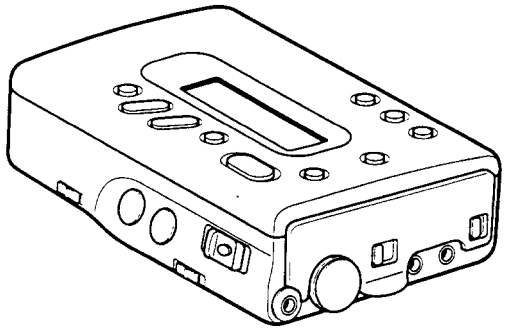
TCD-D7/D7K

SERVICE MANUAL

US Model
Canadian Model
AEP Model
TCD-D7
Tourist Model
TCD-D7K



DAT
Digital Audio Tape

WALKMAN

SPECIFICATIONS

Tape	Digital audio tape
Recording time	Standard: 120 minutes Long-play mode: 240 minutes (with DT-120)
Sampling frequency	48 kHz, 44.1 kHz, 32 kHz
Frequency response	Standard: Fs 48 kHz 20 – 22,000 Hz (±1.0 dB) Fs 44.1 kHz 20 – 20,000 Hz (±1.0 dB) Fs 32 kHz 20 – 14,500 Hz (±1.0 dB) Long-play mode: Fs 32 kHz 20 – 14,500 Hz (±1.0 dB)
Signal to noise ratio	Standard: more than 90 dB Long-play mode: more than 90 dB (1 kHz IHF-A, 22 kHz LPF, LINE IN)
Dynamic range	Standard: more than 90 dB Long-play mode: more than 90 dB (1 kHz IHF-A, 22 kHz LPF, LINE IN)
Total harmonic distortion	Standard: less than 0.008% (1 kHz, 22 kHz LPF, LINE IN) Long-play mode: less than 0.09% (1 kHz, 22 kHz LPF, LINE IN)
Wow and flutter	Below measurable limit (less than ±0.001% W.PEAK)

Input

Jack type	Impedance	Rated input level	Minimum input level
stereo minijack	4.7 kΩ	–	0.4 mV
stereo minijack	47 kΩ	500 mV	80 mV

Output

Jack type	Impedance	Rated output	Maximum output level	Load impedance
stereo minijack	27 Ω	LINE OUT 500 mV	PHONES 5 mW + 5 mW	LINE OUT more than 10 kΩ PHONES 32 Ω

Input/output

DIGITAL I/O • REMOTE jack (special jack)
Digital input/output, remote control operation and timer-activated operation is possible by connection with an adaptor kit to this jack.

Power requirements
- DC 6 V four LR6 (size AA) batteries
- DC IN 6V jack accepts:
  the Sony AC power adaptor (supplied to the AEP, Tourist model only) for use on

	Operating voltage
US, Canadian model	120V AC, 60Hz
AEP model	220—230V AC, 50Hz
German model	120V AC, 60Hz or 220V AC, 50Hz
Tourist model	100—240V AC, 50/60Hz

the car battery cord DCC-E160L (not supplied) for use with 12 V car battery.

Battery life (Approximately hours)

	Playback	Recording
Sony alkaline AM3 (N)	3.5	4 (3*)
Sony NC-AA	2	2 (1.5*)

* while monitoring with the headphones

Power consumption	1.2 W
Dimension	Approx. 132.6 × 36.7 × 88.2 mm (5 1/4 × 1 1/2 × 3 1/2 in.) (w/h/d) not incl. projecting parts and controls
Mass	Approx. 500 g (1 lb. 1oz.) incl. batteries

Model Name Using Similar Mechanism	TCD-D3
Tape Transport Mechanism Type	MT-D7-47

Accessories supplied
Carrying case (1)
AC power adaptor AC-E60L (1) (AEP model only)

For the Tourist model only
Carrying case (1)
LR6 (size AA) batteries (4)
AC power adaptor AC-E60AM (1)
Plug adaptor (1)
Audio connecting cords (2)
(2 phono plugs ↔ stereo-mini plug, stereo for line inputs and outputs)
Digital cable POC-DA12 (1)
(special plug ↔ 2 optical plugs)
Remote commander RMT-D7 (1)
Cleaning cassette DT-10CL (1)

For the operation of the AC power adaptor and the remote commander, refer to each operating instructions manual.

Design and specifications subject to change without notice.

MICROFILM

DIGITAL AUDIO TAPE-CORDER

SONY®

Features

Easy operation with excellent sound quality of DAT
Superb quality recording and playback with excellent frequency response, remarkably low noise and lack of distortion can be made. High speed fast-forwarding/rewinding and cuing/reviewing for easy tape access.

Long play (LP) mode recording
A maximum of four-hour continuous recording is possible using four LR6 (size AA) alkaline batteries which is ideal for recording a meeting or a conference etc.

Adjustable (automatic/manual) recording level
The recording level can be adjusted either manually or automatically to suit every recording situation.

Date function
The date and time are automatically registered at the time of the recording and can be displayed during playback, fast-forwarding/rewinding and cuing/reviewing.

LCD display
LCD display window for indicating the current operational mode and the battery power status etc.

Compact design
A compact mechanism and design for portability.

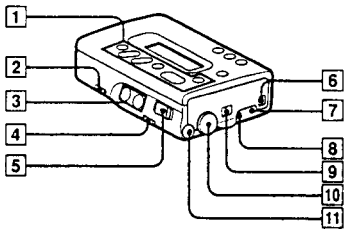
Recording compatibility
Recording can be made from various digital audio equipment such as a CD (compact disc)/MiniDisc player or a BS (broadcasting satellite)/CS (communication satellite) tuner etc.

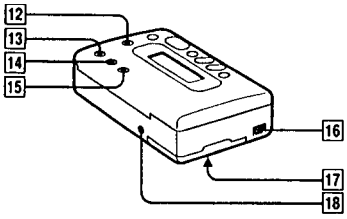
TABLE OF CONTENTS

SECTION 1
GENERAL

This section is extracted from instruction manual.

Location and Function of Controls





Refer to the pages in ● for details.

[1] **Tape operation buttons:**
I◄◄/◄◄ (rewind/review • AMS) button ⑱
■ STOP button ⑮⑱
► PLAY button ⑱
►►/►►I (fast-forward/cue • AMS) button ⑱
REC (record)/ID WRITE (start ID write) button ⑮㉑
II PAUSE button ⑮⑱

[2] **SP/LP (standard play/long play mode select) button ⑮**

[3] **VOLUME buttons ⑱**

[4] **PHONES, AVLS/LINE OUT (headphones, automatic volume limiter system/line out select) switch ⑮⑳**

[5] **HOLD/PUSH OPEN switch ⑰**
Slide this switch to the HOLD position to avoid any accidental operation while the unit is set in a particular operational mode. The use of this switch is recommended whenever you record or play back a tape. However, the display modes can still be changed by pressing the CLOCK/SET button, the COUNTER/– button or the RESET/+ button even when the unit is in the hold mode.

[6] **MIC SENS (microphone sensitivity) switch ⑮**

[7] **MIC (microphone) jack ⑫**

[8] **LINE IN (line input) jack ⑫**

[9] **REC MODE (recording mode) switch ⑮**

[10] **REC LEVEL (recording level) knob ⑯**

[11] **PHONES/LINE OUT (headphones/line output) jack ⑰**

[12] **LIGHT button**
Press to illuminate the display window when using the unit in the dark.

[13] **RESET/+ button ⑩㉔**

[14] **COUNTER/– button ⑩㉔**

[15] **CLOCK/SET button ⑩㉔**

[16] **DIGITAL I/O • REMOTE (digital input/output • remote) jack ⑫⑰**
Connect equipment with digital inputs/outputs using the connecting cord POC-DA12* or RK-DA10 (not supplied), the adaptor kit RM-D3K, or the remote controller RMT-D7* etc.

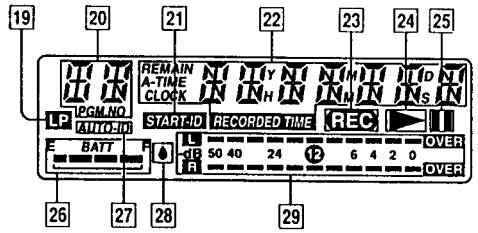
[17] **Battery compartment door**

[18] **DC IN 6V (external power input) jack ⑨**

* Supplied only to the Sony world model

5 6

Display Window



[19] **LP (long play) mode indicator ⑭**

[20] **PGM.NO (program number) • day • AM/PM indicator ⑩㉑**

[21] **START-ID indicator ㉑**

[22] **Tape counter/clock/message indicator**

[23] **REC (recording) indicator**

[24] **► (playback) indicator**

[25] **II (pause) indicator**

[26] **BATT (remaining battery power status) indicator ⑧**

[27] **AUTO-ID (automatic ID signal) indicator ㉑**

[28] **Moisture condensation indicator ④**

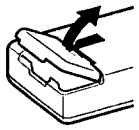
[29] **Peak level indicators ⑮**

Power Sources

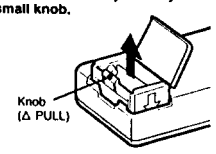
Using with Batteries

Use four LR6 (size AA) alkaline batteries.

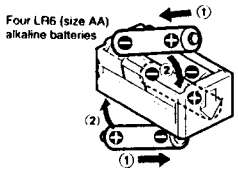
1 **Open the battery compartment door.**



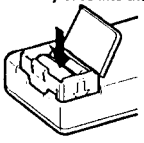
2 **Pull out the battery case by holding the small knob.**



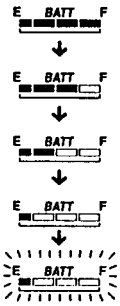
3 **Insert the batteries into the battery case.**
Make sure that the – side of a battery is always inserted first.



4 **Insert the battery case into the unit.**



Remaining battery power status
The indicator constantly shows the remaining battery power status.
This display comes on while the unit is being used with the batteries. They do not come on when the external power source is used.



Replace the batteries at this point. If you continue to use the unit beyond this point, eventually the "bATTEry" message will come on the display window and the unit will cease to operate.

Notes
- This unit is not equipped with a power switch. Consequently, as long as the batteries are inserted, the LCD display will always be turned on. However, the consumption of the electric current will be very small and negligible.
- Do not leave the unit with its battery compartment door open for a long period of time, as doing so may cause the batteries to wear more quickly.

7 8

Notes on batteries

- Insert four LR6 (size AA) alkaline batteries by matching the + and – on the batteries to the + and – in the battery case.
- Do not attempt to recharge the batteries.
- Do not use old batteries with new ones or different types of batteries together.
- When the unit is not to be used for an extended period of time, remove the batteries.
- If the electrolyte inside the battery should leak, wipe the contaminated area of the battery case with a cloth and replace the old batteries with new ones.
- Use only the alkaline batteries. Do not use any other type of dry batteries.

Note on separately sold rechargeable batteries

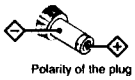
You can use the separately sold rechargeable batteries. However the expected recording/playback time will be shortened considerably.

Using with the AC power adaptor

Connect either the AC power adaptor AC-E60L** (not supplied) or AC-E60AM* (world wide) (not supplied) to the DC IN 6V jack of the unit.

Note

Use only the AC-E60L or AC-E60AM* AC power adaptor (not supplied). Do not use any other AC power adaptor.



Polarity of the plug

**Except for the AEP model

*Except for the Tourist model

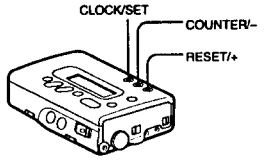
Using the power source of your car

Use the car battery cord DCC-E160L(not supplied).

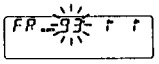
Setting the Clock

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.

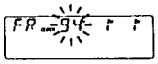
Proceed with the following steps while the unit is in the stop mode.



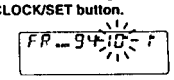
1 **Press the CLOCK/SET button for more than four seconds.**



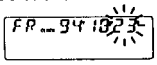
2 **Press the COUNTER/– and RESET/+ buttons to set the year digits, then press the CLOCK/SET button.**



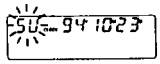
3 **Press the COUNTER/– and RESET/+ buttons to set the month digits, then press the CLOCK/SET button.**



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

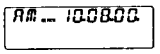


5 **Press the COUNTER/– and RESET/+ buttons to set the day, then press the CLOCK/SET button.**



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. 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 one of the following buttons: ▶PLAY, ■STOP, I◀◀/◀◀ or ▶▶/▶▶I while proceeding with the steps.

However, if you have proceeded to step 6, the year, month, day and date will be set.

To select either the 12-hour or the 24-hour clock display

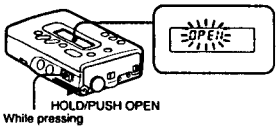
Press the RESET button for more than two seconds.

Notes

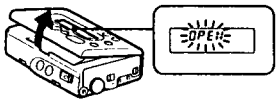
- **If the HOLD/PUSH OPEN switch is set to the HOLD position, you cannot set the clock.**
- **If you leave the unit for more than an hour without any batteries installed, the clock display will return to any original factory-set setting( ). In this case, reset the clock after inserting the batteries.**

Inserting a Cassette

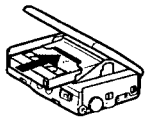
1 **Slide the HOLD/PUSH OPEN switch to the OPEN position.**



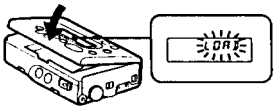
2 **Open the cassette compartment door.**



3 **Insert a cassette with the window facing upward.**



4 **Close the cassette compartment door.**



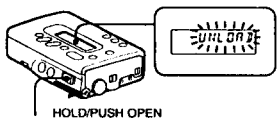
The cassette will be loaded automatically.

Notes

- **When disconnecting the unit from the power source, make sure that the cassette compartment door is closed. Otherwise, you may not be able to close it afterward. If this happens, re-connect the power source.**
- **When inserting a cassette, make sure that the side with which the tape is visible inside is facing upward. If you inset 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, slide the HOLD/PUSH OPEN switch to the OPEN position.



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.

Recording

Connection with Other Equipments

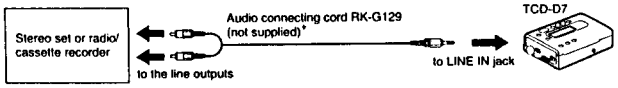
Recording with a microphone

The PLUG-IN POWER type microphones can be used as well.

Notes

- **In this connection example, you need to adjust the recording level. See page 16 for details.**
- **You cannot use an auto-power-supply type microphone such as the electret condenser stereo microphone ECM-S220 etc. with this unit.**

Recording from a stereo set or a radio/cassette recorder etc. (analog connection)

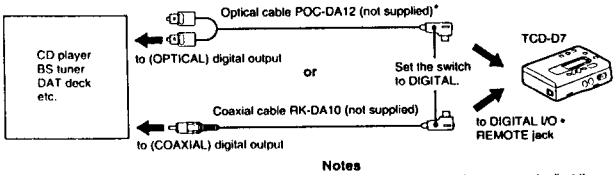


Notes

- **In this connection example, you need to adjust the recording level . See page 16 for details.**
- **If a microphone is connected as well, the microphone connection will override the line connection.**

Recording from equipment with digital outputs (digital connection)

There are two types of digital output connectors: the optical type and the coaxial type.

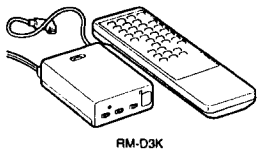


Notes

- **In this connection example, you cannot adjust the recording level. The recording will be carried out at the same level as the source sound.**
- **Make sure that the switch on the connecting cable is set to the DIGITAL position before you start recording.**

*Except for the Sony world model

The adaptor kit RM-D3K (not supplied)
This kit is equipped with the input/output connectors for both the optical cable and the coaxial cable. Therefore, you can use this kit as a relay between the TCD-D7 and another digital equipment. You can also remote control the TCD-D7 with the remote controller supplied to the RM-D3K. The timer operated recording or playback can be performed by adding an optional audio timer. See the operating instructions of the RM-D3K for details.

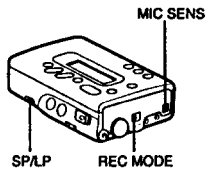

RM-D3K

Note
If you intend to use the RM-D3K, use the AC power adaptor (not supplied)* for the power source of the TCD-D7.

*Except for the Tourist model

Before Recording

Use the following switches according to your needs.



◆ SP/LP switch
SP: When the recording is to be made in the standard play mode. (The recording quality will be better with this mode.)
LP: When the recording is to be made in the long play mode.

LP mode
The recording time varies with the type of DAT cassette you use. See the chart below.

	SP mode	LP mode
DT-120	2 hours	4 hours
DT-90	1.5 hours	3 hours
DT-60	1 hour	2 hours

Notes
- If the sampling frequency (see page 20) of the digital input is either 44.1 kHz or 48 kHz while recording via the digital connection, the LP mode recording cannot be made even if you select the LP position with the SP/LP switch.
- You cannot play back a tape recorded in the LP mode on another DAT deck which is not equipped with the LP mode function.
- If you play back a tape, whose recording speed has been changed halfway from the SP mode to the LP mode, on a DAT deck which is not equipped with the LP mode function, you may experience some loud noise where the recording speed changes. In such a case, turn down the volume.

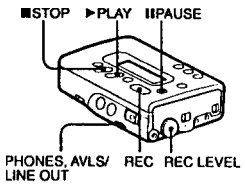
The tape counter display while the LP mode is used
The absolute time (see page 16) and the remaining tape time are based on the SP mode. Therefore, the actual time will be twice the amount of what is being shown on the display window.

◆ MIC SENS switch (for recording with a microphone)
H: Normally set the switch to this position.
L: When recording relatively loud sound (the built-in 20 dB attenuator will be activated).

◆ REC MODE switch
(When another equipment such as a microphone or a stereo set is connected to either the MIC or the LINE IN jack of the unit.)
MANUAL: When adjusting the recording level manually.
The recorded sound will become more faithful to the source sound. See page 16 for more details about adjusting the recording level.
MUSIC: When recording music.(The adjustment of the recording level will be made automatically.)
SPEECH: When recording a meeting or a conference etc. (The adjustment of the recording level will be made automatically.)

To confirm the source of input
Press the REC button twice while the unit is in the stop mode, or if the unit is in the recording or pause mode, press the REC button once. One of the following indications will come on for approx. one second:
MIC or LINE or DIGITAL.
These indications come on when the source of input has been changed as well.

To Record



1 **Insert a DAT cassette. (See page 11.)**

2 **Press the REC button and the ❚❚ PAUSE button.**
The unit enters the pause mode.
- When recording via a microphone or the analog connection, adjust the recording level with the REC LEVEL knob (Recording monitor mode) (see page 16).
- When recording from another equipment, engage the source equipment in the playback 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.**
- You cannot adjust the output level of the LINE OUT jack of this unit.
- Care must be taken if disconnecting a plug from the PHONES/LINE OUT jack while recording, as doing so may cause some noise to be recorded.

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.
- If the unit is left in the stop mode for more than 10 minutes, the unit will automatically disengage the tape from the built-in mechanism. The illumination of the display window will go out at the same time.

To monitor the sound while recording
Plug in the headphones (not supplied) or an active speaker system (not supplied) to the PHONES/LINE OUT jack of the unit.
If the headphones are to be used, set the PHONES, AVLS/LINE OUT switch to either the AVLS ON or AVLS OFF position.
If the active speakers are to be used, set the PHONES, AVLS/LINE OUT switch to the LINE OUT position. (You cannot control the volume with the unit.)

Notes
- If headphones are connected to the PHONES/LINE OUT jack of the unit, do not change the position of the PHONES, AVLS/LINE OUT switch to the LINE OUT position. (If you wish to do so, make sure that the headphones are unplugged first.) However, you can set the switch to either AVLS ON or AVLS OFF position.
- There may be cases where you experience some noise while monitoring the sound while recording via the digital connection.

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 intend 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.)
— If you wish to leave some blank parts, do not forward the tape with the ▶PLAY button or the ▶▶/▶▶I button. Keep the unit in the recording mode but without any input sound.

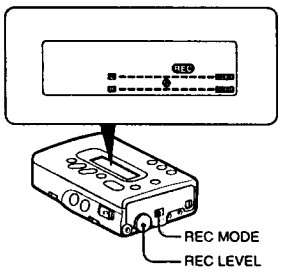
* The absolute time indicates the elapsed time from the beginning of the tape and the current position of the tape which is written digitally. The absolute time will be automatically written when you record a DAT tape for the very first time and cannot be erased once written.

Note
In some cases, the absolute time may not be written if you re-record on the tape on which the absolute time has not been written originally.

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 Record Successfully

To adjust the recording level
Slide the REC MODE switch to the MANUAL position.
Rotate the REC LEVEL knob so that the peak level indicators on the display window flicker at around level ⓭. However, make sure that the level indicators do not go over the 0 dB mark when the peak sound level is recorded.



When the OVER indicator(s) flicker(s)
The recording level is set too high. Lower the level in order to avoid the recorded sound from becoming distorted.

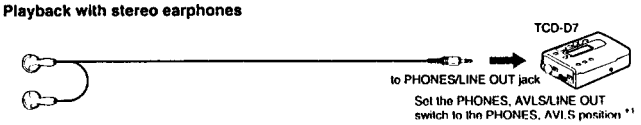
When recording relatively low sound
Lower the recording level and move the microphone as close as possible to the source. You should be able to make a clear recording with the least amount of noise.

Selecting a microphone best suited to the recording situation
The recording characteristics are affected by the type of microphone you use. For a high quality recording, use the ECM-959A (not supplied) or the ECM-737 (not supplied).

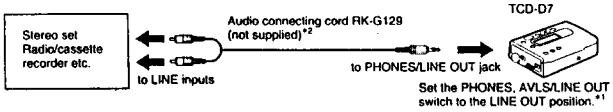
Playback

Connection with Other Equipments

Playback with stereo earphones

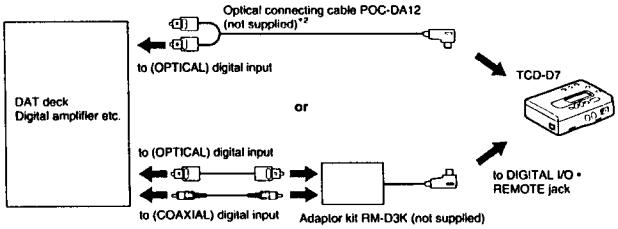


Playback with a connected stereo set or radio/cassette recorder etc. (analog connection)



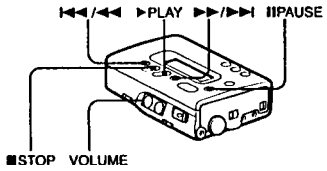
Playback with a connected equipment with digital input connectors (digital connection)

There are two types of digital input terminals: the optical type and the coaxial type.



*1 When selecting other positions, make sure that the headphones, connecting cord etc. is unplugged from the PHONES/LINE OUT jack of the unit.
*2 Except for the Sony world model

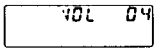
To Play back



1 **Insert a DAT cassette. (See page 11.)**

2 **Press the ► PLAY button.**
Playback starts. The SP mode or the LP mode will be detected automatically, therefore, you do not have to adjust the SP/LP switch.

3 **Adjust the volume with the VOLUME buttons.**



Note
You cannot adjust the output level of the LINE OUT jack of this unit.

To stop playback
Press the ■STOP button.

To pause playback momentarily
Press the II PAUSE button.
To cancel the mode, press either the II 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.
- If the unit is left in the stop mode for more than 10 minutes, the unit will automatically disengage the tape from the built-in mechanism. The illumination of the display window will go out at the same time.

To fast-forward the tape
Press the ►►/►►I button when the unit is in the stop mode.

To rewind the tape
Press the I◄◄/◄◄ 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)

17 18

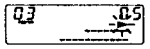
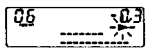
To fast-forward or rewind while monitoring the sound — cue/review

To cue	Keep ►►/►►I pressed during playback.	The tape is fast-forwarded/rewound while the button is held pressed. When you release the button, the unit goes back the normal playback mode.
To review	Keep I◄◄/◄◄ pressed during playback.	

If you press the ► PLAY button and the ►►/►►I button or the I◄◄/◄◄ button during playback, the unit enters the high speed cue/review.

Locating the beginning of a program (track) — AMS* function

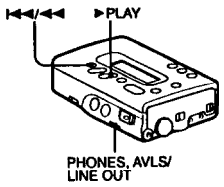
Press either the ►►/►►I or I◄◄/◄◄ button quickly once during playback. If the unit is in the fast-forward/rewind mode, press either the ►►/►►I or I◄◄/◄◄ button once. Or if the unit is in the stop mode, press either the ►►/►►I or I◄◄/◄◄ button twice.

To locate the beginning of the succeeding program (track)	Press ►►/►►I the same number of times as the programs (tracks) to be skipped.	 E.g.: to locate the beginning of the fifth program (track)
To locate the beginning of the previous program (track)	Press I◄◄/◄◄ the same number of times as the programs (tracks) (including the currently played one) to be skipped.	 E.g.: to locate the beginning of the fourth program (track) including the currently played one

* Automatic Music Sensor

Note
The AMS function may not work properly if the start IDs are not registered on the tape or if the tape is recorded on another DAT deck. (See page 21.)

The AMS indication during fast-forward or rewind
The peak level indicators (L/R) show the tape transport direction and the remaining amount of tape to be wound.
L indicator: tape transport direction
R indicator: remaining amount of tape to be wound



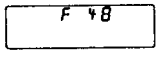
To listen to a tape with headphones with a more comfortable sound pressure level — AVLS* function
When playing back a tape, set the switch to either the AVLS ON or the AVLS OFF position.
AVLS ON: Controls the sound pressure without degrading the sound quality when the volume is turned up. (Only when the headphones are used)
AVLS OFF: Normal sound reproduction

* The AVLS (Automatic Volume Limiter System) function automatically limits the sound pressure so that it will not exceed a certain level without degrading the sound quality, even if you attempt to turn the volume up higher. It also helps to reduce the sound leakage from your headphones.

Note
The reproduced sound may be distorted or unstable due to the type of music (with enhanced bass) being played back. If this happens, turn the volume down.

To listen to a tape from the beginning after it has been rewound — Auto-play function
While pressing down the I◄◄/◄◄ button, press the ►PLAY button.When the tape is rewound to the beginning, the playback starts automatically.

To get the sampling frequency displayed during recording/playback
Press and hold the ►PLAY button during recording/playback. The sampling frequency will be displayed while the button is held pressed.



There are three types of sampling frequencies.

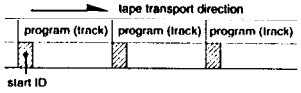
48 kHz	DAT SP (standard play) recording mode
44.1 kHz	CD and MD
32 kHz	DAT LP (long play) recording mode

19 20

Useful Function

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

◆ To write the start IDs automatically while recording

The way in which these IDs are written depends on whether the *AUTO-ID* indicator is appearing on the display window or not.
The *AUTO-ID* indicator can be switched on and off by pressing the REC button while pressing down the ■ STOP button.

When the *AUTO-ID* indicator is off

The way in which the start IDs are written depends on the way the recording has been done. See the chart below.

Recording via MIC input Recording via LINE input	Only when the recording has started (including when the pause mode is released)
Recording from a CD player via digital input	At the beginnings of programs (tracks)*
Recording from a DAT player via digital input	All the start ID signals written on the original DAT tape will be registered.

* There may be cases where the start IDs may not be written by some CD players.

When the *AUTO-ID* indicator is on

The start IDs will be written if there is a section with a very low recording level or no sound at all lasting for more than three seconds is present on a program (track).

Note
There may be cases where the start IDs are not written properly if there is some noise present in the sound source.

◆ 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 (18 seconds if the unit is in the LP mode). While the unit is set in this mode, no operational buttons other than the ■ STOP button will function.

PGM (program) numbers

These signals are used to identify the program (track) numbers.
Examples in which the PGM numbers are registered are as follows:

To record a tape from the beginning
The PGM numbers will be registered simultaneously from PGM number 1 onward while the start IDs are being registered.

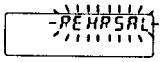
To record on a partially recorded tape
Locate the desired position on the tape by fast-forwarding or rewinding the tape using either the ▶▶/▶▶I or I◀◀/◀◀ button and have the PGM number displayed. Then start the new recording. While the new start IDs are being registered, the PGM numbers will be registered in sequence.

When the optional adaptor kit RM-D3K or the wired remote controller RMT-D7* is used with this unit, you will be able to do the following:

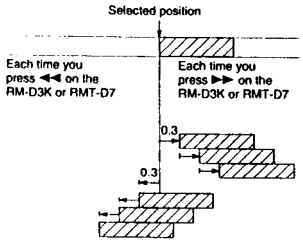
To write the start IDs during playback

You can write the start IDs in the desired positions without erasing the contents of the recording.

When the desired position on the tape is located, the section of the tape lasting three seconds from that position will be played back repeatedly. (Rehearsal function)



If the located position is not where you desired the start ID to be written, you can move that position in either direction by 0.3 second increments by the following method:

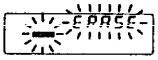


* The rehearsal function can only be repeated up to 16 times at the same position. After that, the unit shuts off automatically.
* You can move the position of a start ID forward or backward to the maximum of approx. 10 seconds.

Notes
* You cannot move the start IDs which have already been written manually, or if they have been written automatically during recording. If you wish to move start IDs, erase the existing IDs first. Then select the desired sections before rewrite the IDs.
* You cannot write the start IDs while the rehearsal function is in operation or if the "START ID" indicator and "WRITE" indication are flashing rapidly.

To erase the start IDs

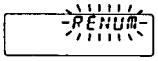
You can erase the start IDs without erasing the contents of the recording on the tape. (Only when the unit is in the stop or playback mode.)



Note
If a start ID is erased, the PGM number which has been written at the same position will be erased as well.

To re-number the PGM numbers (Re-number function)

You may need to renumber the PGM numbers in the following cases:
— When the start IDs are written during playback.
— When the recording has been resumed from the middle of the tape so that the same PGM numbers co-exist on one tape.
— When the start IDs have been erased together with the PGM numbers so that some PGM numbers are missing.



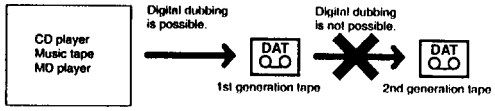
When the re-numbering is over, the tape will rewind to the beginning automatically and stop there.

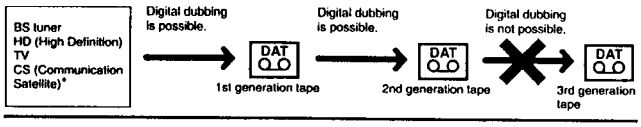
Note
If a tape is used which has been recorded on another DAT deck and has a start ID written at the beginning of that tape, writing or re-numbering the PGM numbers on that tape may not be done properly.

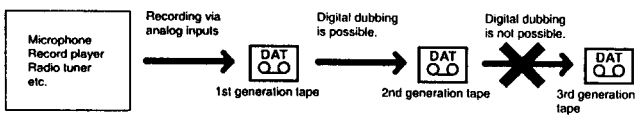
* Except for the Sony world model

Serial Copy Management System

The Serial Copy Management System which is incorporated in the domestic DAT equipment prevents repeated digital dubbing from one equipment to another. However, this system lets you record at least one generation of digital prerecorded software via digital connections.



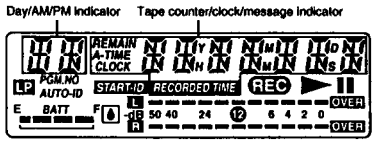




Notes
* There may be cases where the Serial Copy Management System rules are not applicable when an equipment which is not protected with the Serial Copy Management System is used in recording.
* Even if digital dubbing is impossible, you can still dub tape via analog connections.
* When digital dubbing is not possible, the message "COPY PROHIBIT" will come on the display window.

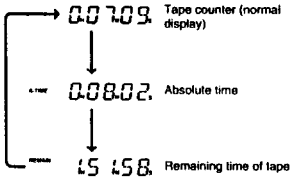
* These source examples may not apply to some countries.

Display Window



◆ The tape counter indications

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



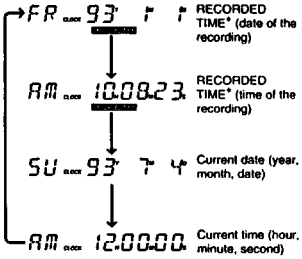
To reset the tape counter (normal display) to "0:00:00"
Press the RESET button.

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 tape counter is not completely accurate in terms of displaying the actual 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.

◆ Message Displays

The following messages will be displayed while operating this unit.

ERROR	Comes on when the unit is malfunctioning due to a fault. → Disconnect the power source and re-connecti it. If this does not improve the situation, disconnect the power source and take the unit to the nearest Sony dealer.
HOLD	Flashes when the HOLD/PUSH OPEN switch is set to the HOLD position.
NO TAPE	Flashes when there is no tape inside the unit.
TAPE· PROTECT	TAPE and PROTECT indications come on alternately when a recording is attempted on a tape whose record-protect shutter is open.
No INPUT	Flashes when the digital input signal is not received.
COPY· PROHIbT	COPY and PROHIbT indications come on alternately when the SCMS signal is received.
OPEN	Flashes when the cassette door is open.
LOAD	Flashes while loading a tape.
UNLOAD	Flashes while un-loading a tape.
TOP	Flashes when the beginning of a tape*1 is reached.
END	Comes on when the end of a tape is reached.
LINEoUT	Flashes when the PHONES, AVLS/LINE OUT switch is set to LINE OUT or when the VOLUME button is pressed in this mode.
bATTERY	Flashes when the batteries are weak.
EE END	Comes on when the end ID*2 is detected.
bLANK	Flashes when the unrecorded part of a tape is detected during playback or fast-forwarding.
WRITE	Comes on while the start IDs are being written.
MIC in	Comes on when the REC button is pressed twice while a microphone is connected. Or if the recording source is changed to that of microphone from another source.
LINE in	Comes on when the REC button is pressed twice while another equipment is connected via the analog connection. Or if the recording source is changed from another source to the equipment with analog connection.
DIGITAL	Comes on when the REC button is pressed twice while another equipment is connected via the digital connection. Or if the recording source is changed from another source to the equipment with digital connection.

*1 It flashes when a new (virgin) tape is used for the first time.

