Alexander Meier Elektronik

Video Time-Inserter TIM-10

Operation Manual

Revision 4.2
January 28th 2010

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Intended Usage

The video time-inserter TIM-10 is intended to display the time, the date and the position (coordinates) to analogue video[1] signals. Every of the 50[2] halfframes will get a precise time stamp with a resolution of 1 ms. So you are able to relate to the recording time of the frame accurately.

The necessary time stamp is supplied by a GPS or a DCF77 receiver and is transmitted to the time- inserter for displaying. The position coordinates can only be displayed using a GPS receiver. If you use a GPS receiver, the Universal Time Coordinated (UTC) will be displayed. If you use a DCF77 receiver instead the Central European Time zone (CET / CET summer time) will be displayed.

The time-inserter TIM-10 is intended to be used in industry, professional astronomy/occultation, research as well as in observation or security applications.

Scope of Delivery

- Video Time-Inserter TIM-10
- Adapter Cinch male to BNC female (2 pieces)
- Adapter Cinch female to BNC male (1 piece)
- Wall power supply 90-240 V / 12 V
- Cinch cable 75 Ohm, 2 meters
- This Operation Manual

Available Accessories

GPS receiver with antenna, 5 m cable, Garmin GPS 18x LVC-5m[3]	AME 10 168
DCF77 receiver with antenna, 5 m cable	AME 10 183
Receiver extension cable, 5 m	AME 10 187
External Puls per Second LED	AME 10 376

1 Displaying to non-standard video signals (e.g. scrambling) is not possible.
2 The video system in the USA uses 60 frames per second. The time-inserter TIM-10 can be used also.
3 The GPS receiver is delivered ready-to-go for the use with our time-inserter.

