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User Manual

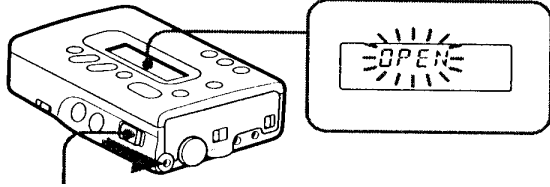
D-2/4



Operating instructions tape deck

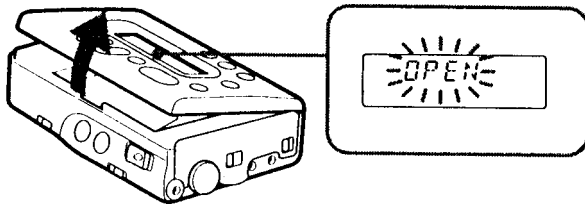
Inserting a Cassette

- 1 Press and hold down the small button and slide the HOLD/PUSH OPEN-switch to the OPEN position.

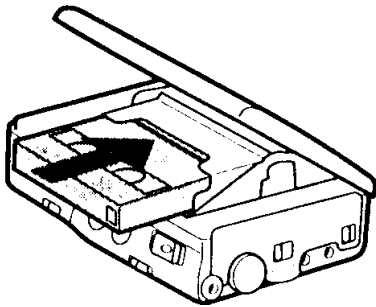


HOLD/PUSH OPEN-switch
While pressing

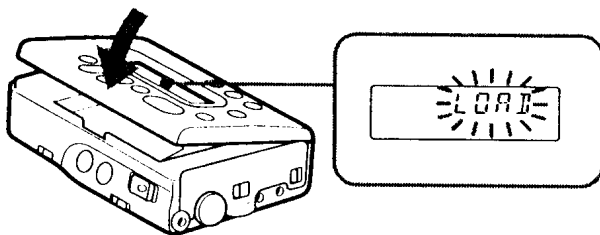
- 2 Open the cassette compartment door.



- 3 Insert a cassette with the window facing upward.



- 4 Close the cassette compartment door.



The cassette will be loaded automatically.

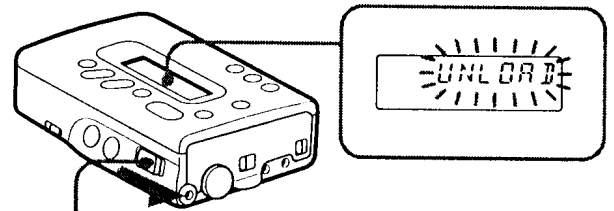
Notes

When disconnecting the unit from the power source, make sure the cassette compartment door is closed. Otherwise, you may not be able to close it afterward. If this happens, reconnect the power source.

When inserting a cassette, make sure that the side with which the tape is visible inside is facing upward. If you insert the cassette upside down, you may not be able to take the cassette out.

To eject the cassette

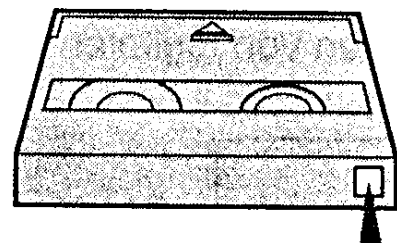
While the unit is in the stop mode, press and hold down the small button and slide the HOLD/PUSH OPEN-switch to the OPEN position.



HOLD/PUSH OPEN
While pressing

Record-protect shutter

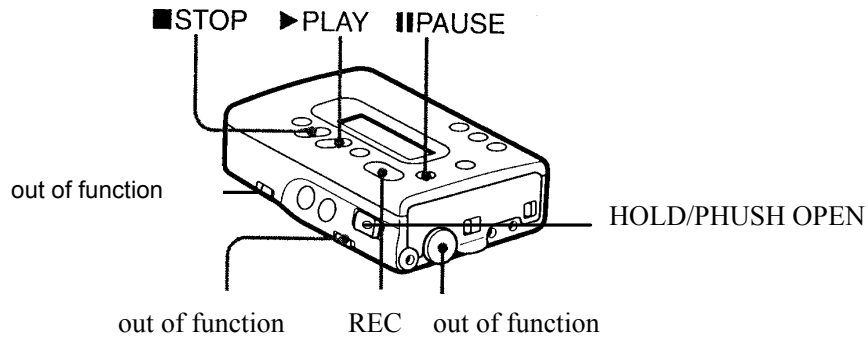
Slide the record-protect shutter to the left to protect a recorded tape from being accidentally erased by recording on the tape for the second time.