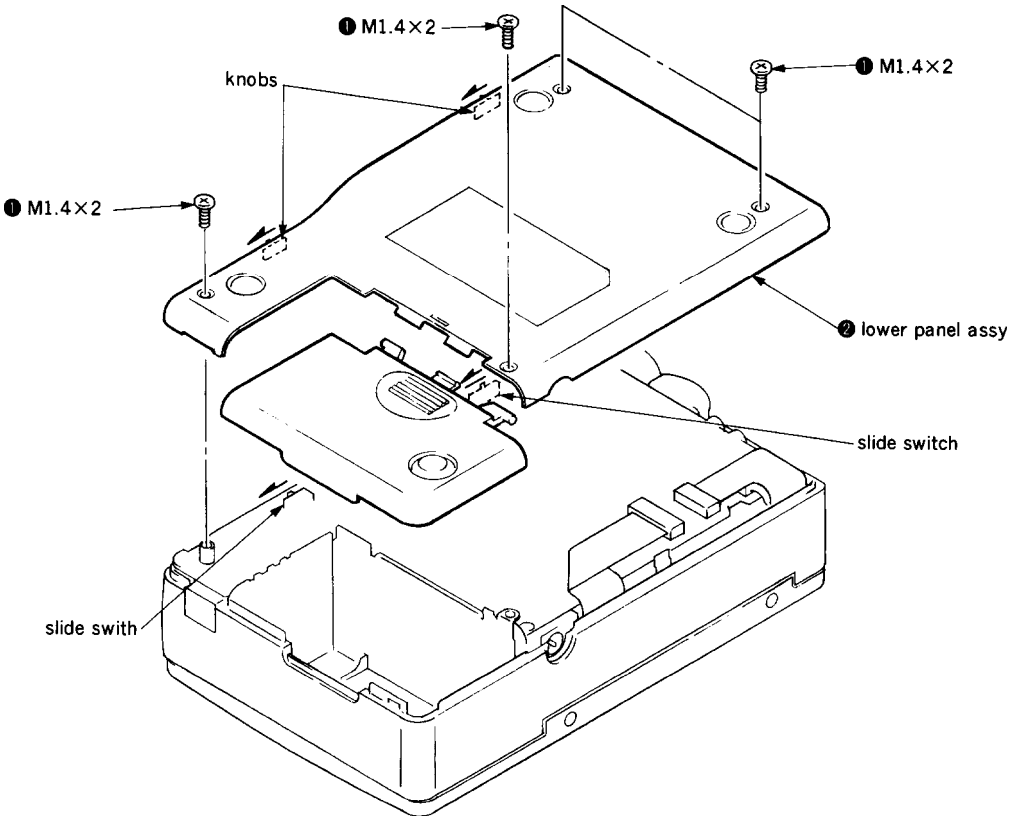
*2 The end ID is a signal to indicate the position of a tape where the recording has ended. You cannot register the end IDs with this unit, however the unit can play back the tapes which are registered with the end IDs and detect them. When the unit detects an end ID, it stops play back there and you can only forward the tape by recording from that point on the tape.

SECTION 2
DISASSEMBLY

Note : Follow the disassembly procedure in the numerical order given.

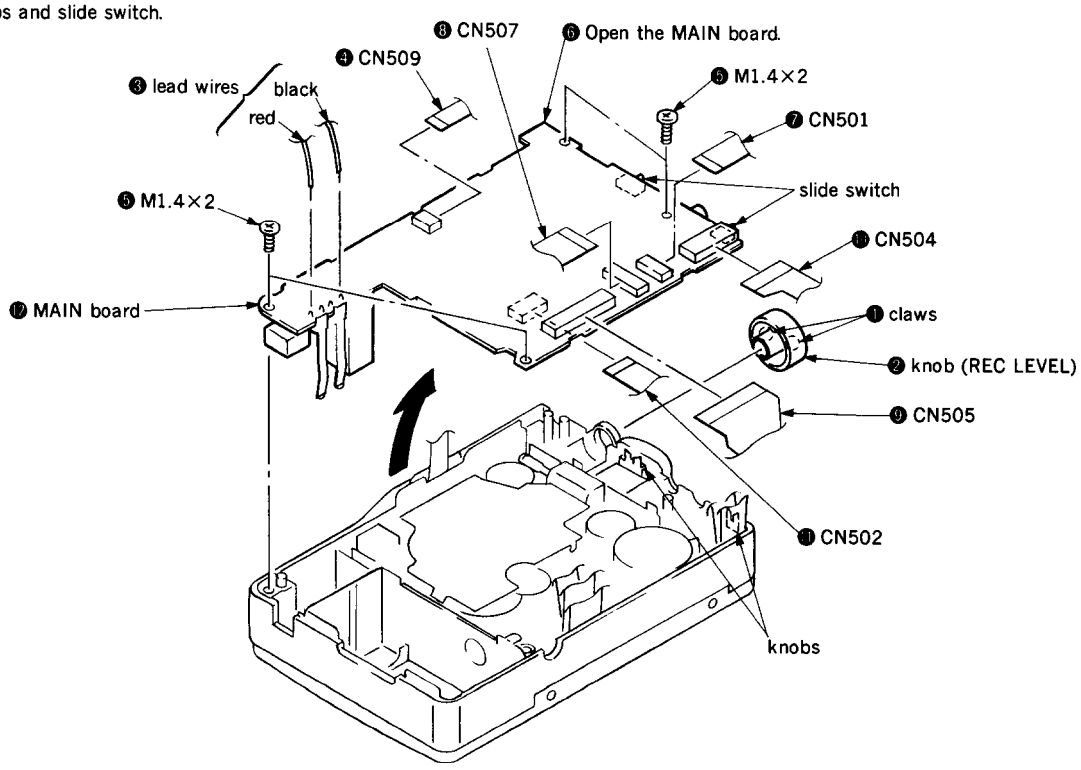
2-1. LOWER PANEL ASSY

Note) Set the knobs and slide switch to slide in the direction of arrow.

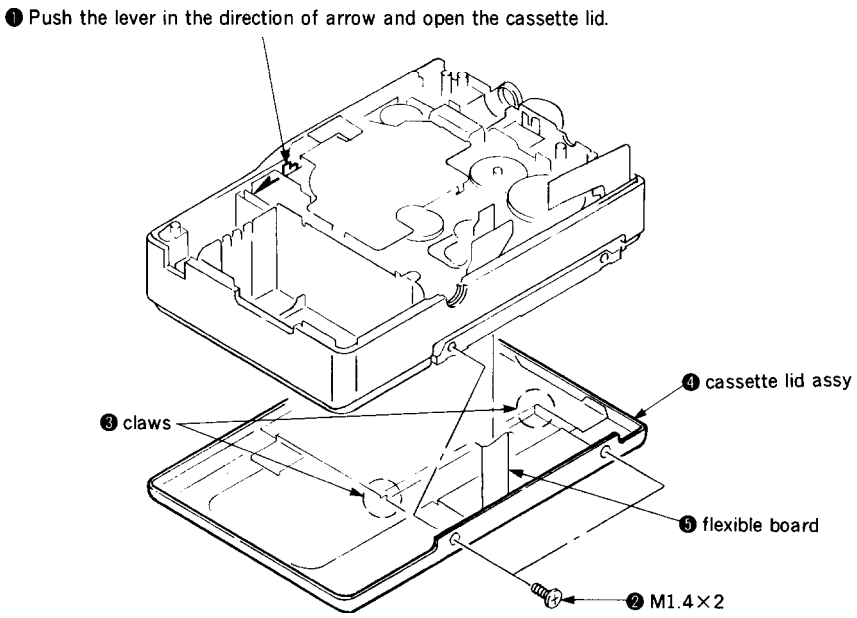


2-2. MAIN BOARD

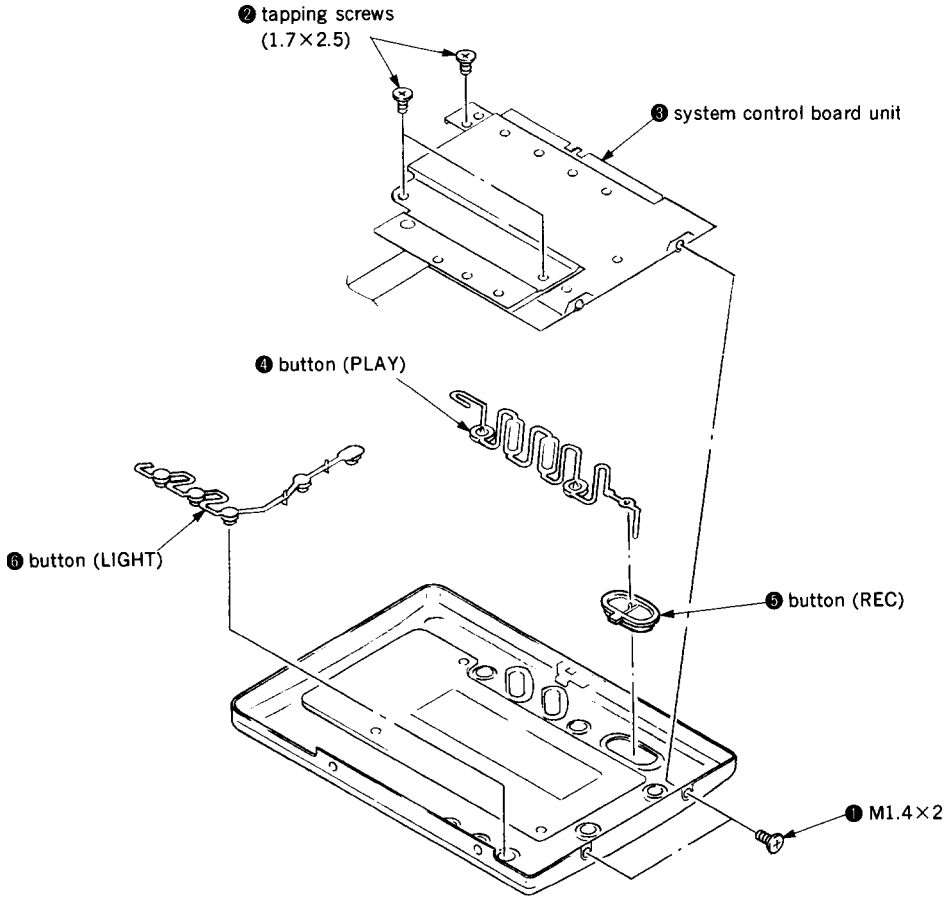
Note) Set the knobs and slide switch.



2-3. CASSETTE LID ASSY

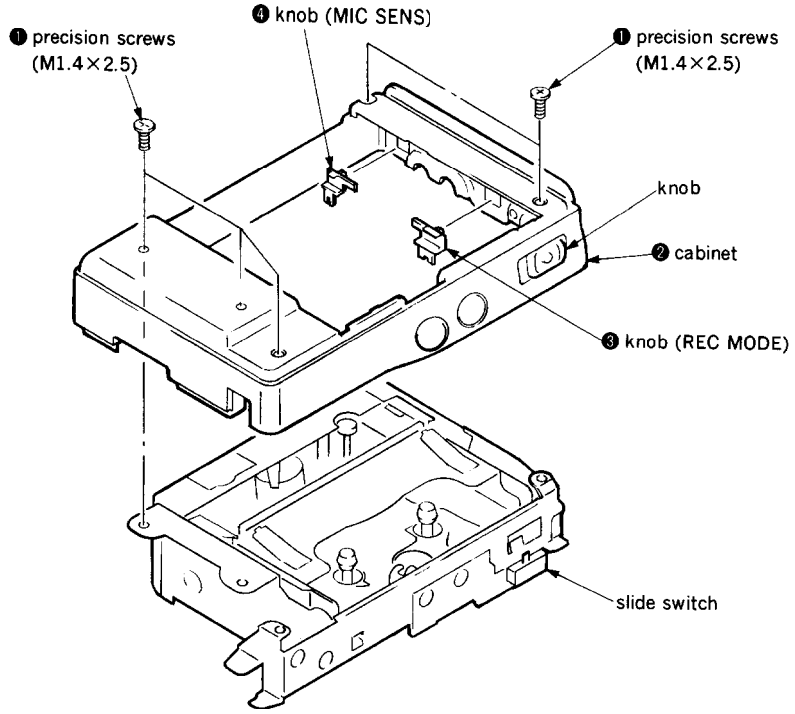


2-4. SYSTEM CONTROL BOARD UNIT

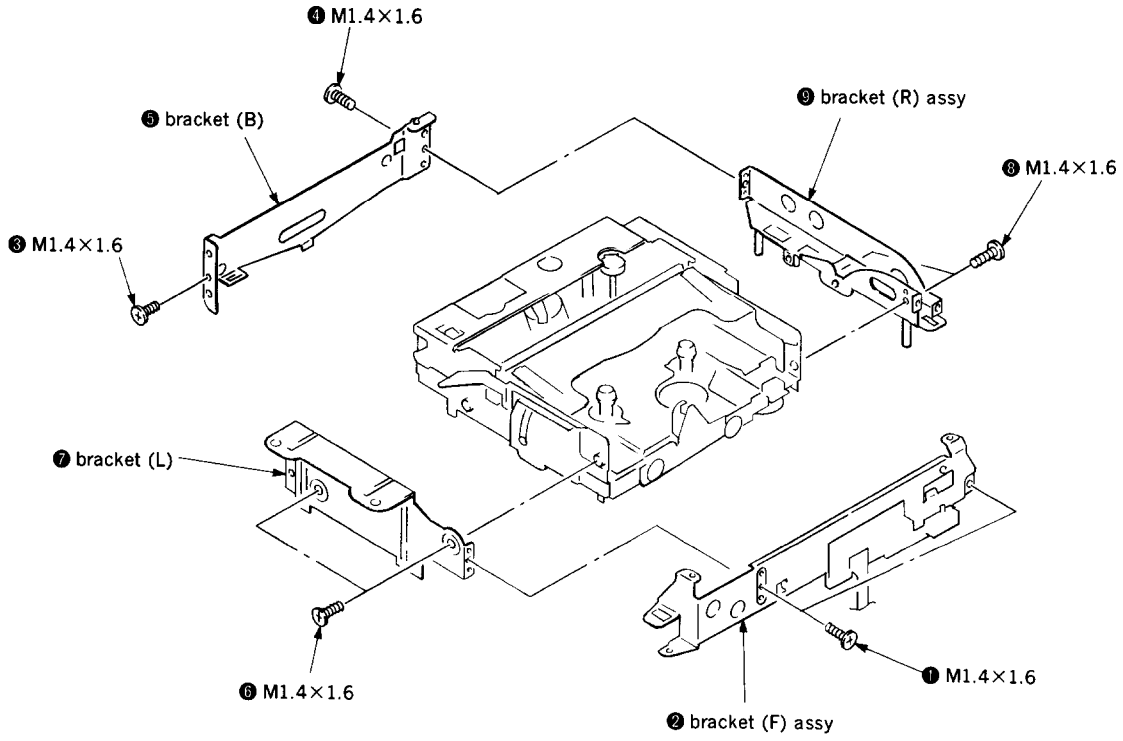


2-5. CABINET

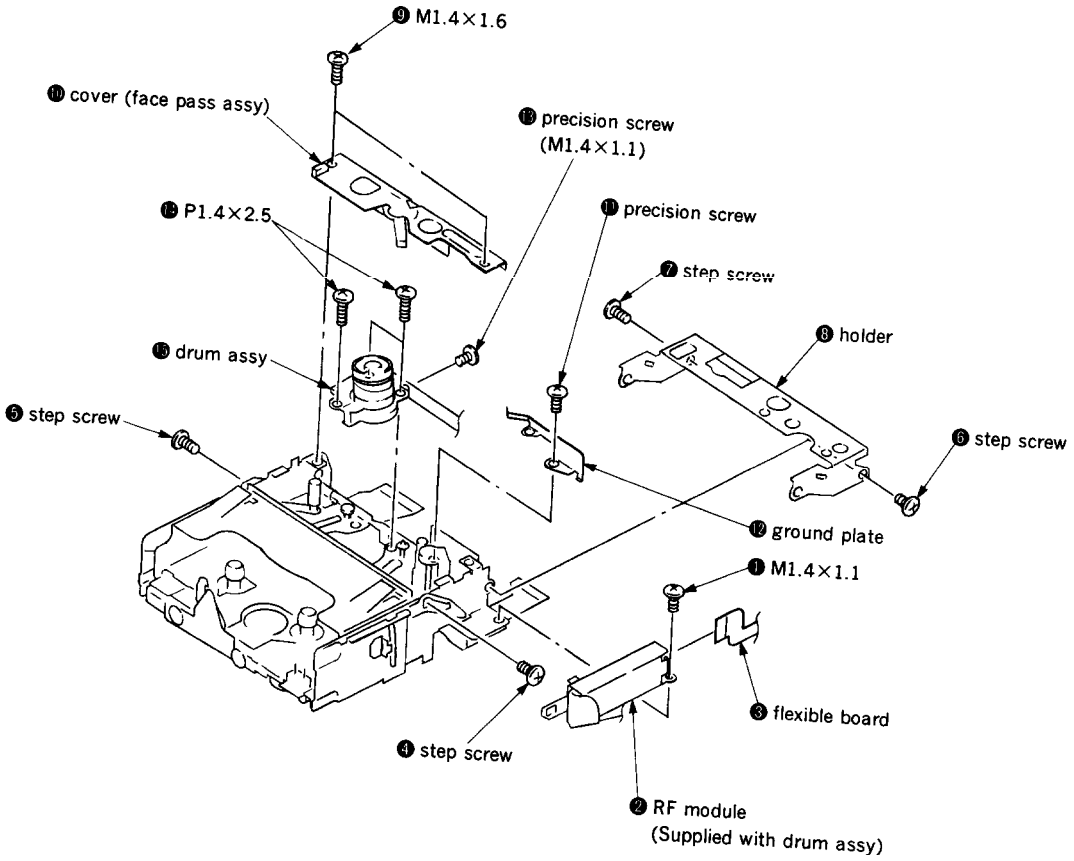
Note) Set the knobs and slide switch.



2-6. BRACKET



2-7. DRUM ASSY


❾ M1.4×1.6
❿ cover (face pass assy)
⓭ precision screw (M1.4×1.1)
⓫ precision screw
❽ P1.4×2.5
❼ step screw
❽ holder
⓭ drum assy
❺ step screw
❻ step screw
⓬ ground plate
❶ M1.4×1.1
❸ flexible board
❹ step screw
❷ RF module (Supplied with drum assy)

SECTION 3
DIAGRAMS

3-1. PIN DESCRIPTION

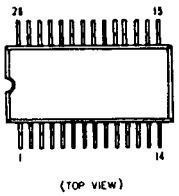
• IC506 CXP80524-078R

Pin No.	Pin Name	I/O	Pin Function
1	DMCRQ	O	Serial communication request signal to LCD micro-computer of system control board unit. ("L" : Communication mode)
2	XSTBY	O	MB3796, CXA8022N and MCD002AM standby signal. ("L" : Standby mode)
3	DRMBR	O	Drum motor brake signal ("H" : Brake)
4	CAPDIR	O	Capstan motor rotation direction control signal ("H" : FWD)
5	DACONT	O	Power ON/OFF signal of D/A converter section. ("L" : Power ON)
6	XRSTDSP	O	CXD2605 reset signal ("L" : Reset)
7	SYSPAW	O	System power ON/OFF signal ("H" : Power ON)
8	LP/SP1	O	LP switch detection output
9		O	Not used
10		—	Not used
11	REI	I	Rotary encoder input 1
12	REM	I	Rotary encoder input 2
13		—	Not used
14	REO	I	Rotary encoder input 3
15	RELD	I	Load detection signal ("L" : Load completion)
16	REULD	I	Unload detection signal ("L" : Unload completion)
17	XRECINH	I	REC proof switch input ("L" : REC prohibition)
18	XCASLK	I	Cassette compartment lock switch input ("L" : Cassette compartment lock)
19	CASIN	I	Cassette insert detection ("H" : Cassette insert)
20		—	Not used
21	XAVLS	I	AVLS switch input ("L" : AVLS)
22	HP/LINE	I	HEADPHONE/LINE OUT switch input ("L" : LINE OUT)
23	MIC/LINE	I	MIC/LINE IN switch input ("H" : LINE IN)
24	MUTM	I	Mute output detection of CXD2605. ("H" : Mute)
25	DIG/ANA	I	DIGITAL/ANALOG switch input ("L" : DIGITAL)
26	VOL−	I	VOLUME DOWN switch input ("L" : VOLUME DOWN)
27	VOL+	I	VOLUME UP switch input ("L" : VOLUME UP)
28		—	Not used
29	AC/DC	I	AC/DC power detection ("L" : AC power)
30	CTRMA	O	Control motor control signal
31	CTRMB	O	Control motor control signal
32	ENLDON	O	Tape top/end LED ON/OFF signal ("H" : LED ON)
33		—	Not used
34	PLGON	O	Plunger ON/OFF signal ("H" : Plunger ON)
35		—	Not used
36	MP	I	Fix to GND.
37	XRST	I	Reset input
38		—	Not used
39	VSS	—	GND
40	XTAL	O	Crystal oscillator (9.408MHz) output
41	EXTAL	I	Crystal oscillator (9.408MHz) input
42	LP/SP2	I	LP switch input ("L" : LP)
43		—	Not used
44	SI	I	Serial data input from system control board unit.
45	SO	O	Serial data output to system control board unit and digital filter.
46		—	Not used
47	XSCK	O	Serial clock output to system control board unit and digital filter.
48	SBSY	I	Communication request signal from CXD2605. (Down edge to start communication)
49	SBSI	I	Serial data input from CXD2605.
50		—	Not used

Pin No.	Pin Name	I/O	Pin Function
51	SBSO	O	Serial data output to CXD2605.
52	EXCK	O	Serial clock output to CXD2605.
53	AVSS	—	Analog port GND
54	AVREF	—	Analog port reference GND
55	AVDD	—	+5V
56	SWPADJ	I	Switching pulse delay adjustment voltage input
57	RFENV	I	RF envelope detection input
58	REMOTE	I	Headphone remote control signal input
59	DEW	I	Dew sensor input ("L" : Dew)
60		—	Not used
61	TEND	I	Tape top sensor input ("L" : Tape top)
62	SEND	I	Tape end sensor input ("L" : Tape end)
63	BATTERY	I	Battery voltage level detection
64		—	Not used
65	ATFPLT	I	ATF pilot detection signal
66	TRLFG	I	Reel FG input of take up side (24 per 1 rotation)
67		—	Not used
68	SRLFG	I	Reel FG input of supply side (24 per 1 rotation)
69	CAPFG	I	Capstan FG input (360 per 1 rotation)
70	DRMFG	I	Drum FG input (24 per 1 rotation)
71	DRMPG	I	Drum PG input
72	DREF	I	Drum reference signal (LP mode : 16.7Hz, SP mode : 33.3Hz)
73	MCLK	I	Channel clock (9.408MHz)
74	RFDT	I	RF signal input
75	AVLS	O	AVLS ON signal
76		—	Not used
77	DRMPWM	O	Drum motor control PWM output (Carrier frequency : 36.75kHz)
78	CAPPWM	O	Capstan motor control PWM output (Carrier frequency : 36.75kHz)
79	ATFPWM	O	ATF gain control amplifier control PWM output (Carrier frequency : 36.75kHz)
80	DARST	O	Reset signal to D/A converter
81		—	Not used
82	MLE	O	Serial data take up signal to digital filter. (Up edge to take up)
83	SYMN	I	C1 syndrome pulse input
84	STBY	I	Sleep input ("H" : Sleep)
85		—	Not used
86, 87	VDD	—	+5V
88		—	Not used
89	VSS	—	GND
90		—	Not used
91	ASTY	O	ATF sync output
92		—	Not used
93	DMUTE	O	Digital mute signal ("H" : Mute)
94	HPVC	O	Headphone amplifier voltage control signal
95		—	Not used
96	MODE	O	Mode setting of RF amplifier ("H" : REC current ON)
97	LMUTE	O	LINE OUT mute signal ("H" : Mute)
98	ADCON	O	A/D converter ON/OFF signal
99		—	Not used
100	SWP	O	Switching pulse output ("L" : Ach head)

3-2. SEMICONDUCTOR LEAD LAYOUTS

AK5344-VS-E1



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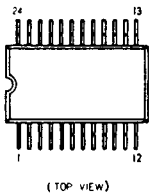
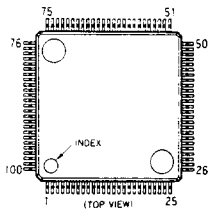
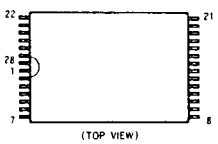
MB3796PFV-G-BND-ER



CXD2605R
CXP80524-078R

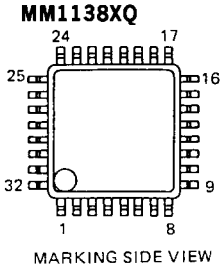


CXK58257ATM-12LB

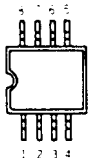


MCD002BM-TLM

MM1138XQ

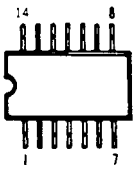


NJM2100V
NJM3416V
NJM4560M
TK15021MTL



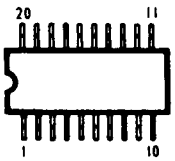
(TOP VIEW)

NJM2112V (TE2)
TK10502MT1



(TOP VIEW)

PCM68U-J-T1



(TOP VIEW)

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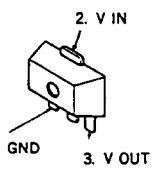

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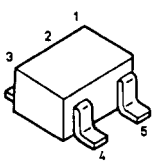

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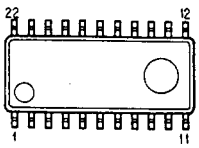

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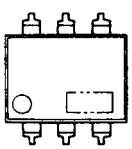
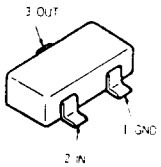


DTC113ZU



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UN5111
UN5114
UN5211
UN5212
UN5214
UN5215
2SA1162-G
2SA1586-YG
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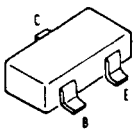
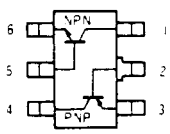
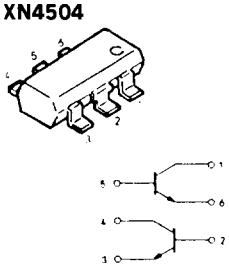
2SC2712-YG
2SD596-DV5
2SD1328-S
2SD1819A-R



XN4315



XN4504



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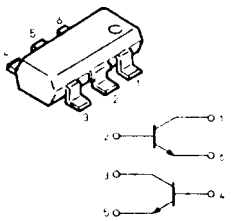

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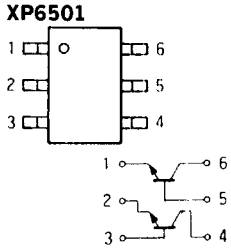

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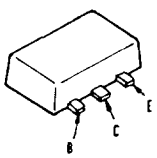
2SB1121-T
2SD999-CLCK



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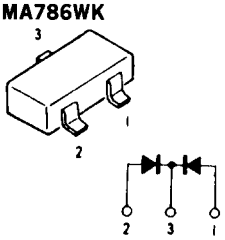

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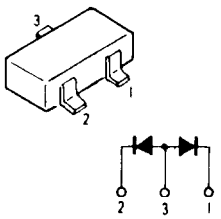
1SS181



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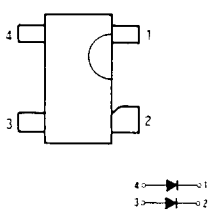
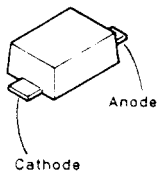


MA728



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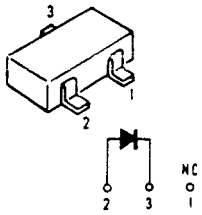
RD5.6M-B2
SB07-03C



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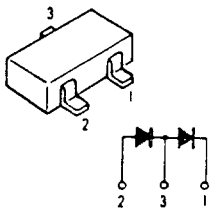
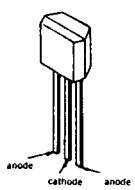
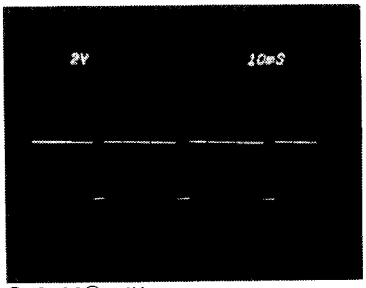


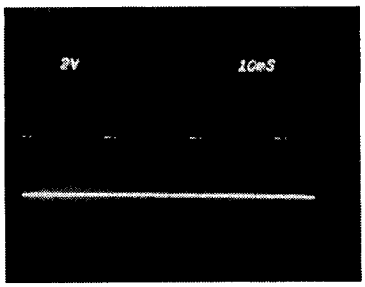
CL-170PG-CD-T



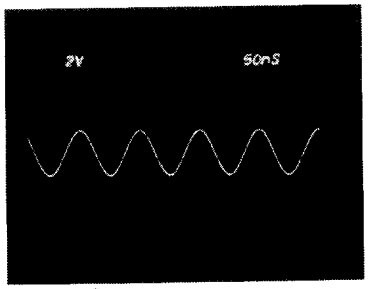
• Waveforms



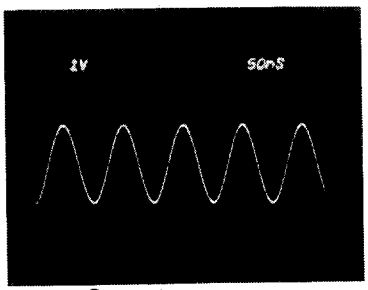
❶ IC506① 4Vp-p



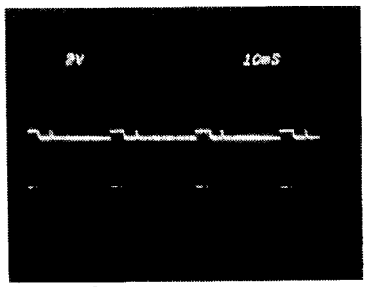
❻ IC506㊾, ㊶ 4.0Vp-p



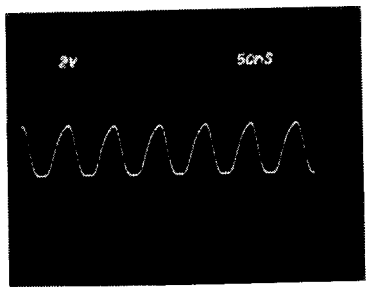
⓫ IC508⑫ 4.0Vp-p



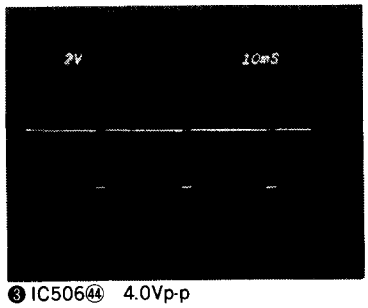
❷ IC506㊶ 2.8Vp-p



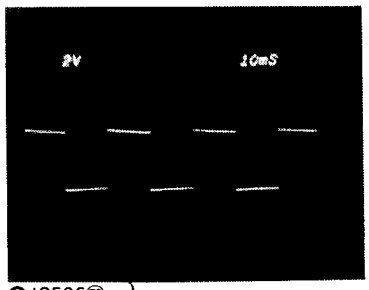
❼ IC506㊷ 4.0Vp-p



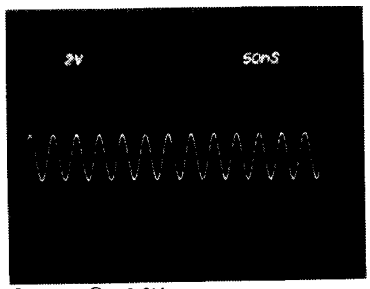
⓬ IC508㊼ 4.0Vp-p



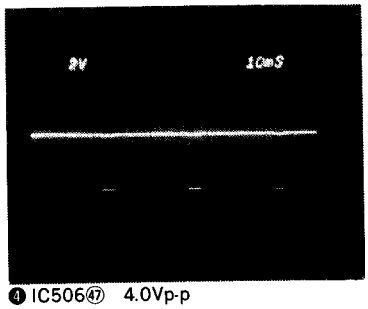
❸ IC506㊹ 4.0Vp-p



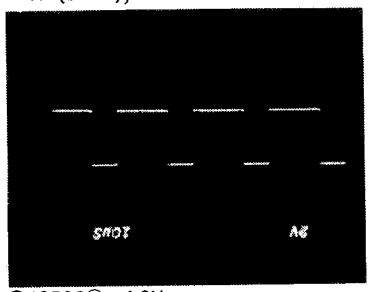
❽ IC506㊷
IC508⑲
TP (DREF) } 4.0Vp-p



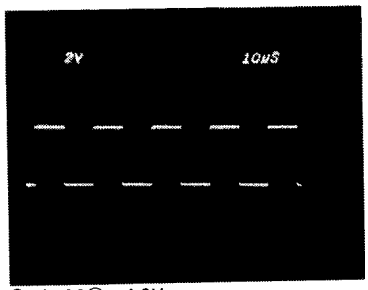
⓭ IC508㊹ 3.2Vp-p



❹ IC506㊼ 4.0Vp-p



❾ IC506㊾ 4.0Vp-p



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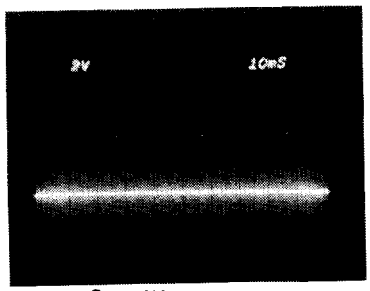
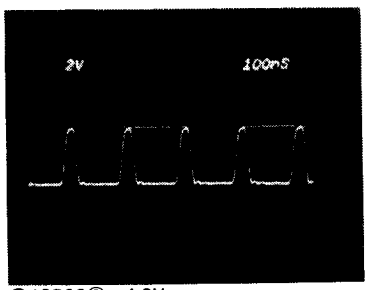
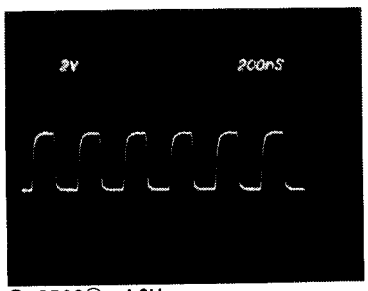


