGRAMS	11
7.1	STANDARD TIME TELEGRAM (IF 482) WITH LOCAL TIME	11
7.2	TIME TELEGRAM WITH UTC TIME.....	11
7.3	TIME TELEGRAM TRANSMITTED WITH LOCAL TIME (THROUGH OUT PLUG).....	11
7.4	TELEGRAM WITH OFFSET TO UTC AND SEASON DATA (SU - Wi).....	12
8.	QUARTZ MOVEMENT QU 192	13
8.1	GENERAL FUNCTION DESCRIPTION QU 192.....	13
8.2	MANUAL STARTING-UP AND TIME SET.....	13
8.3	STARTING-UP AND SYNCHRONIZATION WITH SERIAL TELEGRAMS.....	13
8.4	STARTING-UP AND SYNCHRONIZATION BY PC	14
8.5	STARTING-UP AND SYNCHRONIZATION BY PALM	15
9.	DETAILED FUNCTION DESCRIPTION	16
9.1	CURRENT SAVING MODE OF THE MOVEMENT, CURRENT CONSUMPTION	16
9.2	CONCEPT FOR THE RADIO SIGNAL RECEPTION	16
9.3	CHANGE OF TIME SOURCE	17
10.	PROBLEM REMOVAL	17
11.	CONNECTIONS	18
12.	TECHNICAL DATA	19

1. Introduction, Overview

Movements	BU 192(t)	FU 192(t)	QU 192(t)
Type of movement	Basic movement	Radio movement	Quartz movement
Components	BU 192	BU 192 & Radio Antenna	QU 192 (& IF 494)
Synchronization	Button / serial	DCF 77 Radio Antenna	Quartz / button / serial
t → Long shaft	See Fig. 2 : 192t for illuminated clocks		

Movements for self-setting indoor and outdoor clocks for dials up to 80 cm of diameter. Without illumination series 192, with illumination series 192 t. Up to 3 slave movements can be connected in cascade, Fig. 8, page 8.

2. Dimensions

	192	192t
A	18.9	34.0
B	11.9	27.0
C	8.4	23.5
D	---	8.0

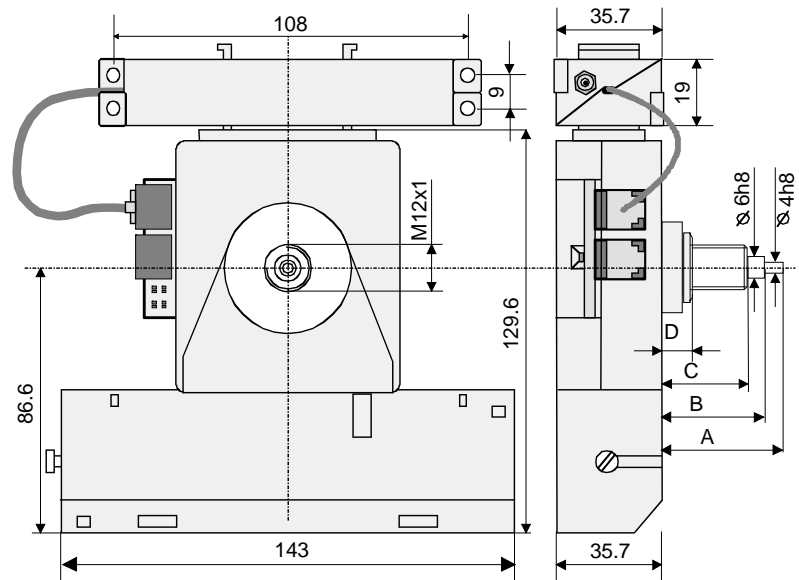


Fig. 1

3. Fixing of Movement

The dial must be sufficiently stable. The fixing hole must have a diameter of 12,3 mm. The movement must be fixed in vertical position.

See Fig. 2 for the position of mounting parts. The disc nut (7*) M12 x 1 has to be tightened with a special wrench tool (Art. No. 36761) and a torque wrench with a torque of 4.5 Nm +/- 0.2 Nm..

Attention:

Using the movement 192t the ring nut (5), and the compensation ring (6) must not be removed..

Movement with short shaft (192): the rubber washer (3) must not be located on movement case side. The case can be bended and therefore block the movement. Always use synthetic ring first (2).

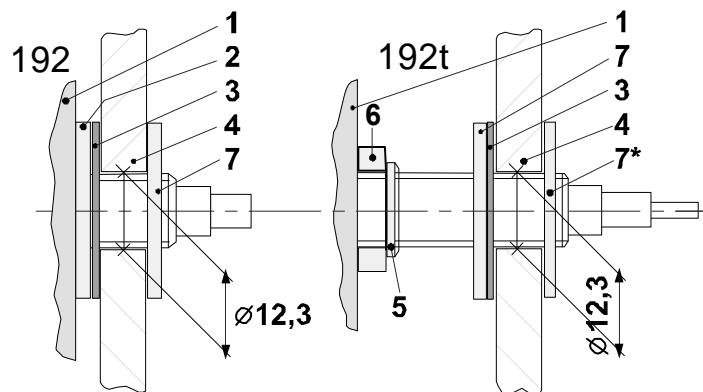


Fig. 2

- 1 Movement
- 2 Synthetic ring
- 3 Rubber washer
- 4 Dial
- 5 Ring nut
- 6 Distance ring
- 7 Disc nut

4. Mounting and Starting-up

4.1 Starting-up of a completely assembled clock with FU 192

- Install the power supply as per Chapter 4.2.3.
- At the foreseen clock place align the antenna and check the reception, see chapter 5.1 page 7.

