SONY

3002442
SONY BDA
PCMF1

DIGITAL AUDIO PROCESSOR
PCM-F1



OPERATING INSTRUCTIONS Page 2

Before operating the unit, please read this manual thoroughly.
This manual should be retained for future reference.

MODE D'EMPLOI Page 26

Avant la mise en service de l'appareil, lire attentivement ce mode d'emploi.
Conserver ce manuel pour toute référence ultérieure.

BEDIENUNGSANLEITUNG Seite 50

Lesen Sie vor der Inbetriebnahme des Geräts diese Bedienungsanleitung sorgfältig durch, und bewahren Sie sie zum späteren Nachschlagen gut auf.

MANUAL DE INSTRUCCIONES Pàgina 74

Antes de utilizar la unidad, lea detenidamente este manual, y consérvelo para futuras referencias.

photocopy for service-use only

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5501

English

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

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FEATURES

In conventional analog recording systems, the quality of sound reproduction depends upon the properties of magnetic tape and heads, so that it is virtually impossible to bypass the inherent limitations of conventional analog recording, including its limited dynamic range and frequency response, and its associated distortion.
The Pulse Code Modulation (PCM) system points the way to a new era in sound reproduction. It can offer performance and fidelity far superior to any analog system.
In the PCM system, sound levels are converted to a series of binary codes. This information is recorded as digital pulses of equal amplitude. In playback, all that has to be done is to discriminate between the presence and absence of a pulse. The quality of recording and playback is thus not dependent on the characteristics of tape and heads.
The PCM-F1 is the newest addition to Sony's line of PCM digital audio processors for consumer applications. With the PCM-F1, hi-fi sound reproduction with wide dynamic range, minimal distortion, low wow and flutter (lower than the measurable limit), and flat frequency response is achieved. Listening to the reproduction of your PCM-F1 is just like being in the concert hall.

Compact, lightweight PCM digital audio processor
In conventional digital audio processors, several hundreds of ICs are employed in digital processing circuitry, which makes it difficult to make the unit compact and lightweight.
The three new LSIs for digital processing developed especially for digital audio processor use have successfully made the PCM-F1 compact and lightweight. The A/D (analog-to-digital) and D/A (digital-to-analog) converters, which are newly developed monolithic ICs, are especially adaptable to mass production. This results in the production of a PCM digital audio processor that is more affordable to a greater proportion of audiophiles.

Resolution selector for recording and playback with wider dynamic range and less distortion
The PCM-F1 was developed in accordance with the technical specifications of the Electronic Industries Association of Japan (EIAJ), which has adopted the 14-bit linear quantization format. In addition, the unit has the capability of recording and playing back in accordance with the 16-bit linear quantization format with wider dynamic range and less distortion than the 14-bit format. The 14-bit and 16-bit formats can be selected with the RES (resolution) selector.

Three different power sources
The unit can be operated on three different power sources: house current using the supplied ac power adaptor, optional rechargeable battery pack, and 12 V car battery using an optional car battery cord. When this compact, lightweight PCM-F1 is combined with the Sony SL-F1 series portable video cassette recorder, you can make a live field recording with wide dynamic range, minimal distortion, and flat frequency response.

Stable power supply
Two dc-to-dc converters incorporated in the unit—one (± 5 V) for the digital circuitry and the other (±15 V) for the analog circuitry—assure stable power supply.

Easy tracking adjustment of video heads
Correct tracking adjustment of the video heads can be easily performed by observing a meter.

Muting switch for continuous sound reproduction
With the MUTING switch set to OFF, the reproduced sound is not cut off even if many dropouts occur, or if the tape is not being transported at the proper playback speed.

Record muting function allows you to easily insert a blank space between selections.

Multi-generation digital-to-digital tape copy can be performed with absolutely no deterioration in signal quality.

With the highly perfected error detection and correction circuits incorporated, the reproduced sound quality is not affected by dropout errors.

You can choose either of two ways to have the peak level indicated on the LED peak program meters.

Microphone head amplifiers are incorporated for recording directly from microphones and provide excellent sound quality.

OPERATING VOLTAGE OF THE SUPPLIED AC POWER ADAPTOR

Before connecting the supplied ac power adaptor to the power source, check that the operating voltage of your unit is the same as the local power line voltage.

The Continental European model (type 1) operates on 220 V ac (or 240 V ac adjustable by authorized Sony personnel).

The United Kingdom model (type 2) operates on 240 V ac (or 220 V ac adjustable by authorized Sony personnel).

TURNING THE AC POWER ADAPTOR ON AND OFF

The POWER switch on the rear panel of the ac power adaptor is the mains power on/off switch. To turn on the ac power adaptor, set the POWER switch to ON first and depress the ON/STANDBY switch. When the POWER switch is set to OFF, the power supply to the unit is shut off so that the unit is not turned on even if the ON/STANDBY switch is depressed.

For the Customers in the United Kingdom

Important

The wires in this mains lead are coloured in accordance with the following code.

Blue: Neutral

Brown: Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black. The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

PRECAUTIONS

On color broadcasting systems

The unit is designed to be used with a video cassette recorder using the PAL or SECAM color standard. Recording and playback with a recorder based on other color systems cannot be done.

On safety

- Operate the unit only on 12 V dc.

For ac operation, use only the ac power adaptor supplied with the unit. Do not use any other ac power adaptor.

For car battery operation, use only the car battery cord recommended for this unit. Do not use any other car battery cord.

- The nameplate indicating operating voltage, power consumption, etc. is located on the bottom.
- Should any liquid or solid object fall into the cabinet of the unit or the ac power adaptor, unplug the units and have them checked by qualified personnel before operating them any further.
- Unplug the ac power adaptor from the wall outlet if it is not to be used for an extended period of time. To disconnect the cord, pull it out by grasping the plug. Never pull the cord itself.

On installation

- Do not install the unit and the ac power adaptor in a location near heat sources such as radiators or air ducts, or in a place subject to direct sunlight, excessive dust, mechanical vibration or shock.
- Good air circulation is essential to prevent internal heat build-up in the unit and the ac power adaptor. Place these units in a location with adequate air circulation. Do not place the ac power adaptor on a soft surface, such as a rug, that would block the ventilation slots on the bottom.
- Do not place anything on top of the cabinets. The top ventilation slots of the ac power adaptor must be unobstructed for proper operation of the unit and to prolong the life of its components.

On operation

- Before making connections, be sure to turn off each component.
- The PCM digital audio processor incorporates a shield which suppresses the radiation of the high-frequency signal used in the pulse-code modulation process. However, the unit may still possibly interfere with an AM/FM tuner or a television set. If reception interference occurs, move the unit away from the affected component.
- The muting circuitry of the unit may activate if a vacuum cleaner, electric shaver, transceiver or similar device causes interference.
- When the unit is not being used, turn the power off to conserve energy and to extend the life of your unit.

On cleaning

Clean the cabinet, panel and controls with a soft cloth lightly moistened with mild detergent solution. Do not use any type of abrasive pad, scouring powder or solvent such as alcohol or benzine.

On repacking

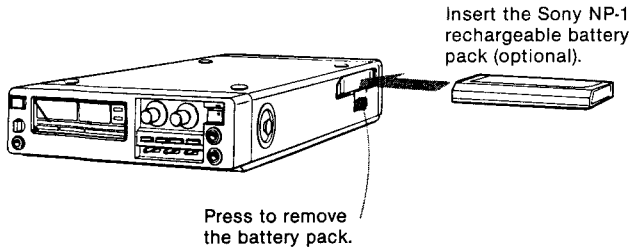
Do not throw away the carton and the packing material. It makes an ideal container to transport the unit. When shipping the unit for repair work or to another location, repack it as illustrated on the carton box.

If you have any questions or problems concerning your unit, please contact your nearest Sony dealer.

POWER SOURCES

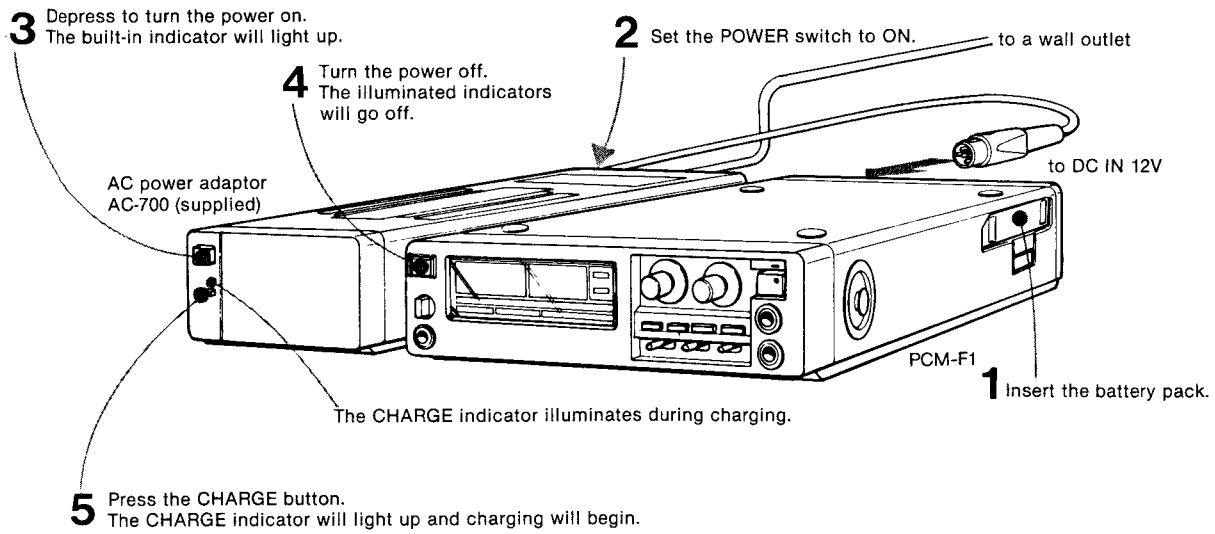
The unit can be operated on any one of the following power sources:
—AC power supply using the AC-700 ac power adaptor (supplied)
—Sony NP-1 rechargeable battery pack (optional)
—12 V car battery using the Sony DCC-2500 car battery cord (optional)

FOR OUTDOOR USE—USING THE RECHARGEABLE BATTERY PACK



Before operating the unit, be sure to recharge the battery pack.

Recharging the battery pack

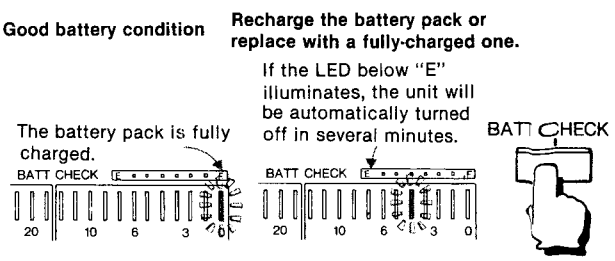


The charging time is about 1 hour at normal temperatures. When the battery pack is fully charged, the charging will stop automatically and the CHARGE indicator will go off.

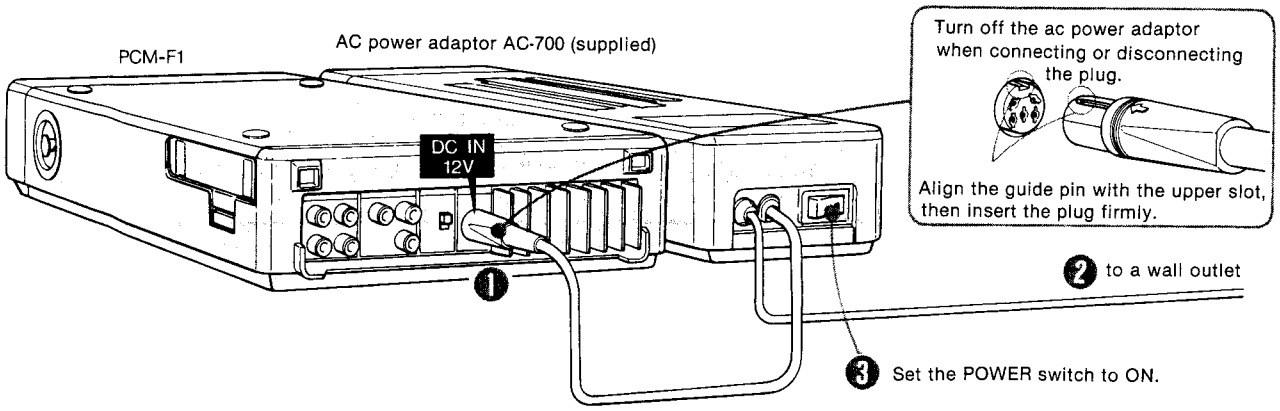
Battery life
At normal temperatures, a fully-charged battery provides 1 hour of continuous operation of the unit.