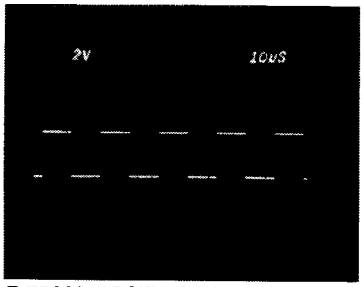
❺ IC506㊽ 4.0Vp-p



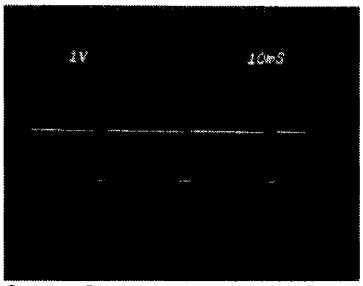
❿ IC508⑧ 4.0Vp-p



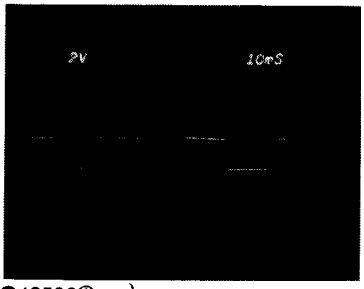
⓯ IC508㊷ 4.0Vp-p



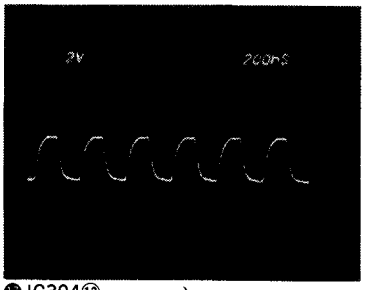
⑯ TP309 (LRCK) 3.1Vp-p



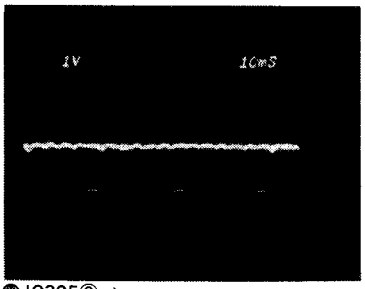
㉑ IC305⑧ TP304 } 1.8Vp-p



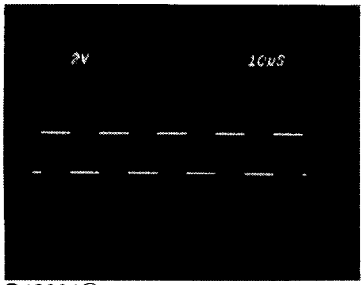
㉖ IC506⑩⑩ IC508㊲ TP (SWP) } 2.2Vp-p



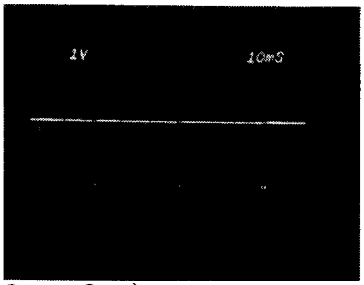
⑰ IC304⑫ TP308 (XBCK) } 3.0Vp-p



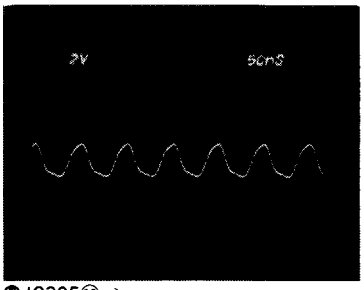
㉒ IC305⑨ TP303 } 1.8Vp-p



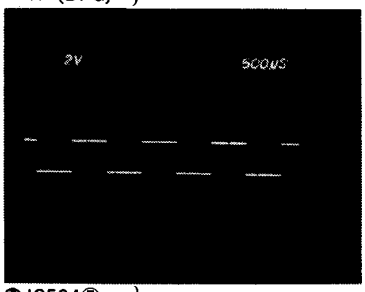
⑱ IC304⑪ TP310 } 2.7Vp-p



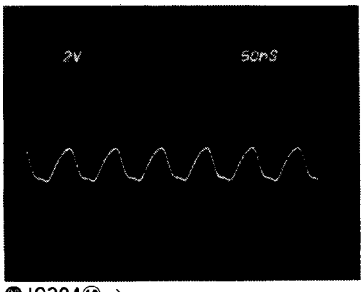
㉓ IC504⑥ IC506㉑ TP (DPG) } 2.2Vp-p



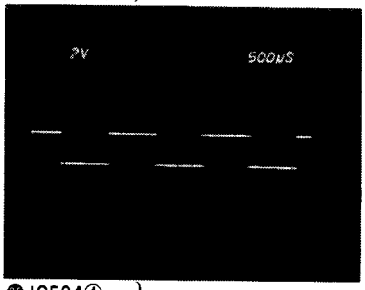
⑲ IC305⑲ IC311⑭ } 2.4Vp-p



㉔ IC504⑤ IC506⑳ TP (DFG) } 2.2Vp-p

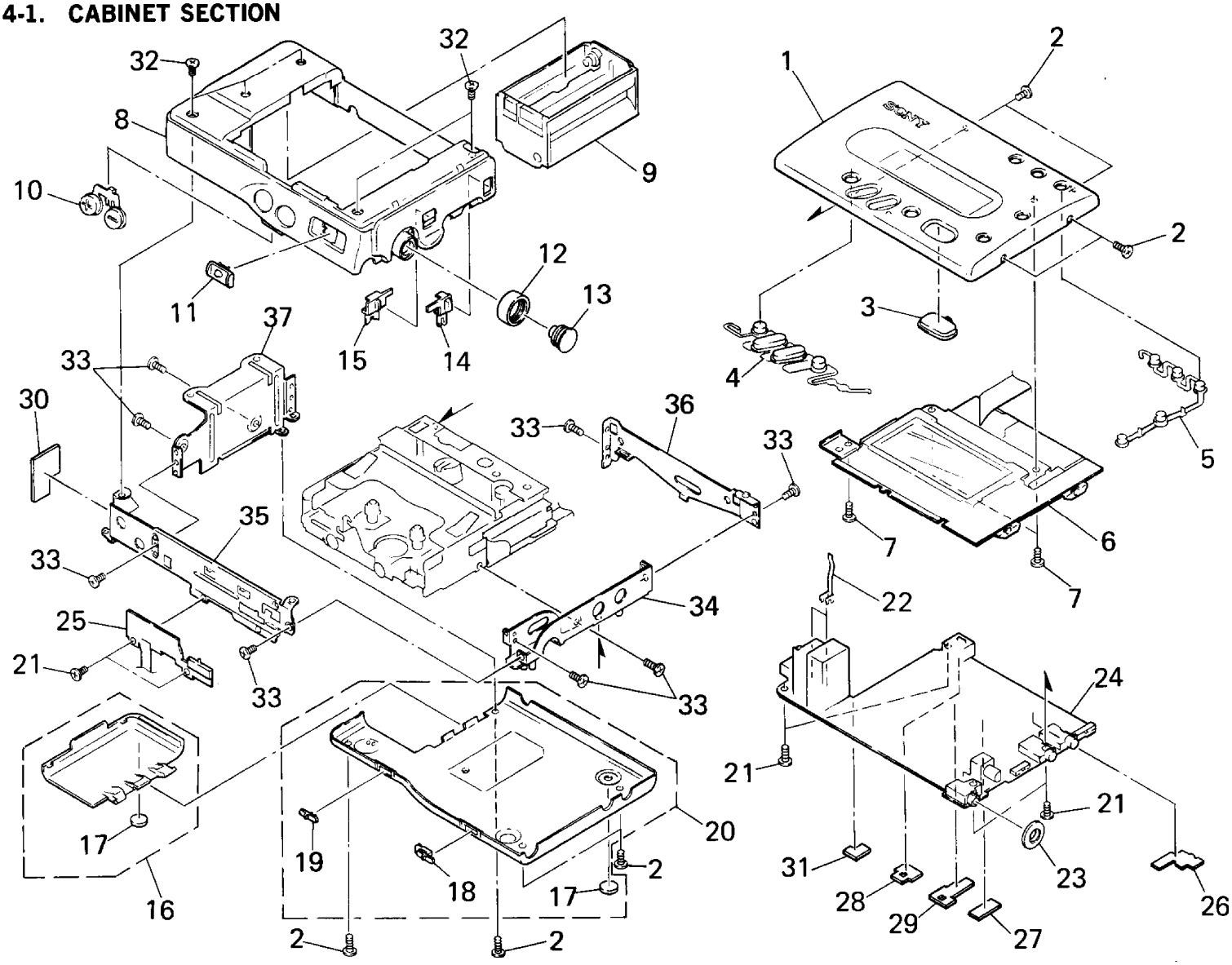


⑳ IC304⑩ TP311 } 2.4Vp-p

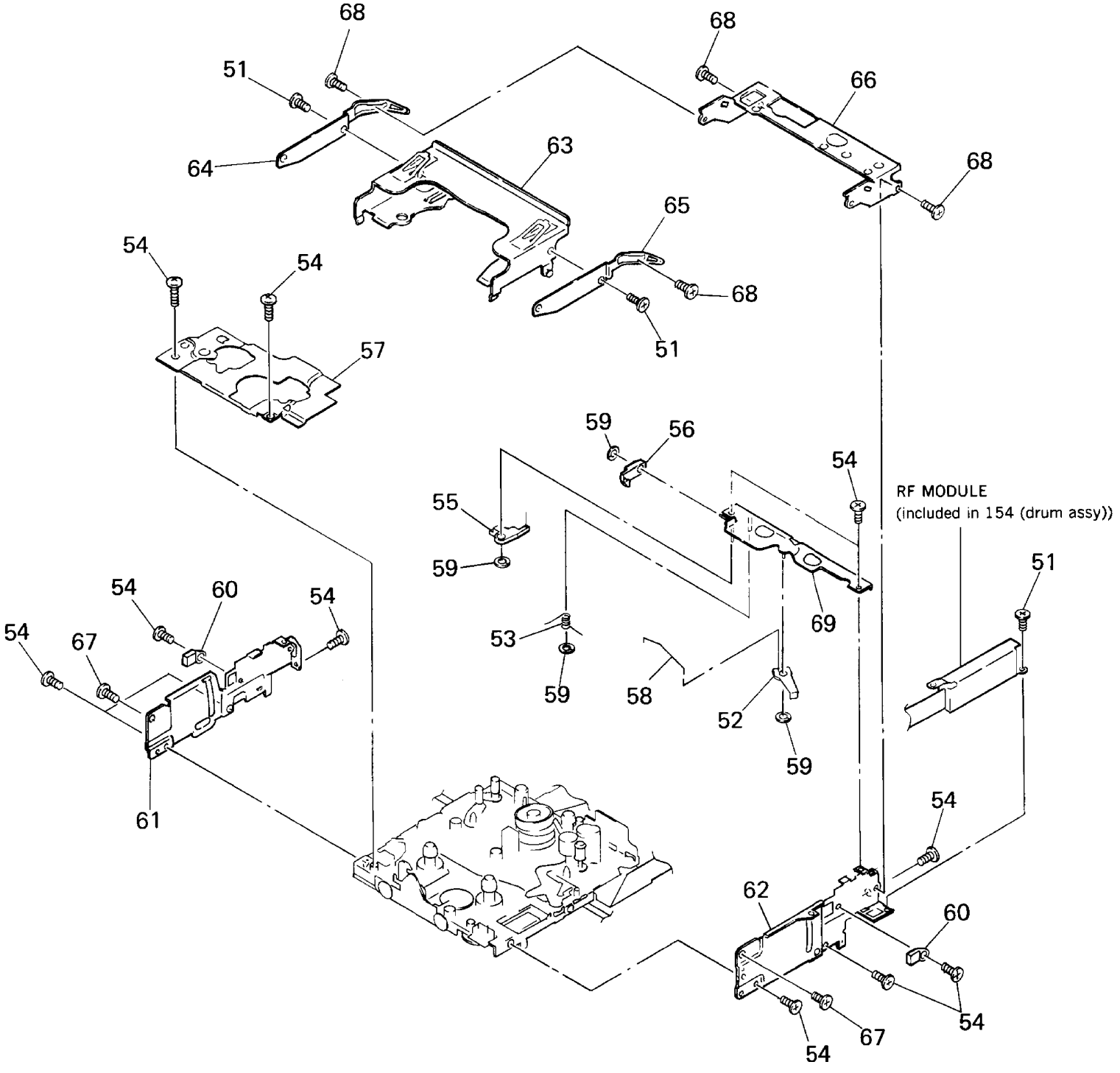


㉕ IC504④ IC506㊹ TP (CFG) } 2.1Vp-p

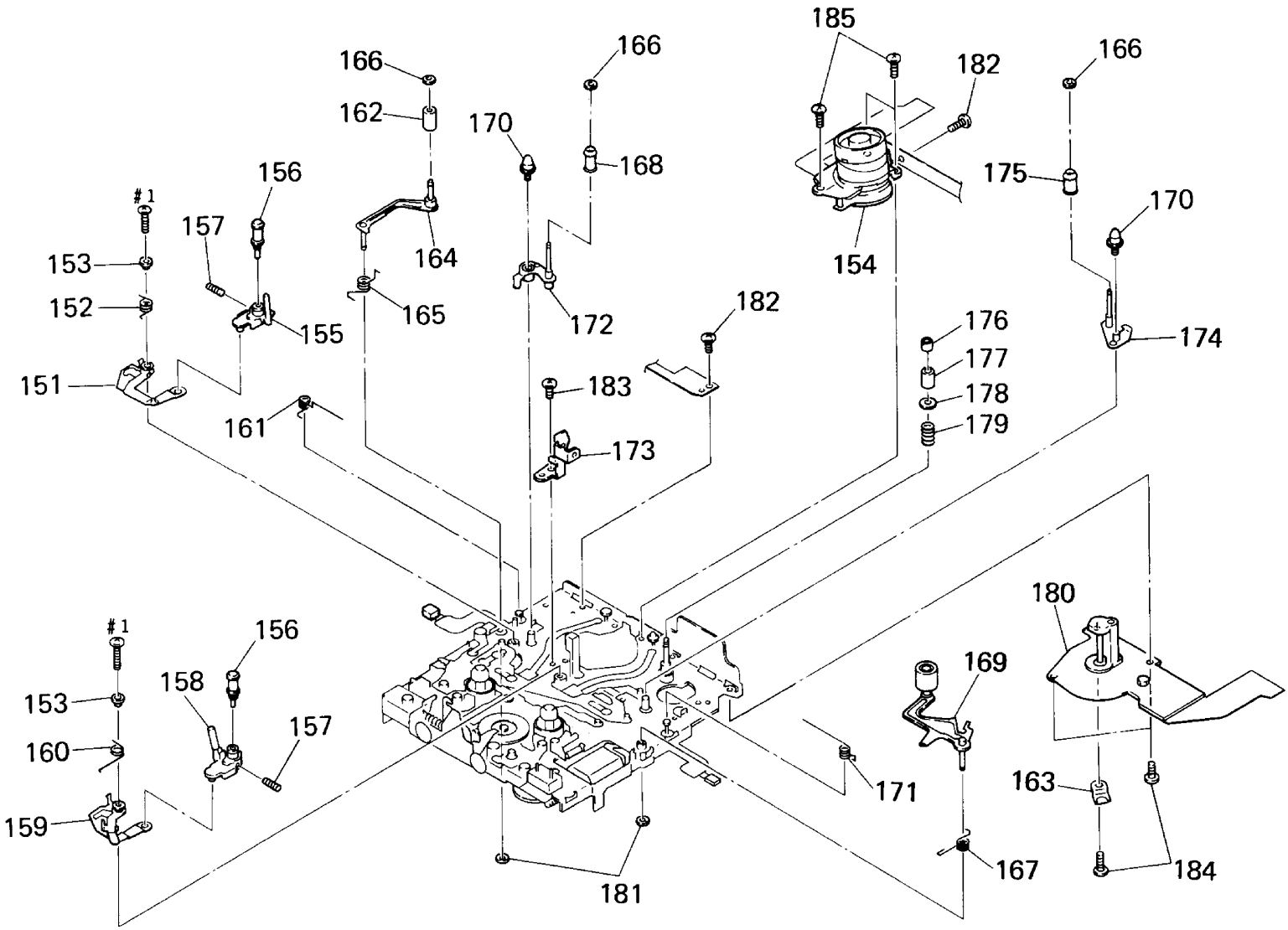
4-1. CABINET SECTION



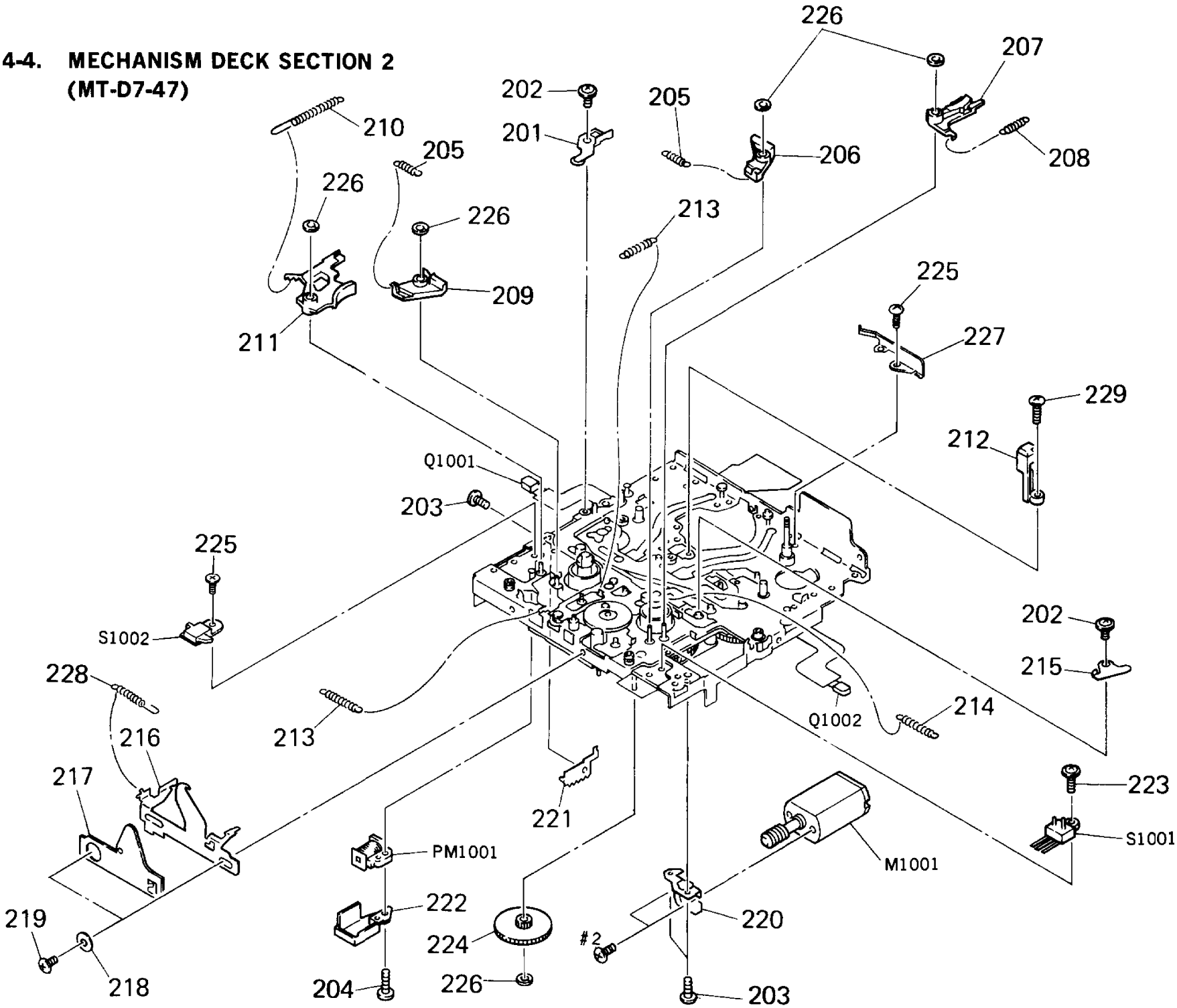
4-2. CASSETTE HOLDER SECTION
(MT-D7-47)



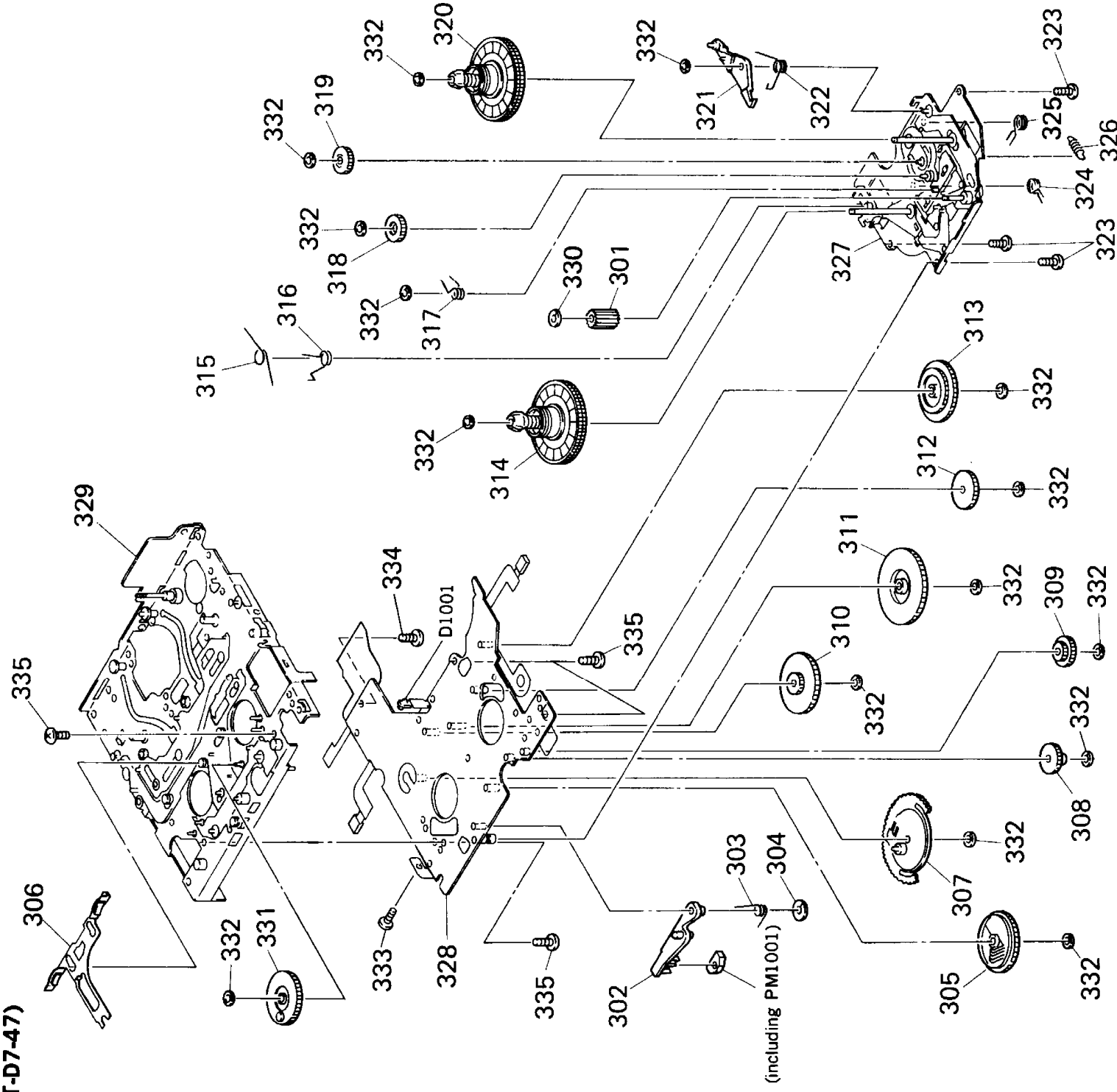
4-3. MECHANISM DECK SECTION 1 (MT-D7-47)



4-4. MECHANISM DECK SECTION 2 (MT-D7-47)

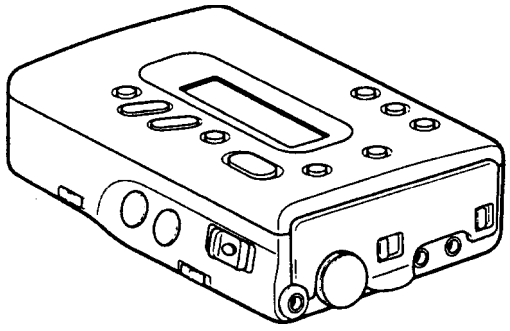


4-5. MECHANISM DECK SECTION 3 (MT-D7-47)



TCD-D7

OPERATION MANUAL



DIGITAL AUDIO TAPE RECORDER

SONY®

1. OUTLINE

TCD-D7 is the world's smallest and lightest portable DAT with a built-in A/D converter. It adopts the SCMS method which records digital signals directly from the CD, and comes with various features such as continuous recording of up to 4 hours using the LP mode. It has been made light and compact with the use of a mechanism deck which incorporates a high density 6-layer board and 15mm ϕ head drum.

1-1. LIGHT AND COMPACT

The conventional DAT uses the mechanism deck employing a 30mm ϕ head drum. By using the 15mm ϕ head drum, the volume and weight of the mechanism deck has been considerably reduced, – approximately 2/5 (345c㎥→138c㎥, 300g→125g). The high density 6-layer board shown in Fig. 1-1 which is 0.6mm thick is used as the printed wiring board.

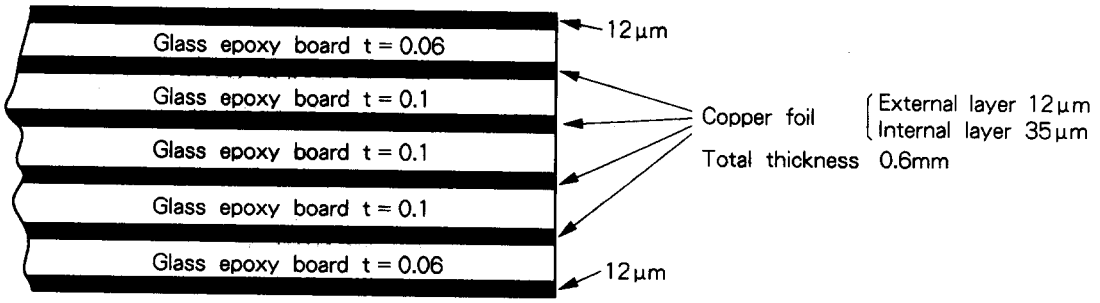


Fig. 1-1. Structure of 6-Layer Board

1-2. LP MODE

By incorporating the 3rd generation LSI (CXD2605Q), and using the 12-bit non-linear 32K : LP mode (option 2) shown in Table 1-1, the unit can continue recording up to 4 hours on the DT-120 tape.

Table 1-1. Input Sources According to Mode

	Max. Recording Time	Sampling Frequency	Quantized Bit No.	Input and Source
48K Mode (Standard)	120 min.	48kHz	16 bits, linear	Digital (DAT, satellite broadcasting mode B)
				Analog (General source)
32K Mode (Option 1)	120 min.	32kHz	16 bits, linear	Digital (Satellite broadcasting mode A)
32K LP Mode (Option 2)	240 min.	32kHz	12 bits, non-linear	Digital (Satellite broadcasting mode A)
				Analog (General Source)
44K Mode	120 min.	44kHz	16 bits, linear	Digital (CD) (MD)

※ For digital inputs, the mode will be selected automatically according to the sampling frequency of the digital signal. But two choices are offered for the 32kHz mode-option 1 or option 2.

※ For analog inputs, the mode can be selected from 48kHz mode, 32kHz, LP mode regardless of the input source.

1-3. OTHER FEATURES

- EL (electric luminescence) backlight liquid crystal display
- Start ID recording function which enables an approximately × 100 high speed search to be carried out
- In addition to the normal cue/review (× 3 speed), high speed cue/review (× 25 speed) can be carried out
- Absolute time display which shows the elapsed time from the TOP of the tape
- Sampling frequency display which shows the recording/playback sampling frequency
- Plug-in power microphone system which corresponds to the optional stereo microphone ECM-S220
- Mic attenuator (– 20dB, – 40dB) which controls excessive input
- LP recording

  4-hour continuous recording with four AA alkaline dry cells. Useful for interviews and meetings.
- Recording level can be set manually/automatically

  Manual level setting recording records the original sound faithfully while automatic level setting recording eliminates the need to set the recording level. Select as desired.
- Date function which automatically writes the date and time of recording in recording, and the data and time can be checked during playback, fast forward/rewind, and cue/review in seconds.
- Liquid crystal display which shows the operating state of the unit and the remaining life of the battery.
- Compact and therefore easy to carry around
- Able to record from different types of digital machines such as CD, MD, BS/CS, etc.
  (With the use of the optional POC-DA12, RT-DA10, or RM-D3K)

2. RECORDING FORMAT

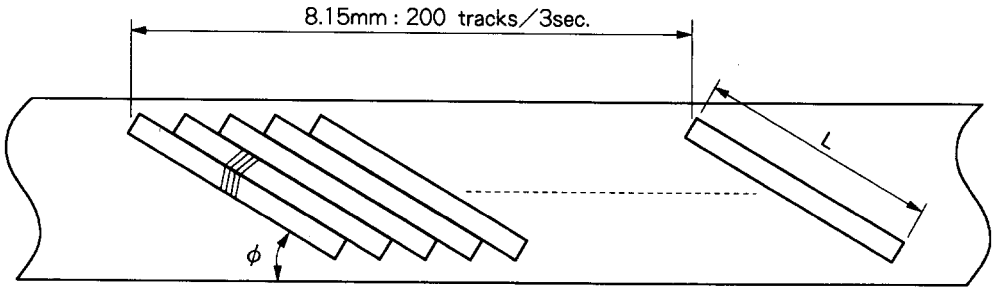
2-1. DAT FORMAT

The track pattern recorded on the tape by the DAT format is defined as shown in Fig. 2-1.

In conventional DATs which employed the 30mm ϕ head drum for the track pattern, the formats are realized by the following specifications :

* 2000rpm head drum speed
* the tape winds around the head drum at an angle of 90°.
* the tape winding around the head drum helically inclines at an angle of 6° 22' (still angle θ) as shown in Fig. 2-2.

The recording format specified for the 30mm ϕ drum is shown in Table 2-1 for reference.



Tape Speed (mm/sec.)	8.15
Track No./Sec.	200/3
Track Angle	6° 22' 59.5"
Track Length (mm)	23.501
Track Pitch (μm)	13.591

Fig. 2-1. Format in Standard Mode

Table. 2-1. Recording Format Specifications (30mm ϕ Drum) (Reference)

Mode / Specification	Recording/Playback Mode				Playback Mode
	(48kHz Mode)	(32kHz Mode)	(32kHz LP Mode)	(44kHz mode)	(44kHz-WT Mode)
Channel No. (CH)	2	2	2	2	2
Sampling Frequency (kHz)	48	32	32	44.1	44.1
Quantized Bit No. (bit)	16 (Linear)	16 (Linear)	12 (Non-linear)	16 (Linear)	16 (Linear)
Transmission Rate (Mbps)	2.46	2.46	1.23	2.46	2.46
Sub Code Capacity (Mbps)	273.1	273.1	136.5	273.1	273.1
Modulation Technique	8 − 10 modulation technique				
Correction Technique	Double Reed-Solomon Code				
Tracking Technique	Area division ATF				
Cassette Size (mm)	73 × 54 × 10.5				
Recording Time (Min)	120	120	240	120	80
Tape Width (mm)	3.81				
Tape Type	Metal powder				Oxide tape
Tape Thickness (μm)	13 ± 1 μ				
Tape Speed (mm/s)	8.15	8.15	4.075	8.15	12.225
Track Pitch (μm)	13.591				20.41
Track Angle	6° 22' 59.5"				6° 23' 29.4"
Drum Specification	ϕ 30 90° wrap				
Drum Speed (rpm)	2.000		1.000	2.000	2.000
Relative Speed (ϕ = 30) (m/s)	3.133		1.567	3.133	3.129
Head Azimuth Angle	± 20°				

2-2. INTERCHANGEABILITY WITH 30mm ϕ DRUM

When using a 15mm ϕ head drum, the track length must be made the same as that for the 30mm ϕ head drum. Therefore, because its diameter is half, the tape must be wound around the drum at an angle of 180° as shown in Fig. 2-3.

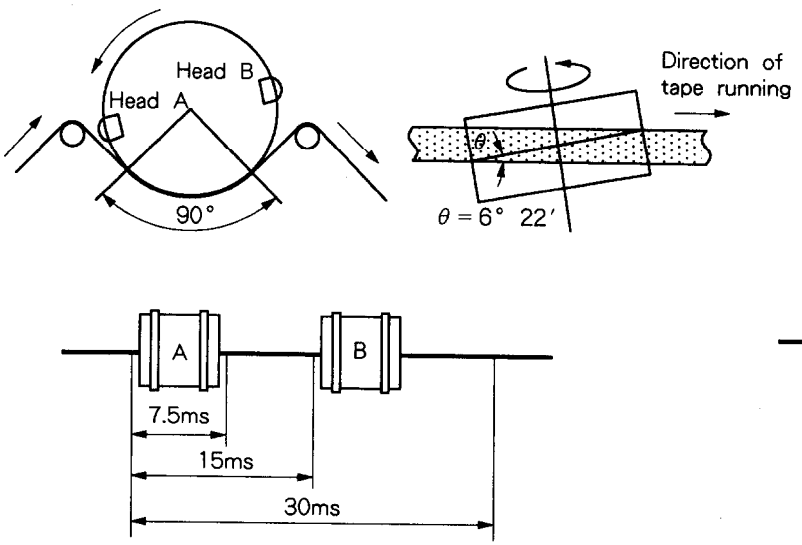


Fig. 2-2. 30mm ϕ drum

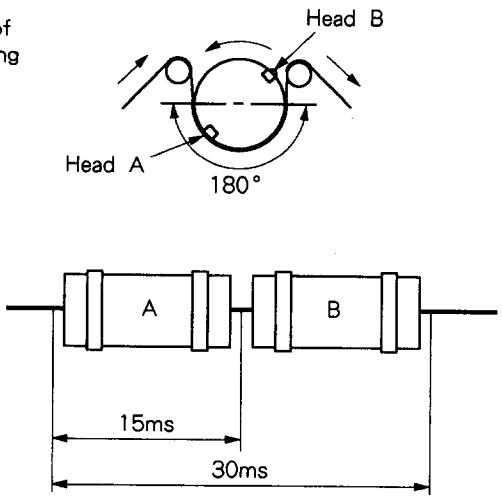


Fig. 2-3. 15mm ϕ drum

In some units, the 15mm ϕ head drum is rotated at 4000rpm, twice that for the 30mm ϕ head drum, so that its relative speed is the same as the 30mm ϕ drum. But in this unit, it is rotated at 2000rpm, the same speed as the 30mm ϕ drum. Because its relative speed then becomes 1/2 and the track angle θ becomes greater than that of the 30mm ϕ drum as shown in Fig. 2-4, the specification for the track angle cannot be satisfied with the still angle for the 30mm ϕ drum.

Therefore, in the mechanism deck of this unit, the still angle θ is made smaller than that of the 30mm ϕ drum by approximately 1'.

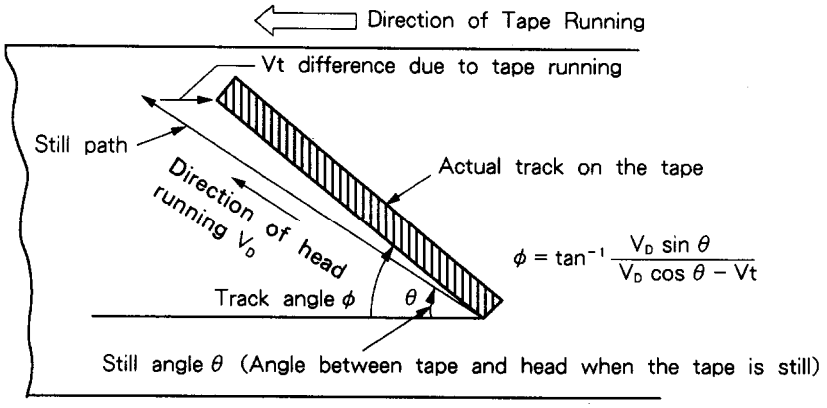


Fig. 2-4. Relation between Track Angle and Still Angle

The signal waveform for the 15mm ϕ drum will be like that of a 30mm ϕ drum waveform whose blank part have been filled by stretching its size by two in the time axis direction as shown in Fig. 2-3. Therefore, the transmission rate of the signal becomes half. The timing for reading the data from the tape must

be changed. But by writing the data read in the memory, the same process as that for the 30mm ϕ drum can be carried out – sending the data to the D/A converter sequentially.

Interchangeability between two types of drum – 15mm ϕ drum and 30mm ϕ drum has been realized by the above method.