Specifications

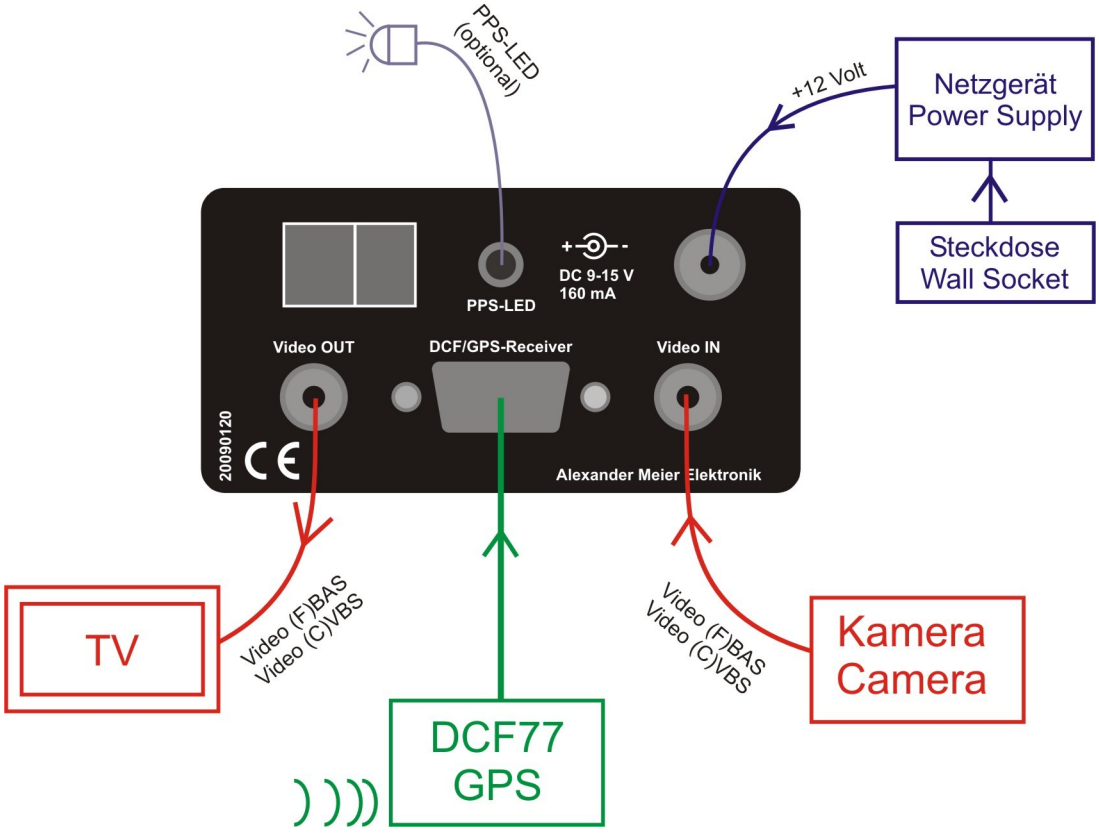
Parameter	Typ. Values
Rear-Panel connectors	
Video input	(F)BAS/(C)VBS, 1 V_{ss}, 75 Ohm, AC-coupling, Cinch connector female
Video output	(F)BAS/(C)VBS, 1 V_{ss}, 75 Ohm, black level clamping 0V, Cinch connector f.
Data input	GPS or DCF77, SUB-D connector female 9pin
PPS-LED	Puls per Second -LED, audio jack 3.5mm 3pin
Text display	
Background	Switchable video signal or opak
Text Brightness	adjustable (black to white)
Background Brightness (Opak)	adjustable (black to white)
Text Size	switchable between normal size or small text size
Vertical Pos. of the on-screen display	lower screen border, can be shifted upwards by several steps
Supported video signals	- 625 lines, 50 halffframes, modulation negative, PAL - 525 lines, 60 halffframes, modulation negative, NTSC
Display of time	
with a GPS receiver	Universal Time Coordinated (UTC)
with a DCF77 receiver	Central European Time CET / Central European Summer Time
Precision and Resolution	
Resolution of Time	1 ms
Precision of Time	0,1 ms (GPS) / approx 10 ms (DCF77)
Internal clock deviation (if DCF/GPS signal is lost)	less than 10 seconds a day
Precision of coordinates[4]	better than 15 meters (95% of time)
Power Supply	DC 9 to 15 Volt (DC-Connector 2.1 mm, center is plus)
Current consumption	70 mA (without receiver) 75 mA (with DCF77 receiver) 160 mA (with GPS receiver)
IP protection	IP 30 (protection against touching or foreign particles (>2.5 mm), no protection against water)
Temperature range	+10°C to +40° C
Dimensions	approx 90x55x120 mm (WxHxD)
Weight (without receiver)	280 gram

4 In association with Garmin GPS 18xLVC

Pin Assignment

DCF/GPS receiver, SUB-D connector female 15-pin	
PIN 1	Ground
PIN 4	NMEA data input, serial 4800 Baud, 0/5 Volt (only GPS)
PIN 5	+5 Volt, power for DCF/GPS receiver, max. 100 mA, self-resetting fuse
PIN 6	Ground
PIN 7	DCF/GPS Puls per Second 0/5 Volt
Power Supply connector, DC-connector 2.1 mm	
Center conductor	Plus (+)
Outer conductor	Minus (-)
PPS-LED (external Puls per Second LED), Audio connector 3.5 mm, 3-pin	
PIN 1 (outer conductor)	No connection
PIN 2 (middle conductor)	LED Anode
PIN 3 (inner conductor)	LED Cathode

Start of Operation



1.Step – Connect the video source and video recorder / TV

The time-inserter is connected in the video signal between your camera and your recorder or TV set (see picture). A cinch cable as well as some adapters are included with your time-inserter.

2.Step – Connect the GPS/DCF77 receiver

Now please connect the GPS or the DFC77 receiver to the 9 pin SUB-D connector. If the cable is not long enough, you can extend it by our extension cable (5 meters, accessory).

3.Step – Connect the power supply

A DC voltage between 9 and 15 volt (250 mA) is needed for the use with your time-inserter. Please use only the supplied wall power supply[5].

4.Step – Start operation

Turn on the time-inserter (rear-panel) as well as your camera and TV set. After the welcome message on the screen, the time-inserter starts displaying time and date. Use the knobs on the front panel to adjust the brightness of text and background.