If the shutter is open, you cannot record on the tape

If the shutter is closed, you can record on the tape

To Record



1 Insert a DAT cassette

2 Press the REC button and the PAUSE-button.

The unit enters the pause mode.

3 Press either the PLAY-or the PAUSE-button.

The recording starts.

Notes

The recording cannot be started by just pressing the REC button, instead, the unit enters the recording monitor mode. The unit can enter the recording monitor mode whether the record-protect shutter of the cassette is open or not. Recording is possible only when the shutter is closed.

To stop recording

Press the STOP-button.

To pause recording momentarily

Press the PAUSE-button.

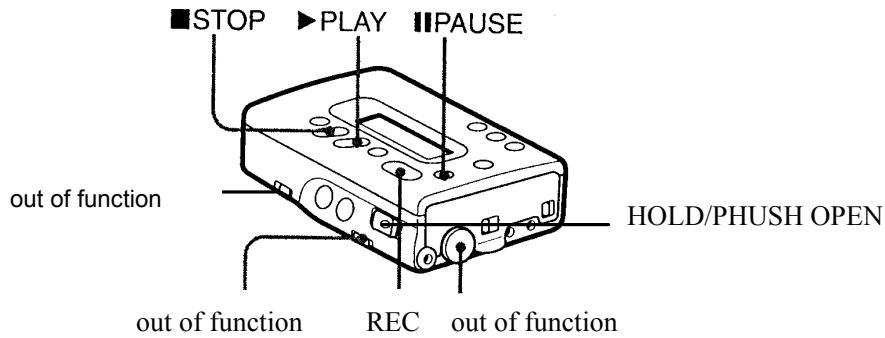
To cancel the pause mode

Press the PAUSE-button again or press the PLAY-button.

Notes

If the unit is left in the pause mode for more than five minutes, the unit will automatically enter the stop mode in order to protect its head and the tape.

Notes on Recording



Do not leave any unrecorded parts on a DAT tape.

If there is a blank (unrecorded) part left on a DAT tape, the absolute time* will not be written thereafter. Also, when the tape is being fast-forwarded or rewound, it will stop at that point. In order not to leave any unrecorded parts on a tape while recording, observe the following:

- If you intent to continue to record on a tape which is partially recorded, make sure that you find the end of the previous recording first, then start the new recording from that point without leaving any unrecorded gap. (If you fast-forward the tape, it should automatically stop where the previous recording has ended.)

*The absolute time indicates the elapsed time from the beginning of the tape and the current position of the tape which is written digitally. The absolute time will be automatically written when you record a DAT tape for the very first time and cannot be erased once written.

When you record to the end of a DAT tape

The tape automatically rewinds to the beginning and will stop there. (Auto-rewind function)

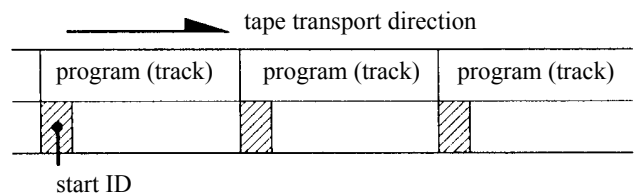
To avoid any accidental operation (Hold function)

Slide this switch to the HOLD position to avoid any accidental operation while the unit is set in a particular operational mode.

(In the HOLD Position are all switches locked!)

Start ID

This signal indicates the beginning of a recorded program (track). By reading these start ID signals, the unit can cue the beginnings of the recorded programs (tracks) automatically.



To write the start IDs automatically while recording

This start codes are set by each new recording, also by using the "Pause button" by recording.