4.2 Mounting of hands and Starting-up

4.2.1 Mounting of hands

The shafts of the hour and minute hands are positioned ex-work on the reference position (12 o'clock). The hands shall be carefully fixed and tightened on the shafts. Enough space must be foreseen between the hands.

The position 12 o'clock must be checked on each movement after the mounting (chapter 4.2.2).

4.2.2 Starting-up and check of the hand position

- Pull out the **IN** plug (the 12 o'clock position must be separately checked in case of cascade connected movements).
Install the power supply as per chapter 4.2.3 → The clock runs to 12 o'clock position
→ Position of hands OK?
- If the hand position is wrong, carefully loosen the hands, adjust and tighten.
→ Check the 12 o'clock position again (initialising by a short interruption of the power supply).
- Insert the **IN** plug (data connection)
- Check the reception, see chapter 5 page 7.

Attention:

- After a correct adjustment the hands must not be turned manually any more!
- If the clock in the meantime has been once synchronized, the movement will behave as per 4.3.1.

4.2.3 Mounting of Power Supply

To open the battery box lift the cover with a screwdriver, which is placed in the foreseen space, and press lightly downwards (Fig. 3). Possible power supplies for this series of movements:

Var.1:	1 Lithium battery 3.6V 27Ah	250394
Var.2:	External power supply 230 VAC	201670
Var.3:	2 Monocells LR20 1.5V	33mm x 60mm

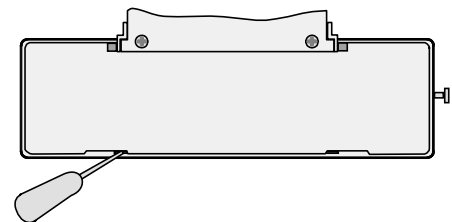


Fig. 3

Attention:

Please pay attention to the polarity of the power supply!
As soon as the movement is under power, the hands will start moving.

Advice:

The electric contact can be improved through a slight tightening of the synthetic screw.
The lithium battery and the mains part shall be connected by using the corresponding connection wires.

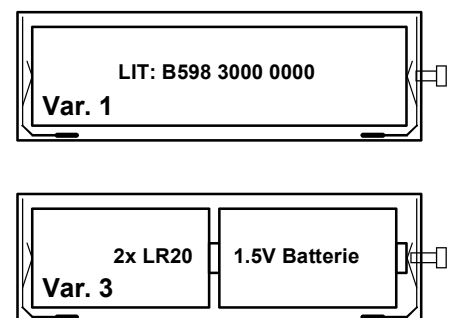


Fig. 4

4.3 Function of the operating key (Fig. 5)

4.3.1 FU / BU 192 (t) in normal operation

The clock has been synchronized once at least !

Key touch < 5s Switch on radio signal reception
Key touch > 5s Positioning onto reference position 12 o'clock

When the hands have been set on 12 o'clock with a key touch > 5s, they remain in this position during 10 minutes and will then start running autonomously to the correct time.

With a brief key touch the hands will run to correct time **immediately**.

If the clock has to be disassembled or the hands adjusted anew, it is recommended to remove the power supply, after that the hands have stopped at 12 o'clock.

This will prevent, that the hands suddenly will start running after 10 minutes.

If the movement never has been synchronized, it will behave as per chapter 5.4, page 8.

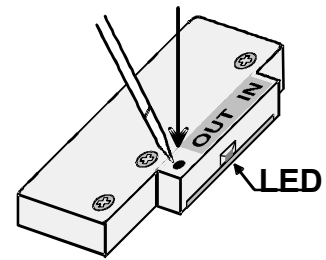


Fig. 5

4.4 Remote control by means of external key (Fig. 6)

The functions with external key are identical with those of the internal operation key (chapter 4.3.1 und 5.4 page 6).

The external key will be connected on the plug position **OUT**. For the connection of the plug see chapter 11, page 18.

An external key including 5 m cable is available (KEY 192).

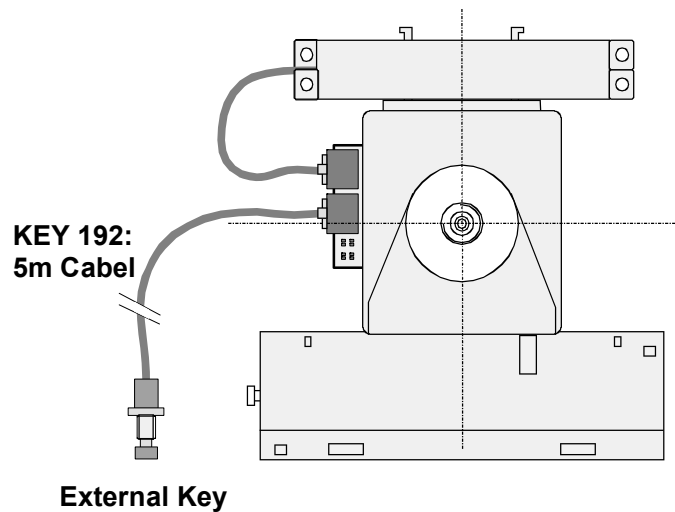


Fig. 6

5. Synchronization

5.1 Synchronization by Antenna AD 192 (DCF-77kHz)

Check radio signal reception → Orientation of the antenna:

The antenna should be oriented towards the site of the emitter (Mainflingen near Frankfurt a.M. / Germany).

Check the reception quality by the side-positioned LED (Fig. 5, page 6).

The LED should flash regularly in second pulses.

Activate reception by a brief key touch (Fig. 5, page 6).

- At bad reception push the antenna backwards from the fixing device and turn it round its own axle (Fig. 7). This will change the orientation of about 40°.
- Should the reception quality, in spite of the turning round the own axle, not has improved much, the antenna can be optimally placed and oriented by means of an extension cable CAB 192.