3. SYSTEM STRUCTURE

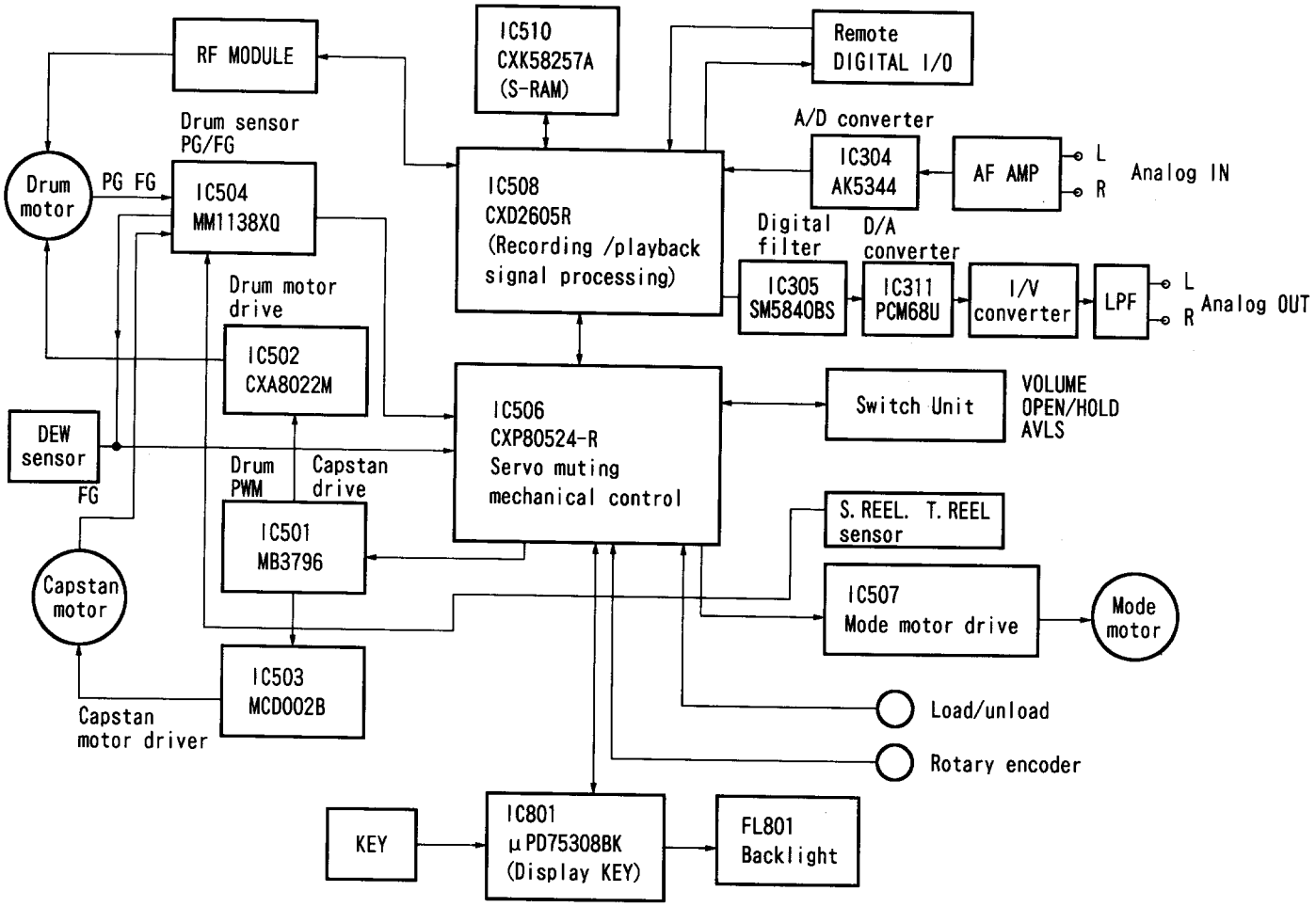


Fig. 3-1. Structure of System

This unit is made up mainly of the 3rd generation LSI signal processing system (CXD2605R) and the CXP80524-R system servo control system as shown in Fig. 3-1. CXD2605R is made up of most of the digital signal processing circuits required for recording and playback, digital I/O signal processing circuit, NT (non tracking) demodulation processing circuit for playback in the LP mode, circuit which automatically detects the intervals between songs when digital recording from the CD, etc. The 16-bit high performance and low power consumption A/D converter, the dual 18-bit D/A converter, and the × 8 over-sampling digital filter are used. CXP80524-R is made up of a system control function which controls the whole system, drum, capstan, mode,their servo and control circuits, muting circuit, key signal reception circuit, etc. MM1138XQ is used for wave shaping of the drum PG, drum FG, and capstan FG, and for the reference voltage of the DEW sensor.

4. OUTLINE OF SYSTEM OPERATIONS (REFER TO BLOCK DIAGRAMS)

4-1. SIGNAL PROCESSING SYSTEM

4-1-1. Recording Process

The MIC terminal J301 uses the plug-in power method. If the MIC plug is not inserted, the 8V power will not be supplied to IC301. The analog signal input to the MIC terminal is amplified by IC301 and output from Pins ⑦ and ①. The MIC sensitivity (H, L) can be selected using the S301-1MIC SENS switch. The analog signal from the LINE IN terminal is input to Pins ② and ⑬ of IC302. IC302 selects whether to carry out the MIC operation or LINE operation according to the signal (H = MIC, L = LINE) from Pin ㉓ of the system controller IC506. S302 selects whether to pass the signal output from Pin ④ of IC302 through the AGC fixed output circuit of the auto REC mode or through the VR output circuit. This signal is then passed through the LINE AMP IC303, the buffer IC313, and input to the A/D converter IC304. IC304 (AK5344) incorporates a 4V single power supply 2 channels A/D converter, and an aliasing noise-prevention digital filter. It adopts the a fourth order △Σ converter carries out × 64 over-sampling, and outputs the reference power supply from Pin ㉕.

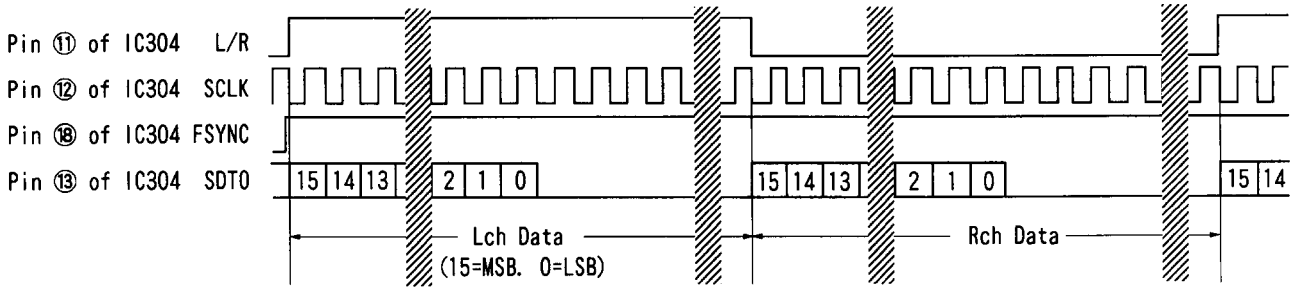


Fig. 4-1. Input/Output Waveform of IC304

• Delta Sigma Conversion Format

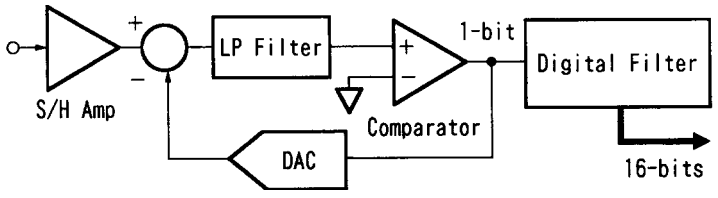


Fig. 4-2. Delta Sigma A/D Converter

The delta sigma A/D converter is made up of the analog modulator and digital filter. The basic delta sigma A/D converter is made up of the conventional VF converter and counter. The VFC 1-bit output signal transmits data by frequency (or duty cycle) and is filtered by the counter (averaged).

The PCM data which has been converted into 16 bits is interleaved and added with the C1 parity and C2 parity, together with sub code data (absolute time, program number ID, etc.) transmitted from the system controller (IC506) in the signal processor (IC508) and S-RAM (IC510).
After they are 8 – 10 modulated, they are added with the ATF signal, etc. and transmitted to the RF module.

This unit uses the 32768 words × 8-bit S-RAM to carry out NT demodulation in the LP mode. The RF module amplifies the data for recording (REDT) from the signal processor (IC508) and records it on the magnet tape using head A and head B alternatively according to the SWP timing.

4-1-2. Playback Process

The RF signal output by the rotary head is wave shaped and amplified by the playback EQ circuit inside the RF module. The playback signal (RFDT) in the RF signal is transmitted to the signal processor (IC508) while the pilot crosstalk (ATF PILOT) from adjacent tracks separated inside the RF module is transmitted to the system control servo (IC506).The reverse of recording is next carried out in the signal processor (IC508) – after the data is 10 – 8 demodulated, it is de-interleaved in the signal processor and S-RAM of IC510, and subjected to error detection and correction. If the data cannot be corrected, then they will be interpolated. The PCM data is then output to the digital filter (IC305) while the sub code data is output to the system controller (IC506). This sub code data is used for displaying the absolute time, program number, etc., and for controlling the system control circuit (skipping to the head of a song according to the ID, etc.). In the digital filter (IC305), the 16-bit PCM data input with the fs sample rate is subjected to 8 fs over-sampling and converted into 18 bits. Sampling noises are eliminated by digital filter calculation. Next, deemphasis, digital VR if the headphone is used, and fs are set. These are controlled by the system controller (IC506). The unit uses a BICMOS process dual 18-bit type D/A converter (IC311). After D/A conversion, I/V conversion (IC314, 3/4, 4/4) is carried out. Next, the data is output to line out (IC304) via the third order low pass filter (IC314, 1/4, 2/4) and headphone AMP (IC308). After being output from the low pass filter, it is made into easy-to-listen sounds by the AVLS circuit (Q355, Q333, Q334, Q356, Q354, Q353, Q316, Q367, Q314). The AVLS circuit can be controlled from the system controller IC506 to the digital filter IC305 and controlled by "H" of Pin ⑮ of the system controller IC506 by turning on S705 (AVLS switch).

4-1-3. Digital Input/Output Process

The digital signals from the digital audio devices (CD player, BS tuner, etc.) input from the remote digital I/O terminal are wave shaped and input to the RX terminal of the signal processor (IC508).

These digital signals conform to the digital audio interface format. They are made up of the preamble, audio data, and control signals, and transmitted serially to L and R alternately. The preamble is equivalent to the sync signal.

The audio data divided inside the signal processor (IC508) is output to the digital signal processing system. The control signals (emphasis, ID, etc.) are output to the system controller (IC506).

On the other hand, the audio data is input from the digital signal processing system while the control signals are input from the system controller (IC506). Their bits are arranged inside the signal processor (IC508) so that they conform to the digital audio interface format. These signals are then subjected to biphase mark method modulation and output from the TX terminal.

4-2. SERVO SYSTEM

4-2-1. Drum Servo

The PG and FG outputs from the drum are wave shaped in the sensor amplifier and then input to the system control servo (IC506). First, the unit calculates the FG period inside the system control servo (IC506) and deducts it from the reference data. It then carries out servo calculation according to this deviation data and outputs the error data by 32kHz basic wave PWM. This is equivalent to the speed servo system.

In the system control servo (IC506), the SWP (switching pulse) is made with the PG and FG. The phase of this SWP and that of the DREF (drum reference) made from the interleave reference signal are compared, and the resultant phase error data is added to the speed error data. The error data PWM output is converted to the analog voltage by the low pass filter, the signal is transmitted to the drum motor via the drive circuit, and the drum servo is controlled so that it becomes 2000rpm if the mode is SP, 1000rpm if the mode is LP during recording, and 2000rpm during playback.

4-2-2. Capstan Servo

As for the drum servo, the FG from the capstan motor is wave shaped by the sensor amplifier and then input to the system control servo (IC506). During recording, the capstan servo calculates the FG period for each speed inside IC506 and deducts it from the reference data. Based on the deviation data obtained, it carries out servo calculation and outputs the error data by 32kHz basic wave PWM. It then converts the output to the analog voltage by the low pass filter, transmits it to the capstan motor via the drive circuit, and controls the tape speed so that it becomes 8.15mm/s if the mode is SP, and 4.075mm/s if the mode is LP.

During playback, using the system control servo (IC506), the capstan servo extracts the ATF sync signal (522kHz, 784kHz) from the playback RF signal (RFDT) output from the RF module. And using this, it creates the sampling pulse.

Next, it inputs the envelope detection output (ATF PILOT) of the ATF pilot signal (130kHz) from adjacent tracks to IC506 from the RF module, A/D converts the peak - to - peak value of each crosstalk wave into 8 bits, and deducts the value sampled according to the timing of the sampling pulse from it. It then multiplies the resultant ATF error value by the gain, adds it to the capstan servo data, and controls the capstan motor so that the head will trace the tape track properly.

In the LP mode, like for the SP mode, the servo rotates the drum at 2000rpm during playback. Because the tape speed in this mode is half that in the SP mode, during recording, the head will run along the tape at an angle different from that in playback.

And because the head reads one track twice, after correcting the errors in the playback data, it will select the playback data which did not have errors and create the audio playback data. The ATF servo is therefore imposed in the LP mode so that, of the two times read, the playback data will be read correctly once.

4-2-3. Reel Servo

The T side and S side reel tables are driven by the capstan motor via the four relay gears.

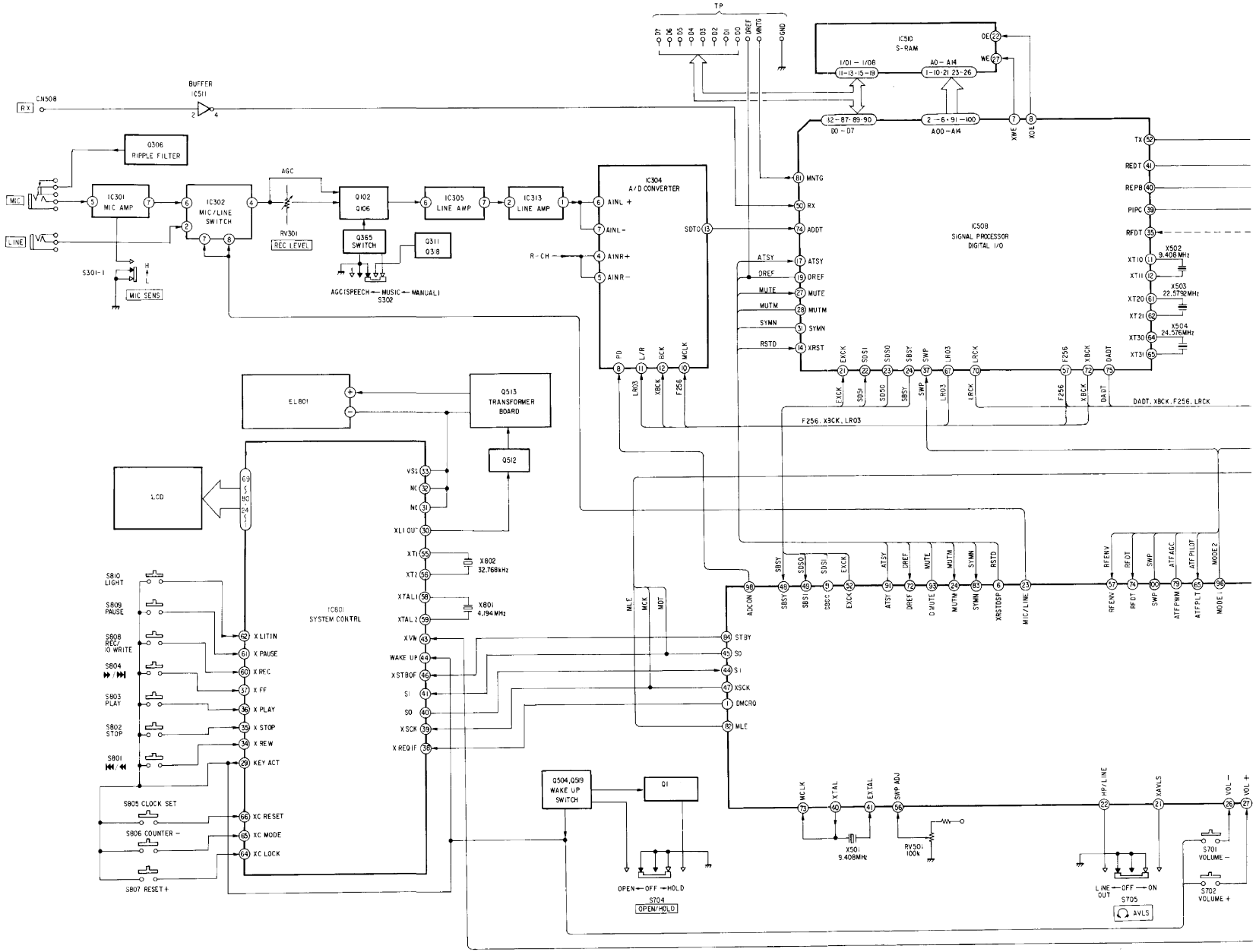
The reel servo is used for running the tape at high speeds during FF/REW etc. The current speed is calculated from the FG periods of both reels and the reel servo is controlled according to the speed of the capstan motor so that tapes of all lengths will be of the same tape running speed.

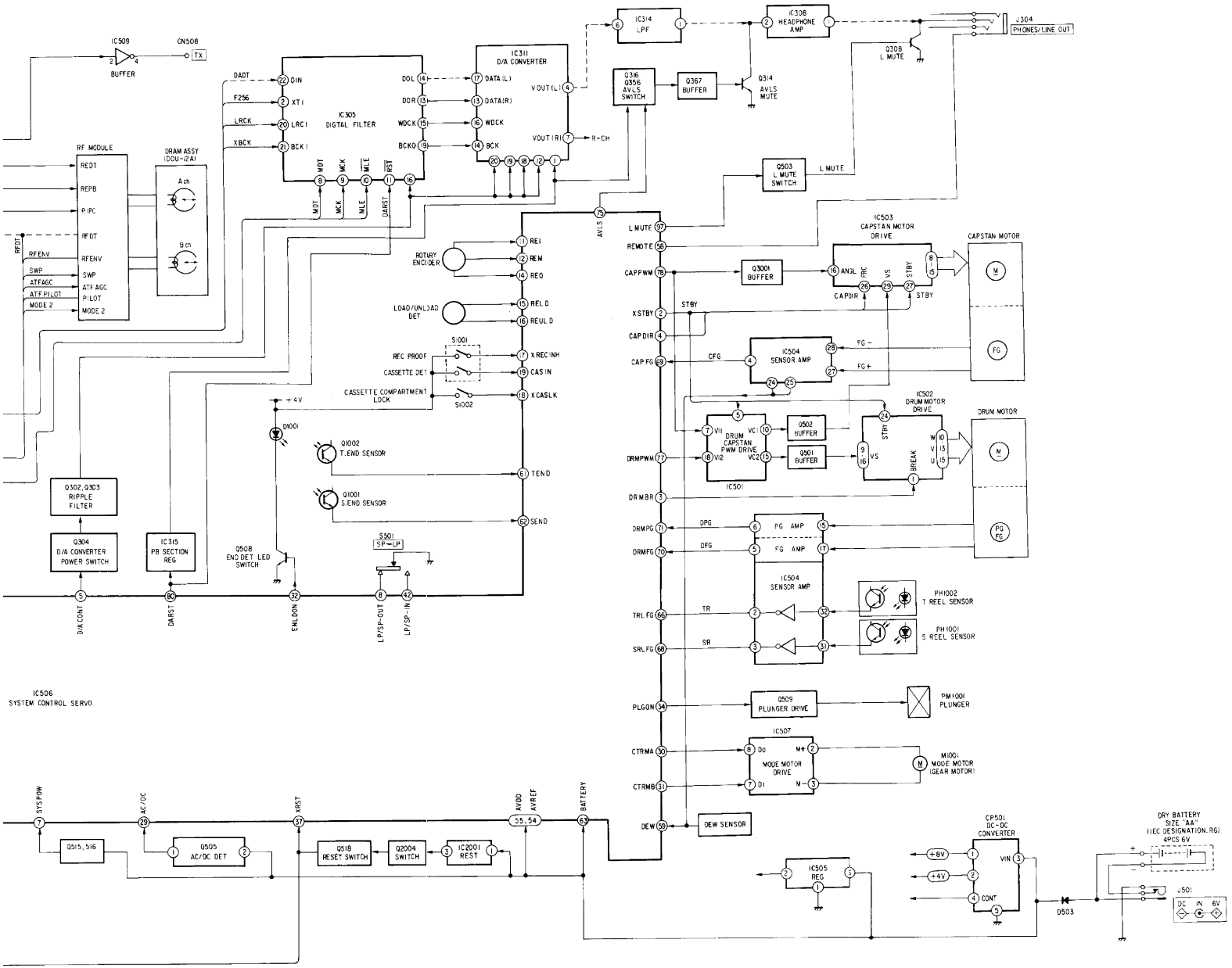
The FGs of the T side and S side reels are also used for the linear counter and for displaying the tape remaining time (remain).

The time taken by each reel to make one round is calculated according to the sum of the time of one cycle of FG for 24 waves or the time of one rotation of the reel. This time is displayed on the linear counter after the calculation.

The remaining time display, on the other hand, displays the data obtained in the measure mode such as the length of the tape (type of the tape) and the sum of the FGs of both reels, after the calculation.

4-2-4. Block Diagram





5. POWER SUPPLY CIRCUIT

Fig. 5-1 shows the block diagram of the power supply circuit.

The power of the AC adapter or battery pack is supplied to the DC-DC converter (CP501), regulator (IC505), Pin ⑥③ of the system controller (IC506), from the EL ON/OFF switch (Q512) to Q513, from the regulator (IC802) to the LCD DRIVE (IC801), etc.

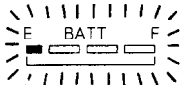
BATTERY (Pin ⑥③) is an analog input terminal, and observes the voltage (3V) input from the battery. The battery terminal shows the following at the different voltages.

When the voltage is 6V : 

When the voltage is 5.06V : 

When the voltage is 4.76V : 

When the voltage is 4.47V : 

When the voltage is 4.2V : 

The AC/DC (Pin ㉙ of IC506) is the power supply detection input. When the battery battery pack is used as the power supply, it is set to "H", when the AC adapter is used, it is set to "L".

The IC304 AK5344 A/D converter operates on 4V, but the operation voltage of the input amplifier is output from Pin ㉕ so that the OFF-state voltage can be detected properly.

The IC311 PCM68U D/A converter operates on 4V in the digital system and on 4.5V in the analog system.

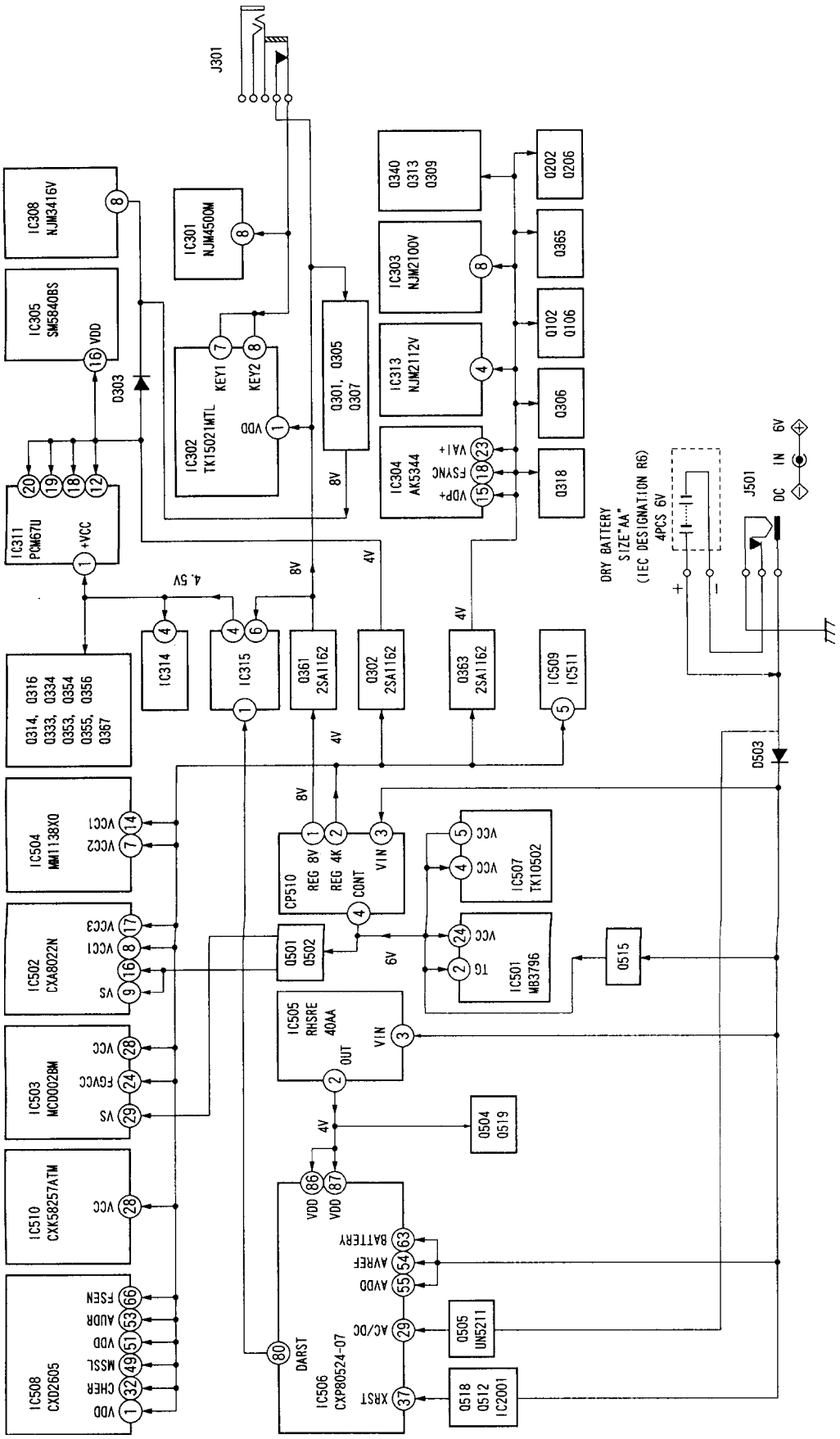
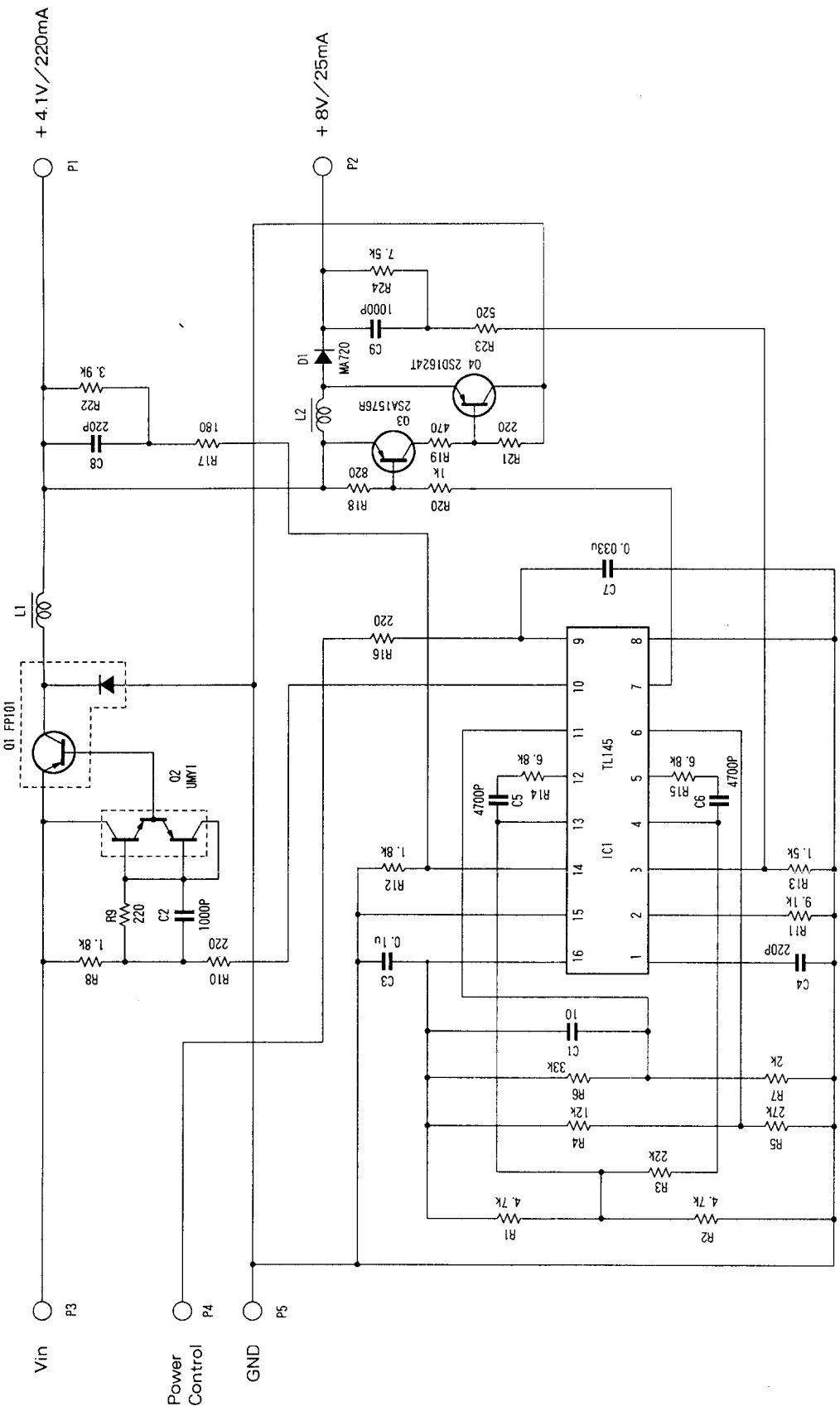


Fig. 5-1. Block Diagram of Power Supply Circuit



• R12, R13, R17, R22, R23, R24 are adjusting resistors.

Fig. 5-2. Schematic Diagram inside CP501

6. SIGNAL CIRCUIT

6-1. SIGNAL PROCESSING (CXD2605R)

The CXD2605R LSI uses one chip to carry out recording/playback signal processing in the R-DAT system.

Features

- Can operate in the following modes using the R-DAT.

48kHz	16 bits	2CH
44.1kHz	16 bits	2CH
32kHz	16 bits	2CH
32kHz	12 bits	2CH

- Superior error correction capacity by new strategy.
  - 1st C1 : Error detection
  - 1st C2 : Max. 5 error correction
  - 2nd C1 : Max. 3 error correction
  - 2nd C2 : Max. 6 error correction
- Does not require external parts and adjustments with its built-in digital PLL circuit for playback signals.
- Incorporates a digital I/O circuit corresponding to the serial copy management system.
- Can record sub code data afterwards.
- Can search sub code data at high speeds.
- Reduces load on microprocessor by automatically switching modes (Fs, etc.) and muting during playback.
- Variable speed playback.
- Outputs various types of monitor signals.
  - C1 check state
  - Error correction state
  - DA output interpolation check
- Can carry out synchronized operations using several chips.
- Can record a test pattern of a single frequency instead of the main data.
- × speed recording and playback.
- Automatic detection of intervals between songs when digital recording from the CD.

Functions

- Modulation of recording signals
- Demodulation of playback signals (Adopts digital PLL)
- Error correction encoding (Parity generation, error detection and correction)
- Microprocessor interface (Sub code processing, system control)
- A/D, D/A interfaces (Including interpolation, muting, etc.)
- Digital interface
- RAM control
- Fs system clock generation
- Peak level meter
- Error count function
- Interval detection function for digital recording from the CD

Structure

CXD2605R is made up mainly of the following nine blocks.

Fig. 6-3 shows the internal blocks.

① D-PLL block

Extracts the playback clock from the playback RF signal and synchronizes the playback data.

② PB block

Detects SYNC, carries out 10 -> 8 demodulation, demodulates and checks the playback data.

③ REC block

Carries out 8 -> 10 modulation, creates recording data, and generates the recording control signal

④ Error correction (ECC) block

Generates C1 and C2 parities during recording, detects and corrects C1 and C2 errors during playback

⑤ SUB block

Interfaces with microprocessor such as transmitting and processing various type of control information, sub code data, etc.

⑥ AD/DA interface (ADA) block

Generates interleave and de-interleave addresses and standard timings for processing, and interfaces with the AD and DA systems

⑦ D-I/O block

Modulates and demodulates digital audio interface format signals (Tx and Rx) and generates Fs system clocks

⑧ RAM interface (RMIF) block

Generates RAM interface signals (addresses, etc.)

⑨ Peak level meter (PLM) block

Detects the peak level within a certain period of time

6-1-1. Digital Audio Interface

Modulates, transmits, receives, and demodulates data according to the digital audio interface format for the R-DAT.

Fig. 6-1 shows the frame and sub frame formats.

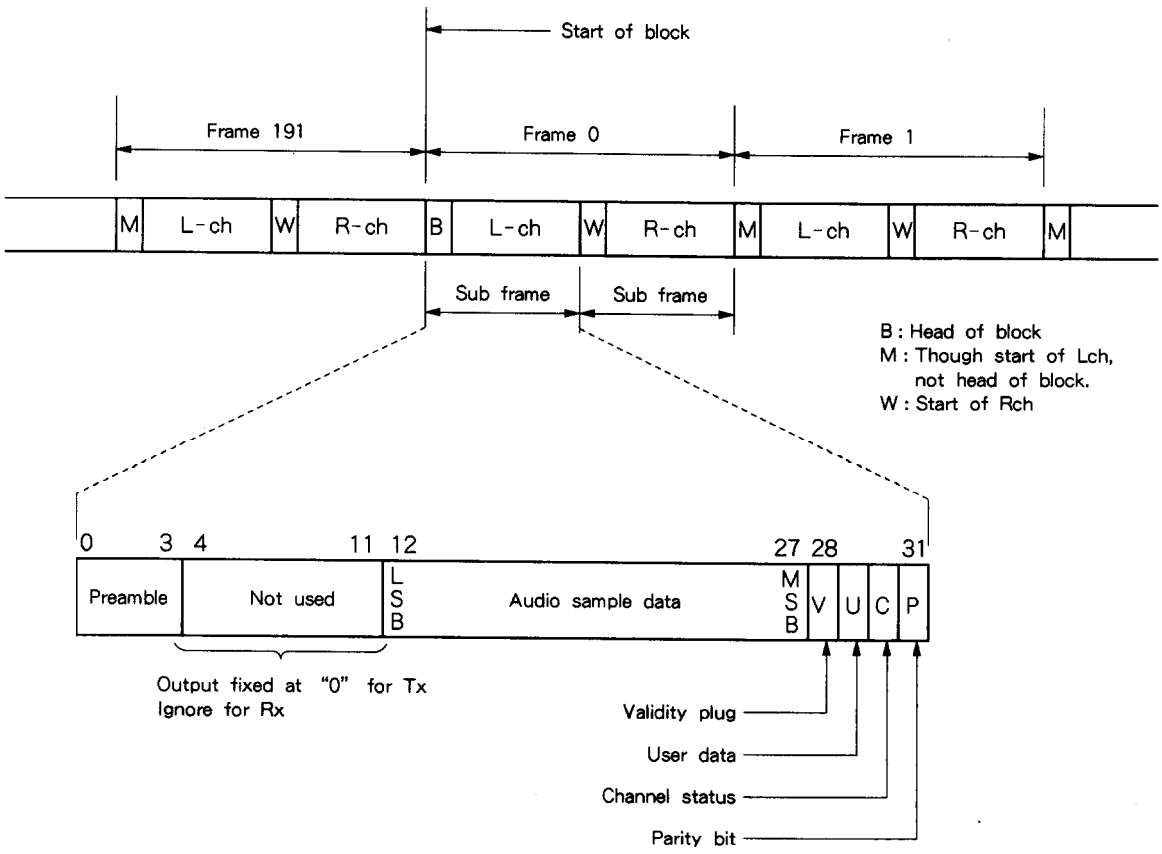


Fig. 6-1. Frame and Sub Frame Formats

6-1-2. Audio Data

The audio data input from the RX terminal is demodulated and output to the ADDI terminal. The audio data input from the DADO terminal is modulated and output to the TX terminal. Fig. 6-2 shows the DADO→TX, RX→ADDI timings.