Important points to remember
- Be sure to prepare spare battery packs, since you may make recordings for a longer time than you intended. A fully-charged battery pack powers the unit for about an hour.
- If an external power source is connected to this unit with the battery pack installed in the unit, the external power source has priority over the battery pack, and the battery pack will be disconnected.
- If the ON switch of this unit is pressed while the battery pack is being charged, the charging will stop and the unit will be turned on.

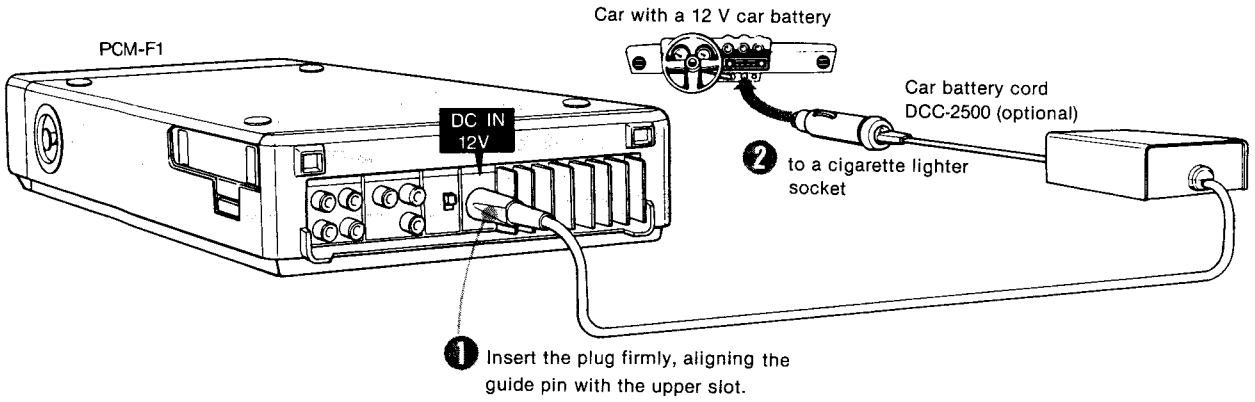
To check the battery pack condition
Turn on the unit, keep the BATT CHECK button depressed and observe the upper LED meter.



FOR INDOOR USE—USING THE AC POWER ADAPTOR



FOR USE IN A CAR—USING THE CAR BATTERY CORD



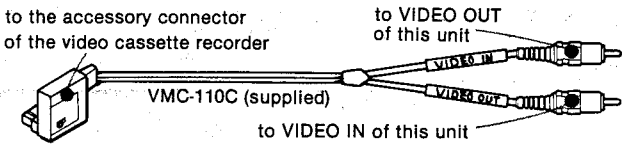
For details, refer to the instruction manual of the car battery cord. This unit has a relatively high power consumption for a portable unit. Be careful that the car battery does not become completely discharged.

SYSTEM CONNECTIONS

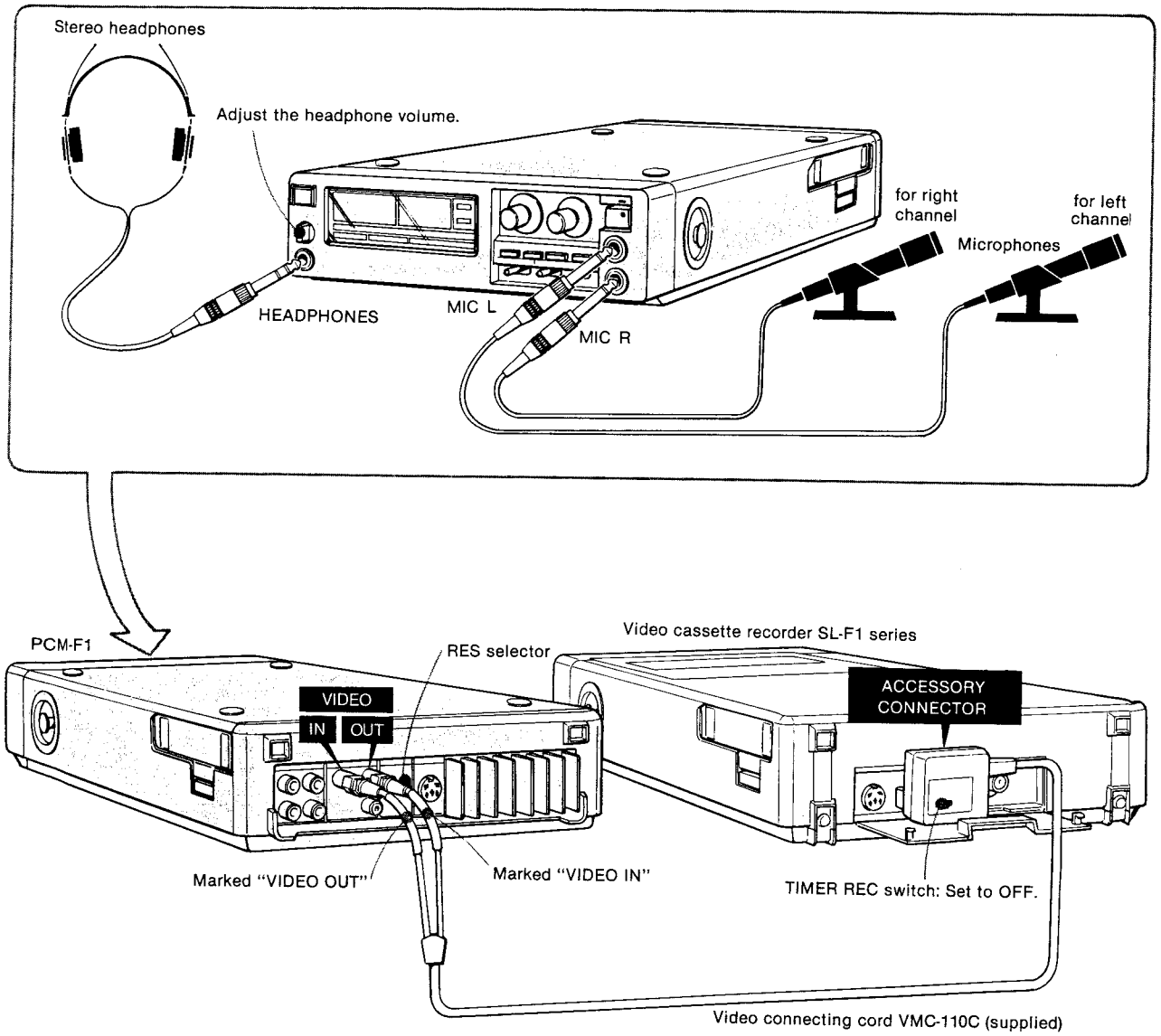
CONNECTION NOTES

- Turn off the amplifier before making connections.
- The supplied connecting cords with red and white plugs are for audio signals, and those with yellow plugs are for video signals.
- Be sure to connect the red plug of the supplied audio connecting cord to the right-channel [R] jack and the white plug to the left-channel [L] jack.
- To connect the unit with the Sony SL-F1 series video cassette recorder, use the supplied VMC-110C video connecting cord. To connect the unit with a video cassette recorder other than the SL-F1 series, use the supplied video connecting cords with a BNC-type plug and a phono plug.

The yellow plugs of the VMC-110C are labelled to indicate the signal flow. The plug labelled VIDEO IN should be connected to the VIDEO OUT jack of this unit and the one labelled VIDEO OUT to the VIDEO IN jack.



CONNECTION WITH THE SONY SL-F1 SERIES VIDEO CASSETTE RECORDER (FOR OUTDOOR LIVE RECORDING)

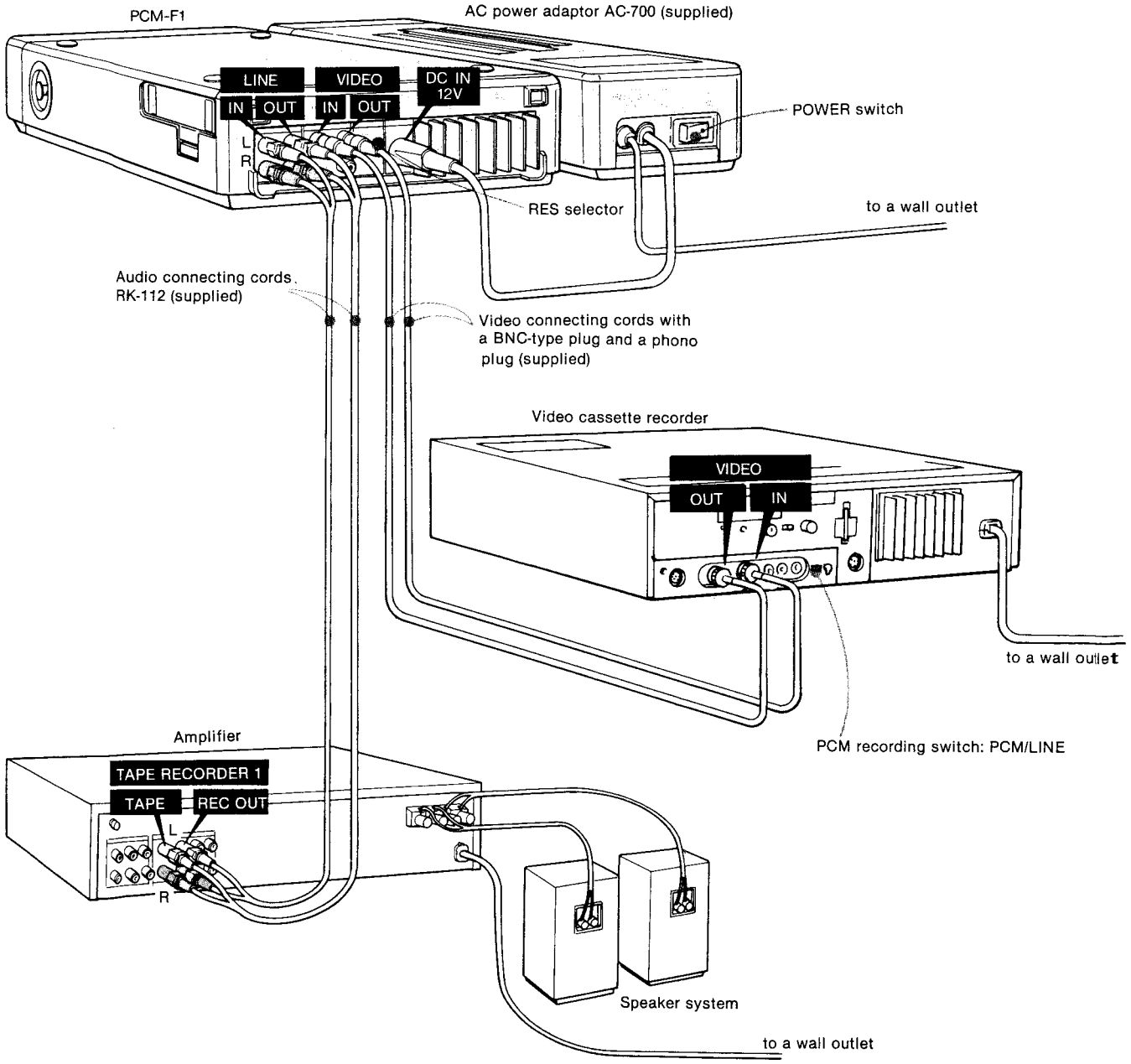


For indoor use with the Sony SL-F1 series recorder and additional audio components, refer to "Connection with the Sony SL-F1 series video cassette recorder for indoor use" on page 19.