A weatherproof (IP54) antenna (AD 192.5) for outdoor use is available for especially difficult cases.

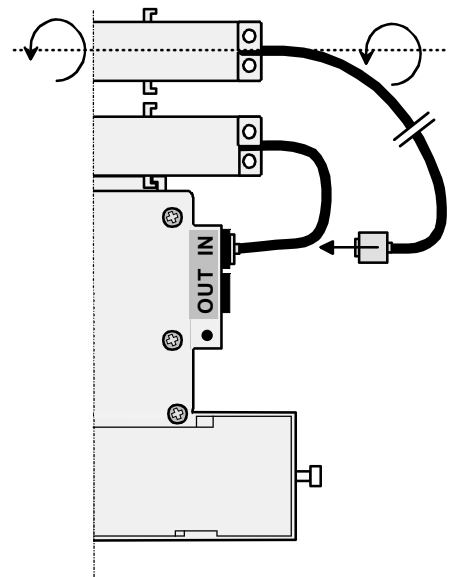


Fig. 7

The radio signal reception is on as long as two valid telegrams are picked up. At good reception conditions the movement should move to actual time after about 2 - 3 minutes.

For further information concerning the radio signal reception, see chapter 9.2 page 16.

The movement can also be set manually to correct time (chapter 5.4 page 8).

5.2 Synchronization by Antenna AM 192 (West European Time)

The movement can also be controlled by an antenna from **MSF-Rugby 60kHz**.

The emitting station is in Rugby, England. The same rules of reception as for DCF-antenna are valid (chapter 5.1).

Important:

Before installation the movement must be coded for MSF operation.

→ A **solder bridge** underneath the OUT plug (Fig. 8, page 8) must be added.

In the MSF operation mode the solder bridges M+1 and M-1 have no influence.

5.3 Synchronization with AD 192 (DCF) in the time zones MEZ+1 or MEZ-1

The movement with the DCF-77 antenna (FU 192) can also be used in the time zones **WEZ** (West European Zone) or **EEZ** (East European Zone), if the radio signals can be received in these zones and if the daylight saving time (DST) change-over is the same as for MEZ.

Before starting-up the movement should be coded for the corresponding operation mode by means of a soldering bridge (**M+1**: MEZ+1, **M-1**: MEZ-1) (Fig. 8 page 8).

Important:

Only one soldering bridge must be added, otherwise the correct function cannot be guaranteed.

5.4 Synchronization by means of internal or external key

Valid for FU-, BU- and QU 192, as well as for movements in cascade connection:

Operation device: Internal key (Fig. 5, page 6), or external key (Fig. 6, page 6)

Condition: **Movement(s) have not yet been synchronized through a external source.**
This condition is also performed after an interruption of the power supply.
If the movement was synchronized before (FU-, BU 192) and the power supply not interrupted, the reaction will be as per 4.3.1.

Key touch < 2s	Forward motion of 1 minute or stop of forward motion	
Key touch > 2s	Forward motion of 1 hour	LED is blinking slowly
Key touch > 5s	Forward motion of 11 hours	LED is blinking quickly

Each key touch sets the time on the beginning of a minute. So the time can be set within an accuracy of ± 1 sec.

In case of movements in cascade connection all movements react at the same time with the key touch of one of the movements. The external key can thus be plugged in the last movement.

5.5 Synchronization of the BU 192 by means of serial telegrams over IF 494

Instead of using an antenna, time can be read-in from a serial telegram. By means of an interface IF 494 a serial telegram can be transmitted to the movements BU 192 or QU 192. The interface connection (**IN** plug) is identical with the antenna connection (Fig. 7).

IF 494, connection possibilities, see page 18.

The synchronization time is about 3 sec. with telegrams sent every second. See chapter 8.3, page 13. Definition of the serial telegrams, see chapter 7, page 11.

5.5.1 Synchronization by local time

The movements BU 192 and QU 192 can be synchronized by **local time** (Chapter 7.1, page 11).

The external device must always transmit the local time in serial telegrams, as the movements BU / QU do not automatically switch onto daylight saving time.

That means, that in this operation mode the movements will always show the time transmitted in the telegram.

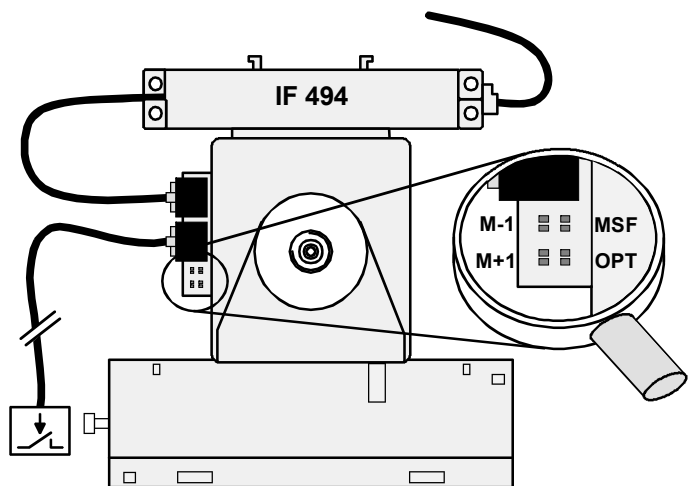


Fig. 8

5.5.2 Synchronization by UTC time

The movement QU 192 can also be synchronized by UTC time (chapter 7.2, page 11).

In this operation mode the movement will autonomously calculate the local time as per predefined season data for MEZ (Middle European Zone). Should the QU 192 be used in another time zone, the offset to UTC-time and season data must be programmed by means of a special serial telegram (chapter 7.4, page 12).