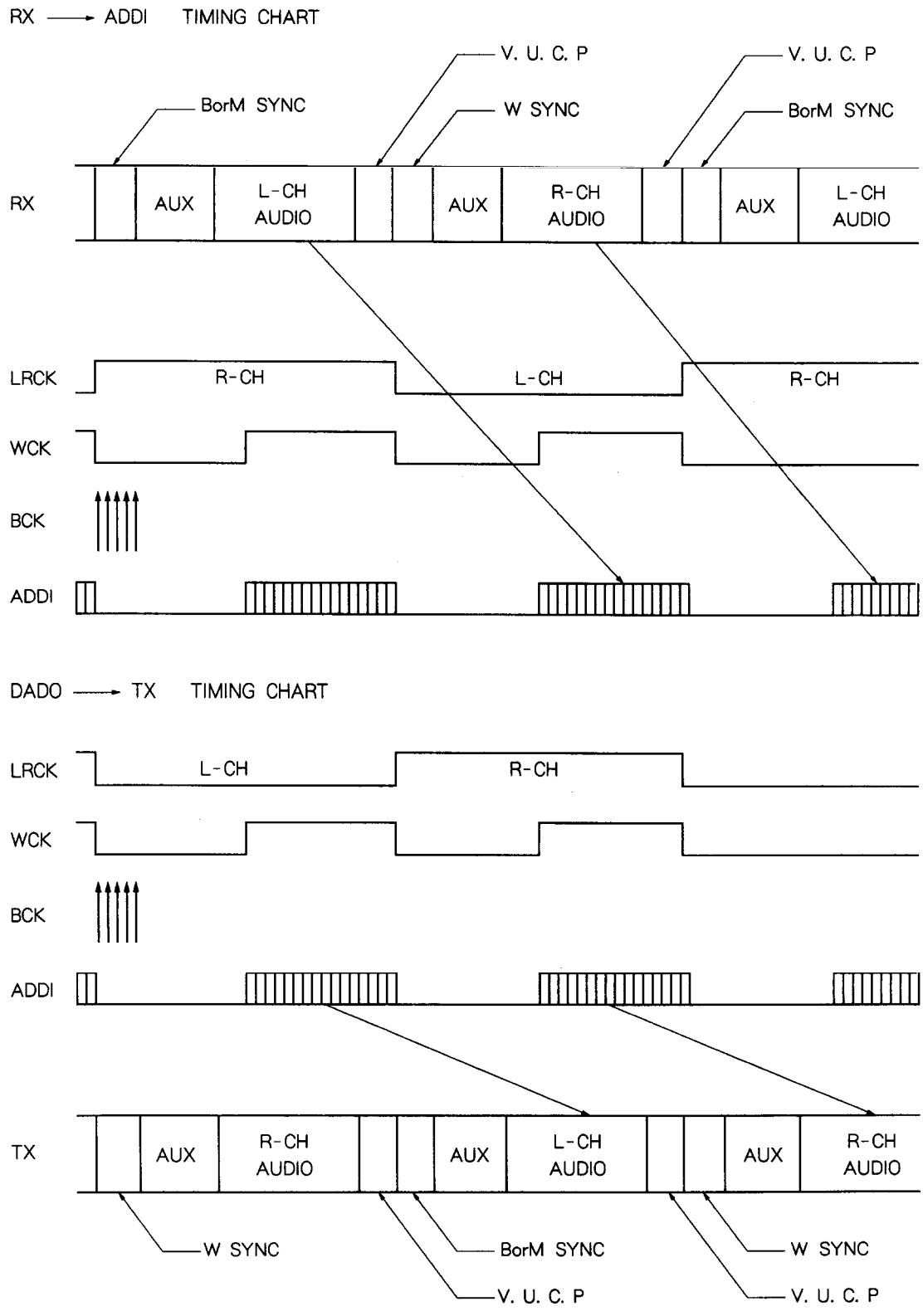


Fig. 6-2. Tx and Rx Timings

Block Diagram

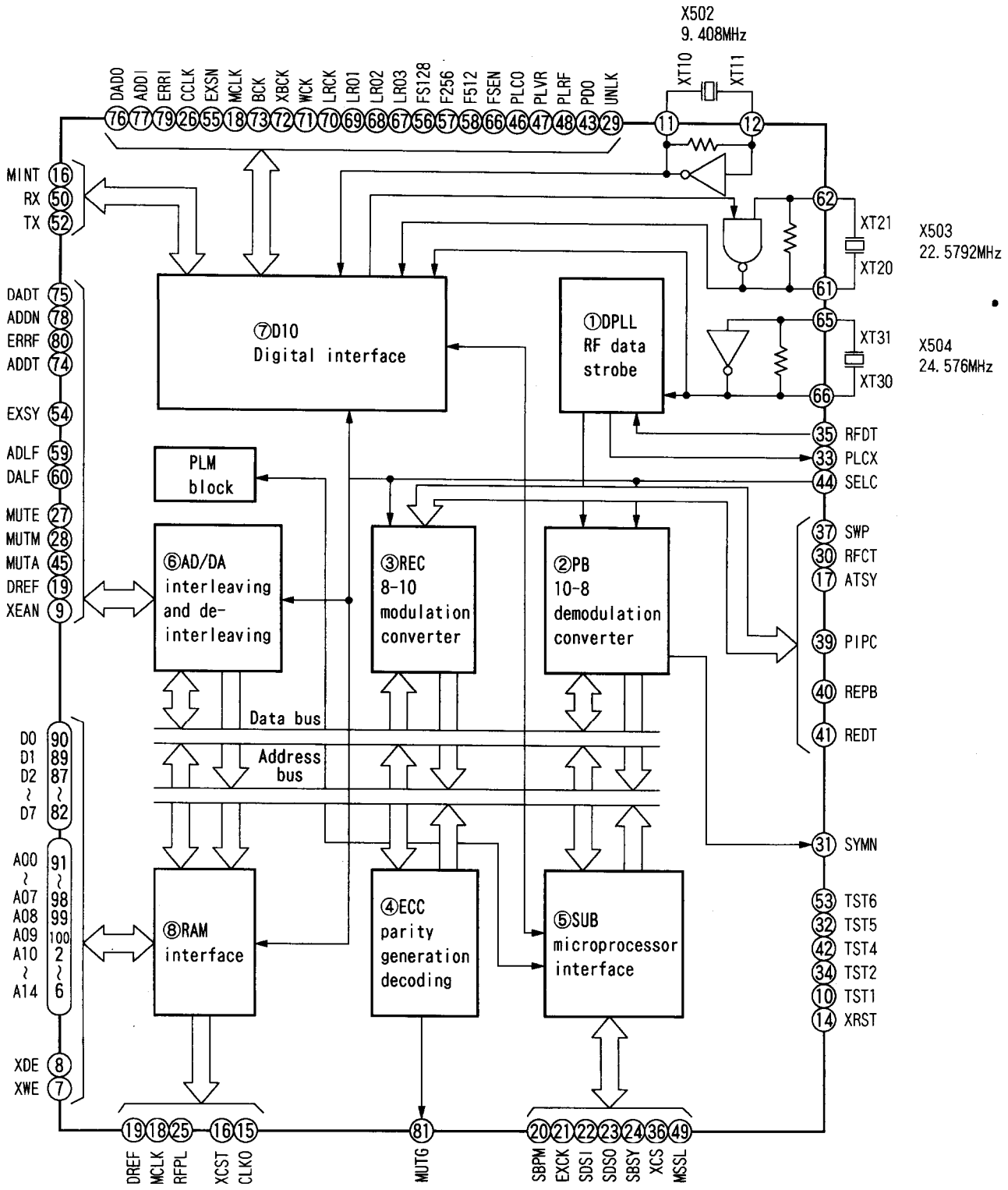


Fig. 6-3.

X502 9.408MHz is the reference clock and X503 22.5792MHz is used only for 44.1kHz. X504. 24.579MHz oscillates at all times.

6-2. SIGNAL FLOW IN RECORDING

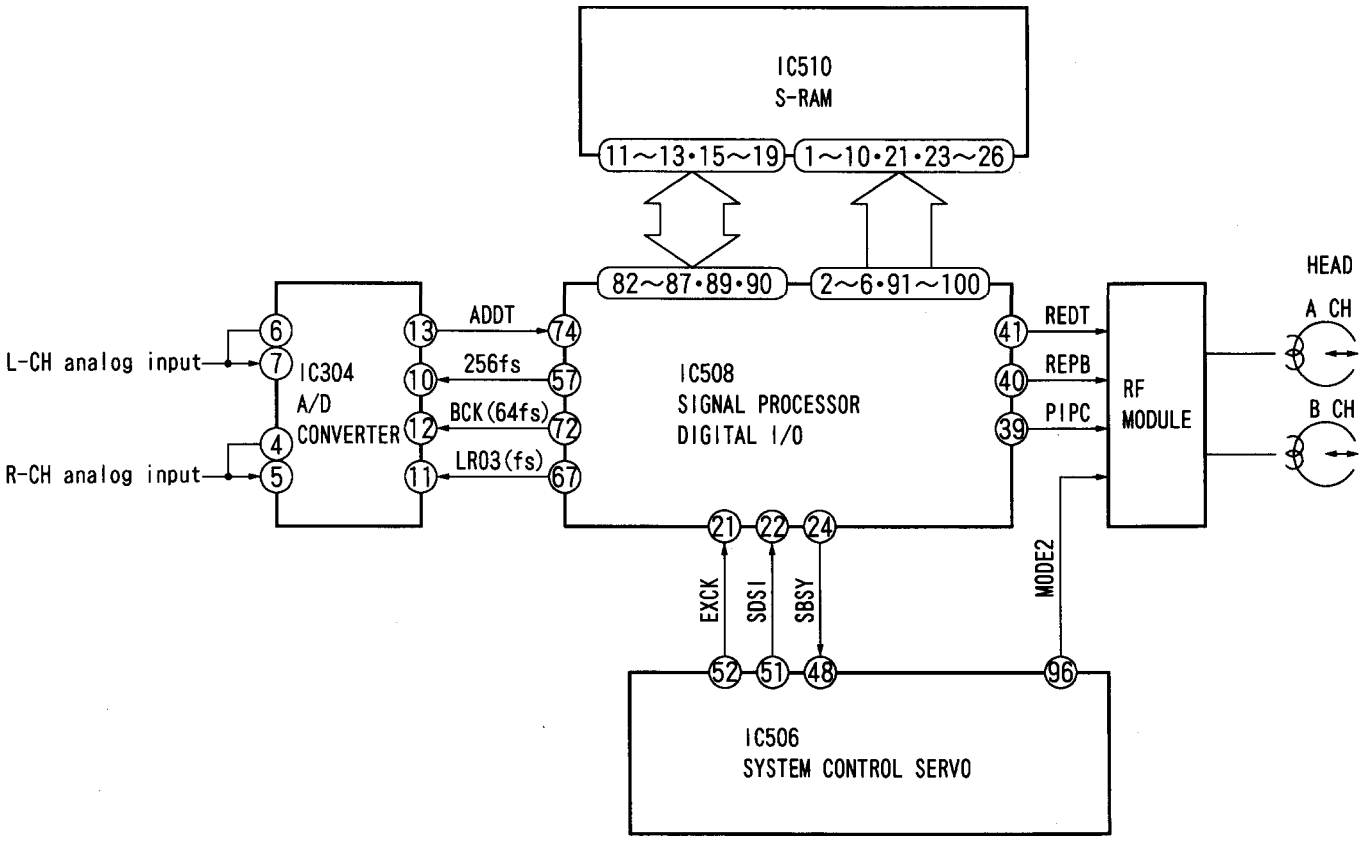


Fig. 6-4. Flow of Recording Signals

The Lch and Rch analog signals input to Pins ⑥, ⑦, ④, and ⑤ of the A/D converter (IC304) are converted to 16-bit digital signals inside the A/D converter. They are then output from Pin ⑬ to L and R alternately and input to Pin ⑭ of the signal processor (IC508). The sub code data (absolute time, ID, etc.) is serially input to Pin ㉒ of the signal processor (IC508). Each signal is interleaved and added with the C1 and C2 parities, 8-10 modulated, added with the ATF signal, etc. in the signal processor (IC508) and S-RAM (IC510), and finally output from Pin ㊶ to the RF module.

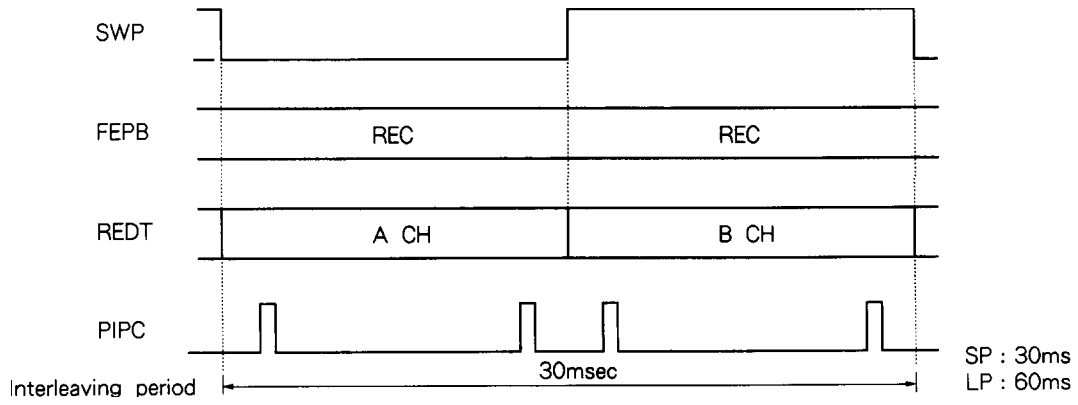


Fig. 6-5. ϕ 15 Type Recording Timing (SP/LP)

In the RF module, the data for recording (REDT) is amplified by the recording amplifier and then the recording signals are transmitted to heads A and B alternately according to the timing of the switching pulse (SWP). (Refer to Fig. 6-5.) Recording/playback of the head recording/playback amplifier inside the RF module is selected by the MODE 2 signal from Pin ㊻ of the system control (IC506) and the recording/playback discrimination signal (REPB) from Pin ㊵ of the signal processor (IC508). Recording is selected when these signals are "H" and playback is selected when they are "L". The PIPC signal from Pin ㊴ of the signal processor indicates the recording area of the ATF pilot signal. The PIPC sets the recording level of the ATF pilot signal.

6-3. SIGNAL FLOW IN PLAYBACK

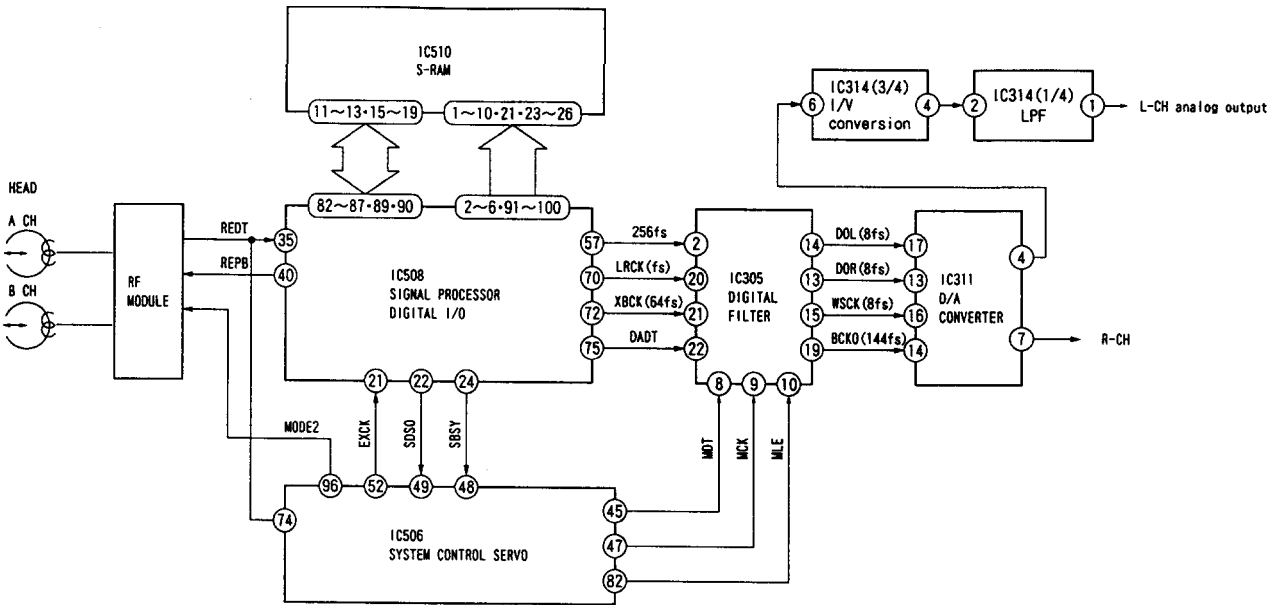


Fig. 6-6. Flow of Playback Signals

The RF signals from heads A and B are input to the RF module according to the SWP timing as shown in Fig. 6-7 and amplified by the internal playback EQ amplifier.

The RF signal then synchronizes with the clock generated from the RF data (RFDT) in the PLL circuit inside the signal processor (IC508), is input from Pin ㉟ and 10-8 modulated - the opposite of recording. It is then de-interleaved by the signal processor and S-RAM (IC510), subjected to error detection, error correction, etc. The PCM data is transmitted from Pin ㉕ to the digital filter while the sub code data is transmitted from Pin ㉓ to the system control (IC506). In the digital filter, the 16-bit PCM data is subjected to ×8 over-sampling, converted to 18 bits, subjected to digital filter calculation, etc. It is then output from Pin ⑭ for the Lch and Pin ⑬ for the Rch to the D/A converter. In addition to these functions, the digital filter also carries out digital deemphasis, digital attenuation, etc. These functions are set by the signals output for the mode set data (Pin ⑧), mode set clock (Pin ⑨), and the mode set latch enable (Pin ⑩).

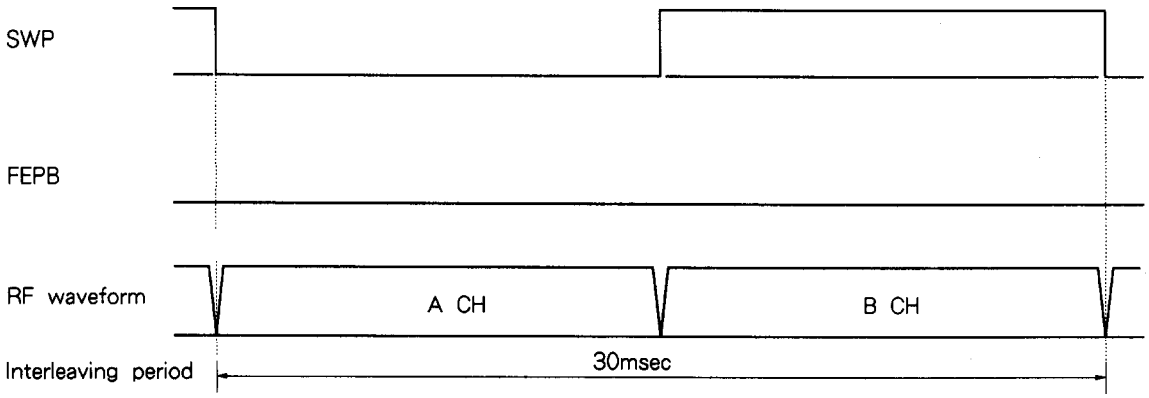


Fig. 6-7. Timing of Signals in Playback(SP Mode)

7. SERVO CIRCUIT

7-1. DRUM SERVO

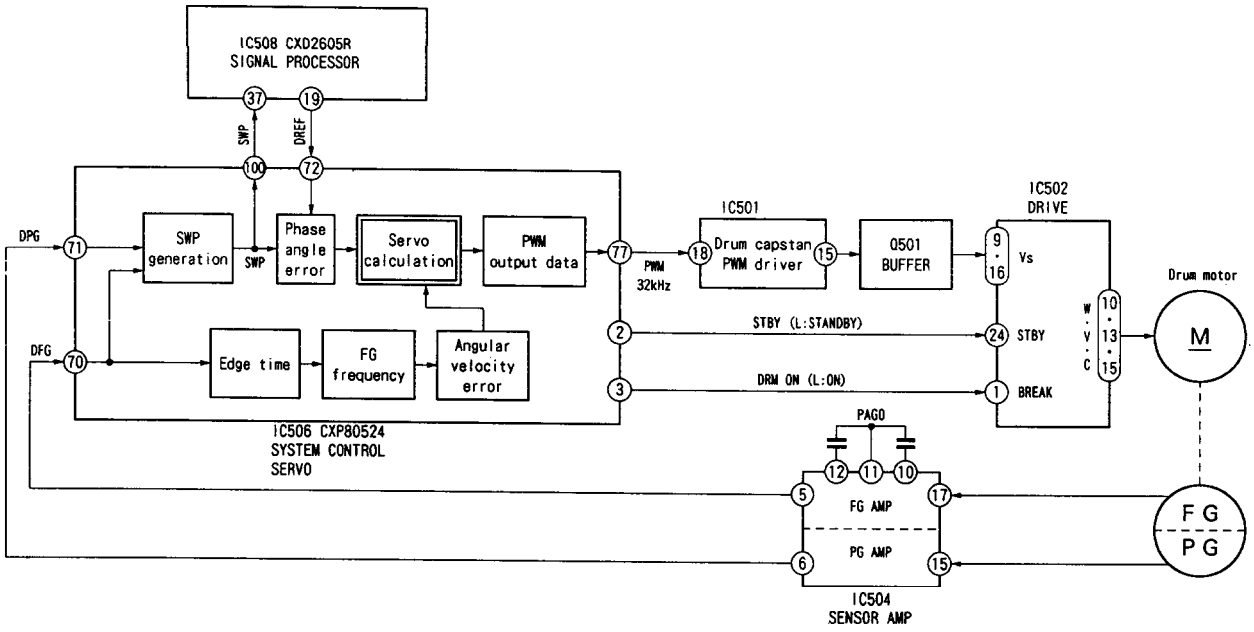


Fig. 7-1. Block Diagram of Drum Servo

The FG and PG signals from the drum motor are first wave shaped in the sensor amplifier (IC504). The FG signal is then input to Pin ⑦⓪ of CXP80524 (IC506) and the PG signal to Pin ⑦① . Inside CXP80524, the FG period is calculated by FRC (Free Running Counter) interruption of the FG and this period is deducted from the reference data. The resultant error data is output from Pin ⑦⑦ as the 32kHz basic wave PWM. The PG on the other hand is input to the SWP generation circuit together with the FG to generate the SWP at the timing shown in Fig. 7-3. (The position for writing in the track can be adjusted by varying VR501. For details, refer to the section "SWP Position Adjustment" in the service manual SUPPLEMENT 1.) The phase of this SWP is compared with that of DREF (made from the reference signal for interleaving in the CXD2605R signal processor), and the resultant error is added to the error data of the FG.

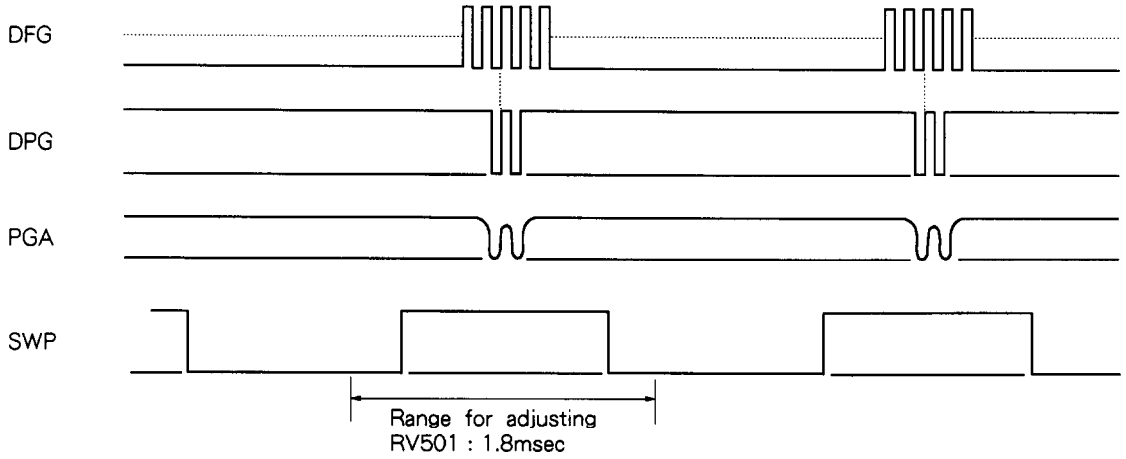


Fig. 7-2. SWP Timing

The PWM error output from Pin ㊼ of CXP80524 is converted to analog voltage by the PWM driver (IC501) of the drum capstan. This signal is passed through the buffer (Q501) and input to the drum motor drive (IC502) to control the rotation of the drum motor.

Table 7-1. Frequencies when Drum Servo is Locked

(Hz)	SP Mode		LP Mode	
	REC	PB	REC	PB
DREF	100/3	100/3	50/3	50/3
SWP	100/3	100/3	50/3	100/3
FG	800	800	400	800

In the SP mode, the speed of the drum when the drum servo is locked is 2000rpm during both recording and playback. In the LP mode, it is 1000rpm during recording and 2000rpm during playback. Table 7-1 shows the frequencies of DREF, SWP, and FG at these times. Fig. 7-3 shows the timing of these signals in the SP mode. As shown in the figure, DREF and SWP have the same phases during both recording and playback. The data for recording (REDT) and the discrimination signal indicating the ATF pilot area (PIPC) are output from the CXD2605R (IC508) signal processor at the timing they synchronize with DREF and SWP. Likewise, the RF signal for playback is also output from the RF module at the timing it synchronizes with DREF and SWP.

Fig. 7-4 shows the timings of the signals in the LP mode. In the LP mode, because the speed of the drum during recording is half that in the SP mode, the periods of the signals are twice those in the SP mode. During playback, because the speed of the drum-2000rpm-is the same as that in the SP mode, the periods of the SWP and RF signals are the same as those in the SP mode.

The envelope of the RF signal during playback is not flat because the speed of the drum is different in recording and playback. A and A', and B and B' are the RF signals of the same tracks.

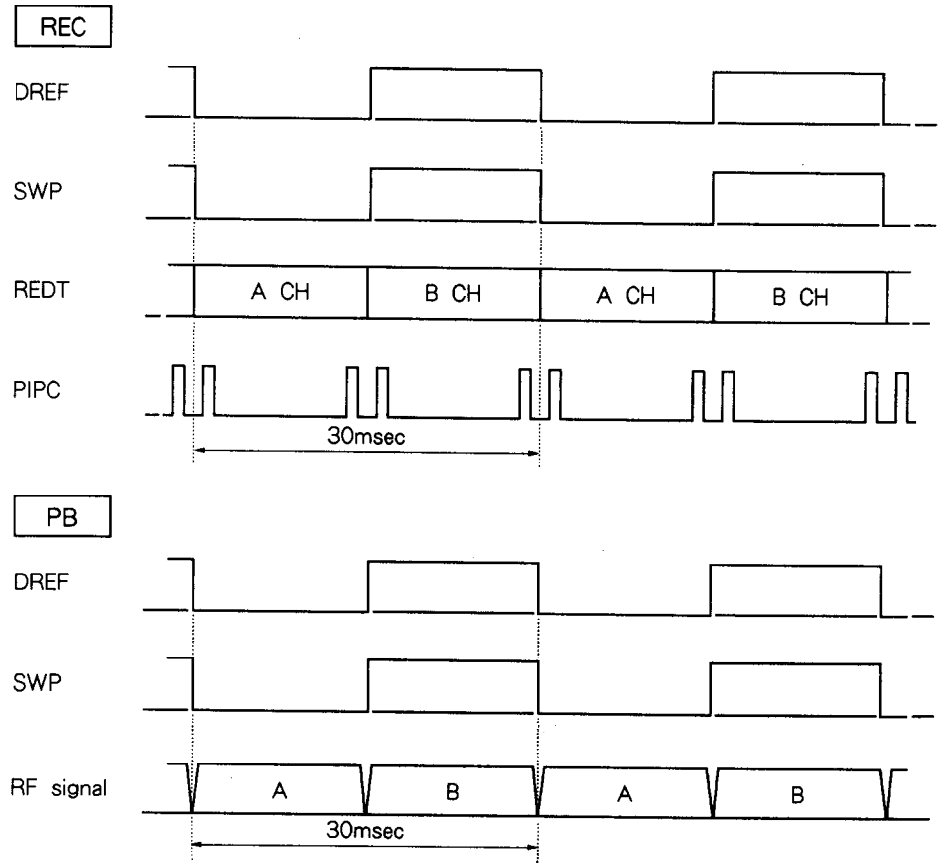


Fig. 7-3. Timings of Signals(SP Mode)

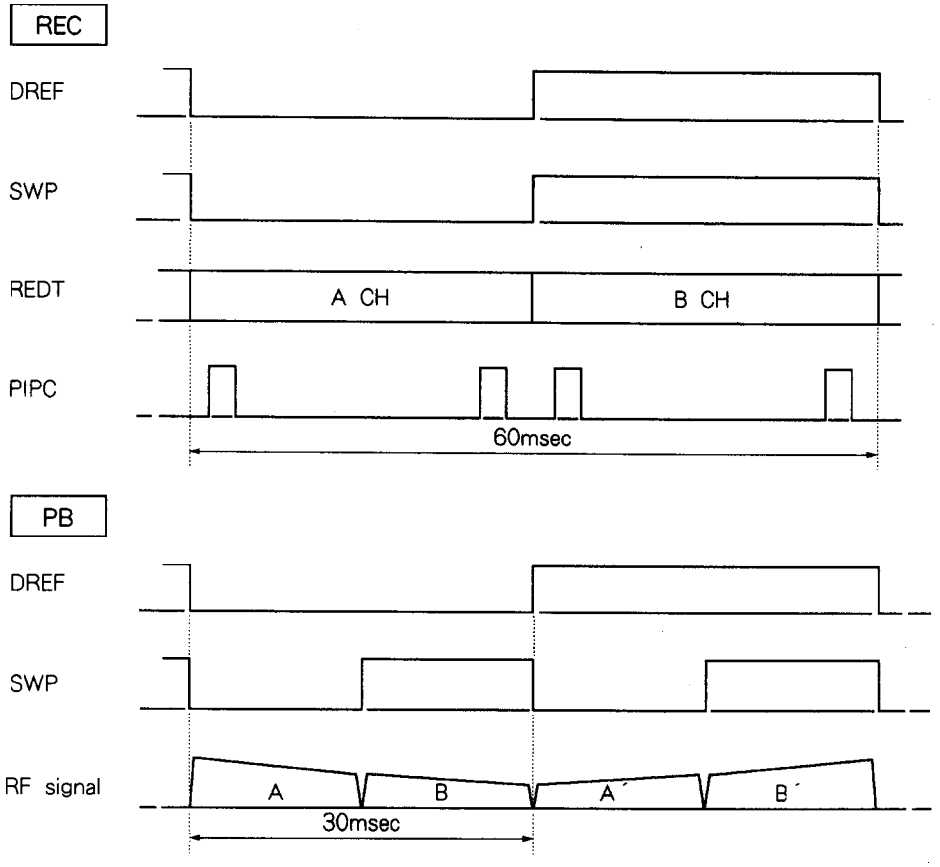


Fig. 7-4. Timings of Signals(LP Mode)

7-1-1. Sensor Amplifier (IC504 MM1138XQ)

The MM1138XQ IC concentrates 5 sensor amplifiers on one chip. The sensor amplifiers are the drum PG, drum FG, capstan FG, T reel FG, and S reel FG of the R-DAT.

Fig. 7-5 shows its block diagram and arrangement of terminals.

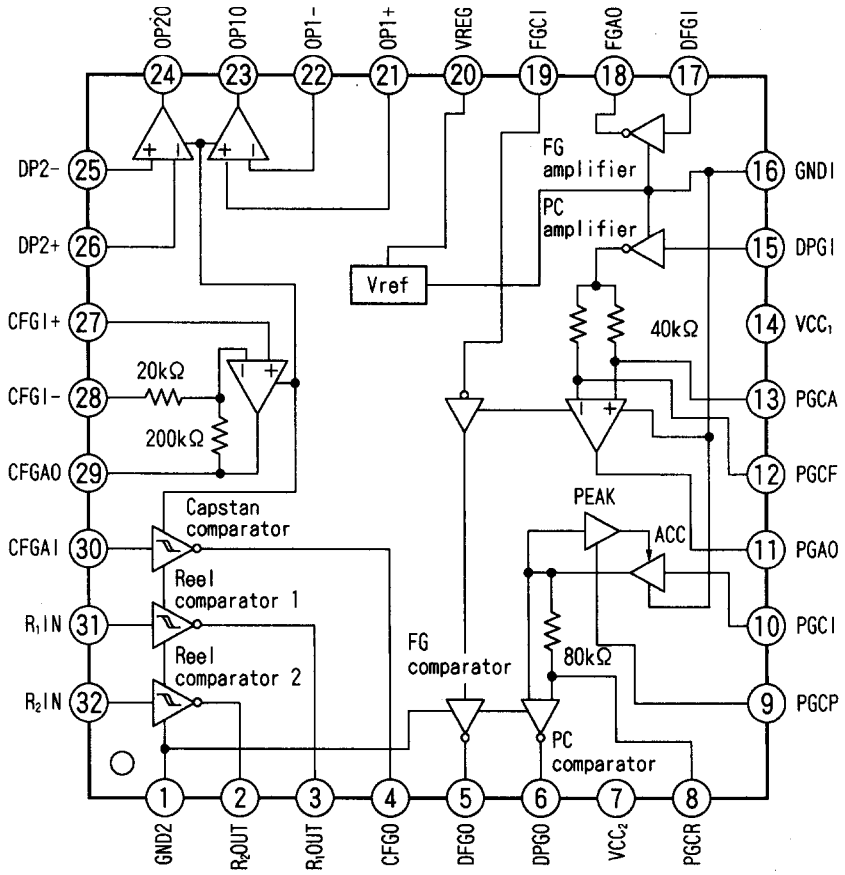
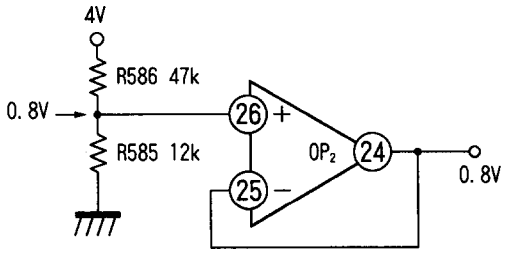


Fig. 7-5. Block Diagram and Arrangement of Terminals

The sensor amplifier shapes the waveforms of the PG and FG signals from the drum motor, the FG signal from the capstan motor, the signal from the takeup reel sensor, and the signal from the supply reel sensor. The PG signal from the drum motor is measured by the Pin ⑪ PGAO terminal, (Refer to page 27).

The ope-amplifier functions as a buffer by making the 0.8V using the ratio of R586 (47k) to R585 (12k). This 0.8V is used as the reference voltage of the DEW sensor. (Refer to page 41.)