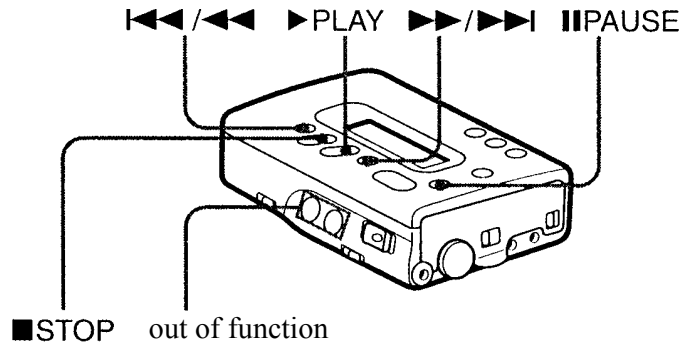
To write the start IDs manually while recording

While recording, press the REC button at the point where you wish to write the start ID.

Note

While writing the start IDs, the *WRITE* indication comes on and the *START-ID* - indicator flashes for about nine seconds. While the unit is set in this mode, no operational buttons other than the ■ STOP button will function.

Playback



1 Insert a DAT cassette

2 Press the ► **PLAY**-button.

Playback starts.

The SP/LP switch is out of function.

To stop playback

Press the ■ **STOP**-button.

To pause playback momentarily

Press the ■ **PAUSE**-button.

To cancel the mode, press either the ■ **PAUSE**-button or the ► **PLAY**-button.

Notes

If the unit is left in the pause mode for more than five minutes, the unit will automatically enter the stop mode in order to protect its head and the tape.

To fast forward the tape

Press the ►►/►►| button when the unit is in the stop mode.

To rewind the tape

Press the |◀◀/◀◀ - button when the unit is in the stop mode.

When a tape is played back to the end

The tape will be rewound to the beginning automatically and the unit enters the stop mode. (Auto-rewind function)

Cleaning the Head

Prolonged operation may cause contamination of the head. To make the best possible recording and playback, we recommend you to clean the head periodically, using the cleaning cassette DT-1OCL (not supplied)*.

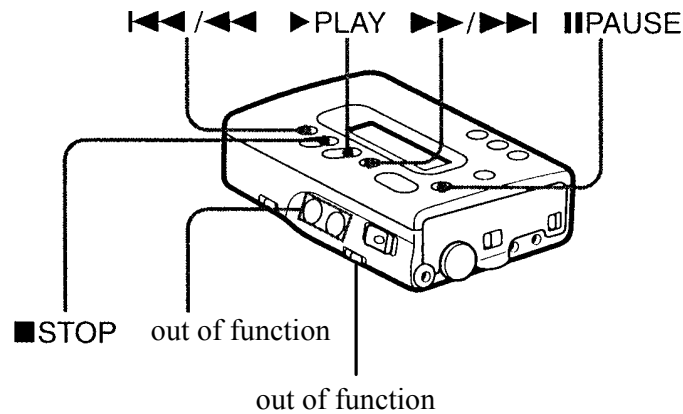
How to use the cleaning cassette

- 1 Insert the cleaning cassette as you would a normal DAT cassette.
- 2 Press the ► **PLAY** button, then press the 3 **STOP** button after about 10 seconds.
- 3 Remove the cleaning cassette without rewinding it.
- 4 Proceed with recording and playback with a normal DAT cassette and check the playback quality.

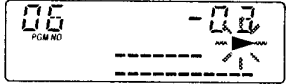
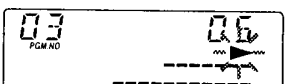
Notes on the cleaning cassette

- The cleaning cassette cannot be used for recording or playback.
- Do not clean the head with the cleaning cassette more than five times in succession. Cleaning the head continuously for a long period of time may cause wear to the head.
- Do not rewind the cleaning cassette each time you use it. When the cleaning cassette tape is taken up (wound) completely, rewind it to the beginning and reuse it. The cleaning cassette can be used approximately 200 times, with 10 seconds of cleaning each time.

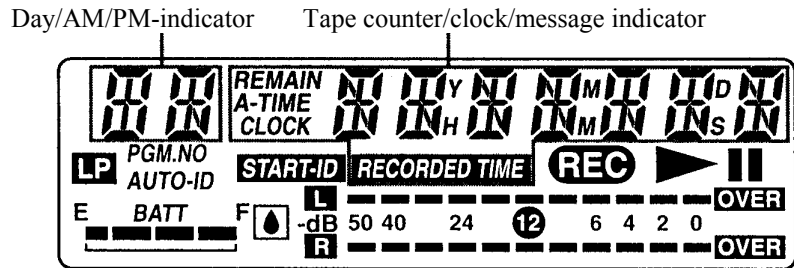
Locating the beginning of a program (track)



Press either $\ggg>$ or $\lll<$ button quickly once during playback. If the unit is in the fast forward/rewind mode, press either the $\ggg>$ or $\lll<$ button once. Or if the unit is in the stop mode, press either the $\ggg>$ or $\lll<$ button twice.

