

PROFESSIONAL

Model PMD720 User Guide

Personal Recording Studio

marantz®

Dear Proud Owner,

We want to thank you for purchasing the Marantz PMD720 personal recording studio, and to congratulate you on your choice.

The PMD720 combines an 8-channel mixer and 4-track recorder in one logical, flexible, integrated package.

The mixer section provides a wide variety of inputs and outputs, including: 4 microphone/line inputs (2 of which offer a choice of XLR or 1/4" connections), 2 channel insert terminals, 2 stereo line inputs, a mono effects send and stereo return, 4 independent track outputs, cue out, sync in/out rerouting, and stereo master outputs.

The recorder section offers a choice of normal speed (1 7/8 ips) or high speed (3 3/4 ips) recording, in addition to $\pm 10\%$ pitch control. dbx noise reduction circuitry significantly improves the signal-to-noise ratio for clear, quiet recording, and all 4 tracks can be recorded simultaneously. Furthermore, the PMD720 offers a smooth, microprocessor controlled transport.

By combining the excellent audio and feature set of the recorder section, with the exceptional flexibility of the mixer section, you will be able to create rather sophisticated productions. Track Bouncing (sometimes called "Ping Pong Recording") can provide up to 10 recorded tracks without bouncing any track more than once, and Virtual Tracking (synchronizing the PMD720 with a MIDI sequencer) can provide any number of additional tracks, limited only by your MIDI rig. With one effect send and two channel inserts, the PMD720 can process up to 3 independent effects at any one time, creating rich sonic textures in your music.

The overall design of the PMD720 was created with the small home studio in mind. Every ergonomic detail—from the spacing of controls, to the feel of the faders, to the backlit VU meters, to the rear patch panel—was designed with you in mind. Every performance detail—from the smooth, reliable transport, to the exceptional audio quality, to the dbx noise reduction —was designed with your music in mind.

We hope your new PMD720 brings you years of joy and music.
That's why we built it.

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HEY YOU! READ THIS! NOW!! I'M NOT KIDDING! READ IT!

Most people never read the manual to anything. We hope you'll make this manual an exception. It's divided up into a bunch of different sections so you can quickly find the information you need, and easily skip the information you don't need.

The first few items are the logistics. There's a table of contents to help you find your way around, a manifest to make sure you got everything you paid for, and a list of really important stuff to know before you start—cautions and a little friendly advice.

Then we get to the fun stuff.

The next few sections are primarily for less experienced users (although veterans could probably still learn a thing or two). The first of these consists of basic terms and definitions to help get you rolling, and then a step-by-step guide to recording on the PMD720—so you can start making music in no time.

The third part of the manual is for the more experienced (or more curious) user. This section goes through EVERY SINGLE BUTTON, KNOB, DIAL, JACK, SWITCH, AND METER ON THE WHOLE MACHINE. There's a lot of really good info here, and it's a great way to learn the finer points of operating the PMD720.

Fourth is a section on Advanced Techniques and Operations. The PMD720 is top-full of useful and flexible features. This section gives you some ideas on how to push your PMD720 to the limit (and maybe farther). It includes Track-Bouncing, Punch In/Out, and even Synchronizing to MIDI Sequencers or SMPTE.

There's also a troubleshooting section to help solve some common problems you may encounter. Finally, there's a comprehensive list of Technical Specifications for all you gearheads out there.

That's it—and that's plenty! Don't throw this manual out. We're sure you will find it to be a valuable and useful companion to your new PMD720.

Manifest

Now is a good time to check and see if you have everything you need.

Your PMD720 Box should include:

- This owners manual (So far so good)
- A 120V AC to 12V DC adaptor, Model DA740PMDU
- A Market Survey Card
- A Warranty Registration card
- The PMD720 Personal Recording Studio

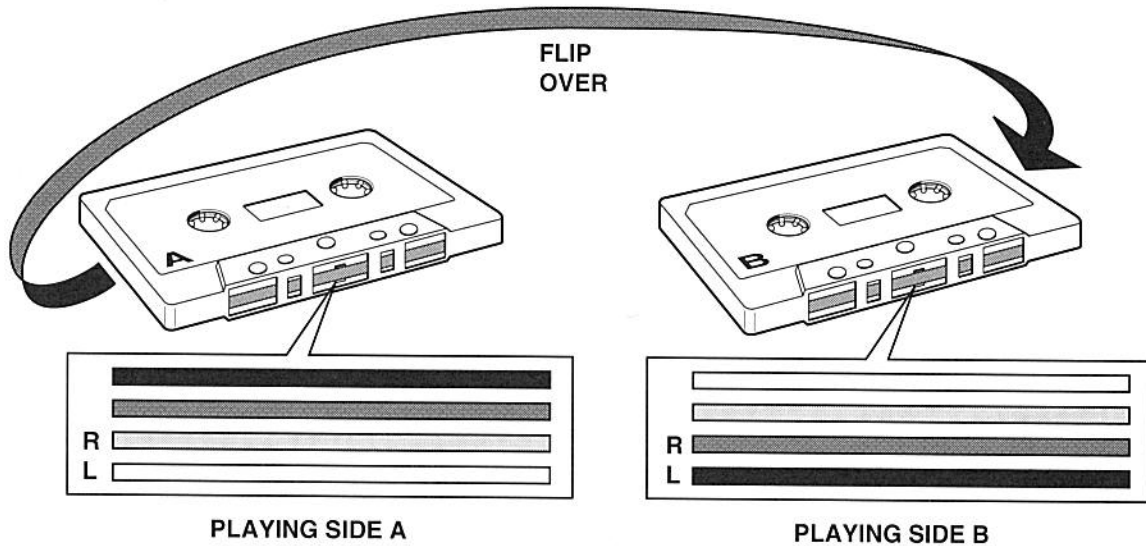
Really Important Stuff to Know Before You Start

1. Track Format: 4 tracks on a standard cassette

Stereo music requires 2 tracks of tape—one for the left speaker, and one for the right speaker. That is why stereo tape is sometimes referred to as 2-track tape.

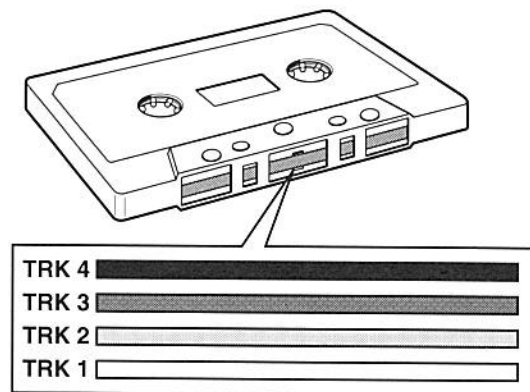
Stereo cassettes actually have 4 tracks on the tape. Tracks 1 and 2 comprise the stereo music on side A, and tracks 3 and 4 comprise the stereo music on side B. See figure 1.

(Fig 1) : Normal Stereo Cassette Track Format



In order to record and play 4 tracks simultaneously, the PMD720 uses the two tracks from side A, and the two tracks from side B at the same time. See figure 2. Effectively, PMD720 4-track tapes do not have a side B—they only have a side A.

(Fig 2) : PMD720 4 track format



You cannot turn a PMD720 four track tape over, and record more tracks on side B.

To protect yourself from accidentally using side B, and destroying your work, you can break the record-protect tab on the top right side of the tape (looking at side A).

2. Tape Type

The PMD720 is designed to provide optimum performance with high quality chrome tapes (sometimes called CrO₂, Type II, or High-position tape). Marantz recommends the use of these chrome tapes in C-90 (90 minute) or C-60 (60 minute) lengths. Longer tapes (C-100, C-120) may be too thin to maintain sound quality during heavy use (such as long overdub sessions), and shorter tape will not provide much recording time. Because you cannot use side B of the tape, a C-60 = 30 minutes of recording at normal speed, and 15 minutes of recording at high (double) speed.

3. Impedance

When you connect other equipment to the PMD720, be aware of impedance matching. As a rule, you may connect lower-impedance outputs to higher-impedance inputs.

PMD720 channel inputs are high impedance (10 K Ohms), and they will accept a wide variety of signals, from low-impedance microphones (approx 600 Ohms) to high impedance sources like tape decks and CD players, and high-impedance microphones (approx 10 K Ohms)

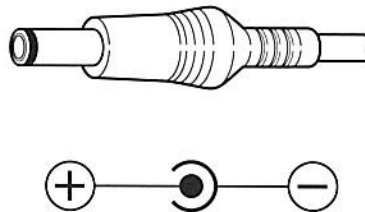
PMD720 outputs are relatively low impedance signals (less than 1 K Ohm). You should plug these into tape decks with an input impedance of 50 K Ohms or more.

Severely mis-matched impedances (usually a high impedance signal into a low impedance input) may result in low signal level and/or poor sound quality.

4. Power supply

The PMD720 is shipped with a DC power supply suitable for use with 120 V AC electrical systems. If any DC adaptor other than the DA740PMDU is used, be sure that the voltage, amperage, and polarity of the adaptor are the same as that of the DA740PMDU.

(Fig 3) : Polarity of AC adaptor.