5.6 Concept for sending and receiving serial telegrams

After the starting-up the BU 192 waits in "Run" mode until the serial telegram arrives. When the movement has received two telegrams with the correct time, it runs to the actual time. At each minute change a telegram will be sent and received. In the second 3 the movement switches again to current saving mode.

The memorized time information deviates in the seconds range or falls out:

If suddenly no telegram occurs between seconds 0 and 3, the movement remains in "Run" mode. After 4 minutes the information from the time source will be deleted, the movement switches onto current saving mode and continues to run un-synchronized on its own time base (quartz precision BU192 50ppm).

When the serial telegram re-appears, the movement will be "waked up", takes over the time from the telegram and runs normally again. Should no telegram occur any more, the movement will activate the radio reception once every hour. If in the meantime an antenna was connected, the time will be taken over from DCF.

After 7 days without time reception, the clock runs to 12 o'clock and stops running.

Duration of the time take-over:

The telegram will be transmitted every second: max. 3 sec.

The telegram will be transmitted every minute (e.g. save movement in cascade): max. 3 min.

6. Cascade

Cascading means that a number of movements will be connected in series.

Up to three slave movements BU192 can be connected to one master movement (Fig. 9).

As master movement the following types can be used:

- FU 192
- QU 192
- BU 192 with serial synchronization (over IF494)

The cascading is done by means of a cascade cable COM 192 (length 1m), enabling to synchronize 4 movements with only one reference signal. After the starting-up the time synchronization for all movements will follow in a few seconds only. Should the time for the master movement change during the normal operation, the time take-over for each connected movement will take about 2 minutes, which means totally about 8 minutes. This is also valid for the daylight saving time change.

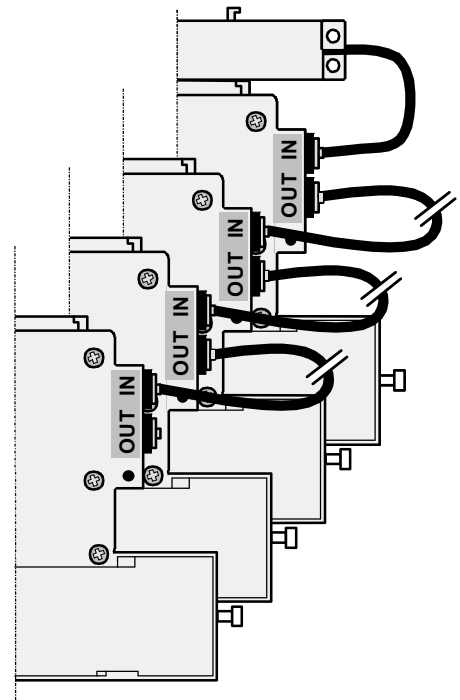


Fig. 9

6.1 Starting-up of cascaded movements

As master movement should be used a **FU 192** with radio signal reception, a **BU 192** or a **QU 192** with serial synchronization:

- Connecting of the power supply → movements run to the reference position (12 o'clock).
- Wait until the master movement has taken over the time.
- The master movement has taken over the time:
 - Starts to run on correct time.
 - Starts to transmit serial telegrams over the OUT plug (chapter 7.3 page 11)
- Some seconds later the slave movements start running to the time of the master movement.

As master movement should be used **QU 192** with manual time setting:

- Separate the first slave movement (IN plug) from the OUT plug of the QU 192.
- Connect the power supply → movements run to the reference position (12 o'clock).
- Set the QU 192 to correct time by means of the internal or external key (chapter 5.4 page 8)
- Connect first slave movement with QU 192 OUT plug.
- After **3 minutes** at the latest the slave movements start running to the time of the master movement.

Remark:

In the cascaded movements all the internal keys are connected in **parallel**.

On the OUT plug of the last movement an additional external key can be connected.

→ Each key touch influences all the movements.

6.2 Master movement Time setting with serial telegrams

A BU 192 or a QU 192 requires at least 2 serial telegrams with valid time. That means, when the same telegram will be transmitted several times, the movement will never take over the time. As the time always continues to run, also the seconds and minutes must be incremented in the telegram.

The date must be a valid value. It can, however, remain constant. (e.g. 01.01.01).

Attention:

After the time setting the QU 192 accepts no new time for about 3 minutes !

7. Serial Telegrams

7.1 Standard Time Telegram (IF 482) with Local Time

Definition: Time telegram (ASCII), terminating at the designed second in the telegram: 9600 bit/s, 7 data bits, even parity, 1 stop bit. Jitter < 50 ms.

Format:

Byte Nr.	Designation	Sign	HEX Code
1	Stat sign	O	4F
2	Supervision 1)	A or M	41 or 4D
3	Time-Season 3)	W, S or L	57, 53 or 4C
4	Year tens	0 .. 9	30 .. 39
5	Year units	0 .. 9	30 .. 39
6	Month tens	0 or 1	31 or 31
7	Month units	0 .. 9	30 .. 39
8	Day tens	0 .. 3	30 .. 33
9	Day units	0 .. 9	30 .. 39
10	Monday .. Sunday 2)	1 .. 7	31 .. 37
11	Hours tens	0 .. 2	30 .. 32
12	Hours units	0 .. 9	30 .. 39
13	Minutes tens	0 .. 5	30 .. 35
14	Minutes units	0 .. 9	30 .. 39
15	Seconds tens	0 .. 5	30 .. 35
16	Seconds units	0 .. 9	30 .. 39
17	Telegram end	CR	0D

- 1) 'A': Correct time code reception from the transmitter. 'M': No time signal has been received during more than 12 hours (Time will be taken over at 'A' and 'M').
- 2) Weekday not evaluated by BU / QU 192.
- 3) **W**inter, **S**ummer or **L**ocal time: Will be checked but not evaluated.