● The cable connectors should be fully inserted into the jacks. A loose connection may cause hum and noise.
● Keep the connecting cords away from the power cords or speaker cords to avoid hum pick-up, and maintain a moderate separation between the connecting cords and any antenna lead-in to avoid possible noise pick-up. Keep the cables as short as practical.
● We recommend using the Sony SL-F1 series portable video cassette recorder or any other Sony video cassette recorder. Also, we recommend the use of L-500, L-250 and L-125 video tapes but not longer tapes, for optimum results.

● For detailed information about connections of the video cassette recorder and amplifier, refer to the instruction manual supplied with each unit.

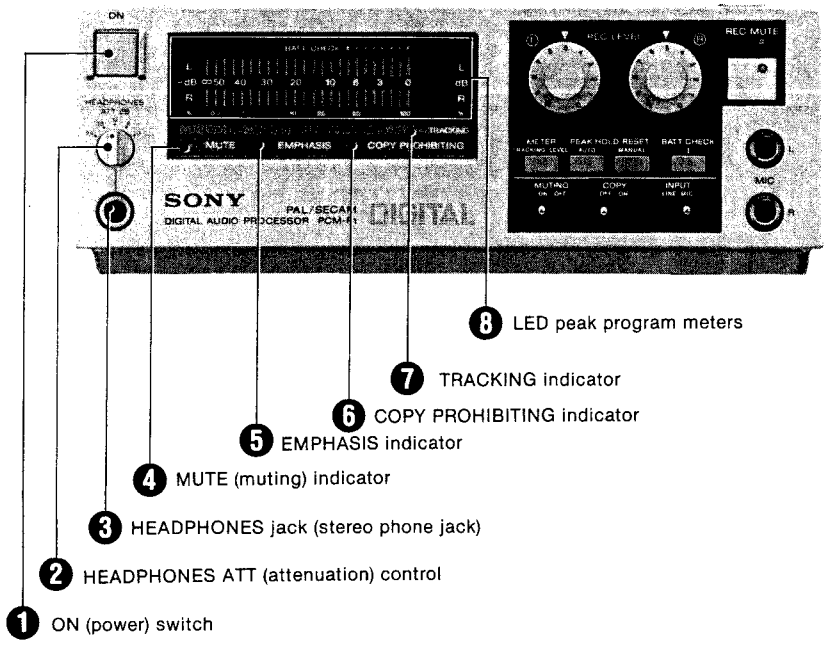
CONNECTION WITH A VIDEO CASSETTE RECORDER OTHER THAN THE SL-F1 SERIES



LOCATION AND FUNCTION OF CONTROLS

Before plugging in or attempting to operate the unit, we suggest that you familiarize yourself with all its switches and controls. Each number in the photo is keyed to the descriptive text.

FRONT PANEL



❶ ON (power) switch
Press to turn on the power. The LED peak program meters will illuminate. To turn the power off, press the switch again.

❷ HEADPHONES ATT (attenuation) control
This control adjusts the volume at the headphones. At the "0" position, the rated output is obtained. When this control is set to the "6" position, the level is reduced by 6 dB, and by setting it to "12", "18" or "24", the level is reduced by that amount of decibels from the rated output obtained at the "0" position.

❸ HEADPHONES jack (stereo phone jack)
Headphones may be inserted either to monitor the input signals to be recorded or to listen to a recording in the playback mode.

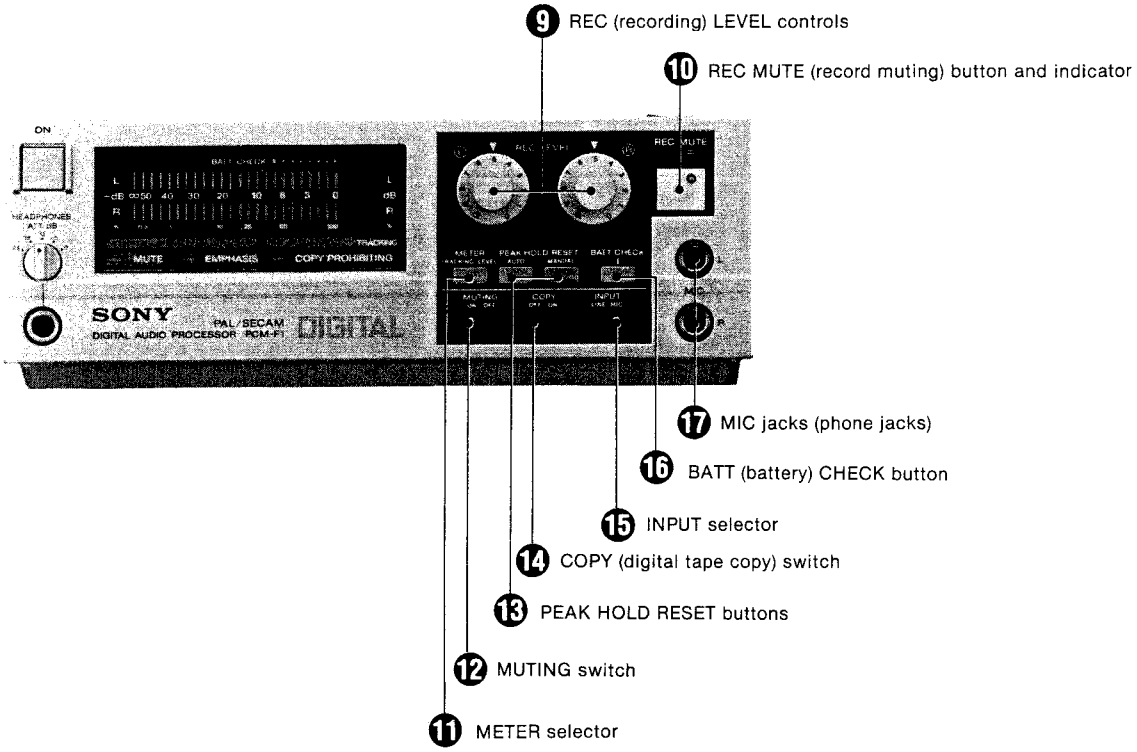
❹ MUTE (muting) indicator
If the video cassette recorder is not transporting tape at the proper playback speed (for example, when the tape first begins to move), or if many dropouts occur, this indicator will light up. When the indicator lights up with the MUTING switch set to ON, the muting circuit will activate.

❺ EMPHASIS indicator
When recording and playback are made with this unit, the emphasis circuit incorporated in the unit activates during recording (pre-emphasis) and playback (de-emphasis) and the EMPHASIS indicator illuminates.
When a tape recorded without pre-emphasis with a PCM digital audio processor other than this unit is played back with this unit, the EMPHASIS indicator will not illuminate.

❻ COPY PROHIBITING indicator
When a tape with a tape copy prohibiting code is played back, this indicator will light up to show that a digital tape copy cannot be made.

❼ TRACKING indicator
When you press the METER selector, the lower LED peak program meter will be changed to a tracking meter, and the TRACKING indicator will light up.

❽ LED peak program meters
These meters show the peak input level of each channel during recording, and the recorded level during playback. They follow the transient peaks of high-level inputs that are too brief to be followed by conventional VU meters so that the optimum recording level can be accurately set. For easy reading, the meters hold the highest peak while indicating the varying levels lower than the peak.
While the BATT CHECK button is kept depressed, the upper meter for the left (L) channel shows the battery pack condition.
When the METER selector is pressed, the lower meter for the right (R) channel shows the tracking condition of the video cassette recorder.



9 REC (recording) LEVEL controls
These controls adjust the recording level. The left knob is for the left channel and the right knob for the right channel.

10 REC MUTE (record muting) button and indicator
Keep this button depressed to eliminate unwanted material and to insert a blank space during recording. While the button is kept depressed, the REC MUTE indicator will illuminate.
See "Record muting" on page 13.

11 METER selector
Press to turn the LED peak program meters into a tracking meter. Each time the selector is pressed, the function of the meter will change.

12 MUTING switch
Normally set this switch to ON.
If the video cassette recorder is not transporting tape at the proper playback speed, or if many dropouts occur due to the mistracking of the video heads of the video cassette recorder, or due to scratches and dust on the magnetic tape, the muting circuit will activate and the reproduced sound will be cut off.
If you do not want the reproduced sound to be cut off by the muting circuit, set the switch to OFF.
See "How to use the MUTING switch" on page 14.

13 PEAK HOLD RESET buttons
You can choose either of two ways to have the peak level indicated:
When the AUTO button is pressed, successive peaks are held for about 1.7 seconds, except when a higher peak occurs before 1.7 seconds have passed, in which case that peak is immediately indicated. When the power is first turned on, the AUTO peak indication mode will automatically operate.

When the MANUAL button is pressed, the peak level will be held on the scale until a higher peak occurs, and that peak will be held. To reset the peak held on the meter, just press this button. You will find this method of indicating the peak input useful when you want to know the highest peak of a tape or disc, or when you want to know both the highest peak as well as the intermittent input levels during live recording.

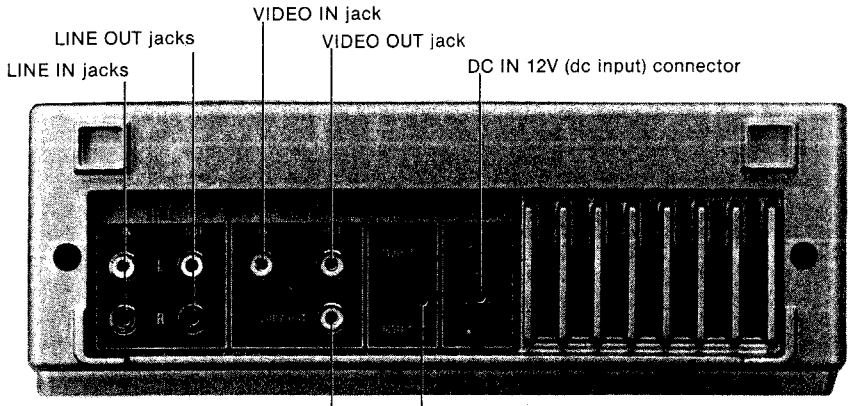
14 COPY (digital tape copy) switch
Set this switch to ON for digital-to-digital tape copy, with absolutely no deterioration in signal quality, using a pair of video cassette recorders and the COPY OUT jack at the rear.
Be sure to set this switch to OFF except during digital tape copy.
With this switch set at the ON position, no signal is obtained at the VIDEO OUT jack.
See "DIGITAL TAPE COPY" on page 15.

15 INPUT selector
LINE: to record through the LINE IN jacks at the rear.
MIC: to record through the MIC jacks.

16 BATT (battery) CHECK button
While this button is kept depressed, the upper meter shows the battery pack condition.

17 MIC jacks (phone jacks)
Any low-impedance microphone equipped with a phone plug may be used. If your microphone is equipped with a mini plug, you will need a plug adaptor.

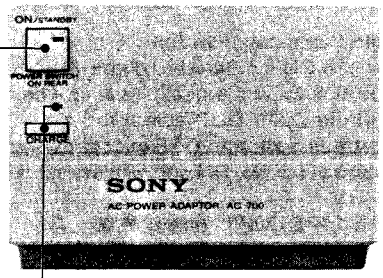
REAR PANEL



RES (resolution) selector
Selects the resolution for recording.
14 BIT: for recording in accordance with the technical specifications of the Electronic Industries Association of Japan (EIAJ) which has adopted the 14-bit linear quantization format.
Set the selector to this position when the tape recorded with this unit is to be played back using another PCM digital audio processor which conforms to the 14-bit quantization format of the EIAJ.
16 BIT: for recording and playing back using this unit with a wider dynamic range and less distortion.
Normally set the selector to this position.
During playback, it is not necessary to select the position of this selector, since the 14-bit or 16-bit format used for recording is automatically selected.
For detailed information, refer to page 24.