5. Connection cable

Because most of the connections on the PMD720 are unbalanced, it is advisable that cable runs be kept to a minimum. Cable runs in excess of 10-15 ft. will be particularly susceptible to RF and EM interference, which can result in hum, noise, signal loss, and lower overall sound quality.

Some Basic Audio Concepts and Vocabulary

1. SIGNAL

Whenever we talk about a SIGNAL, we are talking about sound which has been changed from sound waves in the air—to electricity on a wire. This electricity is the signal. An electrical signal can express all of the characteristics of sound, including: amplitude (loudness), frequency (pitch), and rhythm.

Many terms can be used to describe the strength of a signal, including Loudness, Level, Gain, Amplitude, and even Volume. While these terms are not exactly synonymous, they are fairly close, and can often be used interchangeably.

2. TRACKS AND CHANNELS

The distinction between track and channel is often the cause of great confusion. Hopefully, the following definitions will help to avoid this frustration. The terms "track" and "channel" will follow these definitions throughout this manual.

Channels:

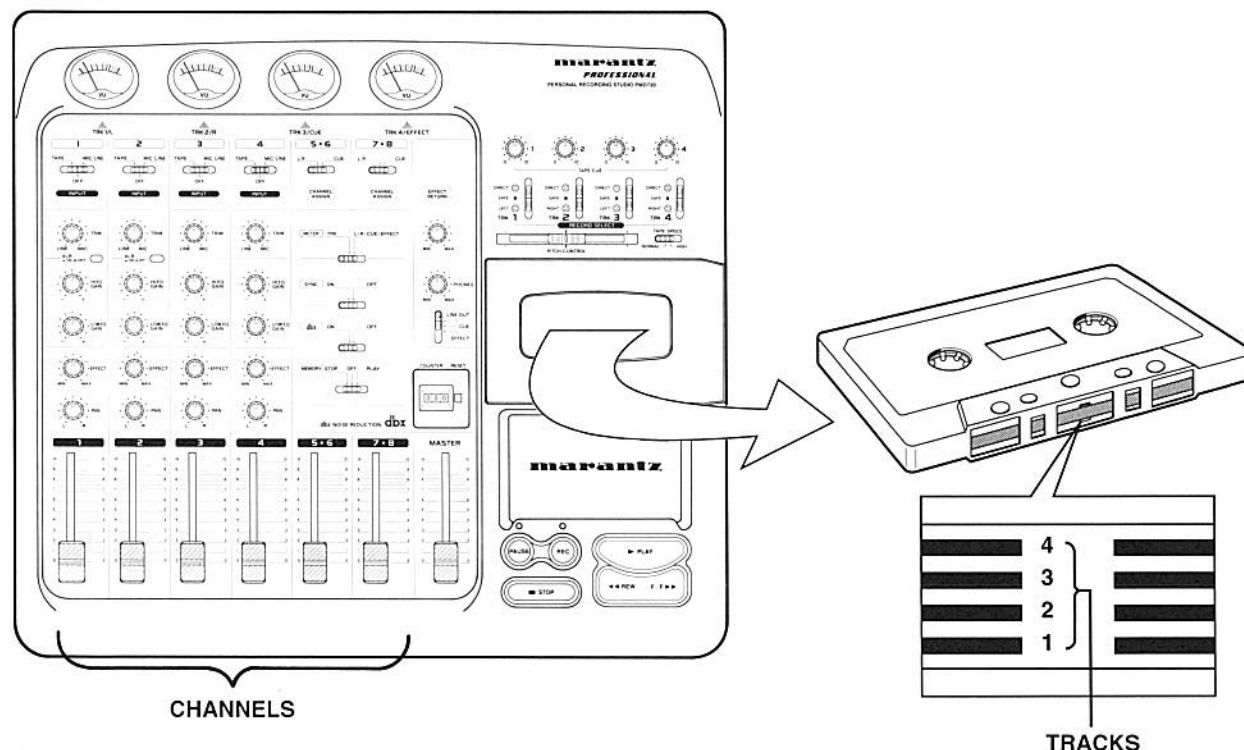
For the PMD720, the term "channel" refers to a controllable electrical path in the mixer section. The PMD720 has 4 mic/line channels, and two stereo line channels. It also has a stereo Effects Return, which can be used as an additional stereo line channel.

Tracks:

For the PMD720, the term "Track" refers to a physical area on a cassette tape. The PMD720 divides the width of the tape into four areas—Tracks 1-4.

See figure 4 to compare tracks and channels.

(Fig 4) : Tracks and Channels



Please be aware that channels **may** match up with tracks, but do **not necessarily** match up with tracks. For example: Channel 1 can be easily routed to Track 1, but Channel 1 can also be easily routed to any other track. In fact, once you learn how to use the routing features of the PMD720, ANY channel can be routed to ANY track. Furthermore, any combination of several channels can be routed to any given track, in order to create complex performances.

3. ROUTING AND SIGNAL PATHS

The route that an electrical signal follows is called a SIGNAL PATH. ROUTING is the way you tell a signal what SIGNAL PATH to follow. If you give someone directions to the supermarket, you are specifying a ROUTE or PATH for them to follow. When you want to record the signal on channel 5 onto track 2, you specify a SIGNAL PATH for that signal to follow—i.e. you ROUTE the signal. There are many controls on the PMD720 which help with signal routing. They include: the INPUT SELECTOR, RECORD SELECT switches, XLR switch, INSERT, EFFECT, PAN, PHONES SELECTOR, and others. While so many options may seem confusing at first, rest assured that it provides a tremendous amount of flexibility, and when you get used to the controls, you'll be glad you have all these options.

4. BUSSES

Busses are not big long cars used for field trips. Instead, you can think of a bus as a major highway for signals inside the PMD720. Signals from several different sources (channels or tracks) can be combined on one of these major highways. You use the ROUTING controls (from #3 above) to send signals to the various busses. Then, you use more routing controls to send the busses to their destination—such as tape tracks, effects, headphones—wherever.

For example, when you want to record the signals from channels 1, 2, and 6 onto track 3, you will use the PAN control (a routing control) to send several channels to the LEFT BUS (one of several "major highways" for signals). Then, you will use the RECORD SELECT control (another routing control) to send the signal on the LEFT BUS to Track 3. All of these steps will be covered in much greater detail in later sections. For now, simply understand that BUSSES are streets for signals, and ROUTING is a set of directions for which streets to take.

There are several BUSSES to which we will refer throughout this manual.

A. THE STEREO BUS.

The STEREO BUS is actually made up of two busses which often—but not always—work together. These two busses, as you might have guessed, are the LEFT BUS and the RIGHT BUS.

When the LEFT and RIGHT BUSSES are working together, we call it the STEREO BUS, and treat it as one STEREO signal. For example, there is one MASTER FADER which controls the total output of the STEREO BUS (LEFT and RIGHT together). The PAN knobs control the Left-Right Balance of each signal on the STEREO BUS.

At other times, the LEFT BUS and the RIGHT BUS are used individually. For example, Tracks 1 and 3 are capable of recording the signal on the LEFT BUS, while ignoring the signal on the RIGHT BUS. Tracks 2 and 4 are capable of recording the signal on the RIGHT BUS, while ignoring the signal on the LEFT BUS. In these cases, the PAN knob controls whether each signal goes to the LEFT BUS (Tracks 1 and/or 3), the RIGHT BUS (Tracks 2 and/or 4), or even to both busses at once.

B. EFFECTS BUS

The EFFECTS BUS is a bus in the PMD720 which carries signals from the mixer to external effects such as reverb, delay, chorus, etc. Channels 1–6 can each send part of their signal to the EFFECTS BUS for processing—how this works will be explained in more detail later.

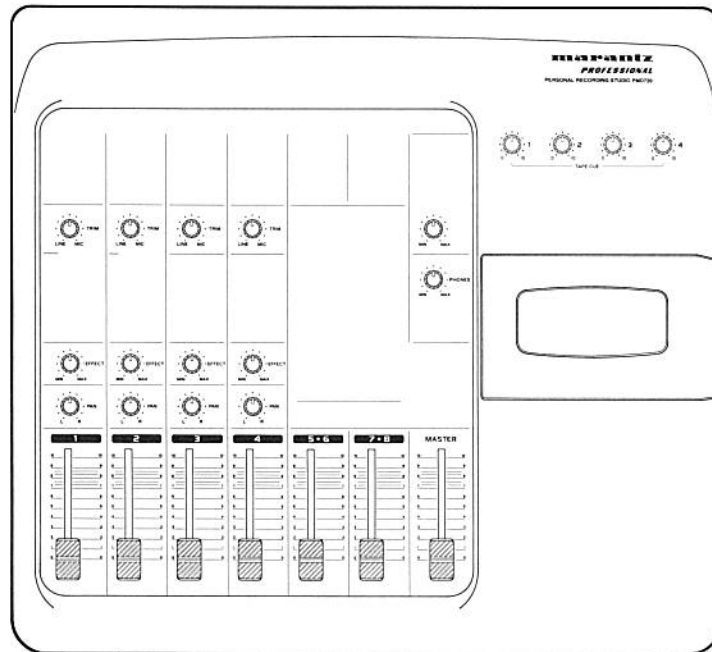
The EFFECTS BUS combines part of the signal from one or more channels, and outputs this combined signal to your external effects for processing.