7.2 Time telegram with UTC Time

Definition: Time telegram (ASCII), terminating at the designed second in the telegram: 9600 bit/s, 7 data bits, even parity, 1 stop bit. Jitter < 50 ms.

Format:

Byte Nr.	Designation	Sign	HEX Code
1	Start sign	O	4F
2	Supervision 1)	A or M	41 or 4D
3	UTC-time	U	55

Bytes 4 – 17 same as standard telegram (IF482) (chapter 7.1).

7.3 Time telegram transmitted with local time (through OUT plug)

Definition: Time telegram (ASCII), terminating at the designed second in the telegram: 9600 bit/s, 7 data bits, even parity, 1 stop bit.

Format:

Byte Nr.	Designation	Sign	HEX Code
1	Start sign	O	4F
2	Supervision 1)	A	41
3	Local time (displayed by the clock)	L	4C
10	not used	F	46

Bytes 4 – 9 and 11 – 17 same as standard telegram (IF482) (chapter 7.1).

7.4 Telegram with Offset to UTC and Season Data (Su - Wi)

Definition: The telegram must be transmitted at least twice:
9600 bit/s, 7 data bits, even parity, 1 stop bit.

Format:

Byte Nr.	Designation	Sign	HEX Code
1	Start sign	O	4F
2	Identification season telegram	S	53
3	1) Type of season – entry tens	0	30
4	Type of season – entry units	2 or 5	32 or 35
5 – 14	2) Daylight saving Time start date / time Daylight saving Time Offset, value ± 120 min:	0 .. 9, A .. F	30 .. 39, 41 .. 46
15	High Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
16	Low Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
17 – 26	2) Daylight saving Time end date / time Local Offset, value ± 780 min:	0 .. 9, A .. F	30 .. 39, 41 .. 46
27	High Byte, High Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
28	High Byte, Low Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
29	Low Byte, High Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
30	Low Byte, Low Nibble	0 .. 9, A .. F	30 .. 39, 41 .. 46
31	End of telegram	CR	0D

- 1) Following types of season entries are available (see below):
 2: Season switch at determined day every year.
 5: No season switch, just offset to UTC

- 2) Definition of summer time start and end date / time:

Type(1B)	SumTime begin Time/Date (5B)				SumOffset (min) (1B)	SumTime end Time/Date (5B)				LocalOffset to UTC (min)(2B)	14B
2	month	WDM	WD	min of day	i.e. 60 (MEZ)	month	WDM	WD	min of day	i.e. 60 (MEZ)	
5	not used				no sumtime	not used				i.e. 60 (MEZ)	

Legend:

WDM: 1 .. 4 = first .. fourth WD (weekday) of month (e.g. first Saturday in April)
 1...31 = first ...thirty-first day of the month (e.g. 21. April)
 -1 (FF) / -2 (FE) = last / last but one WD of month (e.g. last Sunday in March)

WD: Weekday: Monday = 1 ... Sunday = 7 or Day = 0

Example for MEZ:

1 2 3/4 5/6 7/8 9/10 11..14 15/16 17/18 19/20 21/22 23..26 27..30 31
 O S 02 03 FF 07 0078 3C 0A FF 07 00B4 003C 0D

3/4: Type 2
5/6: Month 03 -> March
7/8: Hex FF = -1 -> last weekday of month
9/10: Weekday 7 -> Sunday
11..14: Hex 0078 = 120 -> 120 min. of day -> 02.00
15/16: Season offset 60 min.
17/18: Month 10 -> October
19/20: see 7/8
21/22: see 9/10
23..26: Hex 00B4 = 180 min. -> 03.00
27..31: Offset to UTC 60 min.

8. Quartz movement QU 192

8.1 General Function Description QU 192

The QU 192 reacts in certain situation different from the BU 192 and FU 192. For this reason a special chapter in this manual has been dedicated to the QU 192.

The QU 192 is equipped with a temperature compensated quartz with high running accuracy:

Temperature range 0 – 40°: ± 2 ppm or ± 60 sec. per year.
Temperature range -30 – +70°: ± 7.5 ppm or ± 4 min. per year.

The movement can be set to correct time either manually (chapter 8.2) by means of a key (Chapter 5.4, page 8), or with serial telegrams from a PC or Palm using IF494. (Chapter 8.3 – 8.5).

8.2 Manual Starting-up and Time Set

The following procedure for the manual time setting is recommended:

- Insert power supply → Clock runs to 12 o'clock position.
- **Keep pressed key > 5s** → Clock starts advancing 11 hours → LED blinks quickly.
- About 10 minute steps before the actual time, stop the procedure by means of **brief key touch**.
- Through brief key touch set clock hands to actual time step by step.
- Wait until the reference clock shows the second 59 in the actual minute, then synchronize the clock on the minute beginning by means of a last brief key touch.
- Now the key should not be touched any more. Clock runs on exact time.

In case of manual time setting no automatic daylight saving time switch-over will follow, this can, however, very easily be set by means of the operation key. (Chapter 5.4, page 8).

The setting should always start on second 59, as every key touch sets the second of the internal clock to 0.

8.3 Starting-up and Synchronization with serial telegrams

The serial telegrams can contain either local time (Chapter 7.1, page 11) or UTC-time (Chapter 7.2, page 11). If the QU 192 is synchronized with local time, the functioning is the same as a BU 192.

With the setting of UTC-time, the movement runs in a mode, which will automatically execute the daylight saving time change-over. As standard the programmed time zone is MEZ. Should another time zone be required, it has to be set by means of the special season telegram (Chapter 7.4, page 12).

For the programming of the time zone and the UTC time a PC or a Palm can be used (Chapter 8.4 and 8.5 page 14 and following).