5 The time-inserter is available with a wall power supply for USA/Japan, Australia, Great Britain or Germany (can be used in most central-European countries).

After this, the on-screen display differs between DCF77 and GPS.

On-screen Display (OSD) when using the DCF77 receiver

The time-inserter starts displaying the time 00:00:00 and the PPS-LED will light up. The LED indicator on the DCF77 receiver also lights. After a few seconds the PPS-LED will flash once a second showing the reception of the time signal. After 2 to 3 minutes the time code is received completely and the time on the display will be updated. If the PPS-LED is not flashing, a receiving problem can occur. Please read the chapter „troubleshooting“ to find out what can be wrong.

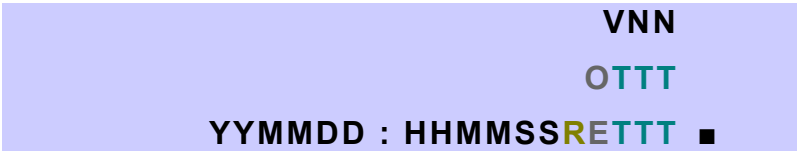
On-screen Display (OSD) when using the GPS receiver

The time-inserter starts to display the time of the internal GPS receiver clock. Of course, this time is not yet updated by the GPS system, so the time can be completely wrong. The upper line of the OSD shows that no satellites are received right now (you can not see a „Vxx“, where xx is the number of received satellites).

After some time your GPS receiver can see enough satellites and starts to calculate its own position. This can take up to 15 minutes[6]. After this „first-fix“ the position coordinates are known as well as the exact time and date. Your time-inserter displays now the exact time and date. You will see a „Vxx“ on the upper line indicating that the time is correct and the „xx“ is the number of received satellites. The time-inserter also displays now the position coordinates for a time of 10 seconds. If you plan an astronomic expedition, be sure to turn on your GPS system early enough.

Display of Picture Data and Time

The picture data is displayed on 3 lines just like this:



V	The received data are valid (only with GPS receiver)	
NN	Number of received satellites will be shown only with valid data	
O[1]	**O** will be shown if the current halfframe is an odd frame. If the halfframe would be even, the O is not shown.	
E[1]	**E** will be shown if the current halfframe is an even frame. If the halfframe would be odd, the E is not shown.	
TTT[2]	Time in ms from the last second pulse to the vertiacal Sync V_{sync} (start) of the current halfframe (odd or even). This indicates, that the halfframe is recorded between **TTT** and **TTT**+20 ms (or TTT+16 ms with NTSC) after the beginning of the last second pulse.	
YY **MM** **DD**	Year Month Day	
HH	Hour	Universal Time Coordinated UTC (GPS receiver)

6 The time until the position coordinates are known after power-on is called time to first fix. It depends on the period to the last operation of the GPS receiver. Mostly it takes just about 1 or 2 minutes.

MM **SS**	Minute Second	Central European Time CET / CET summer time (DCF77 receiver)
R	Received signal **G** = GPS **D** = DCF77 **N** = No Signal	

[1] E and O will always be displayed on the same position, so they never overlap. They are displayed only on the duration of the halfframe and never at the same time. If your recorder cannot separate the halfframes, E and O will be recorded both with half intensity. Both can be read clearly.

[2] To be sure which of the both time stamps (**TTT**) belongs to the current frame just have a look to the display of the **O** or **E**. The time following the **O** or **E** always belongs to the current frame, the other to the frame before.

You can see a square on the right side of the lowest line always on the first frame of a new second. It will be displayed as long as the second pulse of the receiver persists. However, mostly the GPS second pulse of 25 ms will just be displayed for one halfframe. The DCF77 pulse persists for a much longer time, mostly 100 or 200 ms. If you use DCF77, no square will be displayed on the 59th second of a minute. This is caused due to the DCF77 time code system.

Display example

```
                                V05
                                307
                    050729:213642GE327
```

1. Line: Valid GPS data, 5 satellites received
2. Line: The halfframe once before the current halfframe has started at 42,307 seconds
3. Line: The current halfframe (even frame) has started on July 29th, 2005 at 21:36 hours (U.T.) and 42,327 seconds. A GPS signal is received.