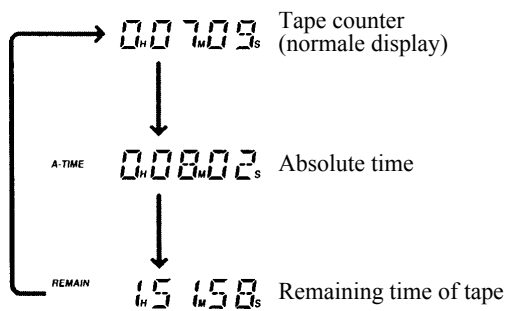
To locate the beginning of the succeeding program (track)	Press $\ggg>$ the same number of times as the programs (tracks) to be skipped.	 <p>E.g. to locate the beginning of the fifth program (track)</p>
To locate the beginning of the previous program (track)	Press $\lll<$ the same number of times as the programs (tracks) (including the currently played one) to be skipped.	 <p>E. g. to locate the beginning of the fourth program (track) including the currently played one</p>

Display



● The tape counter indications

Each time you press the COUNTER button, the display changes cyclically as follows:



To reset the tape counter (normal display) to 00H00M00s
Press the RESET button.

Remaining time of the tape

The remaining time left on the tape will normally come on after about 16 seconds of commencing playback in the SP mode.

However, there may be some aberration in the amount of time displayed which depends upon the tape you use.

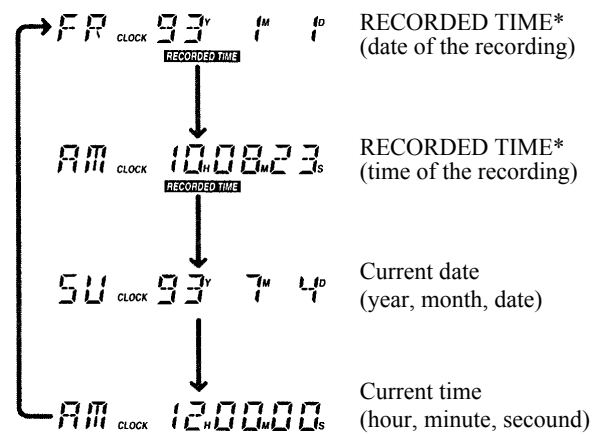
Note

The tape counter should not be used as a clock

What is being displayed on the counter is not completely accurate in terms of displaying the current time. Therefore, do not use the tape counter as a clock.

● Clock display

Each time you press the CLOCK button, the display changes cyclically as follows:

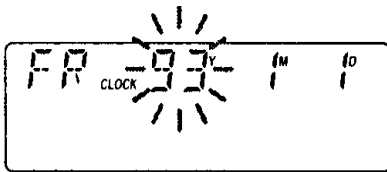


*The RECORDED TIME will not be displayed while the unit is in the recording, recording monitor, or pause mode.

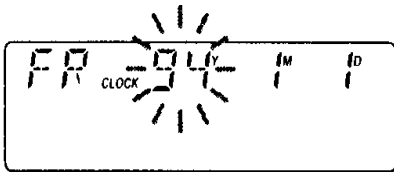
Setting the Clock

The unit automatically registers the date of recording (year/month/date/day/hour/minute/second) at the time of recording. The date of recording can be then displayed on the display window while the unit is playing back, fast forwarding/rewinding or cueing/reviewing a tape (Date function). It is essential to set the clock before any recordings are made. Otherwise, the date function will not work properly and the correct date and time of a recording will not be registered on the tape.

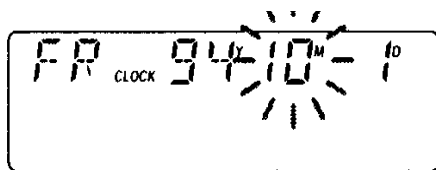
- 1 Press the CLOCK/SET button for more than four seconds.