The following procedure for the starting-up with UTC time is recommended:

- Insert power supply → Clock runs to 12 o'clock position.
- Should the MEZ-time zone not be required, send season telegram twice.
- Transmit UTC-time with telegram every second until the hands start moving.

The serial connection can now be interrupted, as the movement continues to run on its own, precise quartz.

8.4 Starting-up and Synchronization by PC

If the standard time zone MEZ shall be applied, the next step can be overlapped.

Programming of time zone in a QU 192(t)

The diskette 'Timeset Utilities for QU192 with IF494' with Moser-Baer No. 201420 contains the program **Terminal.exe** and the belonging **QU192Sea.trm**.

With a double click on **Terminal.exe** the terminal program will be started and with 'open file' the configuration **QU192Sea.trm** can be charged (Fig. 10).

Some time zones and daylight saving time switch-over are here predefined as examples. They will be sent through a click on the corresponding key in the lower bar.

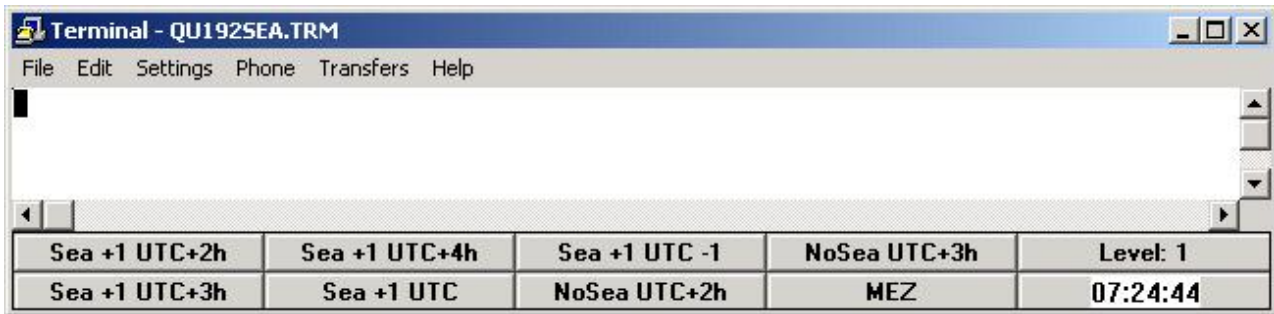


Fig. 10

The examples can be changed or complemented by opening the menu 'Settings – Function Keys' (Fig. 11). The telegram to be transmitted can be composed with the help of the description in Chapter 7.4 and entered in the field 'Command'.

Attention:

The whole telegram will not be displayed. The cursor can, however, be displaced further to the right. At the end of the telegram **^M** must always appear.

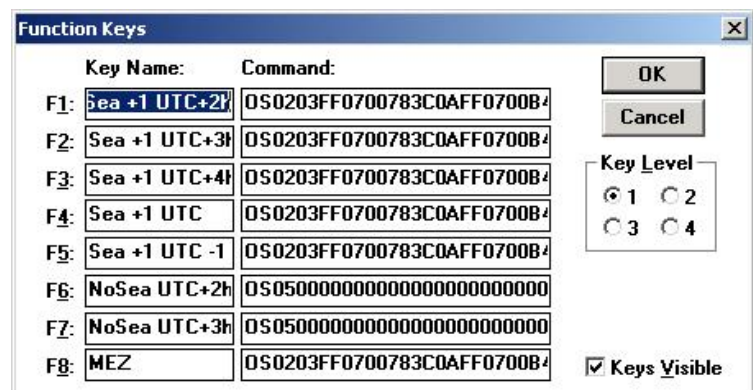


Fig. 11

Setting of UTC time in a QU 192(t)

The diskette 'Timeset Utilities for QU192 with IF494' with Moser-Baer No. 201420 contains the program **MobaSrc.exe**. After the starting-up the window here beside will appear:

In order to be able to send UTC time to a QU 192(t), at **Time** and at **Saison 'UTC'** must be selected.

After a click on the 'Start' key the telegram will be transmitted every second (based on PC time).



Fig. 12

If the PC is correctly connected with the IF 494 and this is plugged into the QU 192(t), the clock starts running to the correct time after a few seconds.

8.5 Starting-up and Synchronization by Palm

The diskette 'Timeset Utilities for QU192 with IF494' with Moser-Baer Nr. 201420 contains the file **201247 Palm SW for QU192.prc**.

This file must be installed on a Palm. The Palm must be connected to a PC (please pay attention to the description of the Palm with its Software).

After the installation on the Palm, please start the application 'TimeStick'. After the start the window as per Fig. 13 will appear.

By pressing on the arrow on the top to the left the window as per Fig. 14 for selection of the time zones will appear. 51 time zones are available. After the selection the window will close again.

By pressing the key 'Season Table' (Fig. 13) the selected time zone will be transmitted to the movement through a serial interface.

First check if the Palm system local time and season is set correctly (see Fig. 13 first section). Otherwise refer to the Palm system time setting view.

By pressing the key 'UTC' the actual Palm system UTC time will be transmitted to the movement.

If the serial interface of the Palm is correctly connected to the IF 494 (please pay attention to the Palm documentation) and this is plugged to the QU 192(t), the clock starts running to the correct time after a few seconds.



Fig. 13



Fig. 14

9. Detailed Function Description

9.1 Current saving mode of the movement, current consumption

"Run" mode: Microprocessor active during time reception and control of the motor
Current saving mode: Microprocessor in repose mode

Starting-up:

After the insert of the power supply the movement remains in "Run" mode until the time is set either manually (by operation key) or by a time signal.

When the time has been taken over, the movement switches to the current saving mode at the next minute step at the latest → normal operation.