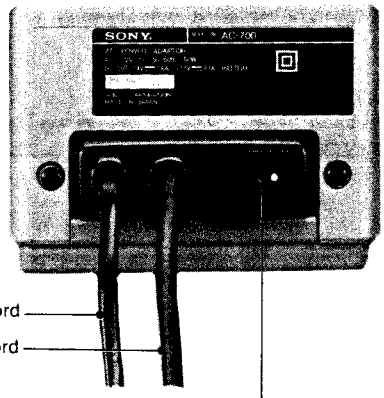
COPY OUT (tape copy output) jack
To perform digital-to-digital tape copy, connect this jack with the video input jack of the video cassette recorder for recording so that when the COPY switch is set to ON, playback signals in which errors are corrected and/or concealed are obtained.
Be sure not to use this jack except during digital tape copy. Normal recording and playback cannot be performed using this jack.

AC POWER ADAPTOR AC-700 (SUPPLIED)



CHARGE button and indicator
Press to start charging the battery pack.
The indicator illuminates during charging.

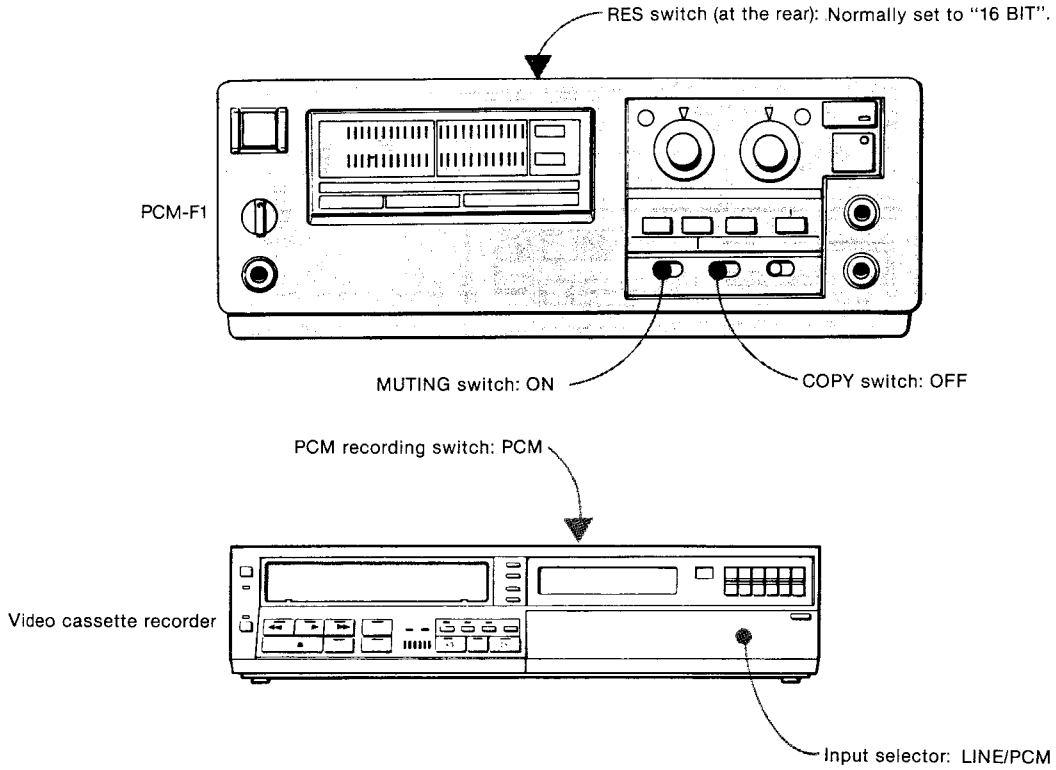
ON/STANDBY switch and indicator
Depress to turn on the unit after setting the POWER switch to ON. The built-in indicator will light up. Press the switch again so that the unit is in the standby mode. The indicator will go off.



POWER switch
Set this switch to ON to supply ac (mains) power to the unit. Set it to OFF to cut the ac power completely.

PREPARATION

For detailed information about the operation of the video cassette recorder, refer to its instruction manual.



Important points to remember

- The COPY switch should be used only for digital-to-digital tape copy.

For normal recording and playback, be sure to set the COPY switch to OFF.

When the switch is set to ON, recording cannot be made and reproduced sound may be somewhat distorted.

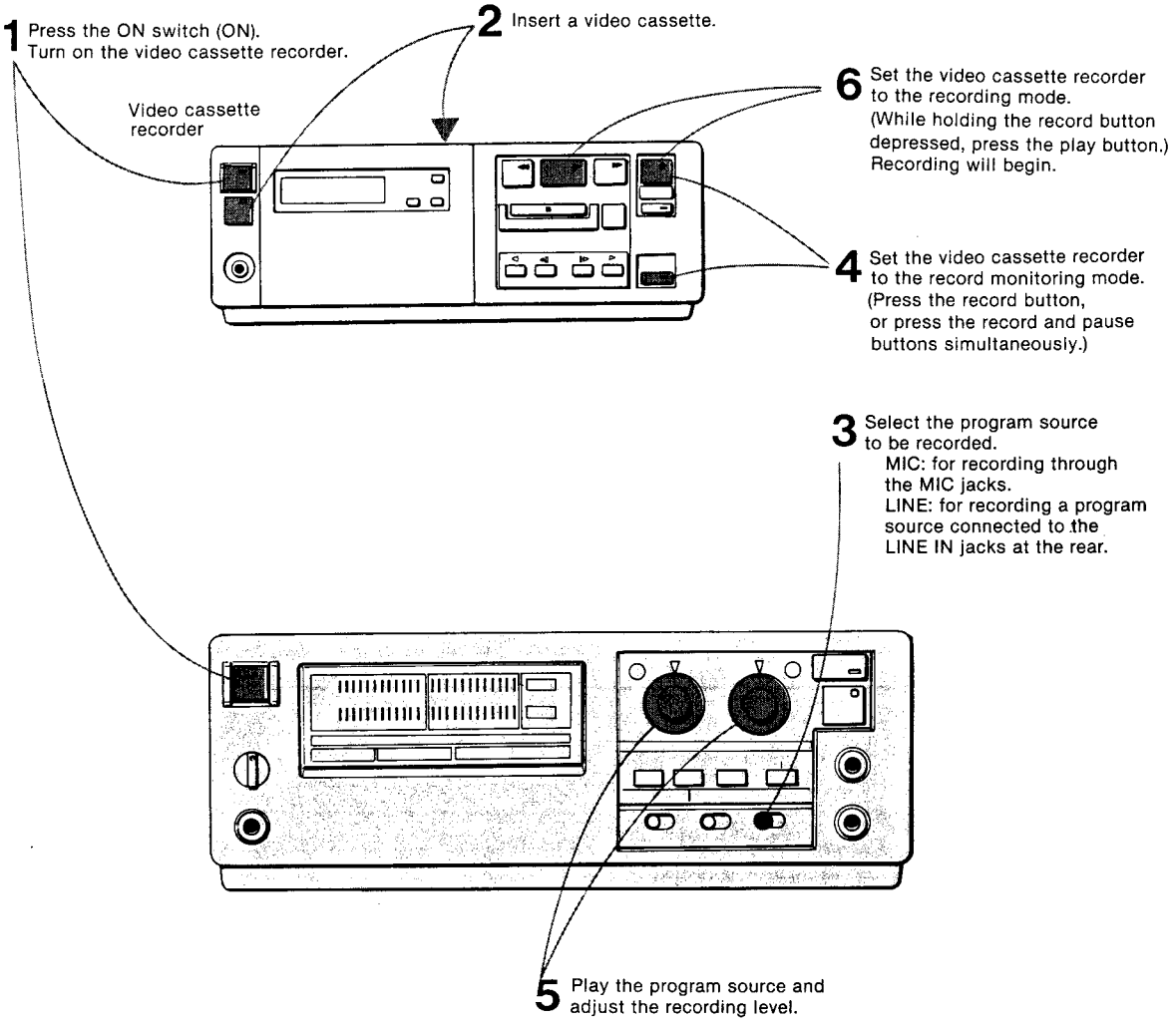
- The pause function of the video cassette recorder is convenient for more accurate start of recording and to stop momentarily during playback. However, the tape may be damaged if it is stopped for an extended period of time. We recommend that the pause function be used only when absolutely necessary.

Note that during the pause mode, the muting function of the unit may not operate well with some video cassette recorders and the reproduced sound may be noisy.

RECORDING

For detailed information about the operation of the video cassette recorder, refer to its instruction manual.

Follow the numbered sequence.



Adjust the REC LEVEL controls so that the red OVER indicators on the peak program meters do not illuminate at the highest signal level.
(For details, refer to "Recording level adjustment" on page 13.)

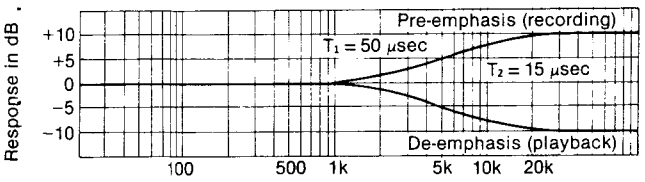
Important points to remember

- Be sure to connect both the VIDEO IN and VIDEO OUT jacks to the video cassette recorder. If the VIDEO IN jack of this unit is not connected to the video output of the video cassette recorder, recording is possible but you cannot monitor the recording, and the peak program meters will not deflect. (For details, refer to "LED peak program meters" on page 24.)
- Video cassettes incorporate a safety tab, just as do audio cassettes. If the tab has been removed, the record mode does not function when the record button is pressed. To record on a cassette which has had the safety tab removed, simply cover the slot with a piece of plastic tape. (For details, refer to the instruction manual supplied with the video cassette recorder.)

RECORDING LEVEL ADJUSTMENT

The PCM recording system has no reference level, but an absolute maximum value of 0 dB. If all the input signals are recorded under 0 dB, the PCM-F1 assures equal characteristics at any input level. This is why the peak program meters of this unit have no plus indication.

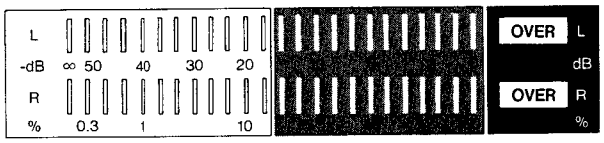
It must be noted that the peak program meters show the pre-emphasized input signal levels. See the diagram below. For this reason, it is important to adjust the recording level so that there will be no clipping over 0 dB. (For details on emphasis and peak program meters, refer to page 24.)



Frequency in Hz

Adjust the recording level with the REC LEVEL controls so that the peak program meters do not deflect over 0 dB. The red illumination of the OVER indicators warns of an overload during recording. If the indicators illuminate frequently, the recording level setting is too high, and this will result in overloaded and distorted recording. Intermittent illumination presents no problem. If the recording level setting is too low, the recording will be noisy.

The correct recording level setting depends upon the program source to be recorded. Generally, adjust the level to about −15 dB.



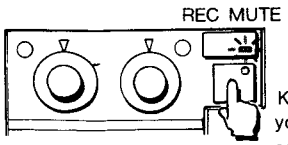
RECORD MUTING

By using the REC MUTE button during recording, you can provide an interspacing in the recording, eliminating unwanted program material such as commercials.

While the record muting is operating, the incoming signal is not recorded on the tape but it continues to register on the meters and feed to the monitor so that you know exactly what is going on.

To insert a blank

Hold down the REC MUTE button for as long as you want the blank segment on the tape to be. When you release the button, the recording will resume.