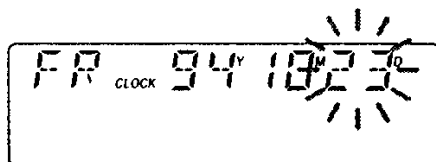
- 2 Press the COUNTER/- and RESET/+ buttons to set the year digits, then press the CLOCK/SET button.



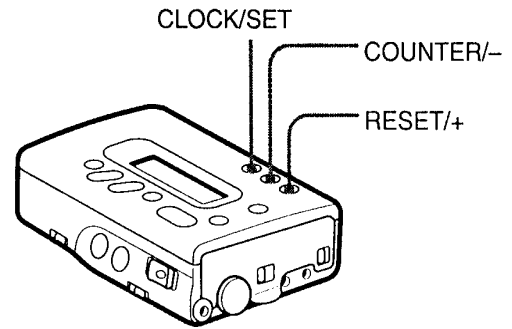
- 3 Press the COUNTER/- and RESET/+ buttons to set the month digits, then press CLOCK/SET-button.



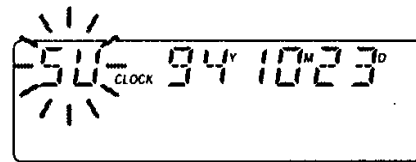
- 4 Press the COUNTER/- and RESET/+ buttons to set the date digits, then press the CLOCK/SET button.



Proceed with the following steps while the unit is in the stop mode.

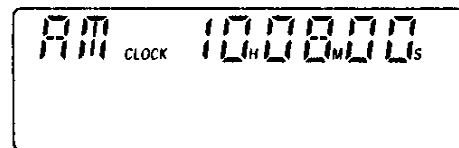


- 5 Press the COUNTER/- and RESET/+ buttons to set the day, then press the CLOCK/SET button.



- 6 Repeat steps 2 to 4 to set the correct current time (hour/minute/second).

The second digits change to "00" when the COUNTER/- or RESET/+ button is pressed and the clock starts activating when the CLOCK/SET button is pressed. Therefore, synchronize the clock by pressing either - or + button with the radio time signal etc.



The flashing will stop and the clock will start activating.

To cancel the procedure

Press the ■ STOP button. The clock display will return to the previous time display. However, if you have proceeded to step 6, the year, month, day and date will be set.

12/24 hour display

To select either the 12-hour or the 24-hour clock display. Press the RESET button for more than two seconds.

Precautions

On Safety

Should any solid object or liquid fall into the unit, unplug the unit and have it checked by qualified personnel before operating it any further.

On Installation

Do not install the unit in a location near heat sources such as radiators or air ducts, or in a place subject to direct sunlight and excessive dust.

On Moisture Condensation

If the unit is brought directly from a cold to a warm location, moisture may condense inside the unit. In such a condition, the tape may adhere to the head drum and can be damaged, or the unit may not operate properly (the ▲-indicator has come on). Always remove the DAT cassette from the unit when the unit is not to be used for an extended period of time.

If moisture is present

Operating buttons and controls may not function properly. The unit may shut off.

Operating instructions D-2/4

Please read the user manual regarding the drive, page two, before starting up the system!

1) **Power on:**

The D2-4 does not have a special power-switch. It is powered on, as soon as the power supply is connected. Attention: Make sure you input the correct power supply voltage. It is 10 up to 18V or 18 up to 32V DC. If it is too low, the DAT recorder may not start up or the commands do not work properly. In this case it can happen, that after activating the record mode, the tape starts moving but stops after three seconds. **If the supply voltage is too high, the internal fuse will be destroyed immediately.**

The DAT recorder needs about 5 to 6 seconds to load the cassette. The mux-mode is equal to the last used after switching on the power. The recording of the analogue channels in two channel mux-mode is realized on channel one and two (in four channel mux-mode on all channels). The current mux-mode is displayed by the corresponding LED on the front of the DAT recorder. During the replay the recorded mux-mode is also displayed, but it is not possible to change it.



2) **Record:**

Check the write-protection at the cassette, press and hold down the small button and slide the HOLD/PUSH OPEN, insert the cassette with the window facing upward and close the cassette compartment door. The cassette will be loaded automatically.