Operation:

In operation the movement awakes for a short time at each second change and checks, if it must remain in "Run" mode or if it can switch off again. At the same time the time will be adjusted.

In the second 59 the movement switches to the „Run“ mode, so that the minute step can follow correctly on second 0. In second 2 (at serial reception second 3) the movement will return to the current saving mode.

Average current consumption (measured over 24h):

Current saving mode	< 10 μ A
"Run" mode	< 3 mA
During motor step	ca. 50 mA
Max. current during motor step and DCF-LED	ca. 60 mA
FU 192, when reception quality is good	ca. 280 μ A
BU 192 synchronized by serial telegram	ca. 360 μ A
QU 192 time manually set	ca. 260 μ A

9.2 Concept for the radio signal reception

The radio clock can receive time signals from the emitter DCF 77 in Mainflingen (D) up to a distance of 1000 – 3000 km from the emitter (as per reception condition on installation site).

If an AM 192 antenna is used, the MSF 60 time signals from Rugby (GB) can be received. The reception is only possible in parts of North and West Europe.

The radio clock receives the time signals through the antenna. The received time signals will be evaluated by the receiver module (situated in the antenna case), demodulated, amplified and re-transmitted as digital signals to the controller of the movement.

If the movement is once correctly adjusted by radio, it runs on its own 32 kHz quartz time base and synchronizes itself once every hour (at minute 56 second 20) from the radio signal from the emitter. In addition, twice every night the whole time information will be read in (01:56:20 and 02:56:20).

If the hourly synchronization cannot be executed within 45s because of interferences, the reception will be switched off and after an hour a new attempt will follow.

If the complete time telegram cannot be received in the night within 5 min. because of interferences, the receiver will be switched off and after an hour a new attempt will follow. This will be repeated until 2 complete telegrams have been received, then it will commute to second synchronization again.

After 7 days without time reception, the clock runs to 12 o'clock, stops and will remain there.

At each minute step an optic check of the hands position follows. If the 12 o'clock position will be identified by the clock and the internal time base is not on 12 o'clock, the hands will automatically be reset to the correct position in fast-running.

The daylight saving time changeover follows automatically.

9.3 Change of time source

Possible changes of time sources:

1. Time source →	2. Time source	Duration until new synchronization
Radio reception	Serial reception	max. 1h
Serial reception	Radio reception	max. 1h, by key touch immediate
Manual time setting	Radio reception	max. 1h
Manual time setting	Serial reception	max. 1min.

10. Problem removal

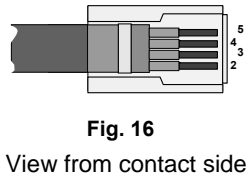
Nr.	Problems	Solutions
1	<p>All movements: Clock shows suddenly wrong time → Hands are untied on axes</p>	<p>FU 192 / BU 192:</p> <ul style="list-style-type: none"> - Touch key > 5s. Clock runs to reference position (12 o'clock) - Check position of hands - Brief touch on key for running to actual time <p>QU 192:</p> <ul style="list-style-type: none"> - Remove and re-insert power supply - Clock runs to reference position (12 o'clock) - Check position of hands
2	<p>FU 192: After more than one night not run on actual time. → Bad reception conditions (In metal or steal premises, near to electrical devices as engines, TV, PCs or fluorescent lamps)</p>	<ul style="list-style-type: none"> - Turn antenna axial for 180° - Extend cable by CAB 192 and mount antenna remotely - Use antenna AD 192.5 and mount it outdoors
3	<p>FU 192 / BU 192: After a normal operation hands stand on reference position. → Degrade of radio reception conditions. → Serial telegram missing.</p> <p>After 7 days without radio reception hands run on reference position.</p>	<p>FU 192:</p> <ul style="list-style-type: none"> - Turn antenna axial for 180° - Extend cable by CAB 192 and mount antenna remotely - Use antenna AD 192.5 and mount it outdoors <p>BU 192:</p> <ul style="list-style-type: none"> - Check LED on IF 494 - Check plug and connection to IF 494 - Check emitting unit to its functionality

11. Connections

Plug IN

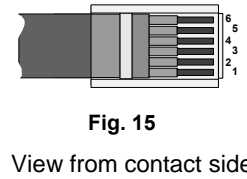
Antenna (Fig. 7, page 7):

- 1 nc
- 2 GND
- 3 VCC Ant.
- 4 DCF in
- 5 GND Ant.
- 6 nc



General occupation (IF 494)

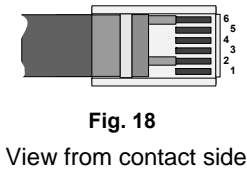
- 1 RxD
- 2 GND
- 3 VCC
- 4 DCF in
- 5 GND Ant.
- 6 Remote key.



Plug OUT

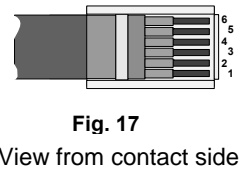
Key remote control (Fig. 6 page 6)

- 1 nc
 - 2 Key
 - 3 nc
 - 4 nc
 - 5 nc
 - 6 Key
- (nc: not connected)



General occupation

- 1 TxD
 - 2 GND
 - 3 Res.
 - 4 nc
 - 5 nc
 - 6 Key
- (nc: not connected)



IF494 Interface for the time setting and/or synchronization of the movements BU192(t) or QU192(t) from a serial interface RS232 or RS422 with the telegram IF 482. Programming of the automatic daylight saving time change-over.