Setting the clock

The clock can only be set automatically by DCF77 or GPS. The clock will be set every minute with DCF77 or every second with GPS. In the time between or if the signal is lost, the internal clock of the time-inserter takes over. The beginning of a new second of the internal clock is synchronized[7] to the universal time coordinated due to the second pulse of the receiver. The beginning of a new second is also displayed by the PPS-Lamp on the front-panel of the time-inserter.

Without synchronization, e.g. if the signal is lost for a longer time, the crystal clock of the time-inserter has an deviation of less than 10 seconds a day.

Please note: If you use the GPS receiver, it will generate the second pulse even if the GPS signal is lost. The second pulse is then not synchronized with high accuracy to the Universal Time Coordinated (UTC). You can assure that the second is synchrony to UTC if you can read a „V“ (=valid) on

7 With DCF77 there is no synchronization with every 59th second of a minute. Also, the PPS-LED will not flash on this second.

the first line of the display for at least the previous 4 seconds. If you cannot read the „V“ which means valid data, you can identify a signal lost.

Display of the Position

The position coordinates (only possible with GPS) are displayed similar to the NMEA standard (National Marine Electronics Association). If you switch on your time-inserter, the position will be displayed always after the „first-fix“[8] for a period of 10 seconds. If you switch on the display of the position coordinates on the front panel of the time-inserter, the position will always be displayed. The Longitude and Latitude will be displayed above the date/time line like this:

LO	**LO**NGITUDE
LA	**LA**TITUDE
DD	Degrees
MMMM	Minutes
mmmm	Fractional amount of minutes, following zeros will not be displayed

The (±)-sign is only displayed with negative values.

8 After switching on the time-inserter with the GPS receiver it takes some time until it has determined its position coordinates. After this „first-fix“ called procedure of the GPS receiver the time-inserter can display the position and the exact time.

Operation of the Time-Inserter

For the operation of your time-inserter, you just need to configure your desired display using the configuration switches and set your preferred brightness of the on-screen display using the two knobs. You can do all settings while the time-inserter is running.

Switch	Position 0	Position 1
BGND	Background Opak	Background video signal (transparent)
Doff	On-screen display on	On-screen display off
Coord.	No coordinates will be displayed	Coordinates will be displayed (GPS)
Text Size	Standard font size	Small font size
+2 Lines	-	Shifts text 2 lines upwards
+1 Line	-	Shifts text 1 line upwards
+ ½ Line	-	Shifts text ½ line upwards
+ ¼ Line	-	Shifts text ¼ line upwards

All configuration switches can be combined, e.g. 2 lines + 1 line + small font size results to a small text size font and shifts the text 3 lines upwards the screen.

The both knobs are used to set the brightness of the text (TEXT) and the background (BGND). Due to the large range you can set a dark text on a bright background or contrariwise. The setting of the background brightness is only possible with the background switch set to „opak“.

Knop	Description
BGND	Sets the background brightness (black to white)
TEXT	Sets the text brightness (black to white)

The both light emitting diodes for POWER and PPS indicates the operation as well as the second pulse for time synchronizing.

Lamp	Description
POWER	Shows that the time-inserter operates
PPS	Flashes with every beginning of the second (DCF77 or GPS) (Note that there is no PPS with every 59th second when using the DCF77 system)

Connectors on the rear-panel

You will find all necessary connections on the rear-panel, as well as the power switch.

Connection	Description
Video In	Video input, $1V_{ss}$, PAL or NTSC, 75 Ohm
Video Out	Video output with on-screen display, $1V_{ss}$, 75 Ohm
DCF/GPS-Receiver	Connection to DCF77 or GPS receiver
Power DC 9-15 Volt	DC Power input (connect to wall power supply)
PPS-LED	You can connect a external PPS-LED here

The PPS-LED is optional. For most applications, it is not needed. However, for some cases, e.g. in astronomy, some people use the PPS-LED to display the start of a second it to an other optical system. The PPS-LED flashes every second synchronized to the time-signal.