Press "REC", and the D2/16 is in a waiting status, (it still doesn't record). In this mode the system is working as if you are recording, except that the tape doesn't move. It enables you to use the system as a normal signal conditioning unit as front-end to the PC, in order to visualize the channels without making a recording. Please ask for our digital interface and software for PC's and notebooks.

See following table regarding sample rates, mux-mode and signal band width.

Total sample rate	Mux mode	Channel sample rate	Cut off frequency = analogue band width
96kS/s	2-channel	48kS/s	16kHz
	4-channel	24kS/s	8kHz

Attention: Analog input is on the left side and the output on right side of the DAT recorder..

The overload LED's (OVL) indicate which channel input level exceeded $\pm 5V$. By pressing the reset switch to the left, you can reset the display (make sure it is not overloaded any more). Please only use the corresponding tool.

By pressing „PAUSE“ the tape is ready for immediate recording. The second time you press "Pause", the pause mode stops and the tape moves again, (REC + play status). Simultaneously the start code is recorded. Attention: It takes about 9 seconds to record the start code, simultaneously together with the data, (you see "START ID" blinking on the display). **During this time it is not allowed to stop the tape, because the start code won't be completely recorded and you may not find it later on.**

At each REC START a new start code will be recorded. In order to find interesting events after recording, further start codes can be set during recording by pressing "REC". Please notice, ascending start codes are only possible if you start recording from the beginning of the tape. In this case the start codes will be counted, stored as a PGM-number and displayed in the PGM-window. We recommend to secure the tape after recording, (with the switch) to avoid overwriting of important data.

Parallel to the analog signals, it's possible, via PCM-input, to record and reproduce digital TTL signals. These are continuously sampled with 192kHz, and can be reproduced with a transition time delay of 5 μ s.

By using the handy microphone, with built in loudspeaker, it's possible to make comments to the recording. To record, just press the switch on the microphone. The reproduction is automatically.

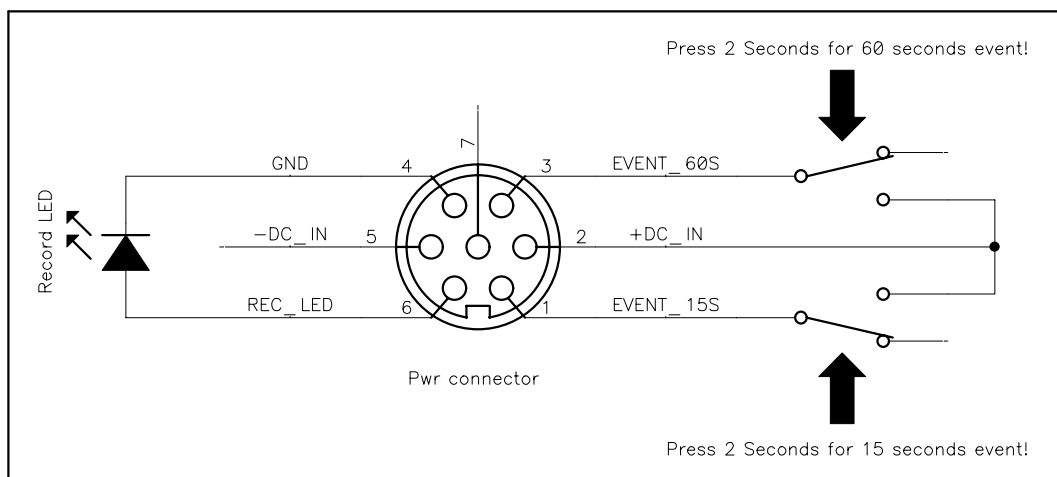
3) **Replay:**

Insert the cassette and press "PLAY". All recorded data are available at the corresponding connector output on the right side of the DAT recorder. Input overload will not be displayed (no „OVL“ display).

All DAT recorders are calibrated with an accuracy of 0,1% over the complete measuring range. To check the accuracy, notice that **the calibration data must be recorded and after them read in Play mode. (In this way the signal pass through the complete system from input to output filter.)**

4) **Event triggered recording**

In case it is not possible to start the record manual there are two internal different event detectors available, in OR-mode, (via pin 1 or 3 of the PWR-connector) for this purpose. These potentials must be between +3V and +30V, with a duration of at least 2 sec.