7-1-2. Drum Capstan PWM Driver (IC501 MB3796)

This is a dual switching regulator control IC.

The oscillation frequency of this IC is determined by C507 and C509 attached to Pins ㉓ and ㉒. The frequency is between 470kHz and 500kHz. As C549 and C550 are sensitive to excessive heat, take care when soldering them.

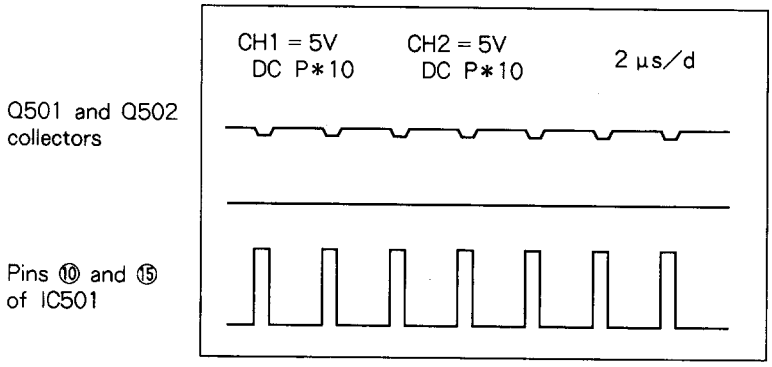


Fig. 7-6.

The drive voltage VS is supplied to Pins ⑨ and ⑯ of IC502, and Pin ㉘ of IC503.

7-1-3. Drum Motor Drive (IC502 CXA8022M)

This is an IC for 3-phase DC brushless bi-directional motor drive.

It carries out switching operations for supplying voltage (1 to 2V) input to the VSs of Pins ⑨ and ⑯ to the U-phase of Pin⑮, V-phase of Pin ⑬, and W-phase of Pin ⑩.

Normally, a Hall element for detecting the position of the rotor is attached, but the drum motor determines the U, V, and W phases with the counter-electromotive force without using the Hall element.

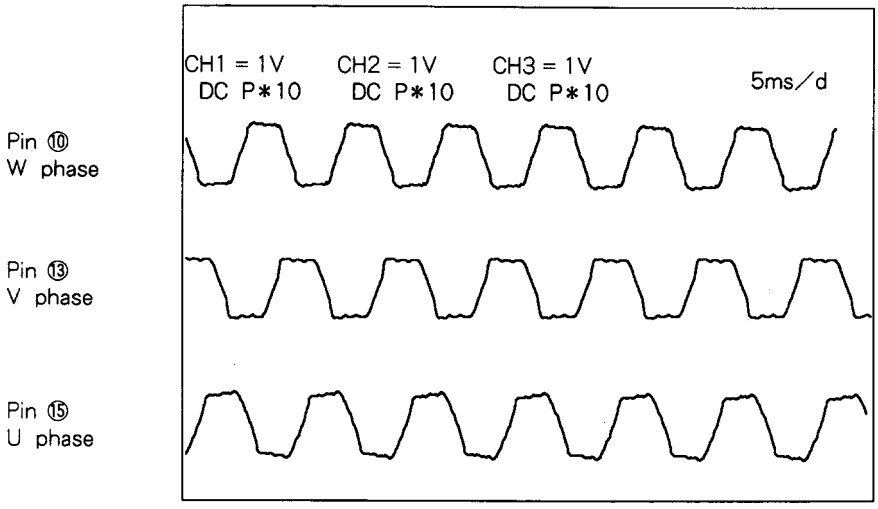


Fig. 7-7.

Pin ① is a brake terminal. It must be set to "H" when stopping the drum motor using the data mode.

7-2. CAPSTAN SERVO

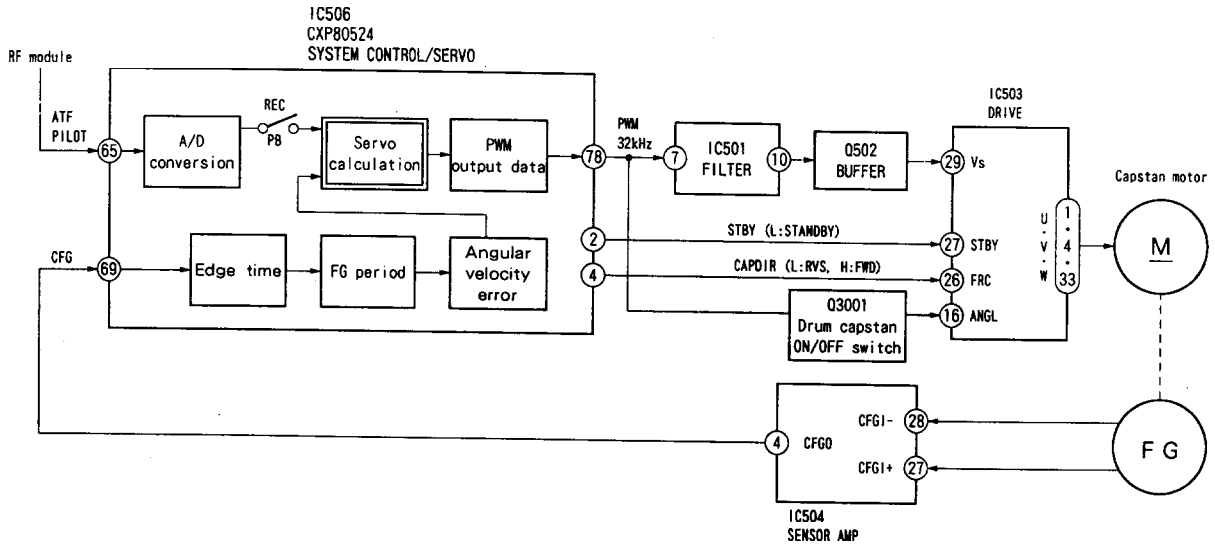


Fig. 7-8. Block Diagram of Capstan Servo

Table 7-2. Types of Capstan Speeds and Main Uses

Speed	CFG (Hz)	Main Use	Remarks
× 0.5	296	LP mode	• Capstan servo by CFG
× 1	592	SP mode	
× 1.5	888	Soft tape	
× 3	1,776	CUE/REV, LOAD/UNLOAD	
× 16	9,472	Measure mode	
× 25		High speed CUE/REV	• Reel servo by reel FG • Pinch roller not pressed
× 25 ≀ × 100		FF/REW Search	

In addition to running the tape at a uniform speed together with the pinch roller, the capstan motor also loads/unloads the tape and mechanism, and drives the T and S reel tables. Table 7-2 shows its speed in the various modes. Tape running speeds × 0.5 to × 16 are controlled by the capstan servo with CFG. For the × 25 high speed CUE/REV and high tape running speeds × 25 to × 100 used for FF/REW, searching, etc., the rotation of the capstan motor is controlled by the FG from the T and S reel tables so that they become uniform. As shown in Fig. 7-8, in circuit operations, the FG output from the capstan motor is shaped for its waveform by the sensor amplifier and then input to Pin ⑥⑨ of CXP80524 (IC506). As the drum servo, the FG period is measured in the CXP80524 by the FRC (Free Running Counter) interruption of the FG and the resultant data is deducted from the reference data. The resultant error data is output as the 32kHz basic wave PWM from Pin ⑦⑧ . During playback, the leak signal (ATF PILOT) from adjacent tracks is A/D converted, the peak to peak values of the leak signal from adjacent tracks are respectively sampled at the timing of the sampling pulse, and the deducted error data is added to the error data of

FG and it is controlled so that the head traces the tracks properly. During the playback of the LP mode, the head is made to trace one track twice at an angle different from the angle during recording so that the speed of the drum becomes twice the speed of the drum during recording (2000rpm). A software is used to control so that the ATF servo is imposed only at the just track part.

7-2-1. Capstan Motor Driver (IC503 MCD00213M)

This is a 3-phase brushless motor driver IC.

It carries out switching operations for supplying the voltage (1 to 2V) input to the Vs terminal of Pin ㉙ to the U-phase of Pin ④, V-phase of Pin ①, and W-phase of Pin ㉝. Pins ⑧ and ⑮ are connected to the Hall element. Q3001 turns OFF when the Vs of Pin ㉙ is 0V. And when R3001 becomes open because it has been grounded, the capstan motor stops. When the Vs is output, Q3001 turns ON and R3001 is grounded so that the capstan rotates.

8. SYSTEM CONTROL

8-1. MODE MOTOR CONTROL

The signals from Pin ㉚ (CTRMA) and Pin ㉛ (CTRMB) drive IC507 (TK10502), rotate and drive the mode motor in the normal and reverse directions.

In this unit, the capstan is made to operate after the mode motor is rotated, the cam gear is rotated, and the modes are decided (load or unload, playback, REW or FF). If the cam gear moves excessively, the PWM square wave is output from IC507, a voltage is supplied alternately at the H and L to the mode motor, and the position of the cam gear is controlled by rotating it slowly.

Refer to the section "7. System (Mechanical) Control" (from page 28) in the TCD-D3 circuit operation guide. (P/N 9-955-978-31)

8-2. ROTARY ENCODER

The rotary encoder is made to operate in the mode in which it stops at H.L.H and L.H.H when rotated by the mode motor. If the waves of the gear are delayed, the encoder will not stop or REW cannot be carried out.

Refer to the section "7. System (Mechanical) Control" (from page 28) in the TCD-D3 circuit operation guide. (P/N 9-955-978-31)

9. CIRCUITS

9-1. END SENSOR

This sensor detects ends using Pin ⑥① (TEND) and Pin ⑥② (SEND). When a pulse signal is output from the Pin ③② (ENLDON terminal), 2SC2712 turns ON and the END LED lights up. This LED will be continuously lit in the test mode. But in normal operations, it will light up for five minutes at the top and end.

When a 1 to 2V analog pulse is input to Pin ⑥① or ⑥② , the sensor will determine if it is the top or the end.

9-2. PLUNGER

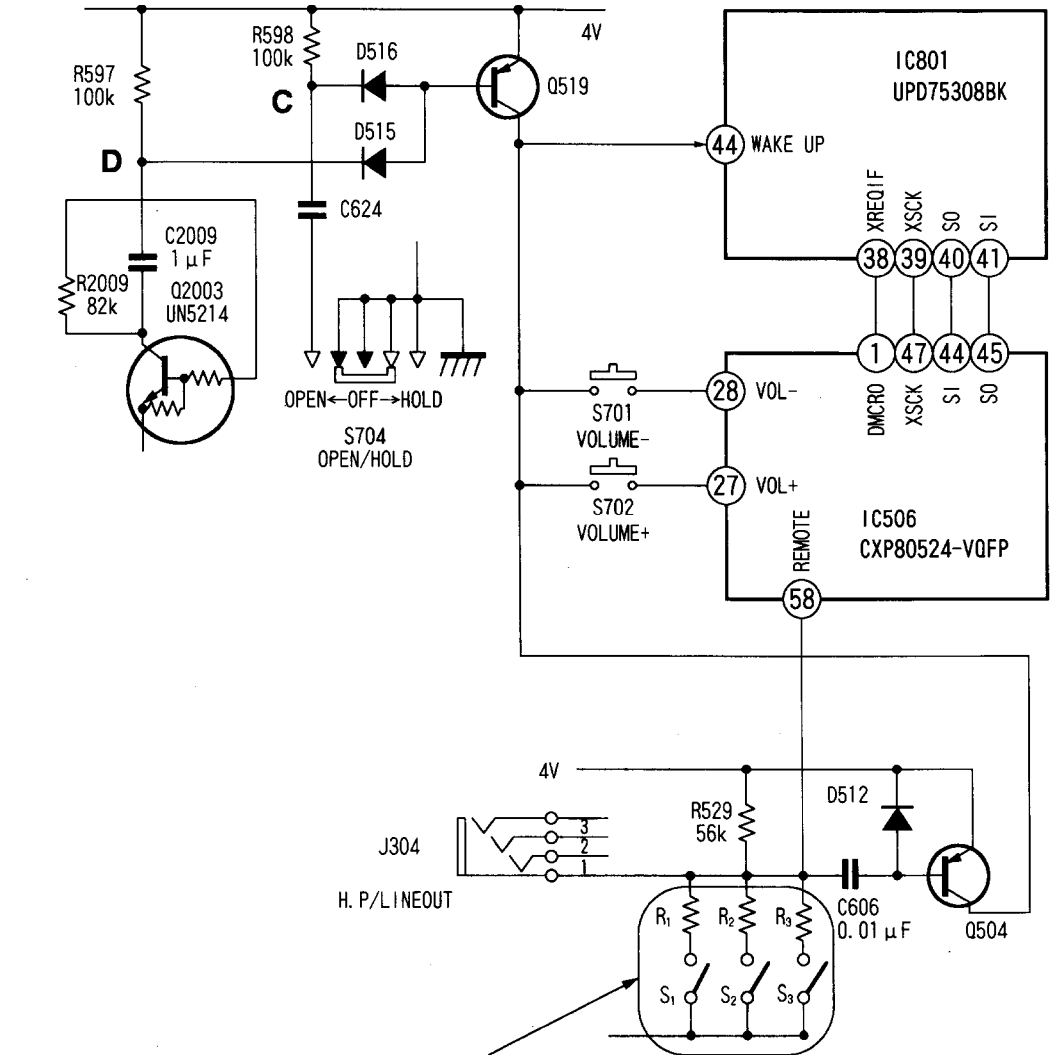
When the mode is FF or RWD, Pin ③④ (PLGON) becomes "H" and Q509 turns ON to draw in the plunger. If the voltage is not output and the plunger is not to be drawn in, only the motor rotates. The reel shaft will not rotate.

9-3. TRANSFORMER BOARD

When the base of Q512 UN5111 becomes "L" because the LIGHT button of the display has turned on, this transformer board (Q513 2SC1623-L5) turns ON and the inverter circuit turns ON. The output, at 80V to 100V, oscillates at 400Hz and serves as the power for the EL801 backlight.

9-4. SLEEP AND WAKE UP

In the sleep mode, only the display operates. To operate the whole unit, A ⊓ pulse is input to C624 and C2009 when ejecting, when the VOLUME button is operated, when the headphone jack is inserted, or when the operation keys are pressed. At points C and D, the pulse becomes ⊓, Q519 turns on, Pin ㊹ of IC801 detects the WAKE UP signal, and the whole unit starts operating.



Becomes like this when the remote control is inserted.
By turning on the desired switch, any mode can be selected.

Fig. 9-1.

For the first 17,000 units, the consumption current supplied is 160 mA (WAKE UP state) at the beginning. After 10 minutes, it becomes 400 μA (SLEEP state). From the 17,001th unit, the current becomes 400 μA after 3 minutes. (after serial numbers 26201)

9-5. REMOTE CONTROL

The 4-polarity remote control unit (MDR-ED7) is used. When the remote control unit is operated, the voltage of Pin ㊽ of IC506 will change and the unit will determine the modes. At the same time, its signal will become the WAKE UP signal that turns Q504 on so that the whole unit starts operating.

9-6. Q2002, Q2003

While the power is off or the unit is in the "sleep" mode, the display memorizes the last operation (charged by the capacitor). If the system controller IC506 is reset in these states, the display and system controller will operate at the same time and as a result the unit will operate abnormally. The pulse used in reset is therefore used to input a slightly delayed pulse to Pin ⑱ of IC506.

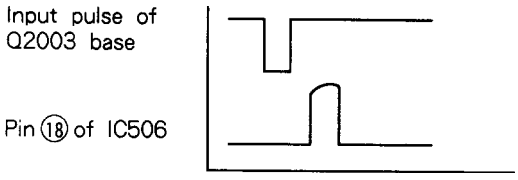


Fig. 9-2.

9-7. C2006 22 μF 6.3V

When Pin ㉙ of the system controller is "L", this capacitor determines that the AC adapter is used. When the pin is "H", it determines that the battery is used. Because IC506 will not operate properly if the pin becomes "H" too quickly, it is made "H" after a delay of two seconds.

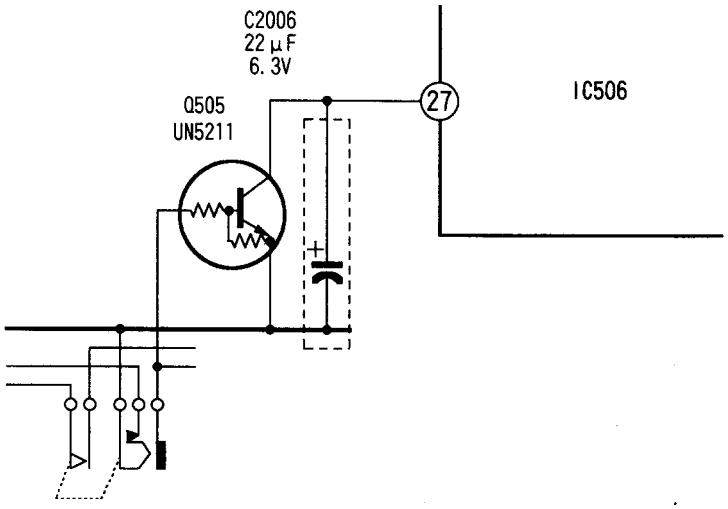
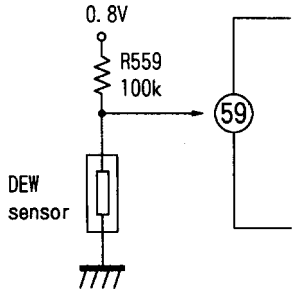


Fig. 9-3.

9-8. DEW SENSOR

When condensation takes place, the voltage of Pin ⑤⑨ of IC506 will rise because the resistance rises. (Refer to page 33.)



9-9. RESET CIRCUIT

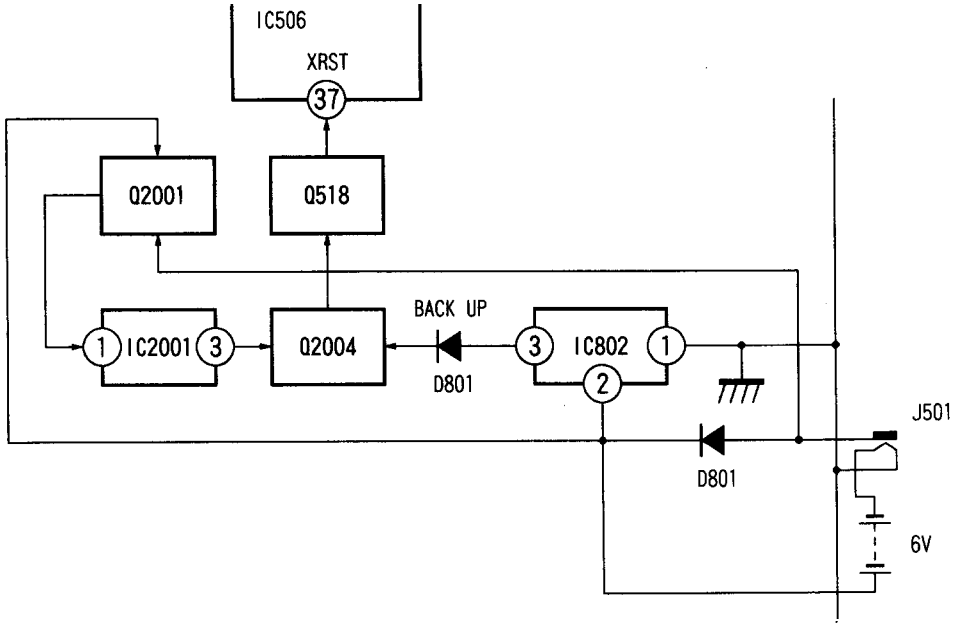
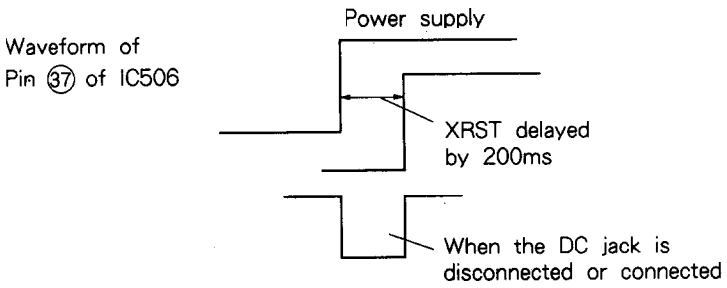


Fig. 9-4.

Pin ㊲ of IC506 will be reset in the following states.

1. When the unit operates on batteries
2. When the DC jack is inserted while the unit is operating on batteries
3. When the DC JACK is disconnected in use while the batteries are on.

The pin will be reset in the above and Q518 will operate.



9-10. AGC CIRCUIT

This circuit selects by switching the AGC (SPEECH, MUSIC, or MANUAL). A recovery time is made for the limiter. When SPEECH is selected, the recovery time is shortened. When MUSIC is selected, the time constant is switched so that the recovery time delays.

9-11. LPF

R122, R123, 150Ω, side L of C113 2200P, R222, R223, 150Ω, and side R of C213 2200P are low pass filters. These filters prevent faulty A/D converter operations caused by high frequency noises.

9-12. AGC AMP, RECT Q313, Q331, Q312, Q332

Q313 (2SC2712) and Q331 (2SD1819) amplify signals input, Q312 and Q332 (2SA1162) rectify them, and C343 22 μF stores the electric charges.

9-13. D/A CONVERTER POWER SWITCH Q304

In Q304 (UN5214), the power is supplied to the playback system circuit after the headphone has been inserted. Q304 turns off, Q303 turns on, and Q302 turns on, and IC308 (NJM3416) carries out 4V driving.

9-14. PB SYSTEM REGULATOR IC315

In IC315 (TK11245), the power is also supplied to the playback system circuit after the headphone has been inserted.

TCD-D7/D7K

SONY®
SERVICE MANUAL

US Model
Canadian Model
AEP Model
TCD-D7
Tourist Model
TCD-D7K

SUPPLEMENT-1

File This Supplement with Service Manual.

9-957-873-81

Sony Corporation
General Audio Group

English
93G0479-1
Printed in Japan

Published by Audio Sector Quality Assurance Dept.

SECTION 1-1
ADJUSTMENTS

NOTES FOR ADJUSTMENT

1. The adjustments should be performed in sequence that they are described.

2. Use the following test tapes:
   TY-7111 (8-909-812-00) for level
   TY-7915 (8-913-932-00) for tape path and SWP
   TY-30B (8-892-358-00) blank tape
   Use the following torque meter:
   TW-7131 (8-909-708-71) for FWD and back tension

3. Set the switch and control to the following positions:
   LP/SP (S501) ·····SP
   HOLD (S704) ·····Released side (in the opposite of → position)

4. Apply 6.0Vdc from the DC IN jack as power supply.

5. For cleaning of the drum, use the chamois leather (2-034-697-00) or four folds of cloth (knitted fabric) wetted with a little amount of alcohol and lightly apply it onto the drum. Then rotate the drum counterclockwise (two to three turns) to clean it.

TEST MODE

1. Enter the Test Mode before performing adjustment.

2. With the power ON, simultaneously press the STOP key, COUNTER key and OPEN button on the set to enter Test Mode. Turn the power OFF to release the Test Mode.

3. When the Test Mode is set, the LCD back light will be lit and the following initial display will appear. Also, the mechanism will be put in the loading state and the segments of the Selected Test Mode Code on the LCD display will be flashing (continuously).

   LCD Initial Display

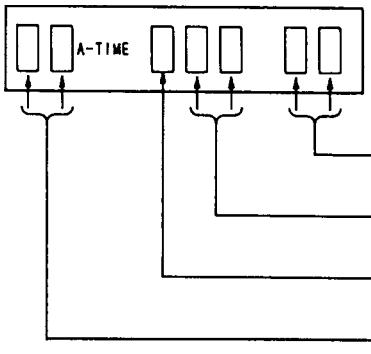
Note: During the Test Mode, each key on the set is available to operate it. In this case, malfunction may occur, but it will be released by pressing ■ key on the set. Also, this malfunction will not cause any damage to tape.

4. Types of Test Modes

Test Mode Code	Contents
01	Normal operation mode
02	Error rate measurement mode
30	End sensor check mode
40	Mechanism single operation mode
41	Constant voltage drive mode
42	Tape path adjustment mode

5. Setting of Test Mode Code (remote commander MDR-ED7 is required.)

• Test Mode Display



Note : During the Test Mode, the display is switched by pressing the COUNTER key on the set. Select the Absolute Time display (" A-TIME " illuminated) to check the current Test Mode.

Set Test Mode Code ·····Segments illuminated.

Selected Test Mode Code ·····Segments flashing.

Capstan speed code ·····Capstan speed displayed in test codes 40 and 42.

Error code ·····Segments displayed in case of emergency in test mode.

1) Each time ▶▶ key on remote commander is pressed, the segment value of the Selected Test Mode Code changes as follows :

01 → 02 → 30 → 40 → 41 → 42

2) Each time ◀◀ key on remote commander is pressed, the segment value of the Selected Test Mode Code changes is reverse order from the above order.

42 → 41 → 40 → 30 → 02 → 01

3) Set the Test Mode Code by pressing ▶ key on remote commander. (After this setting is completed, the Selected Test Mode Code is flashing.)

6. Description of Test Mode Codes

01·····Normal operation mode

This mode produces the same state as the state of the set where the Test Mode is not entered. However, malfunction may occur. So when checking the set in normal operation, do without entering the Test Mode.

02·····Error rate measurement mode

An error rate counter is needed to measure the error rate. Therefore, this mode is not used for servicing.

30·····End sensor check mode

This mode is not available in this adjustment.

40·····Mechanism single operation mode

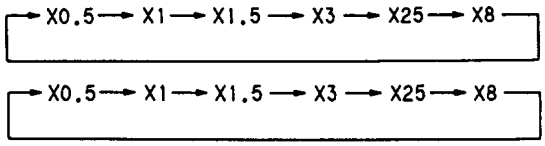
This mode is available whether tape is present or not.

Without tape, tape end and reel error detections are not performed but holder lock detection is performed.

With FF/REW and ×25FWD/×25REV selected, constant voltage drive is activated without tape while servo is activated with tape.

Press VOL (+) key on remote commander.····· (FWD mode)

Press VOL (−) key on remote commander.····· (REV mode)



Capstan Speed Code Display	Capstan Speed	Drum Speed
1	×0.5FWD	1000rpm
2	×1FWD	2000rpm
3	×1.5FWD	2000rpm
4	×3FWD	2000rpm
5	×25FWD	2000rpm
6	×8FWD	2000rpm
−1	×0.5REV	1000rpm
−2	×1REV	2000rpm
−3	×1.5REV	2000rpm
−4	×3REV	2000rpm
−5	×25REV	2000rpm
−6	×8REV	2000rpm

Note: In this mode, when tape is run with ▶ key on the set, even if the capstan speed code display is 1, the capstan speed will be set to ×1FWD.
In this case, use VOL key on remote commander to change the speed, then press ▶ key on the remote commander.

41·····Constant voltage drive mode

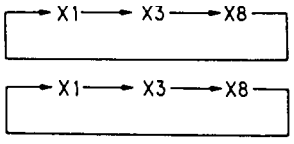
In this mode, pressing ▶ key will cause the drum and the capstan to be driven at a constant voltage.

42·····Tape path adjustment mode

This mode displays the capstan speed and it is effective only when tape is mounted.

Press VOL (+) key on remote commander.····· (FWD mode)

Press VOL (−) key on remote commander.····· (REV mode)



Capstan Speed Code Display	Capstan Speed	Drum Speed
1	×1FWD	2000rpm
2	×3FWD	2000rpm
3	×8FWD	2000rpm
−1	×1REV	2000rpm
−2	×3REV	2000rpm
−3	×8REV	2000rpm

7. Error Code List

Code No.	Block	Contents
00		No error (no emergency)
01-09	Control motor (encoder)	Unable to detect the position*1
10	Mechanism deck	Loading not completed
11		Unloading not completed
12		No eject
13		End sensor fault (T side)*2
14		End sensor fault (S side)*2
15		DEW detected*2
20	Drum	Drum motor won't rotate
21		Drum servo not locked*2
30	Capstan	Capstan motor won't rotate
31		Speed not locked
40	Reel	T reel FG not detected
41		S reel FG not detected
42		Measure abnormally ended

* 1 If the position of the rotary encoder is not detected, the position number for that position is preceded with 0 and this value is displayed as the error code. (See below)

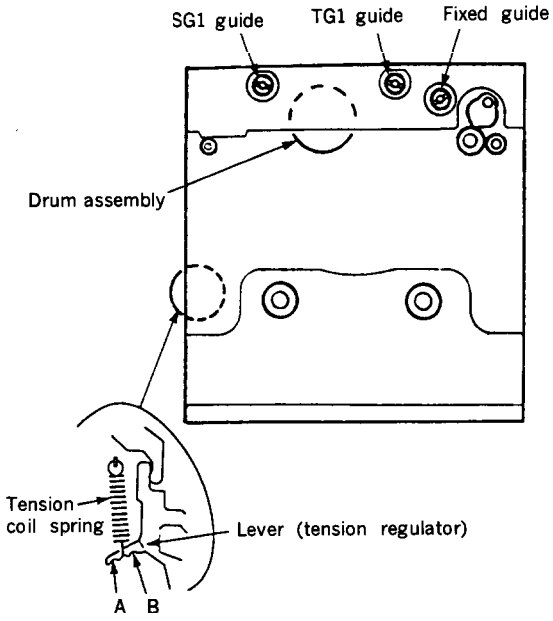
EJECT	: 01	Load	: 04	FF	: 07
Unload	: 02	REV	: 05	STOP	: 08
CASIN	: 03	FWD	: 06	REW	: 09

If an emergency occurs during each test mode, the error code will be displayed.

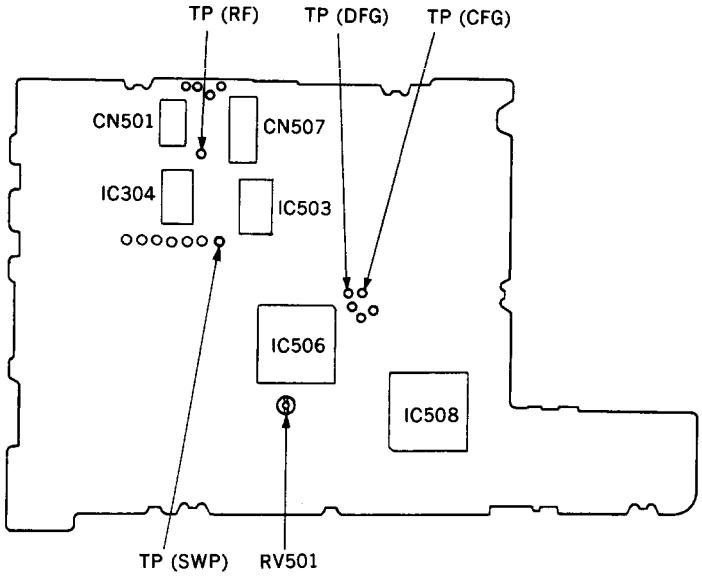
* 2 Displayed only during the Test Mode.

LOCATIONS OF PARTS ASSOCIATED WITH ADJUSTMENTS

—MECHANISM—



—MAIN BOARD—



SECTION 1-2
MECHANICAL ADJUSTMENTS

These adjustment should be always performed when the drum was replaced.

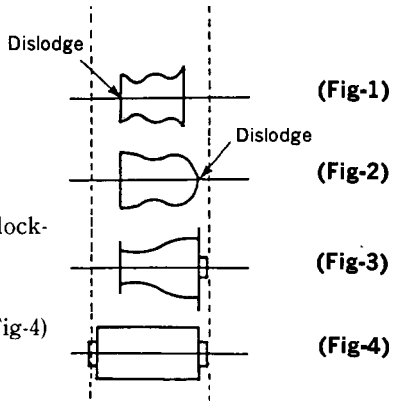
TAPE PATH ADJUSTMENT

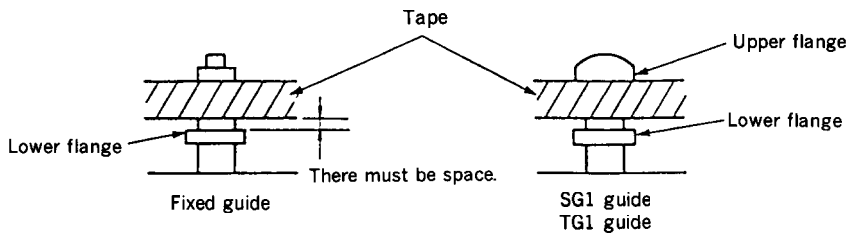
※ Only when checking the tape path, perform Items 6 to 9.

1. Enter the Test Mode, mount test TY-7915, and set tape near the center.
2. Set test mode code 42 and press VOL (+) key on remote commander. (×1FWD)
3. Lower SG1 guide (clockwise) and dislodge tape (Fig-1).
4. Lower TG1 guide (clockwise) and dislodge tape (Fig-2). Then, turn TG1 guide counterclockwise and adjust so that the right edge of the RF waveform (Fig-3) is at right angle.
5. Turn SG1 guide counterclockwise and adjust so that the left edge of the RF waveform (Fig-4) is at right angle.

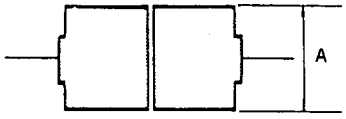
   At this time, the lower flange of fixed guide should not be in contact with tape.
   Also, tape should run along the upper flanges of SG1 and TG1 guides.

—RF WAVEFORM—

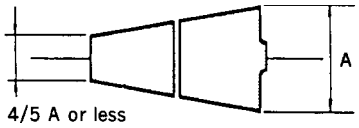




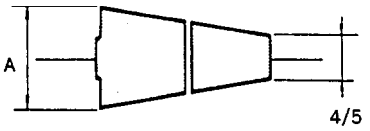
6. Check the RF waveform and fine adjust SG1 and TG1 guides.



(Fig-5)



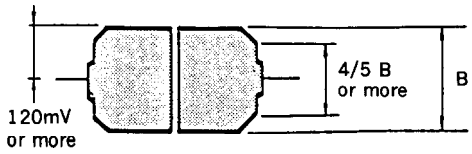
NG **(Fig-6)** ⇨ Fine adjust SG1 guide so as to obtain the waveform as shown in Fig-5.



NG **(Fig-7)** ⇨ Fine adjust TG1 guide so as to obtain the waveform as shown in Fig-5.

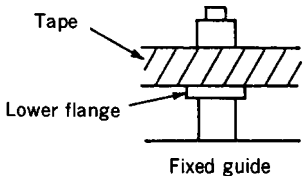
Note : SG1 guide and TG1 guide should not be adjusted alternately. After one guide has been adjusted, the other guide should be adjusted.

7. 1) Press STOP button, then press OPEN button to take out tape once.
   2) Mount tape again and press VOL (+) key on remote commander to select ×1FWD.
   3) Check the peak value and width of variation of the RF waveform.



   4) If the RF waveform does not satisfy the check values, repeat Items 6 to 7.

8. Press VOL (+) or VOL (−) key on remote commander to select ×1FWD or ×1REV.
   Adjust the fixed guide so that the lower flange of the guide is positioned along tape. (No tape curl should be present.)



9. After performing ×8FWD, ×8REV, ×3FWD, and ×3REV operations, confirm that the RF waveform is state.

TORQUE CHECK

Preparation :

Remove the cassette lid from the cassette holder.

(×1FWD)

1. Set the Test Mode.
2. Set test mode code 40.
3. Mount torque meter TW-7131.
4. Press VOL (+) key on remote commander to select ×1FWD mode.
5. Check the torque meter.