Notice: *All connections can be plugged during the operation of the time-inserter. However, if you plug the DCF77 or GPS receiver during operation, please switch off and on your time-inserter so that it can detect the receiver type correctly.*

Comparison of GPS/DCF77

DCF77 is a time code transmitter located in Mainflingen near Frankfurt, whose signal is processed by the Physikalisch-Technische Bundesanstalt (PTB) due to atomic clocks. The time code signal is then transmitted at a frequency of 77.5 kHz (long waves). In Germany, DCF77 transmits the standard time. Due to the low frequency DCF77 can be received all over Germany even in closed buildings. Our neighbor countries can also receive the signal, however the signal strength is getting worse depending on the distance to Mainflingen. Even if the signal should be received up to a distance of 2000 km in theories, we recommend to use the GPS receiver if you are at a distance of more then 500 km to Mainflingen.

GPS means Global Positioning System and is a worldwide satellite network for estimate the position coordinates. The satellites transmit the Universal Time Coordinated (UTC) and with the signal delay the receiver can calculate the position (latitude, longitude, height). For a good reception of the satellite signal, the receiver should have the best possible view to the sky in all directions. However, mostly you can receive even 2 or 3 satellites if you put the receiver on your balcony. For determining the position coordinates, one needs at least 3 to 4 satellites.

	GPS	**DCF77**
Signal reception	Worldwide	Germany
Must be installed outside buildings	Yes	No
Accuracy of second pulse	typ. 1 µs	typ. 1..100 ms
Time format	UTC	CET / CET summer time
Position coordinates	Yes	Not possible

Notes on Antenna Alignment

The reception of the GPS signal is possible worldwide. However the antenna must be installed outside buildings to see the sky – in almost all directions. The GPS receiver is waterproof and will be operated horizontal (bottom with thread parallel to the ground). For testing the receiver, you can try to operate it at your window ledge. You should receive at least 2-3 satellites.

The DCF77 receiver will just be laid down and orientated using the arrow in the direction of Mainflingen near Frankfurt. The receiver is intended for the use in closed buildings and should not be installed outside.

Mobile Operation of the Time-Inserters

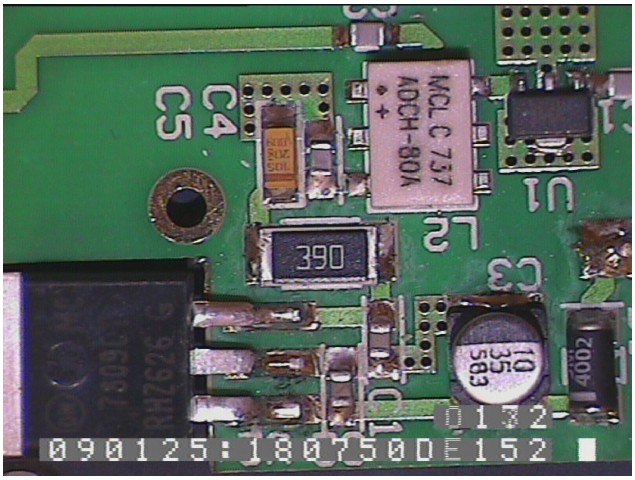
The time-inserter TIM-10 can be operated due to the low operating voltage and power consumption also mobile or portable. The operation in your car is possible using a car power adapter or you can use it portable with a rechargeable battery. Please contact us finding a solution for your application.

Special Solutions for Industrial Purpose or Public Authorities

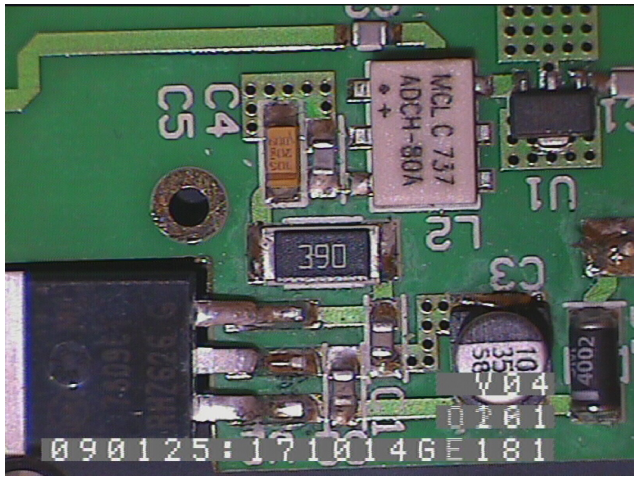
You can also order the time-inserter customized for your application, e.g. without a housing for integration to video systems. Please contact us.