Pin	Data recording time
1	as long as the input pulse is high, at least 15 sec.
3	as long as the input pulse is high, plus 1 minute.

Attention: Before inserting the cassette, make sure that no write protection is done. The message TAPE PROTECT will appear on the display but not via the remote control.. This remote control can only start and stop the RECORD mode. If the DAT-Recorder is currently in PLAY mode, the remote control signals will be ignored.

5) **Date and time:**

How to set it, pls. see "Setting the clock" . One built in 3,6 V Lithium battery (type Sonnenschein SL340) supplies the internal date and time counter after the power is switched off. It has a life time of about one year. To replace it please execute the following steps:

1. Open the battery compartment door, (unscrew the two screws).
2. Cut the wiring directly at the battery socket.
3. Remove the isolation and disconnect the battery pins with an soldering iron.
4. Mount new isolation.
5. Solder the new battery pins (middle red wiring is plus, left green wiring is minus).
6. Fasten the isolation.
7. Close the battery compartment door.



6) **Common hints:**

- 6.1 The D2/4 needs a DC-power supply with 10 - 18V or 18 - 32V (Pwr-connector **Pin 2 Plus** and **Pin 5 Minus**). There is no ground protection. **When you connect a power supply unit, pls. follow the common safety instructions!**
- 6.2 The total sampling rate is fixed at 96kS/s. All channels are filtered and simultaneously sampled. The sample rate per channel is depending on the mux-mode. Just divide 96 kHz by the number of channels and you get the sample rate per channel, (two channel mux-mode 48kS/s each channel and four channel mux-mode 24kS/s each. To avoid anti aliasing effects, the filters will automatically be switched to the max. cut off frequency (a third of the sampling rate) in record as well as in replay-mode. The resolution is 12 bit (72dB Dynamic), that means at an amplitude of $\pm 5V = 10V$ your LSB is 2,5 mV (4096 steps).
- 6.3 The drive processor recognizes cassettes with a max. runtime of 2 hours (tape length of 60 m). Cassettes with a length of 90m. (3 hours runtime) can be used but the displayed remaining time will not be correctly detect from the processor. In this case see the displayed tape length.

7) **Drive modifications**

The tape recorder was modified because of technical reasons. That is why following switches and functions are out of function:

1. **SP/LP**
2. **REC LEVEL**
3. **VOLUME +/-**
4. **AVLS**

8) **Very important remarks.**

We recommend: Use only high quality cassettes and clean the head periodically, using the cleaning cassette DT-10CL (not supplied). If you get any errors, the most common reason is a bad tape or a dirty head. In most cases it's enough, just to cut the power for a second to eliminate trouble effects.

At high temperatures, caused by sun or missing ventilation, it is possible that the D2/4 produce short errors after a longer runtime. To avoid this problem, **switch off the D2/16 when you do not use it.**

9) **Remote Control Box with bargraph display, audio record.**

9.1 **Connection:** Connect the 9pole cable at the audio connector of the DAT-Recorder.

9.2 **Record:** Keep the Record button pressed and press the Play button. Check that the Rec.- and Play LED's getting active.

At the bargraph display all active channels will be displayed. An overload ($>\pm 5V$), will be indicated by one flashing sign or more. It keeps on flashing above or below the corresponding channel until the Stop or OVL/Reset button is pressed.

When record is activated by an EVENT, the Rec.- and the Event-LED' s are lightning up.

9.3 **Replay:** After pressing the play button all recorded amplitudes and OVL's are displayed.

9.4 **Audio:** By pressing the Voice/Record button, at the side of the remote control, during „Record-Mode“, the speech channel with comments will be recorded together with the data. Replay is automatically done in „Play mode.