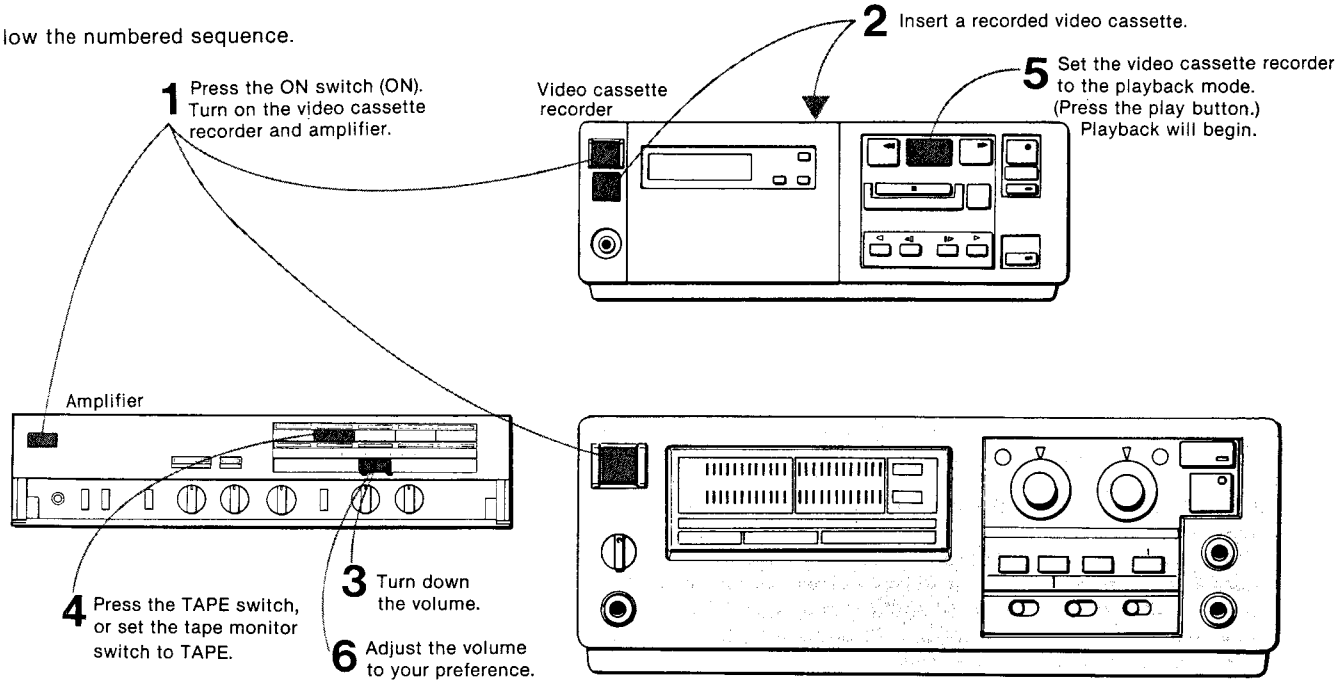


Keep depressed for as long as you want the blank segment on the tape to be.

PLAYBACK

For detailed information about the operation of the video cassette recorder, refer to its instruction manual.

Follow the numbered sequence.



An important point to remember

In the PCM system, a wider dynamic range is achieved than that of the conventional analog system, and the peaks of high level inputs are recorded with high-fidelity. In addition, the noise level is very low.

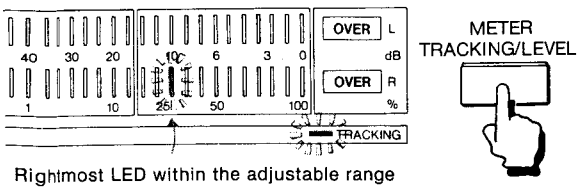
If you turn up the volume inadvertently while listening to a portion of the tape where no audio signals or very low level inputs are recorded, the speakers may be damaged when the portion of the tape with peak levels is played back.

ADJUSTING THE TRACKING OF THE VIDEO CASSETTE RECORDER

When a video tape recorded on another video cassette recorder is played back, dropouts may occur due to the mistracking of the video heads. To obtain the optimum reproduced sound, adjust the tracking of the video cassette recorder as follows.

1 Press the METER selector. The TRACKING indicator will light up, and the lower meter will change to a tracking meter.

2 Insert the recorded video cassette and set the video cassette recorder to the playback mode. After the MUTE indicator goes off, turn the tracking control of the video cassette recorder, observing the lower meter of this unit. Adjust the tracking control so that the rightmost LED within the adjustable range illuminates.



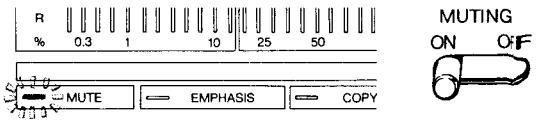
Rightmost LED within the adjustable range

For details on the tracking adjustment, refer to the instruction manual supplied with the video cassette recorder.

HOW TO USE THE MUTING SWITCH

Normally set the MUTING switch to ON. If the video cassette recorder is not transporting tape at the proper playback speed (for example, when the tape first begins to move, or during variable-speed playback, or during pause), or if many dropouts occur, or if a tape on which a signal other than the PCM signal is recorded is played back, the muting circuit will activate.

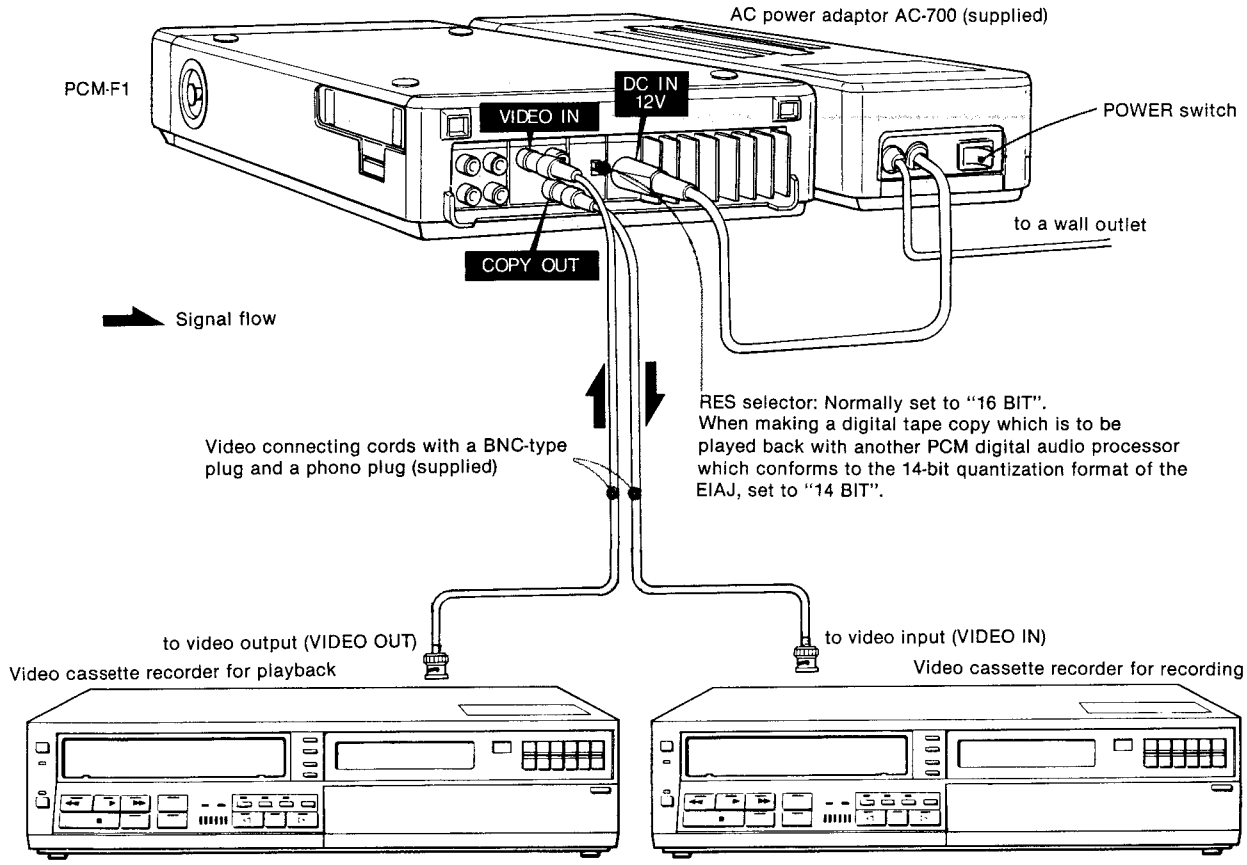
If the muting circuit activates so often that the reproduced sound is frequently cut off, adjust the tracking control of the video cassette recorder, then set the MUTING switch to OFF. Now you can enjoy the reproduced sound without interruption, though it will be somewhat noisy. If the tape has been badly damaged (for example, if it has folds in it), the sound may be muted even if the MUTING switch is set to OFF.



DIGITAL TAPE COPY

Using the COPY OUT jack of this unit and a pair of video cassette recorders, you can make digital-to-digital tape copy with absolutely no deterioration in signal quality.

CONNECTION



OPERATING PROCEDURE

1 Turn on the unit and video cassette recorders.

2 Insert a recorded tape into the video cassette recorder for playback and a blank tape into the video cassette recorder for recording.

3 Set the COPY switch of the PCM-F1 to ON.

4 Start the playback of the video cassette recorder for playback and the recording of the video cassette recorder for recording. Copying will begin.

After the tape copy has been completed, be sure to set the COPY switch to OFF.

Important points to remember

- The reproduced sound being monitored through the headphones or speakers with the COPY switch set to ON may be somewhat more distorted than when played back and monitored with the switch set to OFF. However, the tape will be copied with no deterioration in signal quality.
- No recording level adjustment is necessary when making a digital-to-digital tape copy.
- A tape on which the tape copy prohibiting code has been recorded cannot be duplicated. When such a tape is played back, the COPY PROHIBITING indicator will light up.
- Be sure to set the COPY switch to ON for digital tape copy. Digital-to-digital tape copy cannot be performed with the COPY switch set to OFF.

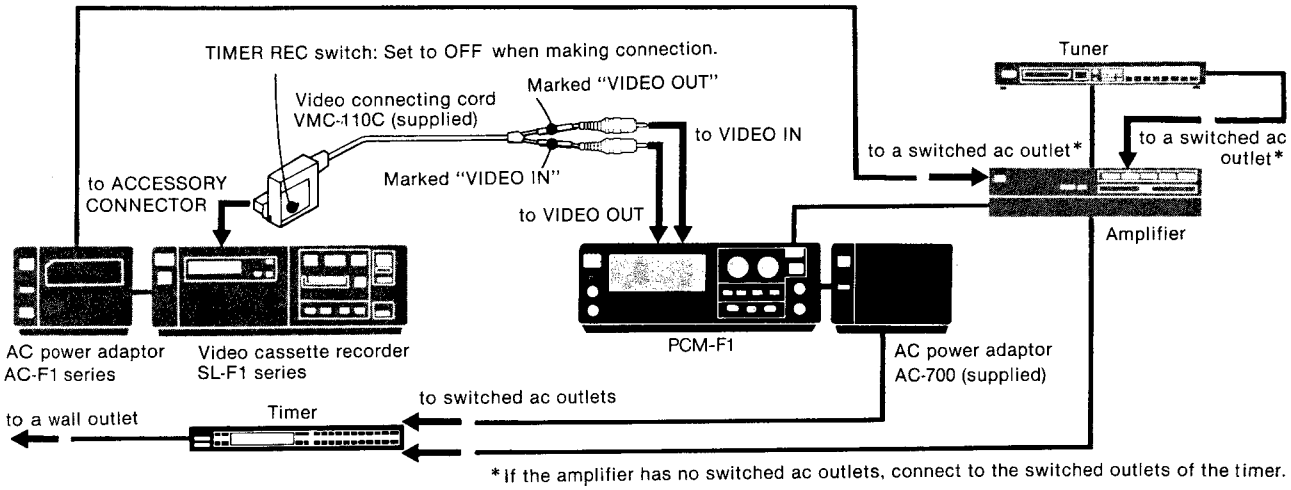
Do not move the COPY switch during tape copy or during normal recording and playback.