Sample Pictures

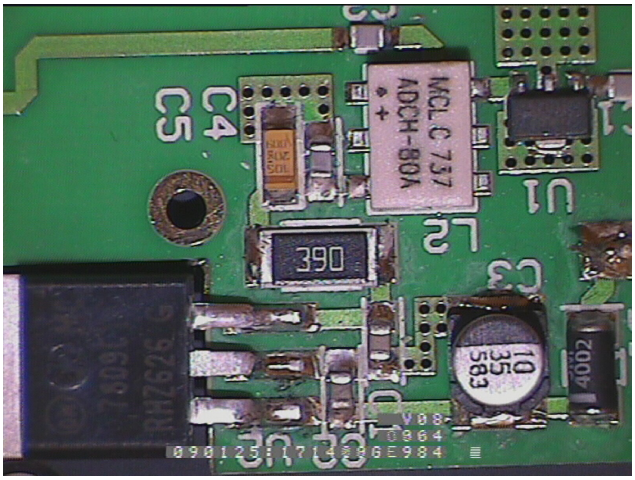
Please have an overview about the effect of the configuration switches or knobs.



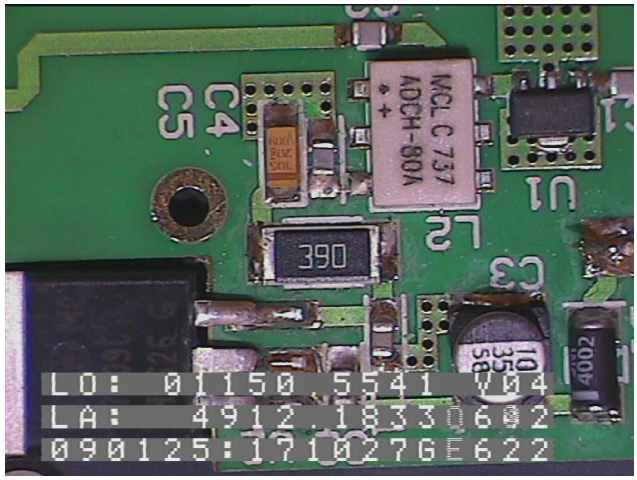
Display with DCF77



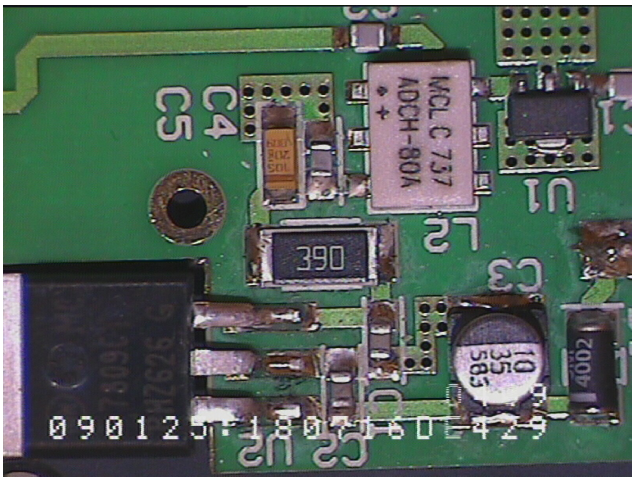
Display with GPS



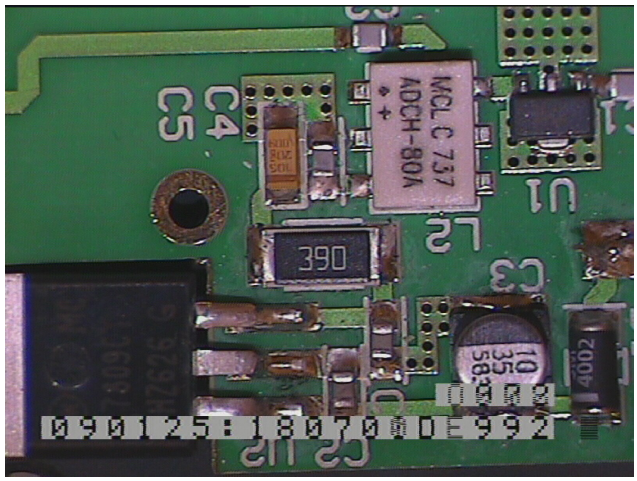
Small text font



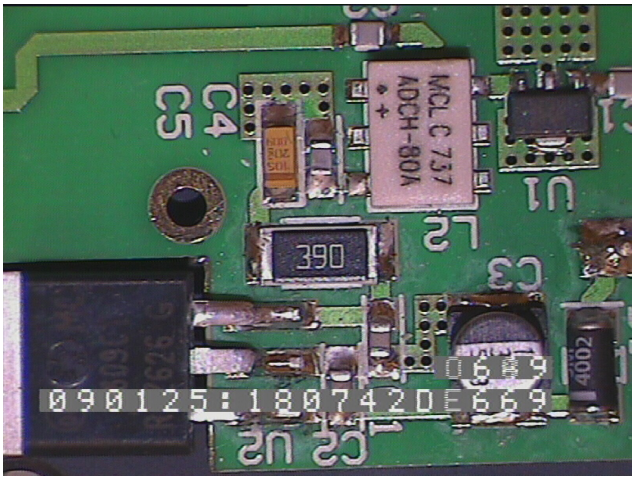
Display of position (GPS)



Background transparent (video signal)



Other brightness of text and background



Text shifted upwards

Application: Astronomy

Troubleshooting

For most common cases you can find a solution here. However, don't hesitate to contact us if you have any questions.

Problem	Possible reason and how to fix
No operation, POWER lamp don't light	- Internal fuse has blown. Switch off the time-inserter and wait about 5 minutes. The fuse is self-resetting. Switch on again. - Wall power supply is broken. Contact us for repairing. - Time-Inserter broken. Contact us for repairing.
None or worse DCF77 reception. PPS-LED doesn't flash every second. The time can not be read by DCF77.	- To less wait time after power on. It takes about 2 to 3 minutes until the time-inserter can get the time from the DCF77 receiver. - To worse reception of the DCF77 signal. Align the antenna in a different way or change its place. A huge problem can be ferro concrete walls or distortion by other devices. Near a TV set is mostly no DCF77 reception possible.