The remote control is also available without a bargraph display in shape of a „handy“



10) Technical Data

10.1 Tape deck

Tape	DAT-tape width 3,81 mm
Track width	ca. 13,6 μm
Tape speed	8,15 mm/s
Density	61kbit/inch
Bit rate	1,536 Mbit/s or 192 kByte/s
Storage capacity	1,38 GByte for 2 hours recording 2,07 GByte for 3 hours recording (not recommended)

10.2 Analog inputs

Selection	2, 4
Input range	$\pm 5\text{V}$
Input impedance	100k Ω
Filter	8 th -order Butterworth
Resolution	12 Bit, simultaneous Sample/Hold for all channels
Total sample rate	96kS/s

10.3 Analog Outputs

Selection	2, 4
Output range	$\pm 5\text{V}$
Output impedance	2 Ω , max. 10mA
Filter	8 th -order Butterworth
Resolution	12 Bit, simultaneous for all channels

10.4 Digital PCM Input/Output

Sample rate	192 kHz
Remaining transition delay	appr. 5 μs
Level	TTL

10.5 Audio channel

Signal bandwidth	100 Hz ... 3000 Hz
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10.6 Interface output

Level	TTL
Cable length	2-3m

The conversion of the data stream into IF16 word parallel format is done in the output connector.

10.7 Remote control

Level	+3 ... 30V
Pulse width	≥ 2 sec.

10.8 System accuracy

	$\pm 0,1\%$ at 0 Hz, Difference of phase delay between all channels at the same frequency max.0,05 $^\circ$.
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10.9 Error correction

Double encoded Reed Solomon Code, bit error better 10^{-10}

10.10 Analog signal bandwidth / Sample rate

Signal band width		Total scanning rate	
2 channels	4 channels	2 channels	4 channels
16 kHz	8 kHz	48 kHz	24 kHz

10.11 Power supply

Input 10 – 18 or 18 - 32 V DC
 Power consumption appr. 10W
 Option Transformer with an input 250V AC (50Hz) and output 15V DC

10.12 Dimensions

150 x 85 x 75 mm without shock absorber

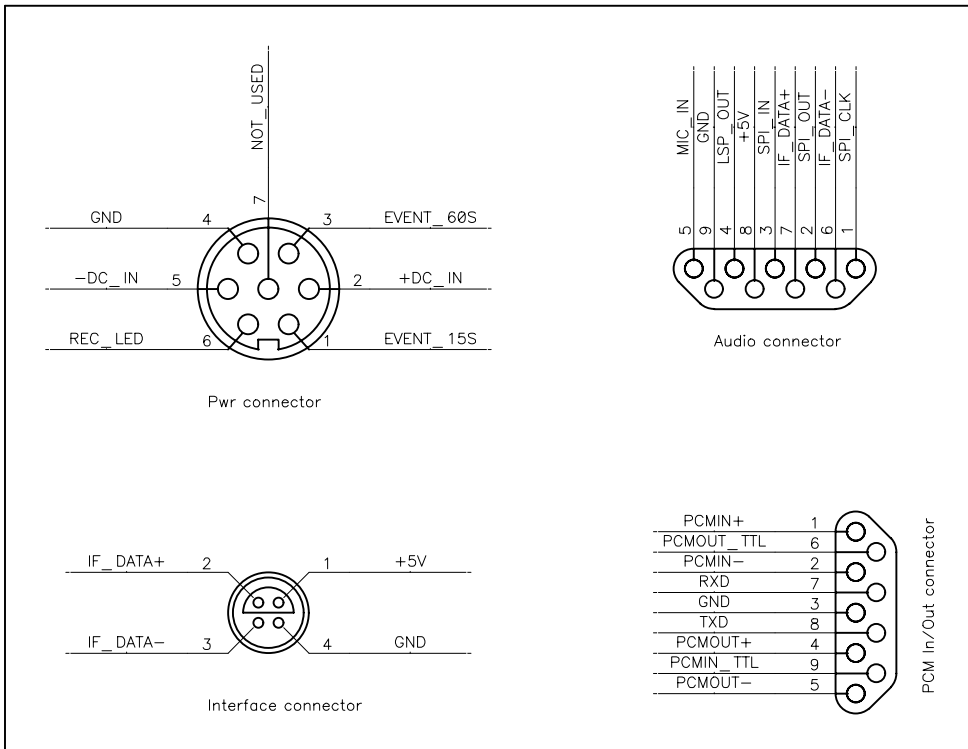
10.13 Weight

appr. 1,5 kg without shock absorber

10.14 Environmental

Operating temperature range -5 °C to +45 °C
 Storage temperature range -20 °C to +60 °C
 Humidity 20 ... 80% non condensing
 Vibration 5g Mil Standard 810C, Curve C
 Shock 10g in all directions

11) [Pin-connection](#)



12) Frequency characteristic