FWD take-up torque	4.5—7.0g•cm (0.063—0.097oz•inch)
FWD back tension	3.0—5.5g•cm (0.042—0.076oz•inch)

6. If the back tension check value is not satisfied, place the tension coil spring set to the lever (tension regulator) to position either A or B. Check the back tension again.

(×1REV)

1. Perform the above items 1 to 3.
2. Press VOL (−) key on remote commander to select ×1REV mode.
3. Check the torque meter.

REV take-up torque	5.5—11.0g•cm (0.077—0.152oz•inch)
REV back tension	6.0—12.0g•cm (0.084—0.166oz•inch)

SPEED CHECK

(Capstan FG)

1. Connect frequency counter to TP CFG.
2. Set the Test Mode.
3. Set test mode code 40.
4. Mount test tape TY-30B.
5. Press VOL (+) key on remote commander and read the frequency in ×0.5FWD, ×1FWD, ×1.5FWD, ×3FWD, and ×8FWD modes.

Mode	Frequency
×0.5FWD	296Hz±5Hz
×1FWD	592Hz±5Hz
×1.5FWD	888Hz±3Hz
×3FWD	1776Hz±3Hz
×8FWD	4736Hz±5Hz

(Drum FG)

1. Connect frequency counter to TP DFG.
2. Perform the above Items 2 to 4.
3. Press VOL (−) key on remote commander and check the frequency in ×0.5FWD and ×1FWD.

Mode	Frequency
×0.5FWD	400Hz±1Hz
×1FWD	800Hz±1Hz

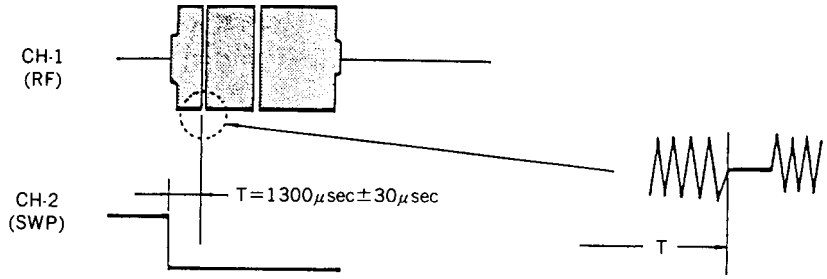
SECTION 1-3
ELECTRICAL ADJUSTMENTS

These adjustment should be always performed when the drum was replaced.

SWP (SWITCHING PULSE) ADJUSTMENT

Preparation : Oscilloscope CH-1 : AC 100mV/DIV
CH-2 : DC 2V/DIV
TRIG : CH-2

1. Connect CH-1 of oscilloscope to TP RF and CH-2 to TP SWP.
2. Set the Test Mode.
3. Set test mode code 42.
4. Mount test tape TY-7915.
5. Press VOL (+) key on remote commander to select ×1FWD.
6. Use RV501 to adjust the period (T) between SWP waveform and RF waveform.



TCD-D7/D7K

SONY®
SERVICE MANUAL

US Model
Canadian Model
AEP Model
TCD-D7
Tourist Model
TCD-D7K

SUPPLEMENT-2

File this supplement with the Service Manual.

We inform the user that according to change of the suffix of the printed wiring board, the printed wiring board and schematic diagram have been changed.

• Semiconductor Location

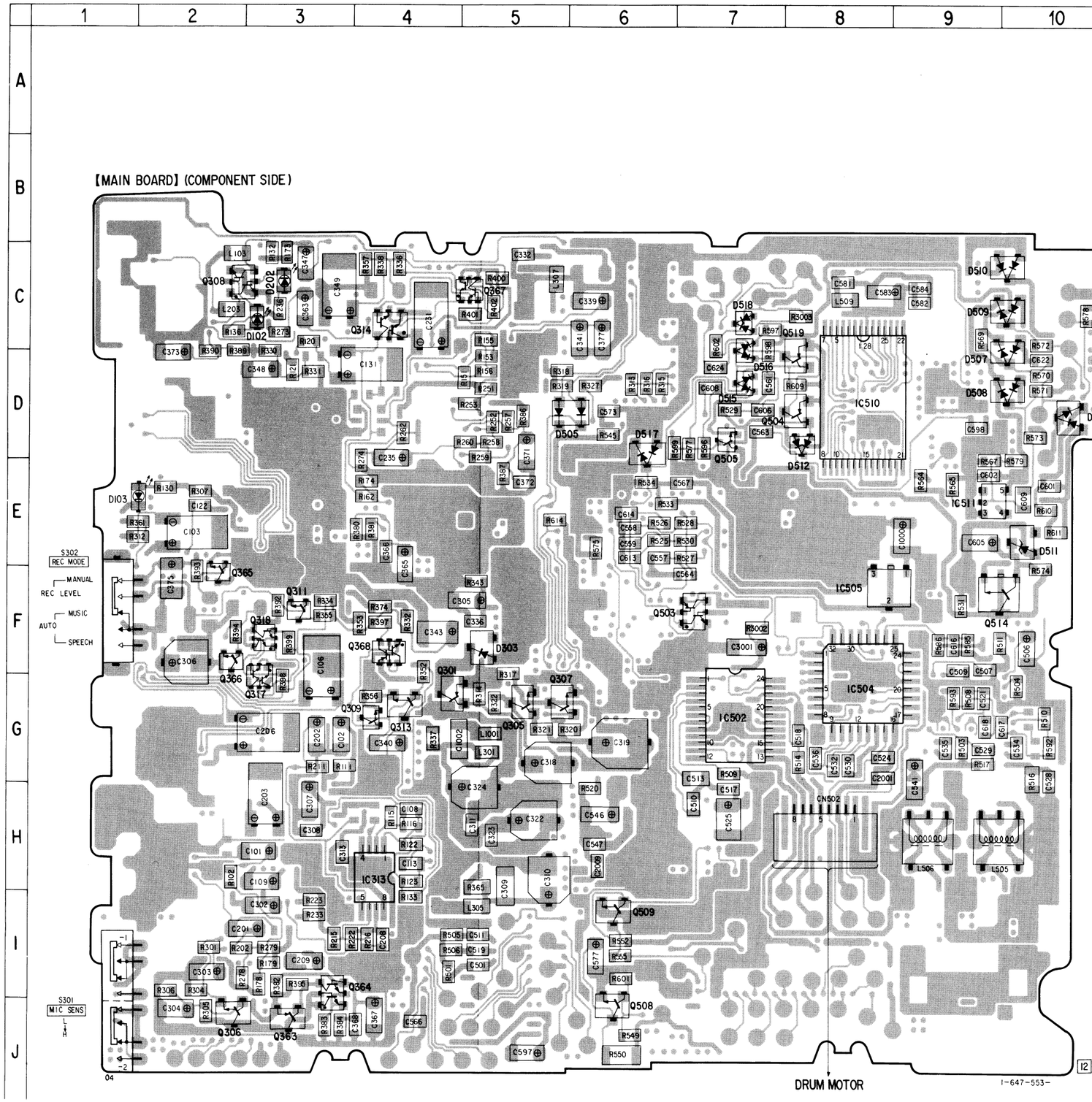
Ref. No.	Location	Ref. No.	Location
D102	C-3	Q202	F-26
D103	E-2	Q206	F-26
D104	E-26	Q301	G-4
D202	C-3	Q302	E-24
D203	F-26	Q303	F-24
D204	E-26	Q304	F-24
D301	C-27	Q305	G-5
D303	F-5	Q306	J-2
D331	F-25	Q307	G-5
D332	C-24	Q308	C-2
D340	F-24	Q309	G-4
D341	C-25	Q311	F-3
D501	H-20	Q312	F-24
D502	H-19	Q313	G-4
D503	I-19	Q314	C-4
D505	D-5	Q316	C-24
D506	D-10	Q317	F-3
D507	D-9	Q318	F-3
D508	D-9	Q331	F-25
D509	C-9	Q332	F-25
D510	C-9	Q333	C-25
D511	E-10	Q334	C-24
D512	D-8	Q353	C-24
D515	D-7	Q354	C-25
D516	D-7	Q355	D-25
D517	D-6	Q356	D-25
D518	C-7	Q357	F-25
D1001	H-13	Q361	F-25
		Q362	E-24
IC301	H-26	Q363	J-3
IC302	E-27	Q364	I-3
IC303	H-25	Q365	F-2
IC304	H-24	Q366	F-2
IC305	C-22	Q367	C-5
IC308	D-26	Q368	F-4
IC311	C-23	Q501	H-20
IC313	H-4	Q502	H-19
IC314	D-24	Q503	F-7
IC315	E-25	Q504	D-8
IC501	G-19	Q505	D-7
IC502	G-7	Q508	J-6
IC503	H-23	Q509	I-6
IC504	G-8	Q512	C-16
IC505	F-8	Q513	A-19
IC506	E-22	Q514	F-9
IC507	H-21	Q515	D-17
IC508	D-20	Q516	D-18
IC509	E-19	Q517	I-23
IC510	D-8	Q518	I-23
IC511	E-9	Q519	C-8
IC2001	H-22	Q1001	I-11
		Q1002	I-14
Q102	E-27	Q2001	G-22
Q106	F-26	Q3001	G-22

Note :

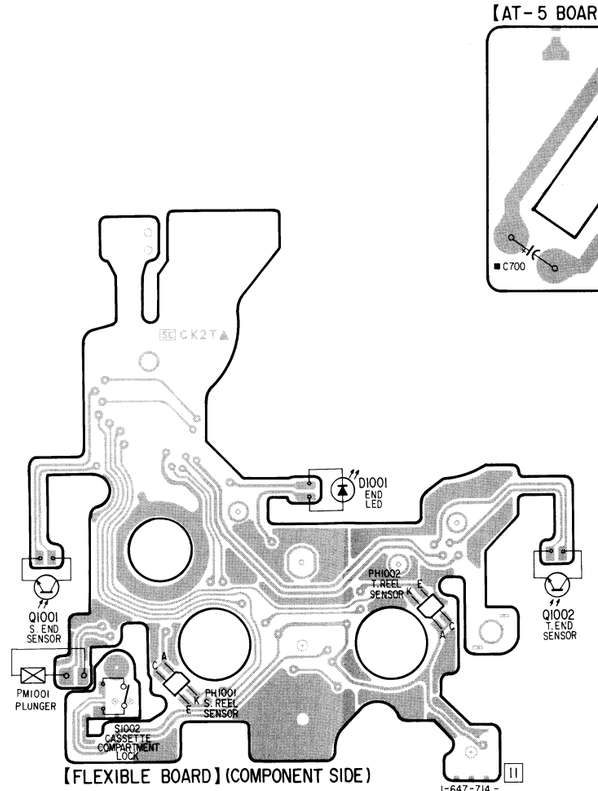
- ——— : parts extracted from the conductor side.
- ■ : parts mounted on the conductor side.
- ▨ : Pattern on the side which is seen.
- ▨ : Pattern on the rear side.

PRINTED WIRING BOARDS

【MAIN BOARD】(COMPONENT SIDE)



【AT-5 BOAR



【FLEXIBLE BOARD】(COMPONENT SIDE)

I-647-714-

【TRANSFORMER BOARD】

【MAIN BOARD】
(CONDUCTOR SIDE)

SWITCH UNIT

【AT-5 BOARD】

【FLEXIBLE BOARD】(CONDUCTOR SIDE)

【BOARD】(COMPONENT SIDE)

SYSTEM CONTROL BOARD UNIT

RF MODULE

CAPSTAN MOTOR

SCHEMATIC DIAGRAM—ANALOG SECTION—

【MAIN BOARD】(2/2)

J301 MIC PLUG IN POWER

J302 LINE IN

J304 PHONES/ LINE OUT

IC301 MIC AMP — IC301 (1/2) NJM4560M

IC301 MIC AMP — IC301 (2/2) NJM4560M

IC302 TKI5021MTL — MIC/LINE SWITCH

IC303 LINE AMP — IC303 (1/2) NJM2100V

IC303 LINE AMP — IC303 (2/2) NJM2100V

IC308 HEADPHONE AMP — IC308 (1/2) NJM3416V

IC308 HEADPHONE AMP — IC308 (2/2) NJM3416V

IC314 — IC314 (1/4) NJM2112V LOW PASS FILTER

Q102, 106 AUTO/MANUAL SWITCH

Q202,206 AUTO/MANUAL SWITCH

Q306 2SD596-DV5 RIPPLE FILTER

Q308 XN4504 LINE MUTING

Q311 VOICE/MUSIC SWITCH

Q314 AVLS MUTING

Q317 AGC MUTING

Q318 BUFFER

Q333 AVLS AMP

Q334 AVLS SELECT

Q353 AVLS RECT

Q354 AVLS AMP

Q355,356 AVLS SWITCH

Q365,366 SWITCHING

Q367 BUFFER

Q316 AVLS SWITCH

S301-1 MIC SENS

S301-2 MIC SENS

S302 REC MODE

REC LEVEL

SPEECH←MUSIC←MANUAL

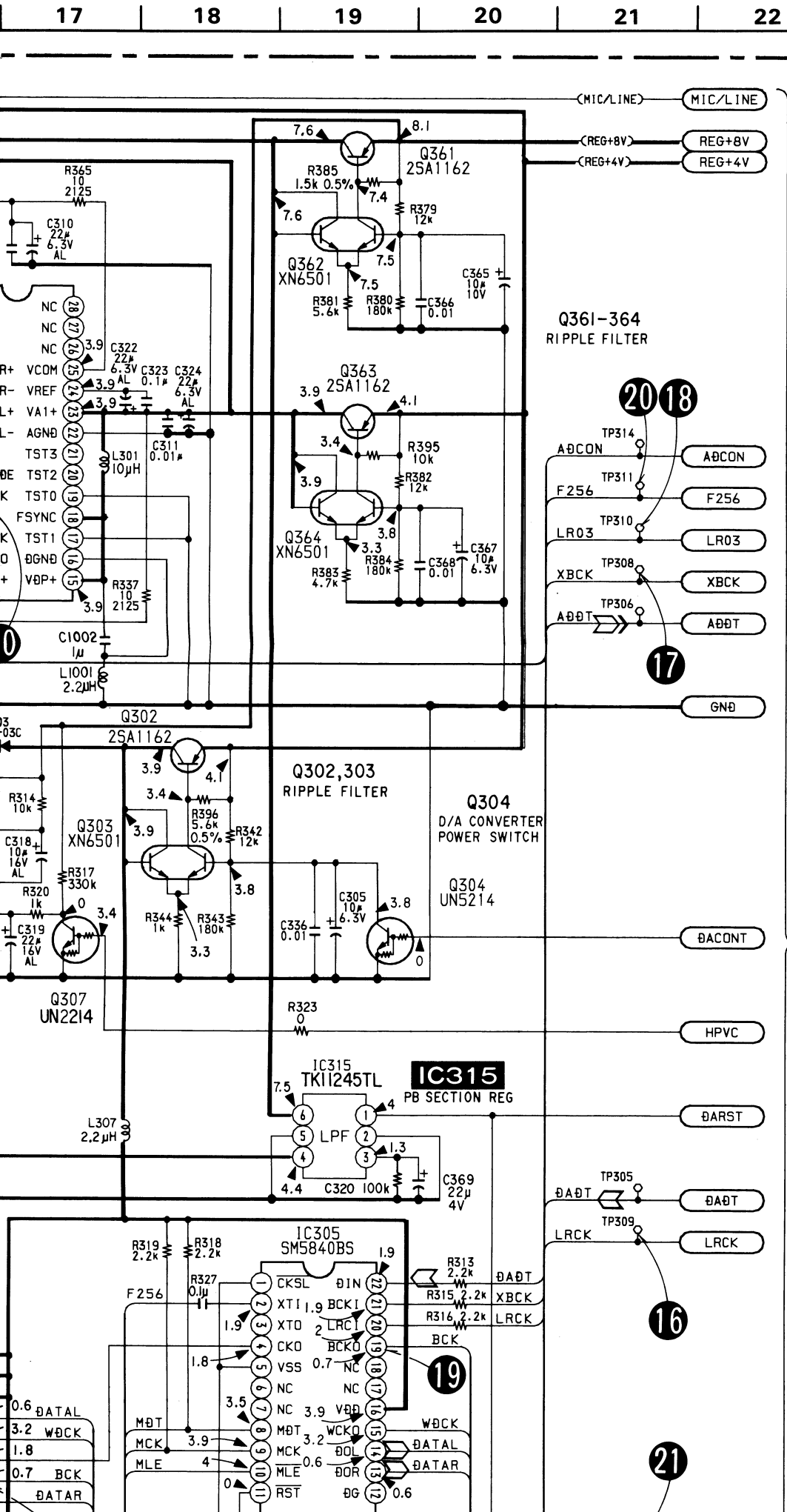
REMOTE

LMUTE

AVLS

8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19

IC303 LINE AMP
IC303 (1/2) NJM2100V
IC303 (2/2) NJM2100V
IC313 LINE AMP
IC313 (1/2) NJM2100V
IC313 (2/2) NJM2100V
IC304 AK5344 A/D CONVERTER
Q365,366 SWITCHING
Q365 2SD1819
Q366 2SD1819
Q318 BUFFER
Q318 XP6501
Q368 XP4315
Q368 SWITCH
Q309 SWITCHING
Q309 UN5214
Q311 VOICE/MUSIC SWITCH
Q311 2SD1819
Q312 2SA1162
Q312 RECT
Q313 2SC2712 AGC AMP
Q317 AGC MUTING
Q317 XP6501
Q332 2SA1162 RECT
Q331 2SD1819 AGC AMP
Q357 UN5214 SWITCHING
Q202 2SD1328
Q202,206 AUTO/MANUAL SWITCH
Q301 2SB624
Q301,305,307 HEADPHONE/ LINE POWER SWITCH
Q305 2SC2712
Q303 XN6501
Q302 2SA1162
Q302,303 RIPPLE FILTER
Q307 UN2214
Q362 XN6501
Q363 2SA1162
Q364 XN6501
IC315 TK11245TL
LPF
IC311 D/A CONVERTER
IC311 PCM67U
IC305 SM5840BS
IC305 DIGITAL FILTER
IC314 LOW PASS FILTER
IC314 (1/4) NJM2112V LOW PASS FILTER
IC314 (2/4) NJM2112V
IC314 (3/4) NJM2112V
IC314 (4/4) NJM2112V
IC314 I/V CONVERTER
SPEECH←MUSIC←MANUAL S302
REC MODE
Q316 AVLS SWITCH
TP320
TP322
TP329
L305 3.3μH
L301 10μH
L307 2.2μH
L1001 2.2μH
SB02-03C
AK5344 A/D CONVERTER
PCM67U
SM5840BS
TK11245TL
NJM2100V
NJM2112V
XP4315
XP6501
2SD1819
2SA1162
2SC2712
2SB624
UN5214
UN2214
XN6501
2SD1328



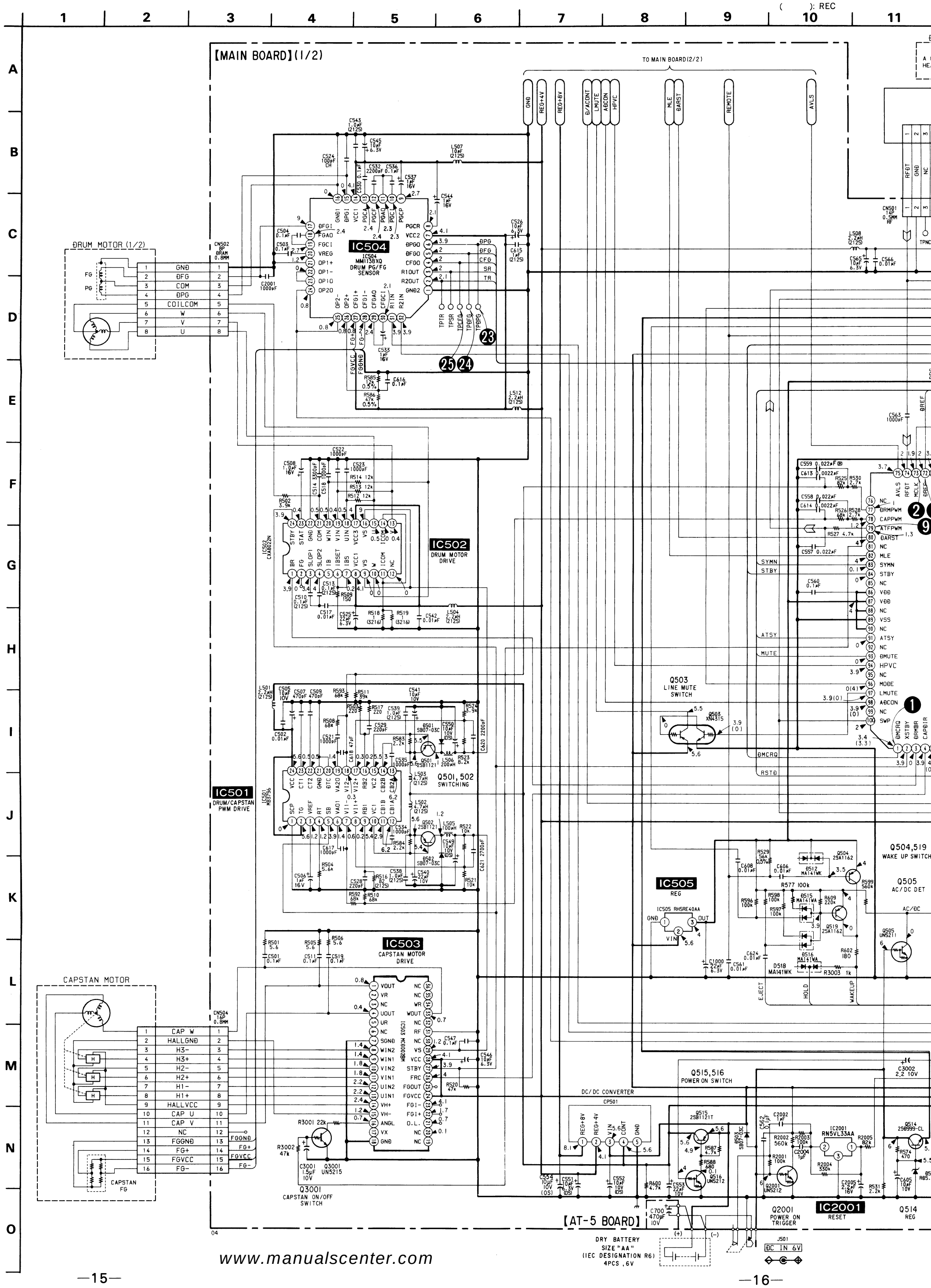
Note :

- All capacitors are in μF unless otherwise noted. pF : $\mu\mu$F 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- % : indicates tolerance.
- ▬▬ : B+ Line
- Power voltage is dc 6V and fed with regulated dc power supply from battery terminal.
- Voltage and waveforms are dc with respect to ground under no-signal conditions.
- no mark: PLAY
  ( ): REC
- Voltages are taken with a VOM (Input Impedance 10MΩ). Voltage variations may be noted due to normal production tolerances.
- Waveforms are taken with a oscilloscope.
  Voltage variations may be noted due to normal production tolerances.
- Circled numbers refer to waveforms.
- Signal path.
  ▷ : PB
  ▷▷ : REC

Note :

- All capacitors are in μF unless otherwise noted. pF : $\mu\mu$F 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- % : indicates tolerance.
- ▬▬ : B+ Line
- Power voltage is dc 6V and fed with reg
  from battery terminal.
- Voltage and waveforms are dc with re
  no-signal conditions.
- no mark: PLAY
  ( ): REC

SCHEMATIC DIAGRAM—MAIN SECTION—



se noted. pF : μμF 50WV
trolytics and tantalums.
ss unless otherwise

- ▬▬ : B+ Line
- Power voltage is dc 6V and fed with regulated dc power supply from battery terminal.
- Voltage and waveforms are dc with respect to ground under no-signal conditions.
- no mark: PLAY
  ( ): REC
- Voltages are taken with a VOM (Input Impedance 10MΩ). Voltage variations may be noted due to normal production tolerances.
- Waveforms are taken with a oscilloscope. Voltage variations may be noted due to normal production tolerances.
- Circled numbers refer to waveforms.
- Signal path.
  ▷ : PB
  ▷» : REC

8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19

TO MAIN BOARD(2/2)

DRUM MOTOR(2/2)

A CH HEAD

B-CH HEAD

RF MODULE

CN501 14P 0.5MM RF

RFDT GND NC RF+4V REDT REPB PIPC SWP MODE2 RFENV RF VIEW ATFAGC GND PILOT

TPRF

TPSWP

TPNC

L508 2.2μH (2125)

C565 10μF 6.3V

C566 0.01μF

MLE DARST REMOTE AVLS

MCK MDT MIC/LINE

DADT ADDT XBCK LRCK LRO3

IC506
IC506 CXP80524-078R
SERVO, MUTING, MECHA CONTROL

IC510
S - RAM

IC510 CXK58257ATM-12LB

TEST POINT

TPD7 TPD6 TPD5 TPD4 TPD3 TPD2 TPD1 TPD0 TPDREF TPMNTG TPGND

R560 470

R561 1k

X504 24.576MHz

DADO ADDI ADDN ERRI ERRF MNTG D7 D6 D5 D4 D3 D2 VSS D1 D0 A00 A01 A02 A03 A04 A05 A06 A07 A08 A09

R533 220k 0.5%

C563 1000pF

C564 100pF

C567 0.1μF

D517 SB007703C

C568 0.022μF

R534 220k 0.5%

C572 10μF 6.3V

C573 0.1μF

R545 22

D505 MA713

RV501 100k SWP

C559 0.022μF (B)

C613 0.0022μF

R525 82k

R530 2.7k

C558 0.022μF

C614 0.0022μF

R526 68k

R528 2.7k

R527 4.7k

C557 0.022μF

C560 0.1μF

C584 0.1μF

C583 10μF 6.3V

C582 0.01μF

C581 0.01μF

L509 2.2μH (2125)

C591 15pF (CH)

C575 15pF (CH)

C574 15pF (CH)

X501 9.408MHz

R575 100k

R590 220k

R589 220k

R544 10k

R546 10k

R576 10k

R537 22k

C571 0.1μF

R542 100k

C570 0.1μF

R541 100k

C569 0.1μF

R540 100k

R539 22k

R538 22k

R536 22k

R535 22k

AVLS RFDT MCLK DREF DRMPG DRMFG CAPFG SRLFG NC TRLFG ATFPLT NC BATTERY SENS TENS NC REW REMOTE RFENV SWPADJ AVDD AVREF AVSS EXCK SBSO

NC DRMPWM CAPPWM ATFPWM DARST NC MLE SYMN STBY NC VDD VDD NC VSS NC ATSY NC MUTE DMUTE HPVC NC MODE LMUTE ADCON NC SWP

NC SBSI SBSY XSCK NC SO SI NC LP/SP-IN EXTAL XTAL VSS NC XRST MP NC PLGON NC ENLDON CTRMB CTRMA AC/DC NC VOL+ VOL-

DMCRQ XSTBY DRMBR CAPDIR DACONT XRSTDSP SYSPOW LP/SP-OUT RLD-TON NC REI REM NC REO RELD REULD XRECINH XCASLK CASIN NC XAVLS HP/LINE MIC/LINE MUTM DIG/ANA

SBSI SBSY XSCK KSI KSO MUTM DREF EXCK SBSI

Q503
LINE MUTE SWITCH

Q503 XN4315

Q504,519
WAKE UP SWITCH

Q505
AC/DC DET

Q505 UN5211

Q504 2SA1162

D512 MA141WK

D515 MA141WA

D516 MA141WA

D518 MA141WK

Q519 2SA1162

R529 56k 0.5%

C608 0.01μF

C606 0.01μF

R577 100k

R596 100k

R598 100k

R597 100k

R609 220k

R599 560k

R602 180

C624 0.01μF

C561 0.01μF

R3003 1k

EJECT HOLD WAKEUP

IC505
REG

IC505 RH5RE40AA

GND OUT VIN

C1000 22μF 6.3V

Q517,518
RESET SWITCH

Q512
EL ON/OFF SWITCH

Q512 UN5111

R608 390

Q518 DTC113ZU

Q517 UN5114

C2009 0.0047μF

C586 0.1μF

C2008 1μF

S501
SP/LP

R554 33k

C580 3300pF

R558 220 0.5%

C578 3300pF

R553 220 0.5%

R551 33k

R559 100k 0.5%

C3002 2.2 10V

Q508
END LED SWITCH

Q515,516
POWER ON SWITCH

Q515 2SB1121T

Q516 UN5212

R587 4.7k

R588 680

R600 4.7k

C553 22μF 10V

C700 470μF 10V

Q2001
POWER ON TRIGGER

Q2001 UN5212

R2002 560k

R2003 100k

C2002 1μF

C2004 1μF

R2001 100k

IC2001
RESET

IC2001 RN5VL33AA

R2004 330k

R2005 82k

C2005 2.2μF 16V

R531 2.2k

Q514
REG

Q514 2SB999-CL

R574 470

D511 RB5.6MB2

C605 10μF 10V

IC507
MODE MOTOR DRIVE

IC507 TK10502

C002 0.22

C001 0.22

R547 4.7k

R548 4.7k

R580 27k

C610 0.1μF

R581 15k

C611 0.1μF

R582 5.6

C576 22μF 10V

Q509
PLUNGER DRIVE

Q508 2SC2712

Q509 2SC2712

R550 100 (5214)

R549 10k

R552 12k

R555 150

R601 10k

C577 1.5μF 10V

R557 560

R556 560

C579 22μF 6.3V

J501
DC IN 6V

CN505 22P MD 0.8MM

GND DEW ENDLED ENTR.S ENTR.T RLTR.S RLTR.T RLLED.S RLLED.T RELD REULD REO REM REI CASLK CASIN RECINH VCC PLG+ PLG- CTLM+ CTLM-

D1001 GL453S END LED

DEW SENSOR

Q1001,1002
PT4810F

Q1001 S.END SENSOR

Q1002 T.END SENSOR

PH1001 S.REEL SENSOR

PH1002 T.REEL SENSOR

PH1001,1002
NJL5161K-A

LOAD/UNLOAD DET

ROTARY ENCODER

S1002 CASSETTE COMPARTMENT LOCK

CASSETTE DET -1

REC PROOF -2

S1001

PM1001 PLUNGER

M1001 GEAR MOTOR

【FLEXIBLE BOARD】

- Signal path.
  - : PB
  - : REC

17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26

TO MAIN BOARD (2/2)

ÐABT, ADBT, XBCK, LRCK, LR03, F256

TEST POINT 8

TP05 TP04 TP03 TP02 TP01 TP00 TPÐREF TPMNTG TPGNÐ

IC509 BUFFER
IC509 SC7S04FER

X503 22.5792MHz
X504 24.576MHz
X502 9.408MHz

C592 5pF (CH) C593 5pF (CH) C595 10pF (CH) C596 10pF (CH)
C591 15pF (CH) C594 15pF (CH)
C601 0.1µF
C627 1µF (2125)
C622 100pF
C599 10µF 6.3V
C600 0.01µF
C602 0.1µF
C609 1.0µF (2125)
C598 0.01µF

R560 470 R561 1k R564 0 R565 68k R566 470
R569 47k R578 56k R570 100 R571 100 R572 100 R573 47k
R610 22k R611 27k R567 22k R579 27k R568 100 L511 0
L510 2.2µH (3216)

Ð506 ÐCC010 Ð507 ÐCC010 Ð508 ÐCC010 Ð509 ÐCC010 Ð510 MA786WK

ÐABT ADBT BCK WCK LRCK LR01 LR02 LR03 FSEN XT31 XT30 VSS XT21 XT20 ÐALF ADLF F512 F256 F128 EXSN EXSY AUÐR TX VÐÐ

ÐADÐ ADÐI ADÐN ERRI ERRF MNTG Ð7 Ð6 Ð5 Ð4 Ð3 Ð2 VSS Ð1 Ð0 A00 A01 A02 A03 A04 A05 A06 A07 A08 A09

RX MSSL PLRF PLVR PLCO AMPO AMPI PÐO TST4 REÐT REÐI REPB PIPC VSS SWP XCS RFÐI TST2 PLCK CHER SYMN ERMN UNLK MUTM MUTE EMP

IC508
IC508 CX02605R
SIGNAL PROCESSOR
DIGITAL I/O

VÐÐ A10 A11 A12 A13 A14 WE OE XEAN TST1 XT10 XT11 VSS XRST CLKO XCST ATSY MCLK ÐREF SBPM EXCK SÐSI SÐSO SBSY COPY

RSTÐ ATSY ÐREF EXCK SÐSI SÐSO SBSY

CN508 REMOTE DIGITAL I/O

TX	1
REG+4/+5V	2
ÐIG/ANA	3
POWTRG	4
RX	5
GNÐ	6
SIRCS	7

SYMN
MUTM
MUTE

Q517,518 RESET SWITCH
Q512 EL ON/OFF SWITCH
Q512 UN5111
Q518 DTC113ZU
Q517 UN5114
R608 390
C2009 0.0047µF
C2008 1µF
C586 0.1µF
C587 0.01µF
C588 68µF 6.3V
R614 47k

【TRANSFORMER BOARD】
C589 3300pF R563 68kΩ R562 1k C590 1µF (2125) C612 0.22F 5.5V
Q513 2SC1623-L5 INVERTER
IVT501

EL801
ELECTRIC LUMINESCENCE ÐEVICE

SYSTEM CONTROL BOARD UNIT

CN507 22P 0.5MM

1	XREQIF	1
2	XSCK	2
3	KSO	3
4	KSI	4
5	STBY	5
6	XRSTRANMA	6
7	XSIRCS	7
8	BACKUP	8
9	WAKEUP	9
10	XVM	10
11	HOLÐ	11
12	EJECT	12
13	LIGHT	13
14	EL (+)	14
15	EL (+)	15
16	VM IN	16
17	UNREG	17
18	UNREG	18
19	SYS+4V	19
20	SYS+4V	20
21	GNÐ	21
22	GNÐ	22

ÐMCRQ XSCK KSO KSI STBY

C597 10µF 10V

CN509 8P 0.5MM

1	VOL+	1
2	VOL-	2
3	XAVLS	3
4	WAKEUP	4
5	GNÐ	5
6	HOLÐ	6
7	EJECT	7
8	HP/LINE	8

VOL+ VOL- XAVLS WAKEUP HOLÐ EJECT HP/LINE

S810 LIGHT
S809 PAUSE
S808 REC/ID WRITE
S804 ▶▶/▶▶▌
S803 PLAY
S802 STOP
S801 ▐◀◀/◀◀

WP801

1	COM3	1
2	COM2	2
3	COM1	3
4	COMÐ	4
5	SÐÐ	5
6	SÐ1	6
7	SÐ2	7
8	SÐ3	8
9	SÐ4	9
10	SÐ5	10
11	SÐ6	11
12	SÐ7	12
13	SÐ8	13
14	SÐ9	14
15	S10	15
16	S11	16
17	S12	17
18	S13	18
19	S14	19
20	S15	20
21	S16	21
22	S17	22
23	S18	23
24	S19	24
25	S20	25
26	S21	26
27	S22	27
28	S23	28
29	S24	29
30	S25	30
31	S26	31
32	S27	32
33	S28	33
34	S29	34
35	S30	35
36	S31	36
37	COM3	37
38	COM2	38
39	COM1	39
40	COMÐ	40

LIQUID CRYSTAL ÐISPLAY PANEL

S701 VOLUME-
S702 VOLUME+
OPEN ← OFF → HOLÐ S704 OPEN/HOLD
LINE OUT ← OFF → ON S705 AVLS

SWITCH UNIT

CASIN

1	XCLOCK	1
2	XCMODE	2
3	XCRESET	3
4	KEYCOM	4

S805 CLOCK SET
S806 COUNTER-
S807 RESET+

【FLEXIBLE BOARD】

ÐEW SENSOR
Q1001 GL453S ENÐ LEÐ
Q1001,1002 PT4810F
Q1001 S.ENÐ SENSOR
Q1002 T.ENÐ SENSOR
PH1001 S.REEL SENSOR
PH1002 T.REEL SENSOR
PH1001,1002 NJL5161K-A
LOAÐ/UNLOAÐ ÐET
ROTARY ENCODER
S1002 CASSETTE COMPARTMENT LOCK
CASSETTE ÐET -1
REC PROOF -2
S1001
PM1001 PLUNGER
M1001 GEAR MOTOR

ELECTRICAL PARTS LIST

NOTE:

- Due to standardization, replacements in the parts list may be different from the parts specified in the diagrams or the components used on the set.
- -XX and -X mean standardized parts, so they may have some difference from the original one.
- RESISTORS
  All resistors are in ohms.
  METAL:Metal-film resistor.
  METAL OXIDE: Metal oxide-film resistor.
  F:nonflammable
- Items marked "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- SEMICONDUCTORS
  In each case, u:μ, for example:
  uA ..: μA.. uPA..: μPA..
  uPB..: μPB.. uPC..: μPC.. uPD..: μPD..
- CAPACITORS
  uF: μF
- COILS
  uH: μH

When indicating parts by reference number, please include the board.