C. CUE BUS

The CUE BUS is a bus in the PMD720 which carries the signals from the four tape tracks. Sometimes, you may wish to listen to the tape tracks for rehearsal or overdubs, but the mixer channels are already being used for other things. The CUE BUS lets you listen to the tape tracks without using the mixer channels. You should be aware that when you listen to the CUE BUS in the headphones, you are hearing a combination of the STEREO BUS and the CUE BUS. This makes it easy to hear both the tape tracks, and the mixer at the same time.

5. GAIN STAGES

(Fig 5) : Gain Stages



GAIN is similar to volume. The biggest difference is that Volume usually refers to how loud sound is in a room, and GAIN usually refers to how strong an electrical signal is inside audio gear. Even with this difference, GAIN controls basically work like a volume knob. When you turn it up ("Boosting GAIN"), the signal gets stronger, and the sound gets louder. When you turn it down ("Cutting GAIN"), the signal gets weaker, and the sound gets softer.

GAIN STAGES refer to the different places in a SIGNAL PATH, where you might want to change the level of a signal.

As you can imagine, there are many different STAGES (places) where you might want to adjust the GAIN in the PMD720 mixer.

Here are only a few examples:

- If the signal coming into the mixer is too strong (loud), you might want to turn it down right away, before it gets to the equalizer, etc.
- When you are mixing several channels together, you may want one to be louder than the others.
- When you get a sound or a mix you like, and you want to turn up the headphone volume on the whole thing.

As you can see, changing the GAIN at different places in the mixer has different effects on the overall sound. This is why we have included several gain stages in the PMD720 mixer section. All of the controls depicted in Fig. 5 are gain controls of one kind or another. As you go through the rest of this manual, you will see the differences between them, and how each one is best used.

Whenever you have a problem with a signal being too loud, or too soft, remember that there are many different gain stages where you may be able to correct the problem.

Amplification vs. Attenuation

Amplification is the process of taking a low-level audio signal, and making it stronger—boosting GAIN. Typically, we think of all GAIN controls as doing this. In fact, most GAIN controls do the opposite—they are at normal volume when they are turned Right, and they reduce the level as the knob is turned Left. This is called ATTENUATION. When the knob is set at the far Left, the signal is essentially turned all the way off. When the knob is set at the far right, the signal is essentially turned all the way on.

ATTENUATION is also called TRIM. You will notice that the first knob on each channel—which also happens to be the first GAIN STAGE—is labelled TRIM. Every signal which enters the PMD720 will go through a Microphone Preamplifier. If any of these signals are high-level signals, they must be ATTENUATED or TRIMMED, so that they will not get too loud, and cause distortion when they go through the Mic Preamp. Even though the various GAIN STAGE controls are not all labelled TRIM or ATTENUATOR, they all work in this same way. This includes the rotary knobs, as well as the sliding FADERS.

This technical difference is helpful in understanding how your mixer works, but you can relax. In terms of what you are hearing...cranking it up is still—cranking it up.

SHOW ME! SHOW ME! SHOW ME!

This section discusses the PMD720's basic features from a hands-on perspective—So grab your '720, grab your guitar (or keyboard or whatever), and grab your hat. Here we go.

The Multitrack Recording Process

Often, multi-track recording begins with one or two basic tracks which are mainly rhythm parts, such as drums and bass. Then, additional instruments are added. Adding or changing instruments over the basic track is called OVERDUBBING. After all the tracks have been recorded, the four tracks may be mixed with effects, and perhaps even additional instruments. All of these sources will be mixed down to two channels—Left and Right—Stereo. This stereo mix can then be recorded on some kind of master stereo recorder. For most PMD720 users, this master recorder will be a cassette deck, or a DAT machine. This process of mixing many sources down to 2 channels is called MIXDOWN. After that, the mixed project can be reproduced on many cassettes for distribution. This replication process is often called DUBBING.

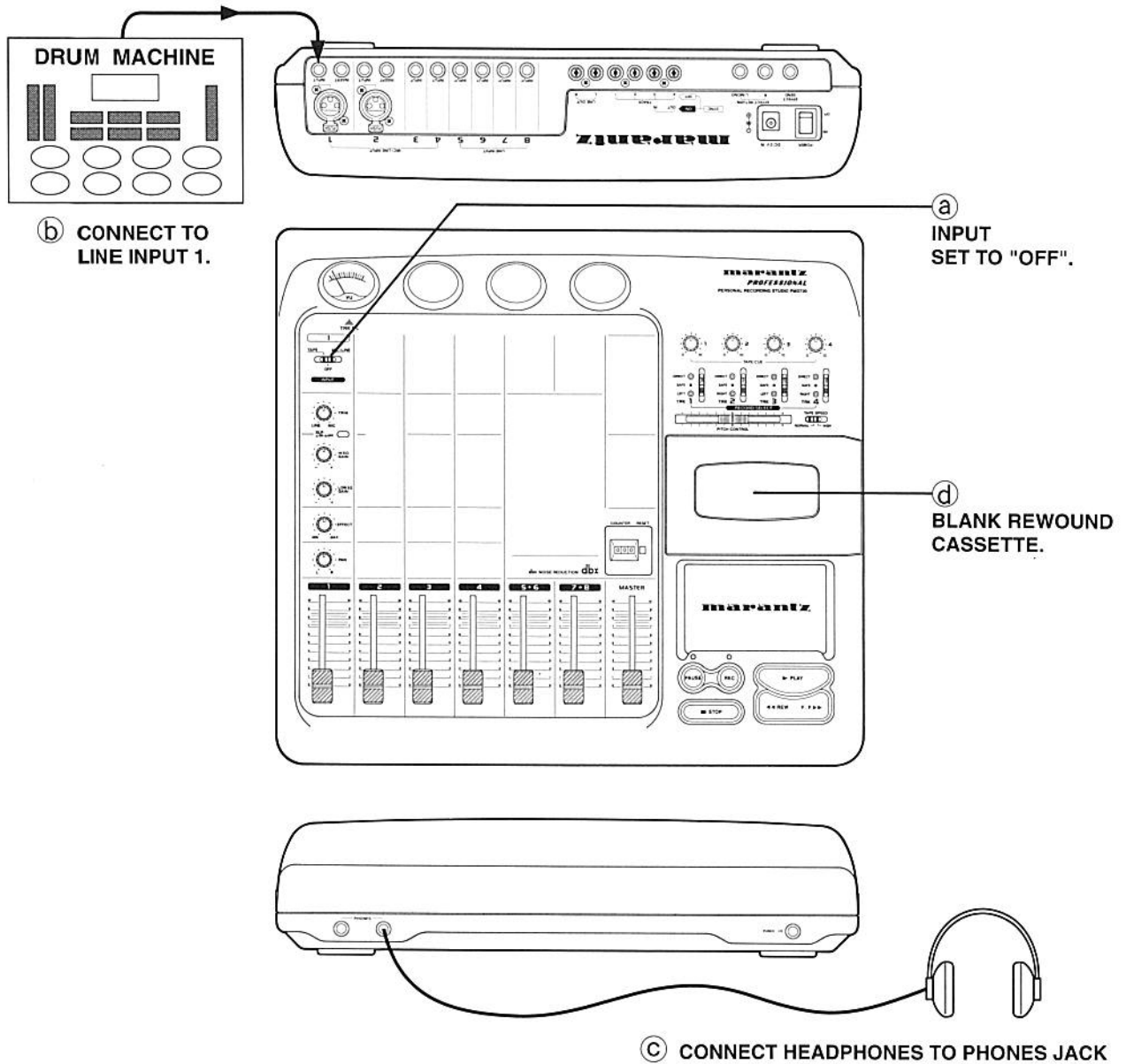
Below, we will describe each step of this entire process in some detail. You can follow along with your own PMD720 if you are unfamiliar with the process.

A) Your First Track

For our first track we will use, as an example, a drum machine with a pre-programmed drum pattern. We will record it from channel 1 of the mixer, to track 1 on the tape. In following along, you may substitute any source you wish for the drum machine, and you may record from any track to any channel.