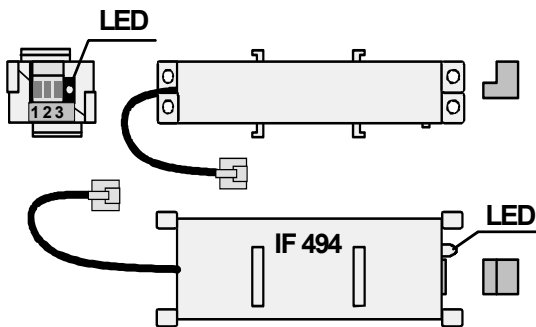


Fig. 19

Synchronization and/or setting to actual time. (Chapter 7.1 - 7.3, page 11)
 Programming of the automatic daylight saving time change-over (Chapter 7.4, page 12)
 The LED confirms the data transmission with brief flashing.
 Mounting: Fig. 8, page 8
 Dimensions ca. 34 x 20 x 15mm.

Data input plug IF 494:

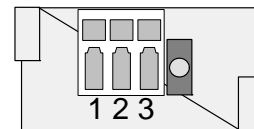


Fig. 20

A RS232 without external power supply

Connection to serial interface:

- 1: TxD
- 2: GND

B RS232 with external power supply

Connection to serial interface with galvanic separated power source (6V – 12VDC)

- 1: TxD
- 2: GND
- 3: +6...12V
- 2: GND

C RS422 without external power supply

Connection to serial interface

- 1: TD -
- 2: TD +

D RS422 with external power supply

Connection to serial interface with external galvanic separated power source (6 – 12VDC)

- 1: TD -
- 2: TD +
- 3: +6...12V
- 2: GND

12. Technical Data

Models 192 / 192t -	Description	FU 192	FU 192t	BU 192	BU 192t	QU 192	QU 192t
Order Reference - Number	200 xxx	205	206	203	204	309	310
Operation	DCF 77 (AD 192 adapted) / DCF 77 or MSF 60 time signal RS 232 / RS 422 for interface IF 494 temperature compensated Quartz with ± 60 sec./ year at 0 - 40°C or ± 4 min./ year at -30 - +70°	• / - — —	• / - — —	• / • • —	• / • • —	— • •	— • •
Type of reception DCF 77	Total reception with diagonal built-in antenna, 180° axial turnable, approx. 30 μ V/m	•	•	—	—	—	—
Synchronization	Synchronization every second: each hour complete time take-over: at starting, minimum. 2 x per night or by key touching	•	•	—	—	—	—
Control of hands position	1 x per 12 hours	•	•	•	•	•	•
Introduction to adjustment	Connection to power supply / key touching	• / •	• / •	• / -	• / -	• / -	• / -
Setting times:							
Starting position	12.00 o'clock (ex-works)	•	•	•	•	•	•
Running time to reference pos.	6 minutes maximum	•	•	•	•	•	•
Read-in of time telegram	< 3 minutes (at perfect reception)	•	•	—	—	—	—
Running time for new adjustment	5 ... 12 minutes (at perfect reception)	•	•	—	—	—	—
Changes of daylight saving time	5.5 minutes maximum	•	•	•	•	•	•
Setting of time, DST/ STD time for QU 192 / QU 192t	Touching key as per description	—	—	—	—	•	•
Power supply for in- and outdoors	1 x 3.6 V Lithium battery power supply for 230 V/50 Hz, 3.6 VDC	•	•	•	•	•	•
For indoor only	2 x 1.5 V IEC LR 20 (Mono cells)	•	•	•	•	•	•
Life-span of batteries	2 x 1.5 V LR 20 batteries approx. 3 years Lithium battery with one clock approx. 6-7 years rechargeable battery in power supply approx. 3-4 years	•	•	•	•	•	•
Actuation	1 motor for minute- and hour hands	•	•	•	•	•	•
Step frequency of minute hand motor	Normal operation mode: 1 step / min Setting mode 2 steps / sec.	•	•	•	•	•	•
Dimensions of hands max.	As per DIN 41092/3 for dial \varnothing up to 80 cm	•	•	•	•	•	•
Weight of hands max.	Balanced min.-hand 140 g, hour-hand 110 g	•	•	•	•	•	•
Fixing	Central nut M 12 x 1 mm	•	•	•	•	•	•
Operation and stocking temperature	-30°C up to +70°C	•	•	•	•	•	•
Dimensions of battery box (Chapter 2, page 4)	B 143 x H 149 x T 35 mm B 143 x H 130 x T 35 mm	•	•	—	—	—	—
Colour	Cream white RAL 9001	•	•	•	•	•	•
Weight without batteries	gram	310	350	260	300	260	300

Radio reception		indoors		outdoors		Reference No..
Model	Description	Ex-works	Extendable by CAB 192	Ex-works	Extension	
AD 192	DCF 77-Radio time signal receiver AD 192	•	4 / 8 m	•	—	200208
AD 192.5	DCF 77-Radio time signal receiver AD 192.5	—	—	—	5 m	200330
AM 192	MSF 60-Radio time signal receiver AM 192	•	4 / 8 m	•	—	200209
AM 192.5	MSF 60-Radio time signal receiver AM 192.5	—	—	—	5 m	200331
Optional:						
COM 192: Cascade cable with connectors (Length = 1 m)						200045
KEY 192: External key with 5 m cable and connectors						201373
Long-life Lithium battery, 3.6 V, 27 Ah		Within a protected clock housing (IP 54) for in- and outdoor use				250394
External power supply unit for 230 V/50 Hz, 3.6 VDC (95 x 40 x 35mm)						201670
IF 494: Interface pluggable, with connection to serial interface RS 232 or RS 422						200328
TIMESSET Kit: Timeset Utilities for IF 494 for programming of the time and season tables with QU 192 (BU 192).		PC Software: 'MobaSrc.exe' Palm Software: '201247 Palm SW for QU192.prc'				201420

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