TIMER-ACTIVATED RECORDING

By connecting any commercially available timer, recording can be made automatically even when you are not at home. For connection with the Sony SL-F1 series video cassette recorder, use the supplied VMC-110C video connecting cord which is equipped with a timer recording switch.

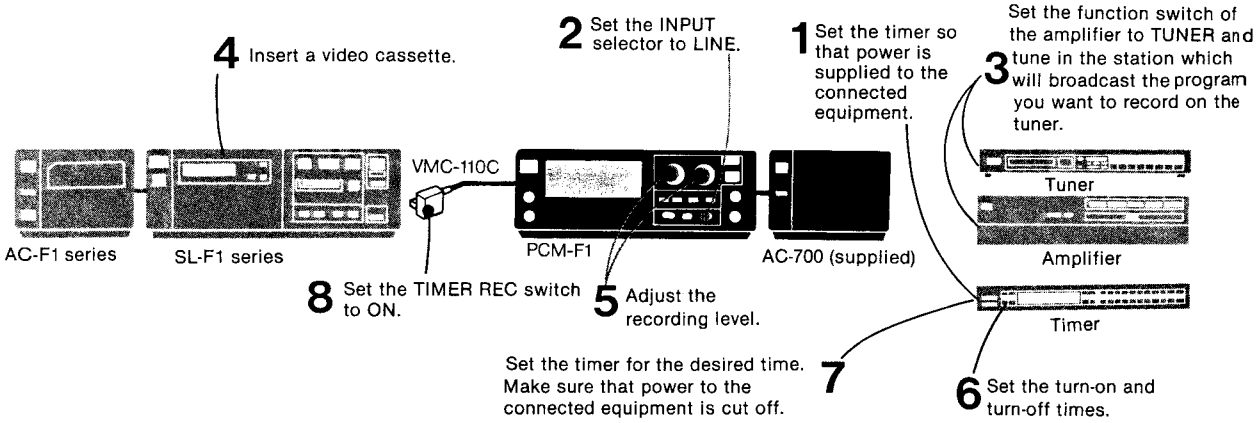
TIMER-ACTIVATED RECORDING WITH THE SONY SL-F1 SERIES VIDEO CASSETTE RECORDER

Connection



*If the amplifier has no switched ac outlets, connect to the switched outlets of the timer.

Recording procedure



Turn the POWER (ON) switches of the equipment to be operated to ON.
(The timer will turn all the connected equipment on and off.)
Be sure to remove the battery packs from the PCM-F1 and the video cassette recorder.

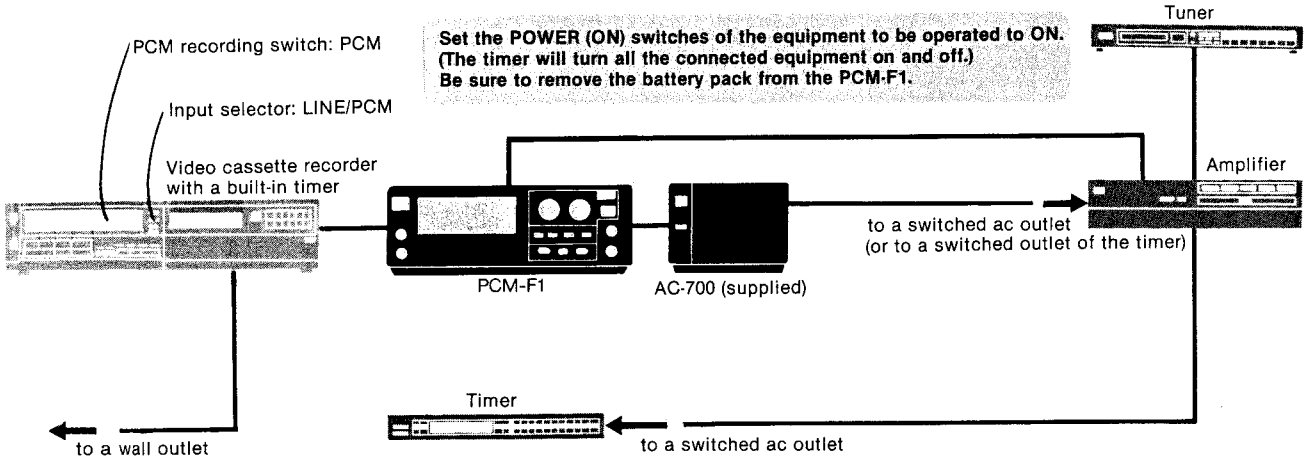
After the timer-activated recording has been completed...
Be sure to first turn off the video cassette recorder, then set the TIMER REC switch of the VMC-110C to OFF.
Do not keep the TIMER REC switch at ON after the timer-activated recording has been completed. If it is kept at ON, the video cassette recorder may be set to the record mode when the recorder is turned on again and the recorded tape may be erased.

Note
Be sure to set the TIMER REC switch of the VMC-110C to OFF except when making a timer-activated recording. Also make sure that the switch is set to OFF when making connections.

To interrupt a timer-activated recording
To interrupt a timer-activated recording, or when the recorder has been accidentally set to the record mode, turn off the recorder, then set the TIMER REC switch of the VMC-110C to OFF.

TIMER-ACTIVATED RECORDING WITH A VIDEO CASSETTE RECORDER OTHER THAN THE SONY SL-F1 SERIES

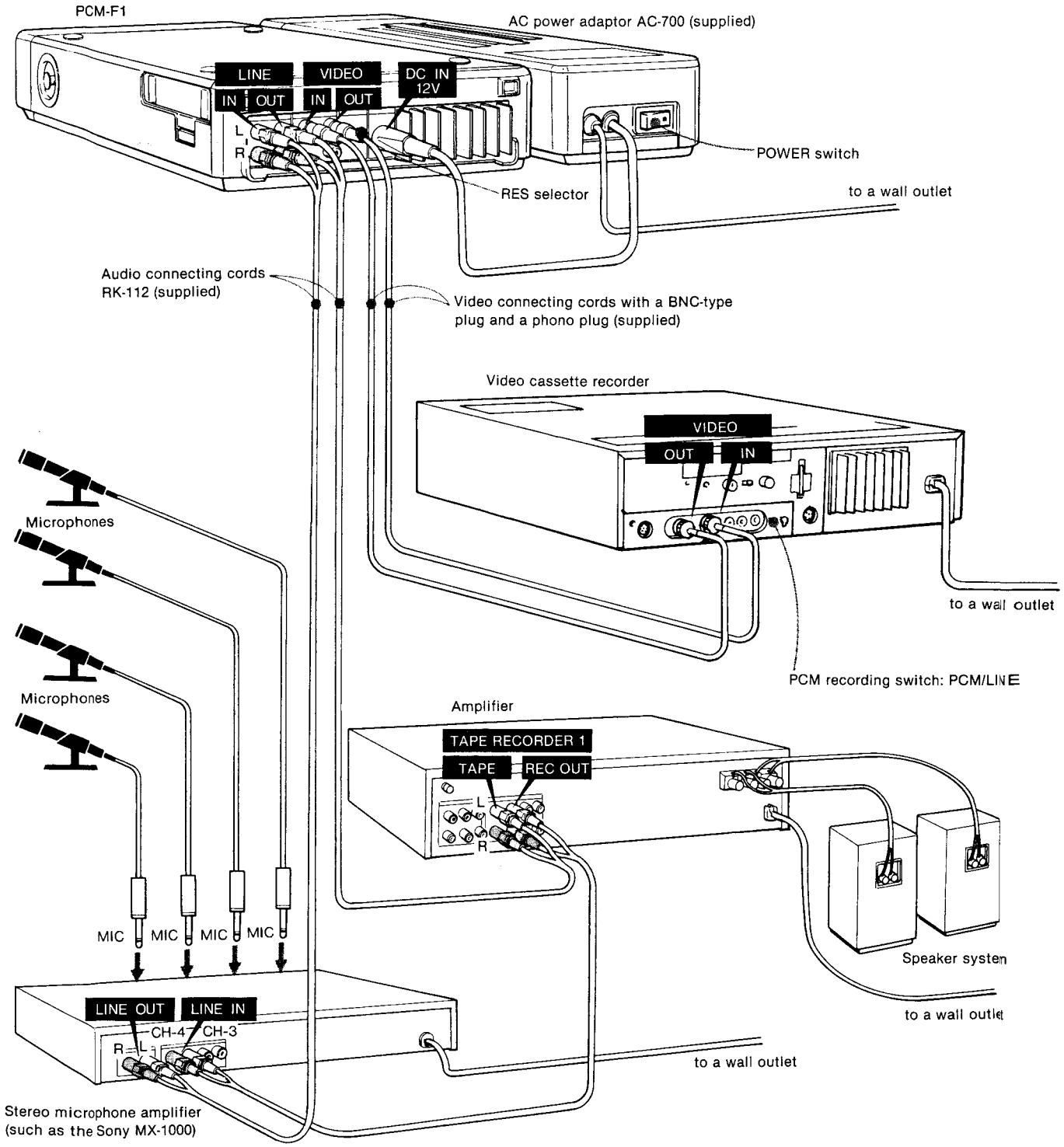
Use a video cassette recorder with a timer-standby function.
Before making a timer-activated recording, make sure that your video cassette recorder can be activated by a timer by referring to the instruction manual supplied with the video cassette recorder or by making test recordings.



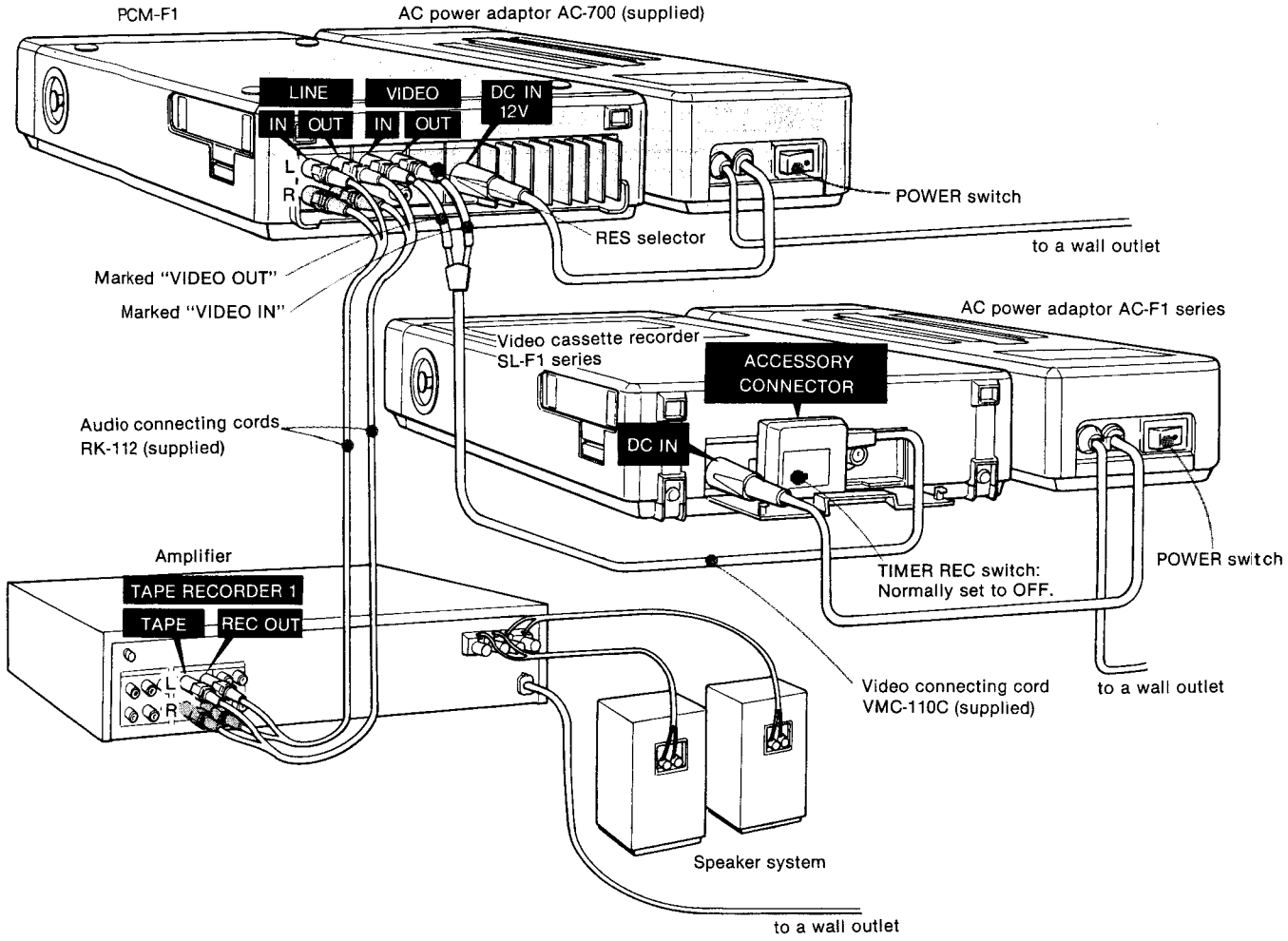
Recording procedure is the same as that with the Sony SL-F1 series recorder and the supplied VMC-110C, except that the video cassette recorder is set to the timer-recording standby mode instead of the TIMER REC switch of the VMC-110C being set to ON.
Be sure to set the turn-on time of the timer and that of the built-in timer of the recorder to the same time.
For details, refer to the instruction manual supplied with each unit.