1) Getting Ready

(Fig 6) : Connection and setup

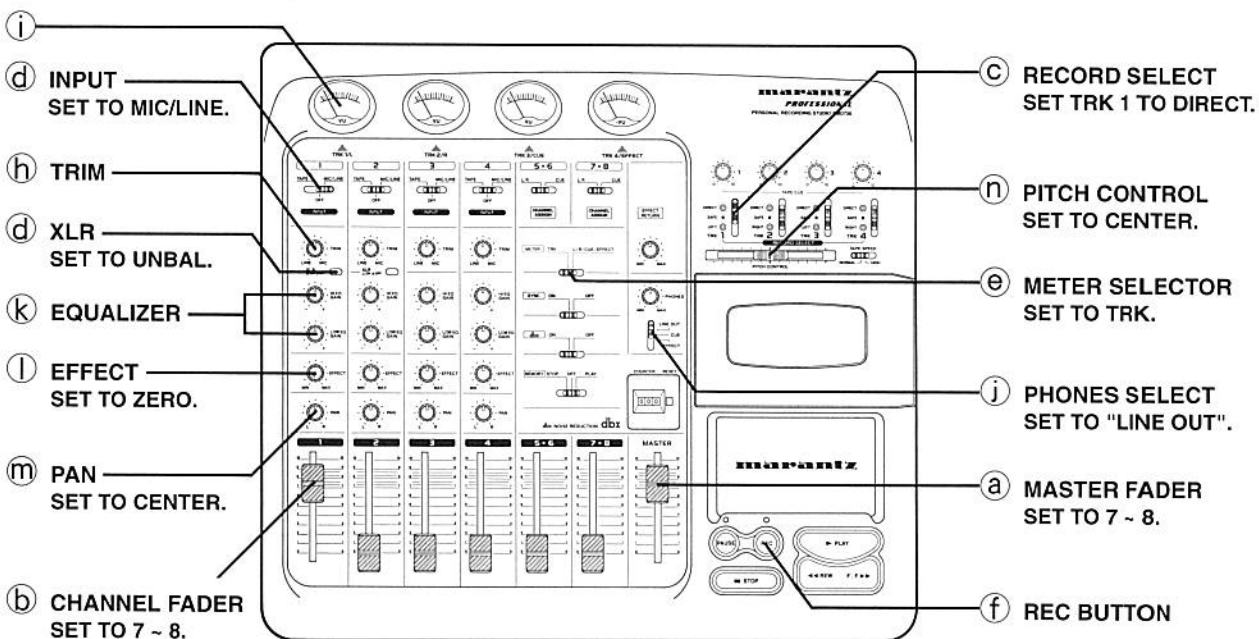


- (a) Set the INPUT SELECTOR on channel 1 to the OFF position. This prevents any "pops" or "clicks" when connecting equipment.
- (b) Connect the output of the drum machine to the 1/4" jack on the rear of channel 1.
- (c) Connect your headphones to the PHONES jack on the front panel.
- (d) Put a blank cassette in the well, and be sure it is rewound.

2) Level setting

Set the controls as in fig #7. You will adjust these settings to suit the situation, but these are good starting points.

(Fig 7) : Level Setting



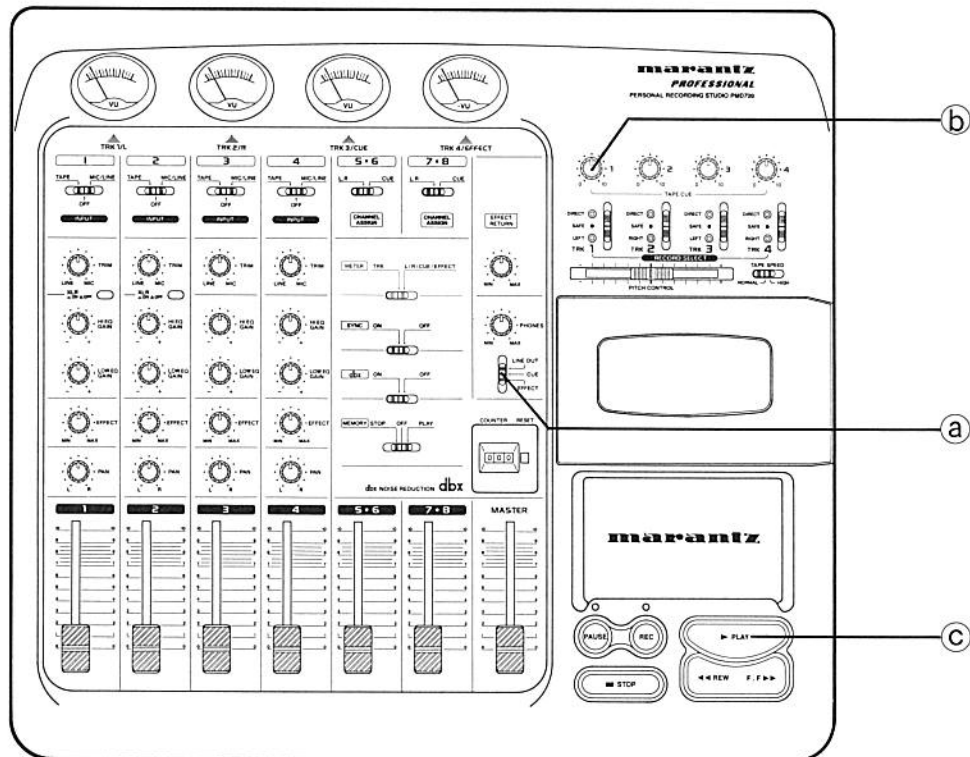
- Set the MASTER fader between [7] ~ [8].
- Set the CHANNEL fader of channel 1 between [7] ~ [8].
- Set the RECORD SELECT switch for TRK 1 to DIRECT. It will now record directly from channel 1 to track 1.
- Set the INPUT SELECTOR of channel 1 to [MIC/LINE], and be sure the XLR switch is set to UNBAL (up). If using a microphone with an XLR connector instead of a drum machine, be sure the XLR switch is set to BAL (down).
- Set the METER SELECTOR to TRK 1-4.
- Press REC to enter record-pause mode. The REC indicator will light.
- Begin playing the drum machine pattern.
- Gradually turn the TRIM knob on channel 1 clockwise, closely observing the needle on VU meter #1.
- Continue increasing GAIN on channel 1 until the needle moves with the drum pattern. IF THE VU NEEDLE STAYS IN THE RED AREA, TURN THE GAIN DOWN. IF THE VU NEEDLE STAYS BELOW -10dB, TURN THE GAIN UP. IT IS OK FOR THE NEEDLE TO ENTER THE RED AREA OCCASIONALLY ON PEAKS, AS LONG AS IT DOESN'T STAY THERE.
- Put the headphones on. Select LINE OUT on the PHONES SELECTOR, and turn the phones control clockwise until the volume is adequate.
- If necessary, you may adjust the EQ on channel 1, to get the "right" sound. Keep in mind that changing EQ changes the overall level. Check the VU meter, and re-adjust if necessary.
- Be sure the effects control for channel 1 is set to zero.
- Set the PAN control for channel 1 to the center position.
- The pitch control should be set to center.

3) Recording

- RESET the tape counter to '000' by pressing the reset button.
- Enter Record-Play mode by pressing play, or by releasing the pause.
- When the recording is finished, press the STOP button, and set the RECORD SELECT switch to SAFE. Now rewind the tape to the starting position. You may also wish to "ZERO" the mixer channel, by making the EQ flat (center) and putting all other knobs at the 0 position. This makes it easier when you plug a new instrument into that channel. Let's listen to the tape to be sure our recording worked out.

4) Listening to the base track

(Fig 8) : Listening to Base Track



- Ⓐ Switch the PHONES SELECTOR to CUE. You can now listen to the tape cue bus.
- Ⓑ Turn up the tape cue for track 1 by turning the knob clockwise to about 12 O'clock. Be sure all other tape cue knobs are set at zero.
- Ⓒ Press PLAY.

If you are unhappy with the result, you can repeat the process from the beginning, changing levels, EQ, etc. If you record on track 1 again, you will erase the recording you just did, and you will record the new version instead.

B) Over-dubbing more tracks

Here we will listen to the Drums on track 1, and record a Bass guitar on track 2 at the same time. Last time, we recorded DIRECT from channel 1 to track 1. Now we will use the stereo bus to record from channel 4 on the mixer to track 2. Note that this procedure would be the same, regardless of the input channel we used. Our choice of channel 4 was arbitrary.