Ref. No.	Part No.	Description			Remark
*	1-648-722-11	AT-5 BOARD			
		**********			
		< CAPACITOR >			
C700	1-104-964-21	ELECT	470uF	20%	10V
**********					
	A-3016-354-A	MAIN BOARD, COMPLETE (INCLUDING TRANSFORMER BOARD)			
		**********			
	3-387-477-01	TERMINAL (MAIN), BATTERY			
	3-708-377-01	SLIDER, SURF LOCK (16P)			
	3-831-441-XX	SPACER			
		< CAPACITOR >			
C001	1-164-222-11	CERAMIC CHIP	0.22uF		25V
C002	1-164-222-11	CERAMIC CHIP	0.22uF		25V
C101	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
C102	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C103	1-128-019-11	ELECT CHIP	6.8uF		6.3V
C105	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C106	1-128-020-11	ELECT CHIP	10uF		6.3V
C107	1-162-922-11	CERAMIC CHIP	39PF	5%	50V
C108	1-162-915-11	CERAMIC CHIP	10PF	0.5PF	50V
C109	1-135-210-11	TANTALUM CHIP	4.7uF	20%	10V
C110	1-135-180-21	TANTALUM CHIP	3.3uF	20%	6.3V
C113	1-164-161-11	CERAMIC CHIP	0.0022uF	10%	100V
C117	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C118	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C119	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C120	1-135-157-21	TANTALUM CHIP	10uF	20%	6.3V
C121	1-164-480-11	CERAMIC CHIP	0.01uF	10%	50V
C122	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C125	1-135-202-21	TANTAL. CHIP	22uF	20%	4V
C126	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C128	1-163-009-11	CERAMIC CHIP	0.001uF	10%	50V
C129	1-163-022-00	CERAMIC CHIP	0.012uF	10%	50V
C131	1-128-014-11	ELECT CHIP	10uF		4V
C134	1-104-848-11	TANTAL. CHIP	100uF	20%	4V
C135	1-135-201-11	TANTALUM CHIP	10uF	20%	4V

Ref. No.	Part No.	Description			Remark
C201	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
C202	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C203	1-128-019-11	ELECT CHIP	6.8uF		6.3V
C205	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C206	1-128-020-11	ELECT CHIP	10uF		6.3V
C207	1-162-922-11	CERAMIC CHIP	39PF	5%	50V
C208	1-162-915-11	CERAMIC CHIP	10PF	0.5PF	50V
C209	1-135-210-11	TANTALUM CHIP	4.7uF	20%	10V
C210	1-135-180-21	TANTALUM CHIP	3.3uF	20%	6.3V
C213	1-164-161-11	CERAMIC CHIP	0.0022uF	10%	100V
C217	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C218	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C219	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C220	1-135-157-21	TANTALUM CHIP	10uF	20%	6.3V
C221	1-164-480-11	CERAMIC CHIP	0.01uF	10%	50V
C222	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C225	1-135-202-21	TANTAL. CHIP	22uF	20%	4V
C226	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C228	1-163-009-11	CERAMIC CHIP	0.001uF	10%	50V
C229	1-163-022-00	CERAMIC CHIP	0.012uF	10%	50V
C231	1-128-014-11	ELECT CHIP	10uF		4V
C234	1-104-848-11	TANTAL. CHIP	100uF	20%	4V
C235	1-135-201-11	TANTALUM CHIP	10uF	20%	4V
C302	1-135-210-11	TANTALUM CHIP	4.7uF	20%	10V
C303	1-135-149-21	TANTALUM CHIP	2.2uF	20%	10V
C304	1-135-149-21	TANTALUM CHIP	2.2uF	20%	10V
C305	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C306	1-124-779-00	ELECT CHIP	10uF	20%	16V
C307	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C308	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C309	1-162-638-11	CERAMIC CHIP	1uF		16V
C310	1-124-778-00	ELECT CHIP	22uF	20%	6.3V
C311	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C312	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C313	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C314	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C318	1-124-779-00	ELECT CHIP	10uF	20%	16V
C319	1-126-395-11	ELECT	22uF	20%	16V
C320	1-216-845-11	METAL CHIP	100K 5%		1/16W
C322	1-124-778-00	ELECT CHIP	22uF	20%	6.3V

MAIN

Ref. No.	Part No.	Description			Remark
C323	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C324	1-124-778-00	ELECT CHIP	22uF	20%	6.3V
C327	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C330	1-135-157-21	TANTALUM CHIP	10uF	20%	6.3V
C331	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C332	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C333	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C334	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C335-337					
	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C338	1-135-210-11	TANTALUM CHIP	4.7uF	20%	10V
C339	1-135-201-11	TANTALUM CHIP	10uF	20%	4V
C340	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C341	1-135-201-11	TANTALUM CHIP	10uF	20%	4V
C342	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C343	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C346	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C347	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C348	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C349	1-128-014-11	ELECT CHIP	10uF		4V
C361	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C362	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C363	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C364	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C365	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C366	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C367	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C368	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C369	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C370	1-135-157-21	TANTALUM CHIP	10uF	20%	6.3V
C371	1-135-201-11	TANTALUM CHIP	10uF	20%	4V
C372	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C373	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C375	1-135-157-21	TANTALUM CHIP	10uF	20%	6.3V
C377	1-135-201-11	TANTALUM CHIP	10uF	20%	4V
C501	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C502	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C503	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C504	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C505	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C506	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C507	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C508	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C509	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C510	1-164-004-11	CERAMIC CHIP	0.1uF	10%	25V
C511	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C513	1-164-004-11	CERAMIC CHIP	0.1uF	10%	25V
C514	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C517	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V

Ref. No.	Part No.	Description			Remark
C518	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C519	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C521-523					
	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C524	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C525	1-104-852-11	TANTAL. CHIP	22uF	20%	6.3V
C526	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C528	1-162-960-11	CERAMIC CHIP	220PF	10%	50V
C529	1-162-960-11	CERAMIC CHIP	220PF	10%	50V
C530	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C532	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C533	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C534	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C535	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C536	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C537	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C538	1-164-234-11	CERAMIC CHIP	1uF		10V
C539	1-164-234-11	CERAMIC CHIP	1uF		10V
C540	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C541	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C542	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C543	1-164-234-11	CERAMIC CHIP	1uF		10V
C544	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C545	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C546	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C547	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C549-552					
	1-127-558-11	ELECT(SOLID)	10uF	20%	10V
C553	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C554	1-127-558-11	ELECT(SOLID)	10uF	20%	10V
C557-559					
	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C560	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C561	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C562	1-163-038-00	CERAMIC CHIP	0.1uF		25V
C563	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C564	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C565	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C566	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C567	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C568	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C569-571					
	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C572	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C573	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C574	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C575	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C576	1-104-852-11	TANTAL. CHIP	22uF	20%	10V
C577	1-135-148-21	TANTAL. CHIP	1.5uF	20%	10V

Ref.No.	Part No.	Description			Remark
C578	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C579	1-104-852-11	TANTAL. CHIP	22uF	20%	6.3V
C580	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C581	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C582	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C583	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C584	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C586	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C587	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C588	1-104-755-21	ELECT	68uF	20%	6.3V
C591	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C592	1-162-910-11	CERAMIC CHIP	5PF	0.25PF	50V
C593	1-162-910-11	CERAMIC CHIP	5PF	0.25PF	50V
C594	1-162-917-11	CERAMIC CHIP	15PF	5%	50V
C595	1-162-915-11	CERAMIC CHIP	10PF	0.5PF	50V
C596	1-162-915-11	CERAMIC CHIP	10PF	0.5PF	50V
C597	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C598	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C599	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C600	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C601	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C602	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C605	1-104-851-11	TANTAL. CHIP	10uF	20%	10V
C606	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C608	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C609	1-164-234-11	CERAMIC CHIP	1uF		10V
C610	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C611	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C613	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C614	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C615	1-164-234-11	CERAMIC CHIP	1uF		10V
C616	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C617	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C618	1-162-923-11	CERAMIC CHIP	47PF	5%	50V
C620	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C621	1-162-979-11	CERAMIC CHIP	0.0027uF	10%	50V
C622	1-162-953-11	CERAMIC CHIP	100PF	5%	50V
C624	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C627	1-164-234-11	CERAMIC CHIP	1uF		10V
C1000	1-104-852-11	TANTAL. CHIP	22uF	20%	6.3V
C1002	1-162-638-11	CERAMIC CHIP	1uF		16V
C2001	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C2002	1-164-234-11	CERAMIC CHIP	1uF		10V
C2004	1-164-234-11	CERAMIC CHIP	1uF		10V
C2005	1-135-179-21	TANTAL. CHIP	2.2uF	20%	16V
C2008	1-164-234-11	CERAMIC CHIP	1uF		10V
C2009	1-162-968-11	CERAMIC CHIP	0.0047uF	10%	50V
C3001	1-135-148-21	TANTALUM CHIP	1.5uF	20%	10V
C3002	1-135-149-21	TANTALUM CHIP	2.2uF	20%	10V

Ref.No.	Part No.	Description	Remark
		< CONNECTOR >	
CN501	1-750-374-11	CONNECTOR, FPC 14P	
* CN502	1-691-419-11	HOUSING, CONNECTOR 8P	
CN504	1-569-530-11	HOUSING, CONNECTOR 16P	
* CN505	1-691-798-11	HOUSING, CONNECTOR 22P	
CN507	1-750-375-11	CONNECTOR, FPC 22P	
CN508	1-750-377-11	SOCKET, CONNECTOR 7P (REMOTE DIGITAL I/O)	
CN509	1-750-373-11	CONNECTOR, FPC 8P	
		< DC-DC CONVERTER UNIT >	
CP501	1-467-045-11	CONVERTER UNIT, DC-DC	
		< DIODE >	
D102-104			
	8-719-033-14	LED CL-170PG-CD-T	
D202-204			
	8-719-033-14	LED CL-170PG-CD-T	
D301	8-719-105-58	DIODE RD3.9M-B2	
D303	8-719-975-43	DIODE RB420D	
D331	8-719-975-43	DIODE RB420D	
D332	8-719-975-43	DIODE RB420D	
D340	8-719-975-43	DIODE RB420D	
D341	8-719-975-43	DIODE RB420D	
D501-503			
	8-719-980-38	DIODE SB07-03C	
D505	8-719-404-16	DIODE MA713	
D506-509			
	8-719-800-76	DIODE 1SS226	
D510	8-719-026-26	DIODE MA786WK	
D511	8-719-105-91	DIODE RD5.6M-B2	
D512	8-719-404-35	DIODE MA141WK	
D515	8-719-820-05	DIODE 1SS181	
D516	8-719-820-05	DIODE 1SS181	
D517	8-719-989-73	DIODE SB007T03C	
D518	8-719-404-35	DIODE MA141WK	
		< IC >	
IC301	8-759-745-64	IC NJM4560M	
IC302	8-759-161-76	IC TK15021MTL	
IC303	8-759-097-92	IC NJM2100V	
IC304	8-759-161-74	IC AK5344-VS-E1	
IC305	8-759-501-41	IC SM5840BS	
IC308	8-759-058-41	IC NJM3416V	
IC311	8-759-178-39	IC PCM69AU-J-T1	
IC313	8-759-097-92	IC NJM2100V	
IC314	8-759-161-75	IC NJM2112V(TE2)	
IC315	8-759-168-90	IC TK11245TL	
IC501	8-759-094-01	IC MB3796PFV-G-BND-ER	

MAIN

Ref. No.	Part No.	Description	Remark
IC502	8-759-094-02	IC CXA8022N	
IC503	8-759-164-58	IC MCD002BM-TLM	
IC504	8-759-159-76	IC MM1138XQ	
IC505	8-759-168-66	IC RH5RE40AA-T1	
IC506	8-752-843-07	IC CXP80524-078R	
IC507	8-759-159-77	IC TK10502MT1	
IC508	8-752-352-24	IC CXD2605R	
IC509	8-759-031-84	IC SC7S04F	
IC510	8-752-343-47	IC CXK58257ATM-12LB	
IC511	8-759-031-84	IC SC7S04F	
IC2001	8-759-178-44	IC RN5VL33AA-T1	
		< JACK >	
J301	1-750-369-11	JACK (MIC)	
J302	1-750-370-11	JACK (LINE IN)	
J304	1-750-372-11	JACK (PHONES/LINE OUT)	
J501	1-750-368-11	JACK, DC (POLARITY UNIFIED TYPE) (DC IN 6V)	
		< COIL >	
L101-103			
	1-410-997-31	INDUCTOR CHIP 2.2uH	
L201-203			
	1-410-997-31	INDUCTOR CHIP 2.2uH	
L301	1-412-006-31	INDUCTOR CHIP 10uH	
L305	1-410-999-11	INDUCTOR CHIP 3.3uH	
L307	1-410-997-31	INDUCTOR CHIP 2.2uH	
L391	1-410-997-31	INDUCTOR CHIP 2.2uH	
L501	1-410-997-31	INDUCTOR CHIP 2.2uH	
L502	1-412-002-31	INDUCTOR CHIP 4.7uH	
L503	1-412-002-31	INDUCTOR CHIP 4.7uH	
L504	1-410-997-31	INDUCTOR CHIP 2.2uH	
L505	1-424-213-11	INDUCTOR 100uH	
L506	1-414-214-11	INDUCTOR 200uH	
L507	1-412-006-31	INDUCTOR CHIP 10uH	
L508	1-410-997-31	INDUCTOR CHIP 2.2uH	
L509	1-410-997-31	INDUCTOR CHIP 2.2uH	
L510	1-410-196-11	INDUCTOR CHIP 2.2uH	
L511	1-216-295-00	METAL CHIP 0 5% 1/10W	
L512	1-410-997-31	INDUCTOR CHIP 2.2uH	
L1001	1-410-997-31	INDUCTOR CHIP 2.2uH	
		< TRANSISTOR >	
Q102	8-729-400-55	TRANSISTOR 2SD1328-S	
Q106	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q202	8-729-400-55	TRANSISTOR 2SD1328-S	
Q206	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q301	8-729-141-48	TRANSISTOR 2SB624-BV345	
Q302	8-729-216-22	TRANSISTOR 2SA1162-G	
Q303	8-729-402-19	TRANSISTOR XN6501	
Q304	8-729-402-93	TRANSISTOR UN5214	
Q305	8-729-230-49	TRANSISTOR 2SC2712-YG	
Q306	8-729-159-65	TRANSISTOR 2SD596-DV5	
Q307	8-729-900-52	TRANSISTOR DTC114YK	
Q308	8-729-425-18	TRANSISTOR XN4504	
Q309	8-729-402-93	TRANSISTOR UN5214	
Q311	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q312	8-729-216-22	TRANSISTOR 2SA1162-G	
Q313	8-729-230-49	TRANSISTOR 2SC2712-YG	
Q314	8-729-402-19	TRANSISTOR XN6501	
Q316	8-729-402-93	TRANSISTOR UN5214	
Q317	8-729-427-83	TRANSISTOR XP6501	
Q318	8-729-427-83	TRANSISTOR XP6501	
Q331	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q332	8-729-216-22	TRANSISTOR 2SA1162-G	
Q333	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q334	8-729-230-60	TRANSISTOR 2SA1586-YG	
Q353	8-729-230-60	TRANSISTOR 2SA1586-YG	
Q354	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q355-357			
	8-729-402-93	TRANSISTOR UN5214	
Q361	8-729-216-22	TRANSISTOR 2SA1162-G	
Q362	8-729-402-19	TRANSISTOR XN6501	
Q363	8-729-216-22	TRANSISTOR 2SA1162-G	
Q364	8-729-402-19	TRANSISTOR XN6501	
Q365	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q366	8-729-402-32	TRANSISTOR 2SD1819A-R	
Q367	8-729-427-83	TRANSISTOR XP6501	
Q368	8-729-425-44	TRANSISTOR XP4315	
Q501	8-729-820-86	TRANSISTOR 2SB1121-ST	
Q502	8-729-820-86	TRANSISTOR 2SB1121-ST	
Q503	8-729-422-18	TRANSISTOR XN4315	
Q504	8-729-216-22	TRANSISTOR 2SA1162-G	
Q505	8-729-015-76	TRANSISTOR UN5211	
Q508	8-729-230-49	TRANSISTOR 2SC2712-YG	
Q509	8-729-230-49	TRANSISTOR 2SC2712-YG	
Q512	8-729-015-74	TRANSISTOR UN5111	
Q514	8-729-140-75	TRANSISTOR 2SD999-CLCK	
Q515	8-729-805-26	TRANSISTOR 2SB1121-T	
Q516	8-729-402-45	TRANSISTOR UN5212	
Q517	8-729-402-96	TRANSISTOR UN5114	
Q518	8-729-924-62	TRANSISTOR DTC113ZU	
Q519	8-729-216-22	TRANSISTOR 2SA1162-G	
Q2001	8-729-402-45	TRANSISTOR UN5212	
Q3001	8-729-420-50	TRANSISTOR UN5215	

Ref. No.	Part No.	Description			Remark
		< RESISTOR >			
R101	1-216-830-11	METAL CHIP	5.6K	5%	1/16W
R102	1-216-864-11	METAL CHIP	0	5%	1/16W
R103	1-218-740-11	METAL CHIP	100K	0.50%	1/16W
R104	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R105	1-216-821-11	METAL CHIP	1K	5%	1/16W
R106	1-216-830-11	METAL CHIP	5.6K	5%	1/16W
R108	1-218-724-11	METAL CHIP	22K	0.50%	1/16W
R109	1-216-809-11	METAL CHIP	100	5%	1/16W
R110	1-218-873-11	METAL CHIP	12K	0.50%	1/16W
R111	1-216-821-11	METAL CHIP	1K	5%	1/16W
R113	1-218-736-11	METAL CHIP	68K	0.50%	1/16W
R115	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R116	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R120	1-218-694-91	METAL CHIP	1.2K	0.50%	1/16W
R121	1-216-864-11	METAL CHIP	0	5%	1/16W
R122	1-218-672-11	METAL CHIP	150	0.50%	1/16W
R123	1-218-672-11	METAL CHIP	150	0.50%	1/16W
R127	1-216-804-11	METAL CHIP	39	5%	1/16W
R129	1-218-724-11	METAL CHIP	22K	0.50%	1/16W
R130	1-216-809-11	METAL CHIP	100	5%	1/16W
R132	1-216-802-11	METAL GLAZE	27	5%	1/16W
R133	1-216-848-11	METAL CHIP	180K	5%	1/16W
R136	1-216-817-11	METAL CHIP	470	5%	1/16W
R137	1-218-295-11	METAL CHIP	5.6K	0.50%	1/16W
R138	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R140	1-216-864-11	METAL CHIP	0	5%	1/16W
R151	1-218-670-11	METAL CHIP	120	0.50%	1/16W
R152	1-216-821-11	METAL CHIP	1K	5%	1/16W
R153	1-218-484-11	METAL CHIP	750	0.50%	1/16W
R155	1-218-695-11	METAL CHIP	1.3K	0.50%	1/16W
R156	1-216-804-11	METAL CHIP	39	5%	1/16W
R157	1-216-841-11	METAL CHIP	47K	5%	1/16W
R158	1-216-821-11	METAL CHIP	1K	5%	1/16W
R159	1-216-821-11	METAL CHIP	1K	5%	1/16W
R160	1-218-700-11	METAL CHIP	2.2K	0.50%	1/16W
R162	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R164	1-216-821-11	METAL CHIP	1K	5%	1/16W
R173	1-216-845-11	METAL CHIP	100K	5%	1/16W
R174	1-216-837-11	METAL CHIP	22K	5%	1/16W
R177	1-216-833-11	METAL CHIP	10K	5%	1/16W
R178	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R179	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R180	1-216-809-11	METAL CHIP	100	5%	1/16W
R181	1-216-833-11	METAL CHIP	10K	5%	1/16W
R201	1-216-830-11	METAL CHIP	5.6K	5%	1/16W
R202	1-216-864-11	METAL CHIP	0	5%	1/16W
R203	1-218-740-11	METAL CHIP	100K	0.50%	1/16W

Ref. No.	Part No.	Description			Remark
R204	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R205	1-216-821-11	METAL CHIP	1K	5%	1/16W
R206	1-216-830-11	METAL CHIP	5.6K	5%	1/16W
R208	1-218-724-11	METAL CHIP	22K	0.50%	1/16W
R209	1-216-809-11	METAL CHIP	100	5%	1/16W
R210	1-218-873-11	METAL CHIP	12K	0.50%	1/16W
R211	1-216-821-11	METAL CHIP	1K	5%	1/16W
R213	1-218-736-11	METAL CHIP	68K	0.50%	1/16W
R215	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R216	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R220	1-218-694-11	METAL CHIP	1.2K	0.50%	1/16W
R221	1-216-864-11	METAL CHIP	0	5%	1/16W
R222	1-218-672-11	METAL CHIP	150	0.50%	1/16W
R223	1-218-672-11	METAL CHIP	150	0.50%	1/16W
R227	1-216-804-11	METAL CHIP	39	5%	1/16W
R229	1-218-724-11	METAL CHIP	22K	0.50%	1/16W
R230	1-216-809-11	METAL CHIP	100	5%	1/16W
R232	1-216-802-11	METAL GLAZE	27	5%	1/16W
R233	1-216-848-11	METAL CHIP	180K	5%	1/16W
R236	1-216-817-11	METAL CHIP	470	5%	1/16W
R237	1-218-295-11	METAL CHIP	5.6K	0.50%	1/16W
R238	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R240	1-216-864-11	METAL CHIP	0	5%	1/16W
R251	1-218-670-11	METAL CHIP	120	0.50%	1/16W
R252	1-216-821-11	METAL CHIP	1K	5%	1/16W
R253	1-218-484-11	METAL CHIP	750	0.50%	1/16W
R255	1-218-695-11	METAL CHIP	1.3K	0.50%	1/16W
R256	1-216-804-11	METAL CHIP	39	5%	1/16W
R257	1-216-841-11	METAL CHIP	47K	5%	1/16W
R258	1-216-821-11	METAL CHIP	1K	5%	1/16W
R259	1-216-821-11	METAL CHIP	1K	5%	1/16W
R260	1-218-700-11	METAL CHIP	2.2K	0.50%	1/16W
R262	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R264	1-216-821-11	METAL CHIP	1K	5%	1/16W
R273	1-216-845-11	METAL CHIP	100K	5%	1/16W
R274	1-216-837-11	METAL CHIP	22K	5%	1/16W
R277	1-216-833-11	METAL CHIP	10K	5%	1/16W
R278	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R279	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R280	1-216-809-11	METAL CHIP	100	5%	1/16W
R281	1-216-833-11	METAL CHIP	10K	5%	1/16W
R301	1-216-815-11	METAL CHIP	330	5%	1/16W
R304	1-216-841-11	METAL CHIP	47K	5%	1/16W
R305	1-216-845-11	METAL CHIP	100K	5%	1/16W
R306	1-216-853-11	METAL CHIP	470K	5%	1/16W
R307	1-216-821-11	METAL CHIP	1K	5%	1/16W
R308	1-216-821-11	METAL CHIP	1K	5%	1/16W
R309	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R310	1-218-732-11	METAL CHIP	47K	0.50%	1/16W

MAIN

Ref. No.	Part No.	Description				Remark
R312	1-216-834-11	METAL CHIP	12K	5%	1/16W	
R313	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R314	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R315	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R316	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R317	1-216-851-11	METAL CHIP	330K	5%	1/16W	
R318	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R319	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R320	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R321	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R322	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R323	1-216-864-11	METAL CHIP	0	5%	1/16W	
R327	1-164-156-11	CERAMIC CHIP	0.1uF			25V
R330	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R331	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R332	1-216-827-11	METAL CHIP	3.3K	5%	1/16W	
R334	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R336	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R337	1-216-001-00	METAL CHIP	10	5%	1/10W	
R338	1-216-864-11	METAL CHIP	0	5%	1/16W	
R342	1-216-834-11	METAL CHIP	12K	5%	1/16W	
R343	1-216-848-11	METAL CHIP	180K	5%	1/16W	
R344	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R351	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R352	1-216-854-11	METAL CHIP	560K	5%	1/16W	
R353	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W	
R355	1-216-854-11	METAL CHIP	560K	5%	1/16W	
R356	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R357	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W	
R358	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R359	1-216-857-11	METAL CHIP	1M	5%	1/16W	
R360	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R361	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R365	1-216-001-00	METAL CHIP	10	5%	1/10W	
R366	1-216-809-11	METAL CHIP	100	5%	1/16W	
R371	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R372	1-216-854-11	METAL CHIP	560K	5%	1/16W	
R373	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R374	1-216-827-11	METAL CHIP	3.3K	5%	1/16W	
R375	1-216-857-11	METAL CHIP	1M	5%	1/16W	
R376	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R377	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R378	1-216-809-11	METAL CHIP	100	5%	1/16W	
R379	1-216-834-11	METAL CHIP	12K	5%	1/16W	
R380	1-216-848-11	METAL CHIP	180K	5%	1/16W	
R381	1-216-830-11	METAL CHIP	5.6K	5%	1/16W	
R382	1-216-834-11	METAL CHIP	12K	5%	1/16W	
R383	1-216-829-11	METAL CHIP	4.7K	5%	1/16W	
R384	1-216-848-11	METAL CHIP	180K	5%	1/16W	

Ref. No.	Part No.	Description				Remark
R385	1-216-823-11	METAL CHIP	1.5K	5%	1/16W	
R386	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R387	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R389	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R390	1-218-732-11	METAL CHIP	47K	0.50%	1/16W	
R392-395	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R396	1-218-295-11	METAL CHIP	5.6K	0.50%	1/16W	
R397	1-216-839-11	METAL CHIP	33K	5%	1/16W	
R398	1-216-809-11	METAL CHIP	100	5%	1/16W	
R399	1-216-809-11	METAL CHIP	100	5%	1/16W	
R400	1-216-849-11	METAL CHIP	220K	5%	1/16W	
R401	1-216-809-11	METAL CHIP	100	5%	1/16W	
R402	1-216-809-11	METAL CHIP	100	5%	1/16W	
R501	1-216-794-11	METAL CHIP	5.6	5%	1/16W	
R502	1-216-828-11	METAL CHIP	3.9K	5%	1/16W	
R503	1-216-813-11	METAL CHIP	220	5%	1/16W	
R504	1-216-830-11	METAL CHIP	5.6K	5%	1/16W	
R505	1-216-794-11	METAL CHIP	5.6	5%	1/16W	
R506	1-216-794-11	METAL CHIP	5.6	5%	1/16W	
R508	1-216-843-11	METAL CHIP	68K	5%	1/16W	
R509	1-216-811-11	METAL CHIP	150	5%	1/16W	
R510	1-216-843-11	METAL CHIP	68K	5%	1/16W	
R511	1-216-840-11	METAL CHIP	39K	5%	1/16W	
R512-514	1-216-834-11	METAL CHIP	12K	5%	1/16W	
R516	1-216-023-00	METAL CHIP	82	5%	1/10W	
R517	1-216-813-11	METAL CHIP	220	5%	1/16W	
R518	1-217-806-11	METAL GLAZE	1	5%	1/8W	
R519	1-217-806-11	METAL GLAZE	1	5%	1/8W	
R520	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R521	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R522	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R523	1-216-832-11	METAL CHIP	8.2K	5%	1/16W	
R524	1-216-828-11	METAL CHIP	3.9K	5%	1/16W	
R525	1-216-844-11	METAL CHIP	82K	5%	1/16W	
R526	1-216-843-11	METAL CHIP	68K	5%	1/16W	
R527	1-216-829-11	METAL CHIP	4.7K	5%	1/16W	
R528	1-216-826-11	METAL CHIP	2.7K	5%	1/16W	
R529	1-218-734-11	METAL CHIP	56K	0.50%	1/16W	
R530	1-216-826-11	METAL CHIP	2.7K	5%	1/16W	
R531	1-216-825-11	METAL CHIP	2.2K	5%	1/16W	
R533	1-218-748-11	METAL CHIP	220K	0.50%	1/16W	
R534	1-218-748-11	METAL CHIP	220K	0.50%	1/16W	
R535-539	1-216-837-11	METAL CHIP	22K	5%	1/16W	
R540-542	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R544	1-216-833-11	METAL CHIP	10K	5%	1/16W	

Ref. No.	Part No.	Description			Remark
R545	1-216-801-11	METAL CHIP	22	5%	1/16W
R546	1-216-833-11	METAL CHIP	10K	5%	1/16W
R547	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R548	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R549	1-216-833-11	METAL CHIP	10K	5%	1/16W
R550	1-216-174-00	METAL GLAZE	100	5%	1/8W
R551	1-216-839-11	METAL CHIP	33K	5%	1/16W
R552	1-216-834-11	METAL CHIP	12K	5%	1/16W
R553	1-218-676-11	METAL CHIP	220	0.50%	1/16W
R554	1-216-839-11	METAL CHIP	33K	5%	1/16W
R555	1-216-811-11	METAL CHIP	150	5%	1/16W
R556	1-216-818-11	METAL CHIP	560	5%	1/16W
R557	1-216-818-11	METAL CHIP	560	5%	1/16W
R558	1-218-676-11	METAL CHIP	220	0.50%	1/16W
R559	1-218-740-11	METAL CHIP	100K	0.50%	1/16W
R560	1-216-817-11	METAL CHIP	470	5%	1/16W
R561	1-216-821-11	METAL CHIP	1K	5%	1/16W
R564	1-216-864-11	METAL CHIP	0	5%	1/16W
R565	1-216-843-11	METAL CHIP	68K	5%	1/16W
R566	1-216-817-11	METAL CHIP	470	5%	1/16W
R567	1-216-837-11	METAL CHIP	22K	5%	1/16W
R568	1-216-809-11	METAL CHIP	100	5%	1/16W
R569	1-216-841-11	METAL CHIP	47K	5%	1/16W
R570-572					
	1-216-809-11	METAL CHIP	100	5%	1/16W
R573	1-216-841-11	METAL CHIP	47K	5%	1/16W
R574	1-216-817-11	METAL CHIP	470	5%	1/16W
R575	1-216-845-11	METAL CHIP	100K	5%	1/16W
R576	1-216-833-11	METAL CHIP	10K	5%	1/16W
R577	1-216-845-11	METAL CHIP	100K	5%	1/16W
R578	1-216-842-11	METAL CHIP	56K	5%	1/16W
R579	1-216-838-11	METAL CHIP	27K	5%	1/16W
R580	1-216-838-11	METAL CHIP	27K	5%	1/16W
R581	1-216-835-11	METAL CHIP	15K	5%	1/16W
R582	1-216-794-11	METAL CHIP	5.6	5%	1/16W
R583	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R584	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R585	1-218-873-11	METAL CHIP	12K	0.50%	1/16W
R586	1-218-732-11	METAL CHIP	47K	0.50%	1/16W
R587	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R588	1-216-819-11	METAL CHIP	680	5%	1/16W
R589	1-216-849-11	METAL CHIP	220K	5%	1/16W
R590	1-216-849-11	METAL CHIP	220K	5%	1/16W
R592	1-216-843-11	METAL CHIP	68K	5%	1/16W
R593	1-216-843-11	METAL CHIP	68K	5%	1/16W
R596-598					
	1-216-845-11	METAL CHIP	100K	5%	1/16W
R599	1-216-854-11	METAL CHIP	560K	5%	1/16W
R600	1-216-829-11	METAL CHIP	4.7K	5%	1/16W

Ref. No.	Part No.	Description			Remark
R601	1-216-833-11	METAL CHIP	10K	5%	1/16W
R602	1-216-812-11	METAL CHIP	180	5%	1/16W
R608	1-216-816-11	METAL CHIP	390	5%	1/16W
R609	1-216-849-11	METAL CHIP	220K	5%	1/16W
R610	1-216-837-11	METAL CHIP	22K	5%	1/16W
R611	1-216-838-11	METAL CHIP	27K	5%	1/16W
R614	1-216-841-11	METAL CHIP	47K	5%	1/16W
R2001	1-216-845-11	METAL CHIP	100K	5%	1/16W
R2002	1-216-854-11	METAL CHIP	560K	5%	1/16W
R2003	1-216-845-11	METAL CHIP	100K	5%	1/16W
R2004	1-216-851-11	METAL CHIP	330K	5%	1/16W
R2005	1-216-844-11	METAL CHIP	82K	5%	1/16W
R3001	1-216-837-11	METAL CHIP	22K	5%	1/16W
R3002	1-216-841-11	METAL CHIP	47K	5%	1/16W
R3003	1-216-821-11	METAL CHIP	1K	5%	1/16W

< VARIABLE RESISTOR >

RV301	1-223-361-11	RES, VAR, CARBON 20K/20K (REC LEVEL)
RV501	1-238-667-21	RES, ADJ, CERMET 100K

< SWITCH >

S301	1-571-277-11	SWITCH, SLIDE (MIC SENS)
S302	1-571-506-41	SWITCH, SLIDE (REC MODE)
S501	1-571-275-31	SWITCH, SLIDE (SP/LP)

< VIBRATOR >

X501	1-579-924-11	VIBRATOR, CRYSTAL (CHIP TYPE) (9.408MHz)
X502	1-579-924-11	VIBRATOR, CRYSTAL (CHIP TYPE) (9.408MHz)
X503	1-579-923-11	VIBRATOR, CRYSTAL (CHIP TYPE) (22.5792MHz)
X504	1-579-922-11	VIBRATOR, CRYSTAL (CHIP TYPE) (24.576MHz)

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TRANSFORMER

Ref.No.	Part No.	Description			Remark
*		TRANSFORMER BOARD (SUPPLIED WITH MAIN BOARD, COMPLETE)			
		**********			
		< CAPACITOR >			
C589	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C590	1-164-234-11	CERAMIC CHIP	1uF		10V
C612	1-125-507-11	DOUBLE LAYERS	0.22F		5.5V
		< TRANSFORMER >			
IVT501	1-423-601-11	TRANSFORMER, OSCILLATION			
		< TRANSISTOR >			
Q513	8-729-120-28	TRANSISTOR	2SC1623-L5L6		
		< RESISTOR >			
R562	1-216-821-11	METAL CHIP	1K	5%	1/16W
R563	1-218-736-11	METAL CHIP	68K	0.50%	1/16W

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