MORE ABOUT SYSTEM CONNECTIONS

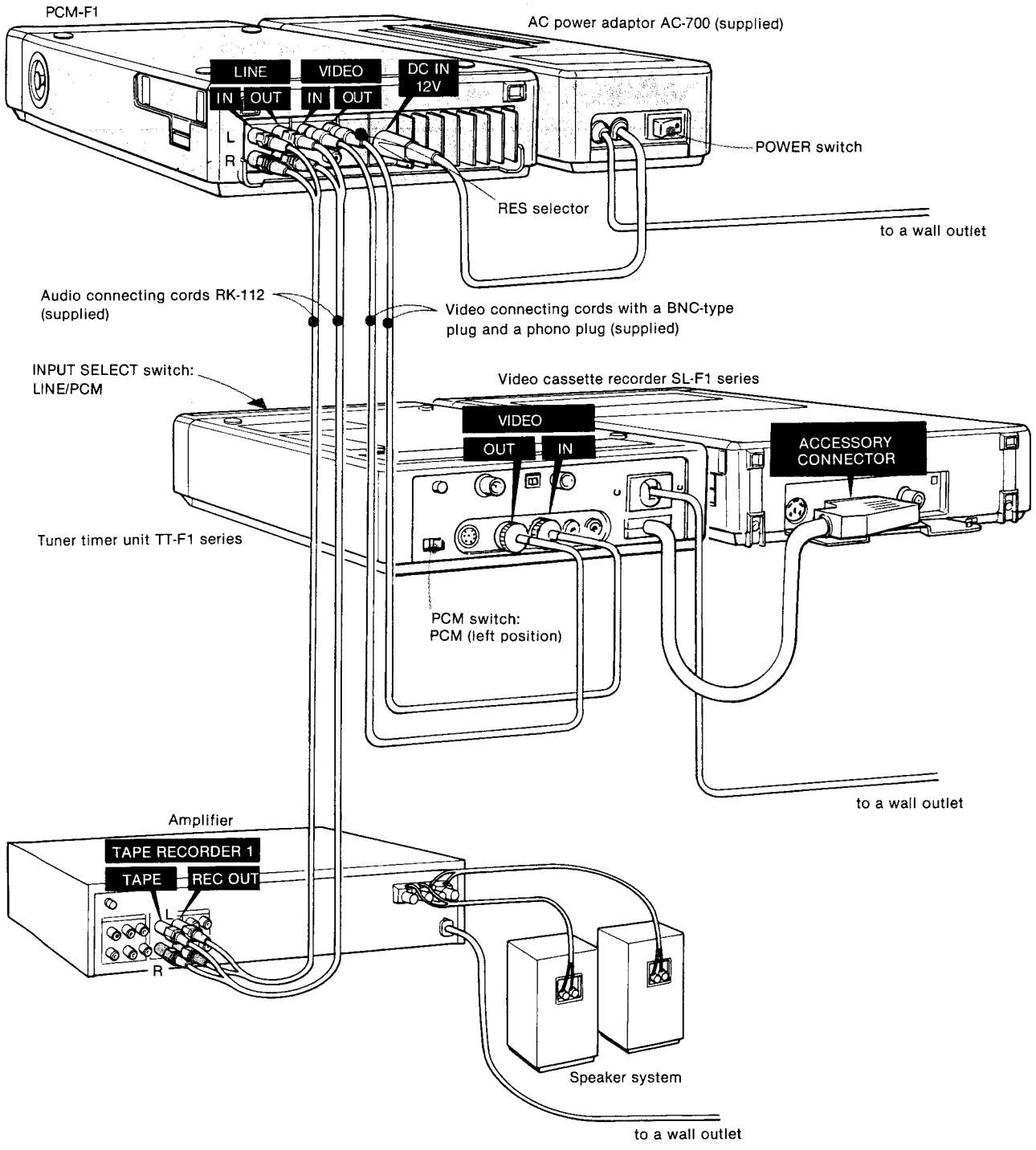
SYSTEM CONNECTIONS FOR RECORDING USING THREE OR MORE MICROPHONES



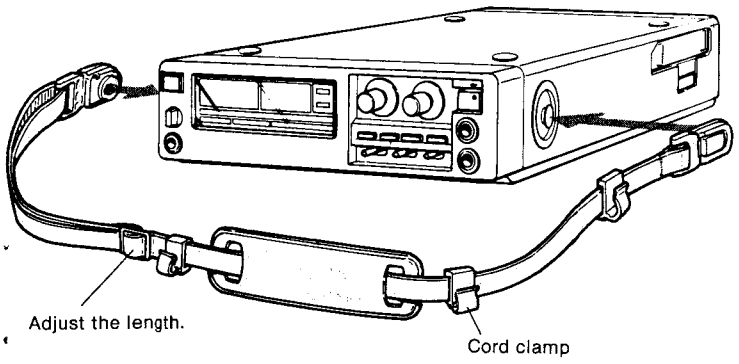
CONNECTION WITH THE SONY SL-F1 SERIES VIDEO CASSETTE RECORDER FOR INDOOR USE

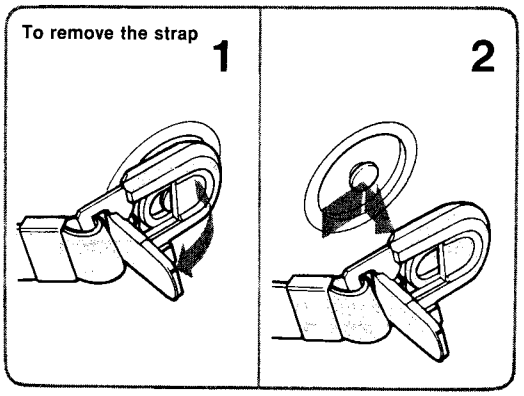


CONNECTION WITH THE SONY SL-F1 SERIES RECORDER AND THE SONY TT-F1 SERIES TUNER TIMER UNIT



ATTACHING THE SHOULDER STRAP





SPECIFICATIONS

Signal system	Conforms to CCIR television standard, PAL/SECAM color
Code format	Conforms to the technical specifications of the EIAJ (standard format using 14-bit quantization), or 16-bit quantization format
Number of audio channels	2 channels
Sampling frequency	44,100 Hz
Quantization	14-bit linear quantizing, or 16-bit linear quantizing
Frequency response	10–20,000 Hz ±0.5 dB
Harmonic distortion	Less than 0.007% (14-bit format) Less than 0.005% (16-bit format)
Dynamic range	More than 86 dB (14-bit format) More than 90 dB (16-bit format)
Channel separation	More than 80 dB
Wow and flutter	Below measurable limit
Error correction	Error correction and concealment using CRCC and parity
Emphasis	Pre-emphasis (in recording): fixed at ON De-emphasis (in playback): automatically switched to ON or OFF (by detecting pre-emphasis identification code) Time-constant: 50 μsec, 15 μsec

Inputs

	Type	Reference input level	Impedance	Minimum input level
MIC	Phone	—	Accepts low impedance microphones.	0.435 mV (−65 dB)
LINE IN	Phono	−10 dB*	40 kilohms	95 mV (−18 dB)
VIDEO IN	Phono	1 Vp-p	75 ohms	—

Outputs

	Type	Reference output level	Load impedance
LINE OUT	Phono	−10 dB**	More than 10 kilohms
VIDEO OUT	Phono	1 Vp-p	75 ohms
COPY OUT	Phono	1 Vp-p	75 ohms
HEADPHONES	Stereo phone	−24 to −48 dB Attenuation: 5 steps (24, 18, 12, 6 and 0 dB)	Accepts low impedance headphones.

* Input level when the peak program meters deflect to −15 dB.
** Output level when the playback level is −15 dB as shown by the peak program meters.

General

Power requirements	Operating voltage: 12 V dc Usable power sources: 12 V dc with the Sony NP-1 rechargeable battery pack (optional) 220 V ac (or 240 V ac adjustable by authorized Sony personnel), 50 Hz (type 1) or 240 V ac (or 220 V ac adjustable by authorized Sony personnel), 50 Hz (type 2) with the supplied AC-700 ac power adaptor 12 V car battery with the Sony DCC-2500 car battery cord (optional)
Power consumption	17 watts dc
Dimensions	PCM-F1: Approx. 215 × 80 × 305 mm (w/h/d) ($8^1/_2 \times 3^1/_4 \times 12^1/_8$ inches) AC-700: Approx. 107 × 80 × 305 mm (w/h/d) ($4^1/_4 \times 3^1/_4 \times 12^1/_8$ inches) not including projecting parts and controls
Weight	PCM-F1: Approx. 4 kg (8 lbs 13 oz) net AC-700: Approx. 3.2 kg (7 lbs 1 oz) net
Total weight	Approx. 8.1 kg (17 lbs 14 oz) in shipping carton, including PCM-F1 and AC-700
Accessories supplied	AC power adaptor AC-700 (1) Video connecting cord VMC-110C (1) Video connecting cords with a BNC-type plug and a phono plug (2) Audio connecting cords RK-112 (2) Shoulder strap (1)
Optional accessories	Rechargeable battery pack NP-1 Car battery cord DCC-2500 Carrying case LC-170 Carrying handle AH-330

While the information given is true at the time of printing, small production changes in the course of our company's policy of improvement through research and design might not necessarily be indicated in the specifications. We would ask you to check with your appointed Sony dealer if clarification on any point is required.

TECHNICAL INFORMATION

BASIC TERMINOLOGY

A/D and D/A converters
In a PCM system, analog signals are quantized and then recorded as digital signals. In reproduction, the digital signals are converted back into analog signals. Converting the signals into digital signals is performed by the analog-to-digital (A/D) converter, and converting the digital signals into analog signals is performed by the digital-to-analog (D/A) converter.

Analog
The word analog is used in contrast to digital. Analog quantities denote quantities that change continuously like the temperature or voltages. Ordinary audio signals are called analog signals, and VU meters have an "analogy" with the variation in these analog signals which is indicated by the deflection of the pointer. This type of meter can be called an analog display meter.

Bit
This is an abbreviation of binary digit. It is a unit of information equal to one binary decision, so that 1 digit is referred to as 1 bit. Three bits refer to a 3-digit code. With n bits, it is possible to indicate and subdivide 2^n types of information.