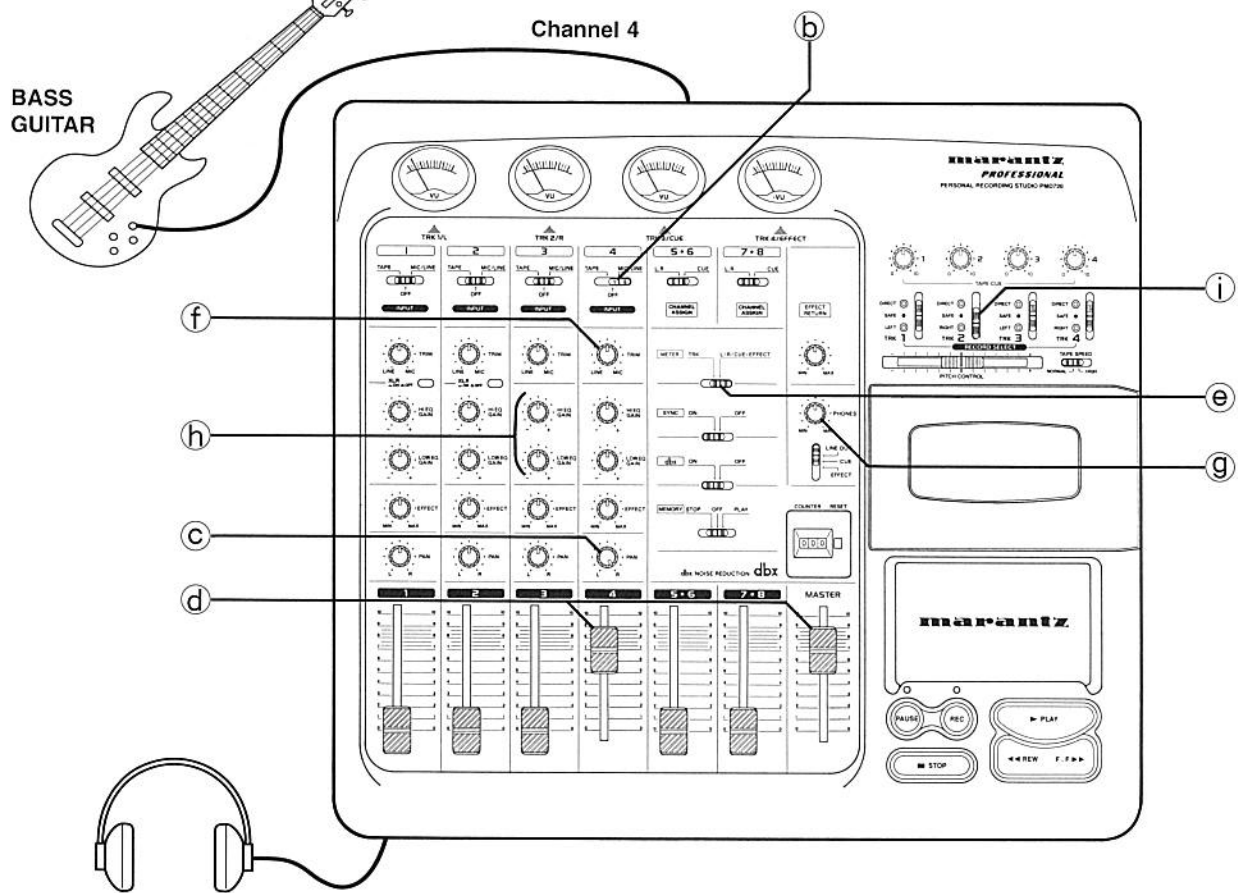
During over-dubbing, always select CUE on the PHONES SELECTOR. The sound of tape playback (cue) will be mixed with new input sources, and both will be heard in the PHONES.

To adjust the overall monitor volume, adjust the PHONES level knob. To adjust the mix of TAPE CUE to the STEREO BUS (Line out), adjust the individual levels of the TAPE CUE knobs.

We recommend that you do not use the mixer faders or input knobs to adjust headphone volume, as that will affect the recording level.

OK, here we go...

(Fig 9) : Overdubbing



1) Getting Ready and Setting Levels

- a) Plug the output of the bass guitar into the 1/4" jack for channel 4.
- b) Set the INPUT SELECT switch of channel 4 to MIC/LINE.
- c) Turn the PAN control for channel 4 all the way to the Right. Now the signal is going to the RIGHT BUS only.
- d) Set the channel and master faders around 7 or so. Again, this may change, but 7 is a good place to start.
- e) Be sure that the METER SELECTOR is set to L/R/CUE/EFFECT.
- f) Turn the TRIM knob of channel 4 gradually to the right, until the RIGHT/TRACK 2 VU meter indicates an acceptable level as described in the section on "Level setting", page 11.
- g) Put headphones on, and turn PHONES knob clockwise to adjust headphone output.
- h) If necessary adjust the tone control by using the EQ knobs as above.
- i) Arm track 2 by setting the RECORD SELECT Switch to R. Now it will record from the RIGHT BUS.
- j) To avoid accidental erasure or accidental recording, be sure that all unused channels are turned off, and all unused tracks are set to safe.

2) Rehearsing and Recording the Overdub

- a) Press PLAY to start playback, and adjust the level of your first track by using the TAPE CUE knob for track 1.
- b) At this point, you can rehearse your part, and then rewind and rehearse again. You can use the MEMORY-PLAY feature here to rehearse more effectively (more on this later).
- c) When you are done rehearsing, rewind to the start of the track.
- d) Press REC and then PLAY to start recording of track 2. If all has gone well, you will hear both the Drum machine and the bass, but only the bass will be recorded on track 2.
- e) When the take is finished, press STOP, switch all RECORD SELECT switches to SAFE, and REWIND the tape.

3) Checking the over-dub

- Pull the MASTER FADER down to zero. This turns off the bass (which is still plugged in), and makes it possible to hear only the recorded tracks.
- Press PLAY to start playback and adjust the level of the bass guitar by turning up TAPE CUE 2. Now TAPE CUE 1 and TAPE CUE 2 are turned up, and both should be audible in the Phones.
- Turn TAPE CUE 1 down, to confirm that ONLY the bass guitar was recorded on track 2.
- Set the VU METER SELECTOR to Track 1-4. You should be able to confirm the level of the Bass guitar on tape track 2.

How was it? If the recording is satisfactory, then over-dub tracks 3 and 4 with the same procedures.

How would you record DIRECT from channel 4 to Track 4? Try it. If you get stuck, look at the original "first track" example above, which records DIRECT from channel 1 to track 1.

How would you record track 3 from the LEFT BUS? If you get stuck, look at the overdub example above, which records track 2 from the RIGHT BUS.

As you can see, you can record from any channel to any track by using the LEFT or RIGHT BUSES, in conjunction with the RECORD SELECT Switches.

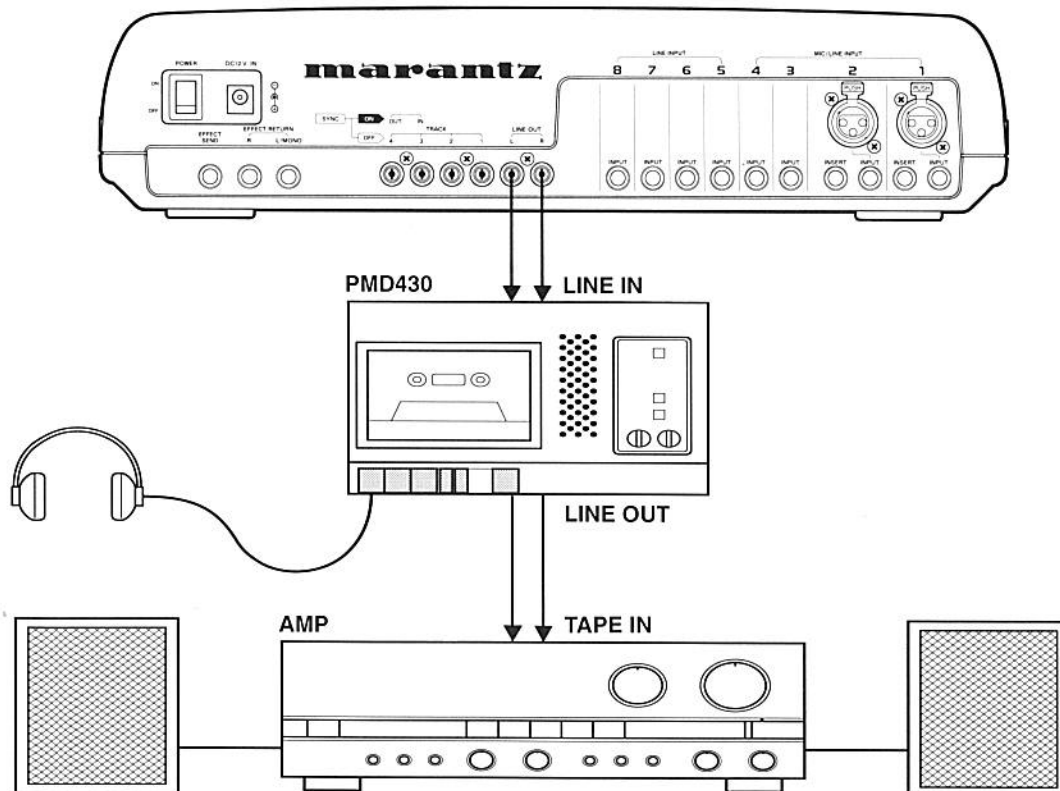
C) Mixdown

What is mixdown?

Mixdown refers to the process of taking multiple sources (tape tracks, effects, processing, synthesizers, drum machines, samplers, live musicians, etc.), and mixing them down to one Master Stereo Tape. The relative volume, EQ, reverb, special effects, and Left-Right balance of each source are adjusted and fine tuned, so that the Master tape sounds like one big piece of music, rather than like a clumsy combination of the independent sources they once were.

In the example below, we will show how to mix down 4 tracks of audio. Later on, we'll learn how to add reverb for ambience. Connect your equipment as in figure 10, and set the INPUT SELECTORS for channels 1-4 on TAPE. You will notice that Tracks 1-4 will now be played on channels 1-4.