None or worse GPS reception	- To less wait time after power on. It can take several minutes after switching on the time-inserter until the GPS receiver has enough data to show time and position - To worse reception. The receiver should have a clear view all over the sky.
On-screen display jumps upwards/downwards	Worse video signal quality or a distorted video signal (e.g. analogue copy protection, scrambling)
The welcome message screen persist	This can happen if the DCF77 or GPS receiver is connected to the time-inserter after switching the device on. Please switch the inserter off and on again and so the receiver can be detected.

Maintenance and Safety instructions

There is no maintenance or calibration needed for the time-inserter.

Clean the surface only with a wet cloth. Never use any kind of solvents!

Don't try to repair the time-inserter by yourself. Consult us if there is a problem with your time-inserter.

Protect the time-inserter from humidity, moisture, and excessive temperature.

Use only the enclosed wall power supply.

Disposal

Please return the time-inserter to us at the end of its lifetime. We dispose the inserter environment-friendly. In no case it is allowed to dispose the time-inserter in your garbage.

Warranty

The warranty begins with the date of purchase and takes 2 years. Excluded from the warranty are wear parts or defectives due to wrong or improper operation, e.g. due to nonobservance of this operation manual.

Contact Address

Please contact our support team if you have questions about the time-inserter. We are always available for your questions.

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