Code error
This refers to an erroneous 1 or 0 in the encoded signals. It is caused by dropouts, jitter, noise, etc. If a recording is played back with these code errors, it will come through as a clicking sound. In order to compensate for these errors, a number of methods are used in the circuitry: pre-value holding, linear interpolation and error correction word encoding.

CRCC (Cyclic Redundancy Check Code)
A group of bits or a "word" which detects erroneous data. The probability of detecting erroneous data depends upon the number of bits. In the EIAJ format and the PCM-F1, each TV H (horizontal) line has one "word" of CRCC which comprises 16 bits, so erroneous data are detected at a 99.9985% probability.

Digital
This word originates from "digit" meaning finger and is used in contrast to analog. A digital quantity denotes a quantity by which a variable amount is discontinuously encoded (numerical values). In other words, a digital quantity is an encoded analog quantity. The word also denotes using numbers expressed in digits and in a certain scale of notation to represent all the variables that occur in a problem.

Dropout
This refers to distinct but temporary gaps in the signal level during the playback of recorded data caused by marks or dirt on the surface of the tape. In PCM systems, it results directly in a code error. When burst-formation type of dropouts occur, the errors are scattered and corrected or interpolated.

Dynamic range
In PCM, dynamic range is expressed as the ratio between the maximum acceptable signal input and the quantizing noise. With linear quantizing the range is proportional to the number of bits, but with non-linear quantizing the obtainable dynamic range is much wider with the same number of bits. Thus, in the PCM-F1 which has adopted linear quantization format, the dynamic range of the 16-bit format is wider than that of the 14-bit format.

Encoding
Encoding denotes the conversion of quantized amplitudes into a pulse code. A binary code is most commonly used. In actual operation, the quantizing and encoding are performed simultaneously by the analog-to-digital converter.

Error correction words
In the 14-bit format of the EIAJ, two error correction "words", P and Q, are added to each data block consisting of six "words". Each P and Q corrects one "word" of erroneous data, so that two "words" of erroneous data in a data block can be corrected. With the interleaving process, erroneous data up to 32 H can be corrected.

Interleaving
Interleaving is a method to disperse dropout errors by changing the sequence of information "words" (hereafter referred to simply as word without quotation marks) in recording. Restored to the original order in playback, the erroneous word is invariably placed between the correct words, and thus linear interpolation, etc., can be easily performed.

Jitter
This term denotes the instability of a signal in either its amplitude, its phase, or both. It is generated when signals are played back on a tape recorder with wow and flutter, whereby noise is added to the signals. In PCM systems, it is the cause of code errors along with dropouts in the tape medium.

Linear interpolation
When a word error has been detected, it is corrected by the error correction circuitry. If the error exceeds the error correction capability of the digital audio processor, the average value of the preceding and succeeding words is substituted for the erroneous word. The error is thus interpolated so that there is no audible difference. In the 14-bit format of the EIAJ, burst errors of 32H or more, which cannot be corrected, are interpolated.

PCM
This acronym stands for pulse code modulation. It refers to a system of modulation whereby ordinary signals like audio signals are replaced by pulses, their amplitudes are turned into digital codes, and the resulting signals are transmitted or recorded. All the signals are expressed in binary digits, 1 for every pulse and 0 for every absence of pulse. Therefore, the signals are resistant to noise, and distortion can be kept down to a very low level right up to the high frequencies without being dependent on the frequency.
In the PCM system, the signals are sampled several tens of thousands of times a second and the sampled values are quantized. The code resulted from quantization each time is 42 bits consisting of 14 bits for right (R) channel, 14 bits for left (L) channel and 14 bits for error correction and error detection. The binary code per second is equivalent to a frequency of several megahertz.
A frequency as high as this cannot be recorded by a conventional audio tape recorder. This is why a video cassette recorder, which can record the PCM code delivered by the PCM digital audio processor, must be used with the PCM processor. The PCM processor requires less than half the frequency bandwidth of TV signals. Of course, to be recorded on a video cassette recorder, the PCM code must first be converted into a TV signal.

Quantizing and quantizing noise
Quantizing is the process in which analog signals are translated into a digital code. Quantizing is done by dividing the range of values of the sampled amplitude of an analog signal into a great number of subranges, to each of which is assigned a value. There is a slight error between the original signal and the quantized value. This is heard as noise and is known as quantizing noise, or quantization distortion. This noise is inherent to PCM. The signal-to-noise ratio of the PCM and dynamic range are determined by this noise.

Sampling and holding
This is a circuit which is used in an analog-to-digital converter to measure an analog signal (sampling) and to increase the duration of that signal (holding). With holding, a fixed period of time is required to convert the analog signal into a digital signal.

Sampling and sampling theorem
Sampling refers to the extraction of the amplitude of an analog signal at regular intervals of time.
The sampling theorem (developed by Shannon) states that two samples per cycle will completely characterize a bandlimited signal; that is, the sampling rate must be twice the highest frequency component.

Word
A group of bits that express a single quantizing value is called a word. In the PCM-F1, a word comprises 14 or 16 bits.

SYSTEM AND CIRCUIT DESCRIPTION

Emphasis
The emphasis circuit of this unit is designed to reduce the amount of noise and improve the signal-to-noise ratio by automatically boosting the high-frequency response during recording (pre-emphasis) and detecting the boosted amount and lowering the response during playback (de-emphasis).

LED peak program meters
An incoming analog signal is converted to a digital signal, which is further converted to a video signal and delivered from the VIDEO OUT jack of this unit to a video input jack of a video cassette recorder. When the video cassette recorder is set to the record or record monitoring mode, the video output signal from the recorder is fed to the VIDEO IN jack of this unit. The incoming video signal is converted to a digital signal, then to an analog signal, and the peaks of this analog signal are displayed on the LED peak program meters.
For this reason, if the VIDEO IN jack of this unit is not connected with the video output jack of the video cassette recorder even in recording, you cannot monitor the input signals to be recorded, nor do the meters deflect, though recordings can be made.

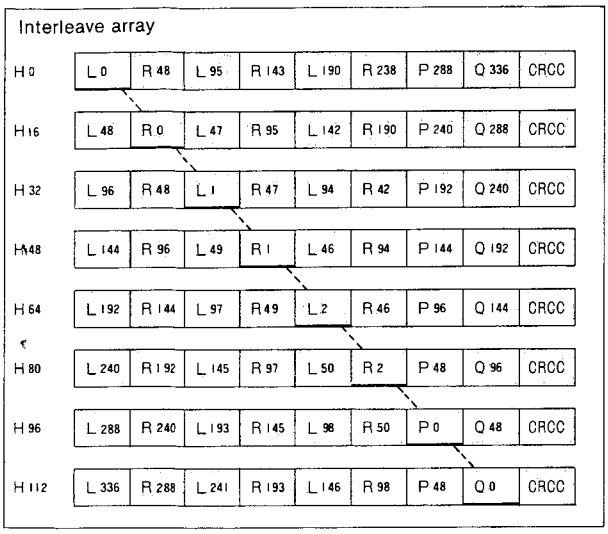
14-bit format and 16-bit format
The 14-bit format of the PCM-F1 conforms to the technical specifications of the EIAJ which has adopted the 14-bit linear quantization format. In the PCM-F1, the 16-bit format which is compatible with the 14-bit format of the EIAJ is adopted together with the 14-bit format in order to obtain better results such as wider dynamic range and less distortion. The 14-bit and 16-bit formats can be selected with the RES selector.
A tape recorded using the PCM-F1 with the RES selector set to "16 BIT" can be played back using another PCM digital audio processor which conforms to the 14-bit format of the EIAJ. In this case, the reproduction will be equivalent to that of the 14-bit format. A tape recorded using another PCM digital audio processor which conforms to the 14-bit format of the EIAJ can, of course, be played back using this unit.
During playback, the difference between these two formats is detected automatically.
If a tape recorded in accordance with the 16-bit format is duplicated using the digital-to-digital tape copy function of this unit with the RES selector set to "14 BIT", the format will be converted to the 14-bit format.

Error correction capability of the 14-bit and 16-bit formats
In recording with the 16-bit format of this unit, the error correction word Q of the 14-bit format is replaced by the 15th and 16th bits of the data so that the 16-bit format is compatible with the 14-bit format of the EIAJ. For convenience, we express the word comprising the information of the 15th and 16th bits by a symbol "S" instead of the symbol "Q" of the 14-bit format. In the 14-bit format, data contain error correction words of P and Q; in the 16-bit format, data contain a single error correction word of P. Accordingly, the error correction capability of the 16-bit format is inferior to that of the 14-bit format. If a tape recorded with the 16-bit format is played back by using a PCM digital audio processor which conforms to the 14-bit format of the EIAJ, the error correction capability will be equal to one parity bit of the 16-bit format.

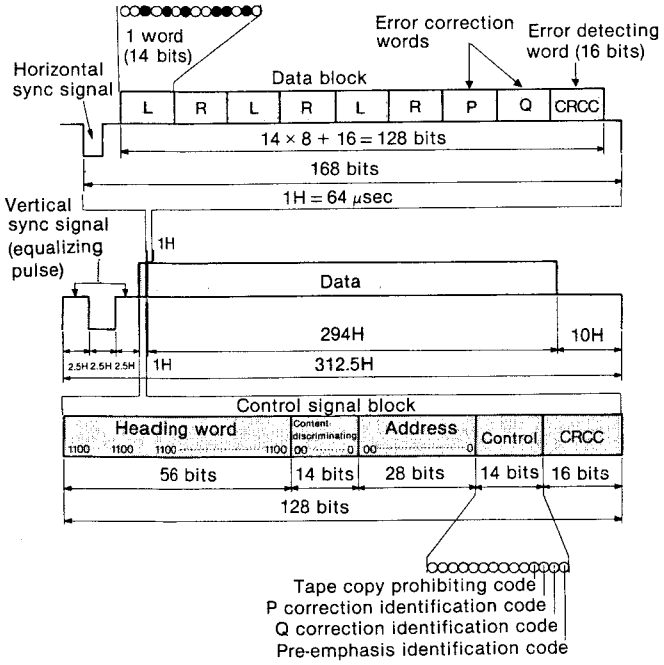
	Usable error correction word	Error correction capability
14-bit format of the EIAJ	Two parity bits of P and Q	Burst errors of up to 32 H can be corrected.
16-bit format of the PCM-F1	A single parity bit of P	Burst errors of up to 16 H can be corrected.

It should be noted that burst errors beyond the error correction capability will be compensated for so that they are not perceptible.

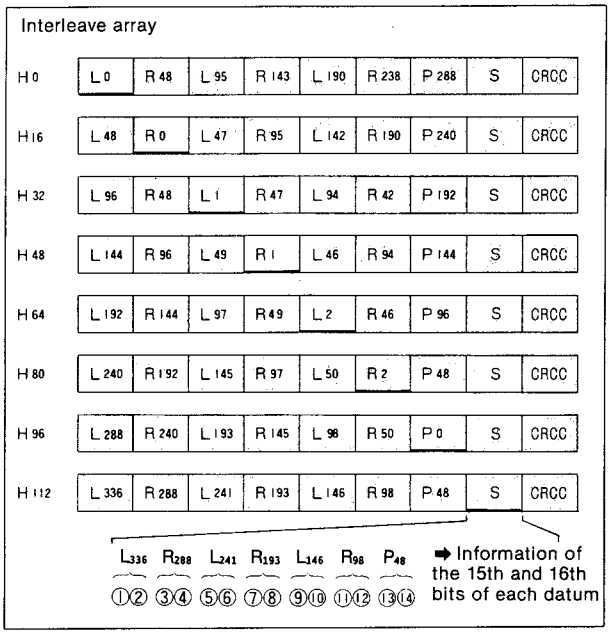
14-bit format of the EIAJ



Signal array and structure within one field



16-bit format of the PCM-F1



Signal array and structure within one field