(Fig 10) : Mixdown Connections



- 1) The Line output of the PMD740 is connected to the inputs of the Master Stereo Recorder.
- 2a) Since the final result or your recording will be played through speakers, we recommend that you connect the output of the master recorder to an amplifier and speakers. You may need to put the Master Recorder into REC-PAUSE mode in order to check levels, and to get output to the amplifier.
- 2b) If you mix with headphones instead of speakers, set the PHONES SELECTOR to LINE OUT. Be aware that headphones tend to exaggerate the effects of Stereo Panning and Reverb.
- 3) Set the METER SELECTOR to L/R/CUE/EFFECT. By now, you should be able to recognize a healthy—but not-to-hot signal.
- 4) You now have a great deal of flexibility with volume, EQ, panning, and effects, by playing with the controls on each channel. We could offer a lot of advice about what to pan where, what to do with reverb, how to EQ different instruments, etc. In the end, however, it is YOUR music. We encourage you to play with the mixer features, and let YOUR EARS make the creative decisions.

Adjusting each track

- 5) Now that the setup is ready, spend some time rehearsing your mix. You may find that one instrument is fine for most of the song, but too loud in one particular place. You can practice lowering that fader at the loud section, and then re-setting it to the normal position. If you do it well, your ears will think it was the perfect volume the whole time. When you have rehearsed your mix enough, you will finally be ready to record it to the Master Stereo Recorder.
- 6) With the PMD720 in PLAY mode, and the Master Recorder in Record-Pause mode, adjust the input level until the meters read an optimum level. Presumably, you have already set the optimum level on the PMD720 while rehearsing, so you will NOT want to adjust any of the channel faders or the master fader.
- 7) Rewind your song.
- 8) Release the pause on the Master Recorder, and press PLAY on the PMD720. You are now mixing to a stereo master.
- 9) When it is finished, play it back on your regular stereo system, or in a boom box or personal cassette player. If you are not satisfied, you can mix your song again, with changes.
- 10) When you are satisfied with the result, you will be able to make multiple copies of your master tape directly to a cassette deck, DAT, Reel to Reel, etc.
- 11) After copyrighting your work, send it off to a big record company, become rich and famous, and tell everyone that you did it on a Marantz.

D) Using Effects

Special effects can bring a great deal of life and depth to music recorded in the dead, sterile environment of a home recording studio. Ambient effects like reverb or echo can provide a sense of depth and space; Gates, Compression, and EQ can fine-tune a sound; and special effects like chorus and flanging can completely change the character and shape of your music.

Effects can be used in many ways, whether added in the recording of a basic track, an overdub, track-bouncing, or even as a finishing touch on a mix. The PMD720 has been designed to let you use your effects easily and effectively. With 2 insert points, a mono effect bus, and a stereo return, the PMD720 allows the use of up to 3 effects at a time. By recording some during tracking, some during overdubs, and some during mixdown, a wide variety of effects can be used to color your music.

Effects routing on the PMD720 takes 2 forms: INSERT POINTS and the EFFECTS BUS.

1. INSERT POINTS

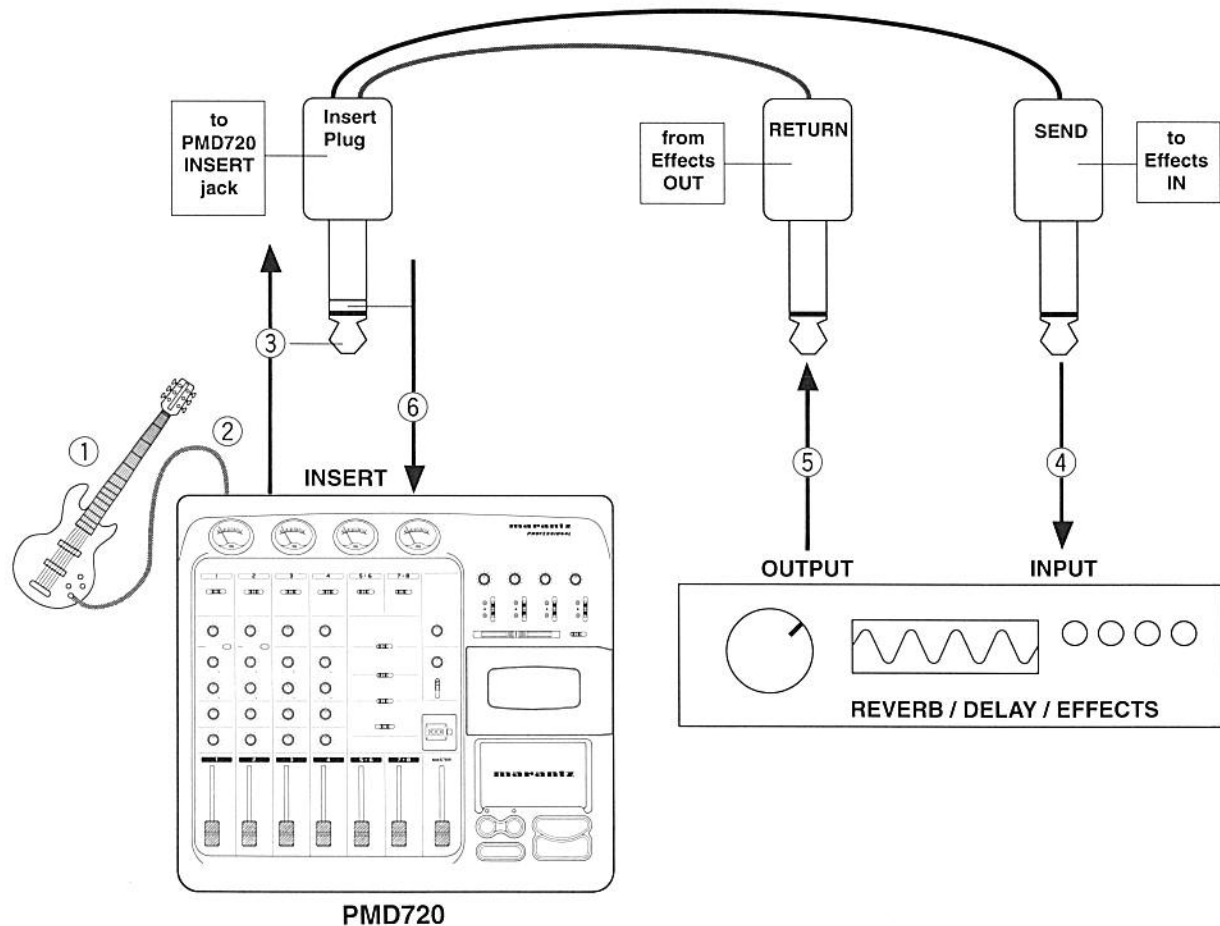
The PMD720 has 2 insert points—one on each of the first 2 channels. These points occur before the EQ, and the channel fader. This means that a signal (let's say a guitar) enters the PMD720 at the input, goes through the TRIM control, and then leaves the PMD720 on a special insert cable. The signal goes into your effects unit (let's say a chorus effect), gets changed by the effects circuits, and then returns to the PMD720 on that same special insert cable. Back in the PMD720, the signal continues to the EQ, the channel fader, and then the PAN pot.

Even though this sounds complex, we have already done all the difficult work. Your job is easy. Let's say you already have a guitar plugged into a channel on the PMD720, and you want to add a chorus effect to it. You will need a special "insert cable", which you can probably buy where you bought the PMD720.

- a) Plug the 3-conductor TRS plug (in the middle of the insert cable) into the channel insert jack (next to the 1/4" input jack)
- b) Plug the SEND plug on one end of the insert cable into the INPUT on your effects unit.
- c) Plug the RETURN plug on one end of the insert cable into the OUTPUT on your effects unit.

You're done. You plugged in 1 easy cable, and added in-line effects to your mixer!

(Fig 11) : Connection between PMD720 and effector



Signal Flow for Insert Points:

- ① Signal leaves Guitar.
- ② Signal enters PMD720 through 1/4" jack
- ③ Signal leaves PMD720 on Insert plug SEND (TIP of TRS plug)
- ④ Signal enters Effects device from Insert Send Plug
- ⑤ Signal leaves Effects device into Insert Return Plug
- ⑥ Changed Signal enters PMD720 on Insert plug RETURN (RING of TRS plug)

2. THE EFFECTS BUS AND THE EFFECTS RETURN.

The above method of using insert points is great for adding effects to individual elements in a mix. But how do you add one effect to all the elements of a mix? For example, reverberation effects can add depth to all aspects of a mix, especially featured instruments or vocals.

The PMD720 includes an EFFECTS BUS which takes part of the signal from every Mic / Line channel, combines them, and sends these signals out through a jack on the back. This combined signal gets processed in the effects unit, and sent back into the PMD720's stereo bus. If the effect is a stereo effect, the new, altered signal is sent back into the PMD720 in stereo.

Let's say you're adding reverb to everything, but you want to add extra reverb to a featured instrument (let's say the vocals)? How do you control the amount of reverb applied to each instrument?

You can specify more or less effect for each channel with that channel's EFFECT control. Turning the control all the way to the left means that no signal from that channel will be sent to the EFFECTS BUS, and subsequently, there will be no change in the sound of that instrument. Turning the EFFECT control farther to the right sends more signal to the EFFECTS BUS. This means that more of that channel's signal will be processed, and the sound of that channel will change more dramatically.

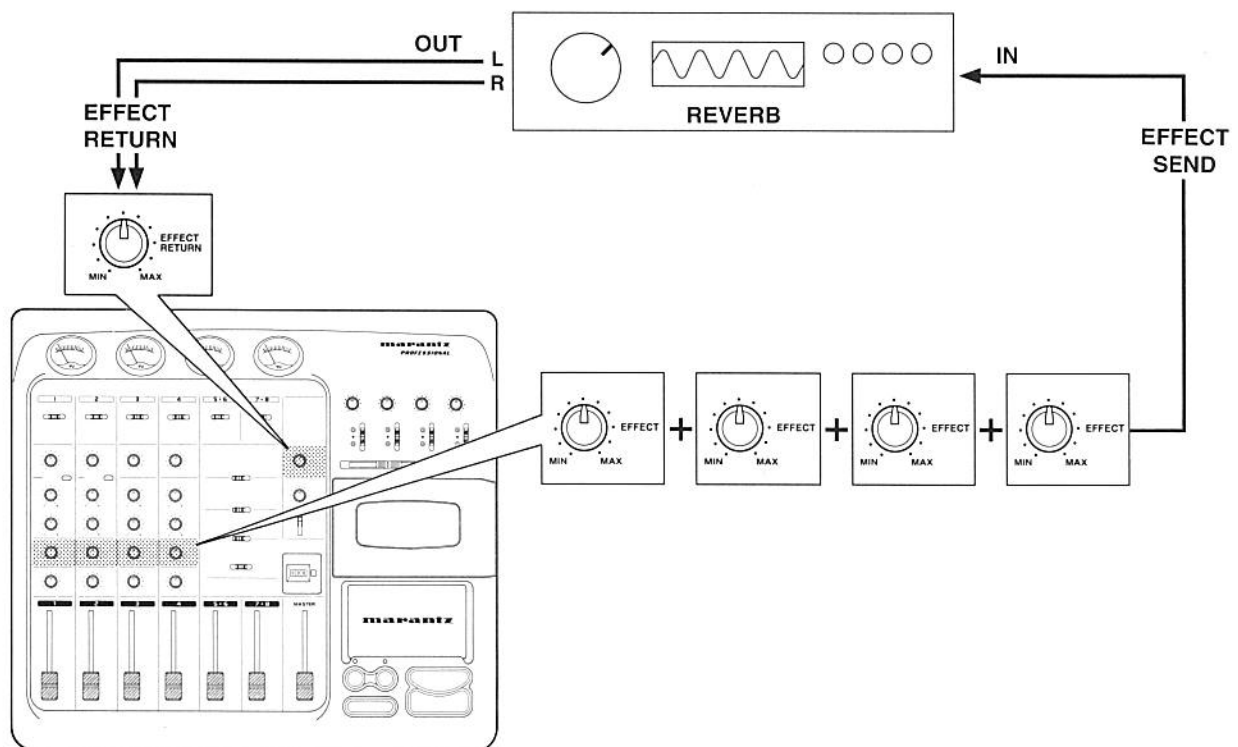
To answer the question about adding more reverb to the vocals, simply turn the EFFECT control on the vocals' channel farther to the right than the EFFECT controls on other channels.

The EFFECT RETURN control is a master control for how much reverb (or other effect) is added to the STEREO BUS. You can think of this as an overall volume level for the reverb.

It is interesting to note that the EFFECT SEND occurs AFTER the CHANNEL FADER on each channel. This means that as you increase the volume of a given channel, you also increase volume of the reverb added to that channel. This gives the illusion that the reverb is part of the original sound, rather than a special effect that is added later. Since the EFFECTS SEND BUS is affected by the CHANNEL FADERS, it is called a POST-FADER SEND. You may remember that the CUE BUS is not affected by the CHANNEL FADERS, so it is called a PRE-FADER SEND.

This is how a reverb unit would connect to the PMD720. The arrows show how signal goes from a channel, to the EFFECTS BUS, to the EFFECTS SEND jack, through the REVERB UNIT, into the EFFECT RETURN, and into the STEREO BUS.

(Fig 12) : Connection between PMD720 and effector

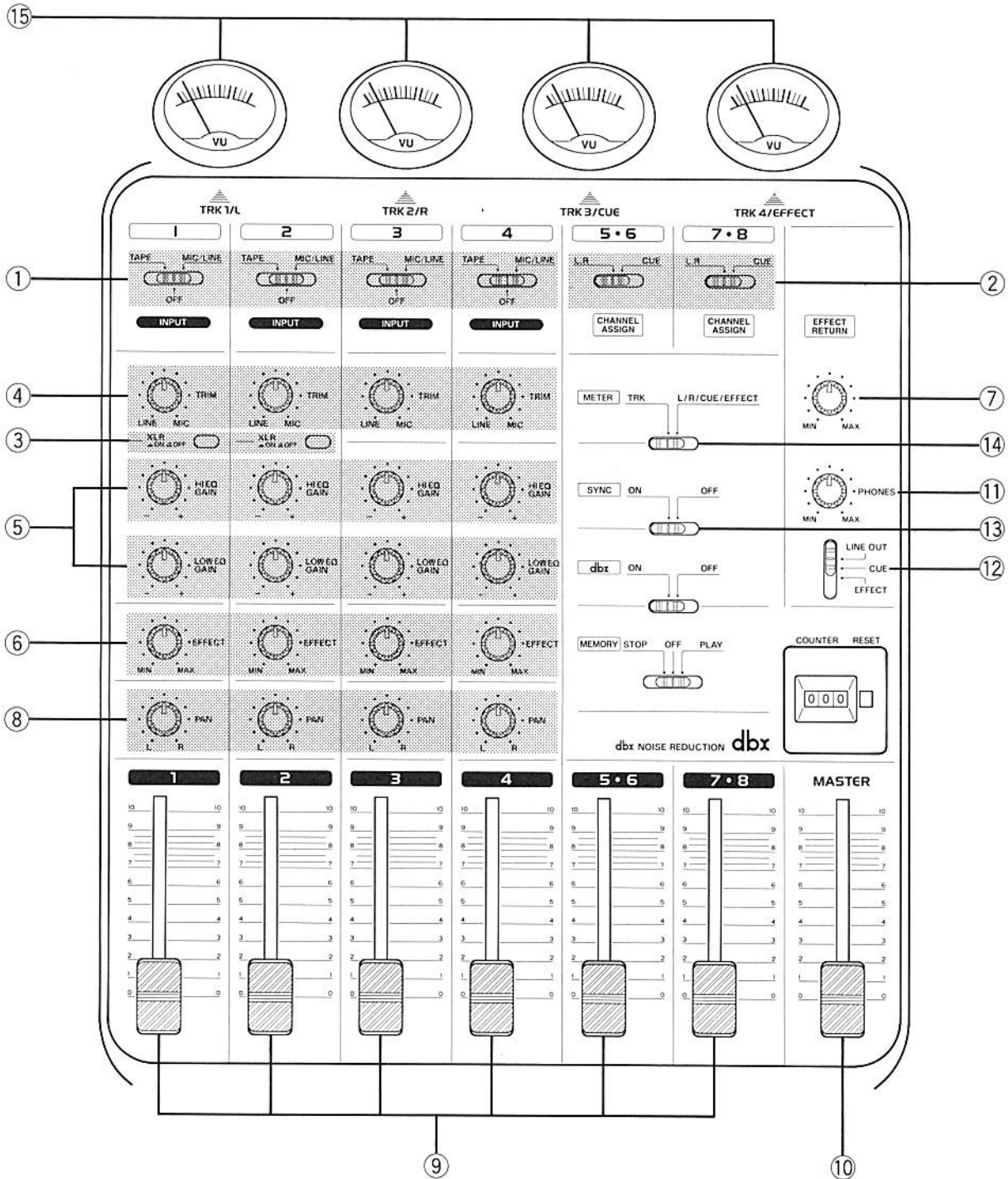


Say, What does THIS button do?

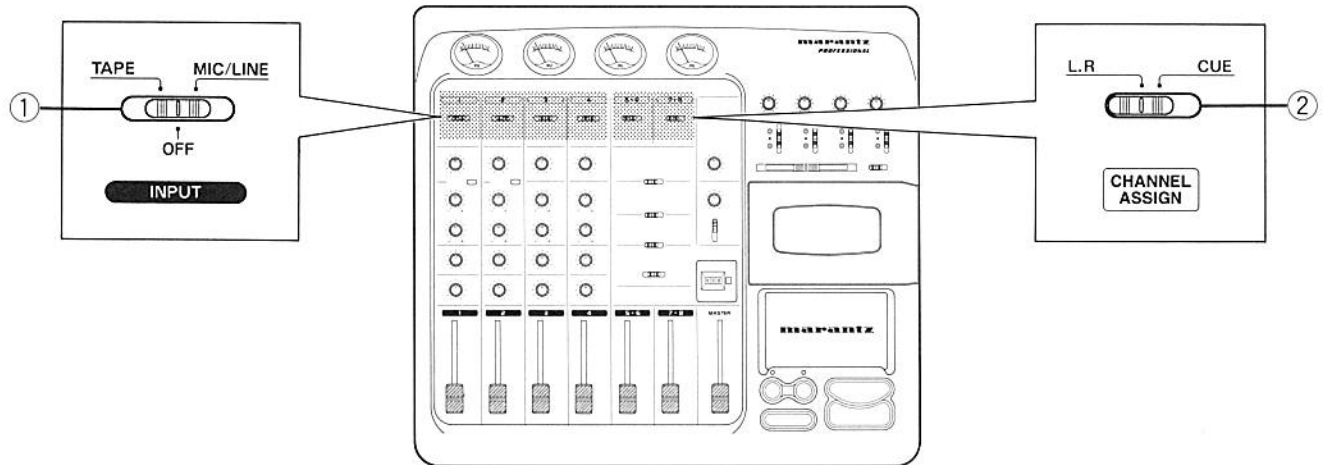
This section discusses all of the Inputs, Outputs, Controls, and Displays of the PMD720.

The PMD720 Mixer

(Fig 13) : Mixer section



(Fig 14) : Input selector switch, Channel Assign Switches (Channel 5/6 and 7/8)



① **INPUT SELECTOR SWITCH (Channels 1-4)**

These switches select the source of input to the mixer section.

MIC/LINE

In the Mic/Line position, the input for that channel will come from the back panel XLR or 1/4" jack for that channel. See also the XLR switch, page 20, figure 15.

OFF

The off position is used to mute all input to that channel. Even when a channel fader is all the way down, the active circuits can introduce noise into your recordings and mixdown. By setting an unused channel to "OFF", you can effectively mute the channel, and eliminate this noise.

TAPE

When Channels 1-4 have "Tape" selected as their input source, the corresponding tape track will be routed to that channel, instead of the Mic or Line source plugged into the back. For example, if channel 3 is set to "Tape" input, then channel 3 will get its signal from tape track 3, regardless of what is plugged into Mic or Line input #3 on the back panel.

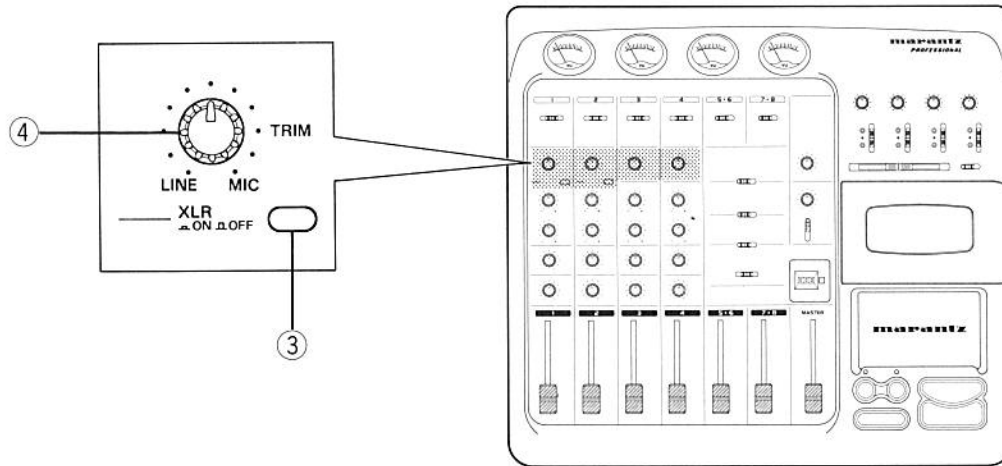
② **CHANNEL ASSIGN SWITCH (Channels 5/6 and 7/8)**

The CHANNEL ASSIGN switches allow you to route the stereo input of these channels directly to the Headphones CUE. This is especially useful for those times when you want to listen to the instruments on these channels, but you do not want to record them with the rest of Left / Right Mix. When the switch is in the L / R position, the stereo signals on that channel are routed to the LEFT and RIGHT BUSES. When the switch is in the CUE position, the stereo signals on that channel are routed directly to the Headphones CUE, without being mixed with the rest of the signals in the mixer first.

PLEASE NOTE:

Channels 5/6 and 7/8 are Stereo Channels, and are sent to the headphones in Stereo. However, because the CUE BUS is a Monaural Bus, these Stereo Channels cannot be sent to the CUE OUTPUT, nor appear on the CUE METER.

(Fig 15) : XLR Switch and Trim Control



③ **XLR SWITCH (Channels 1 and 2)**

These switches are found only on the first two channels. When they are in the BAL (down) position, the channel is expecting input from its XLR connector. When in the UNBAL (up) position, the channel will expect input from its 1/4" connector. Both the XLR and the 1/4" connectors are found on the rear panel. Both can be used for either mic or line level inputs.

④ **TRIM CONTROL (Channels 1-4)**

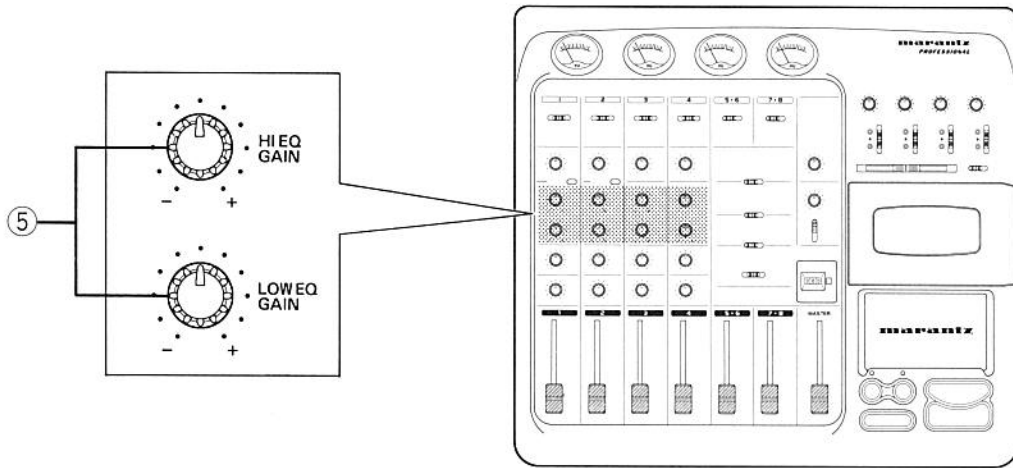
When the channel input selector is set to TAPE, this knob has no effect. The TAPE input level is fixed.

When the input selector is switched to MIC/LINE, these controls adjust how much signal goes from the channel input jack (on the back panel) to the preamplifier for that channel. You can raise the level of quiet signals, and lower the level of loud signals, so that they are easier to mix together. This is only the first "gain stage" for the channel. If you use this control to set a "rough" volume level, you can use other controls for finer adjustment.

Turning the control counter-clockwise decreases the signal going to the pre-amp. When using high level inputs like synthesizers, CD players, other line sources, etc., you will want to turn the level down, so you can even out the input levels of all the sources entering the mixer. If the TRIM control is set at the minimum level (hard left), and the signal is still too loud, then decrease the output level of the source equipment.

Turning the control clockwise increases the signal going to the pre-amp. When using low level inputs such as microphones, acoustic pickups, etc., you will want to raise the level so as to even out the input levels of all the sources entering the mixer.

(Fig 16) : The EQ Section.



⑤ **HI EQ/LOW EQ CONTROL (Channels 1-4)**

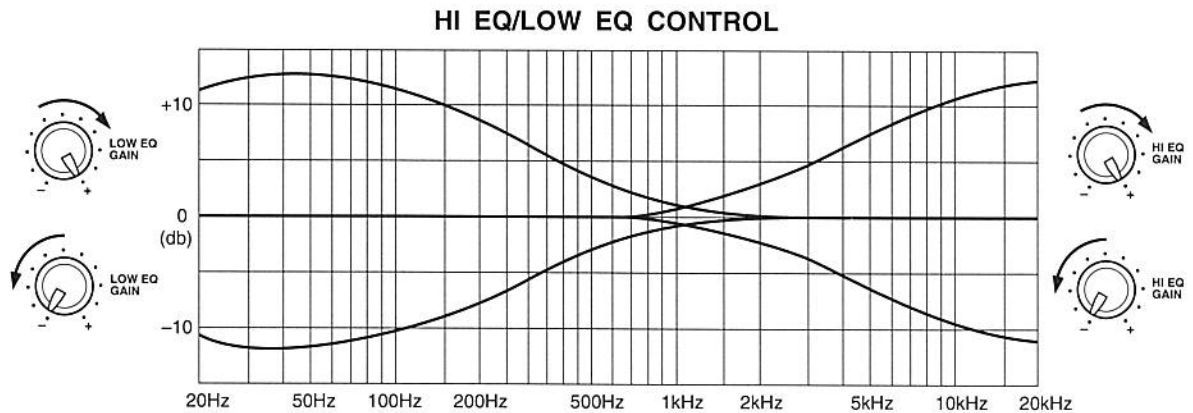
These Equalization controls are found on each of channels 1-4. They control the High (Treble) and Low (Bass) frequency content of the signal on that channel.

The HI EQ is a +/-12 dB shelving Equalizer with a hinge frequency at 10KHz, and a 3dB per octave slope.

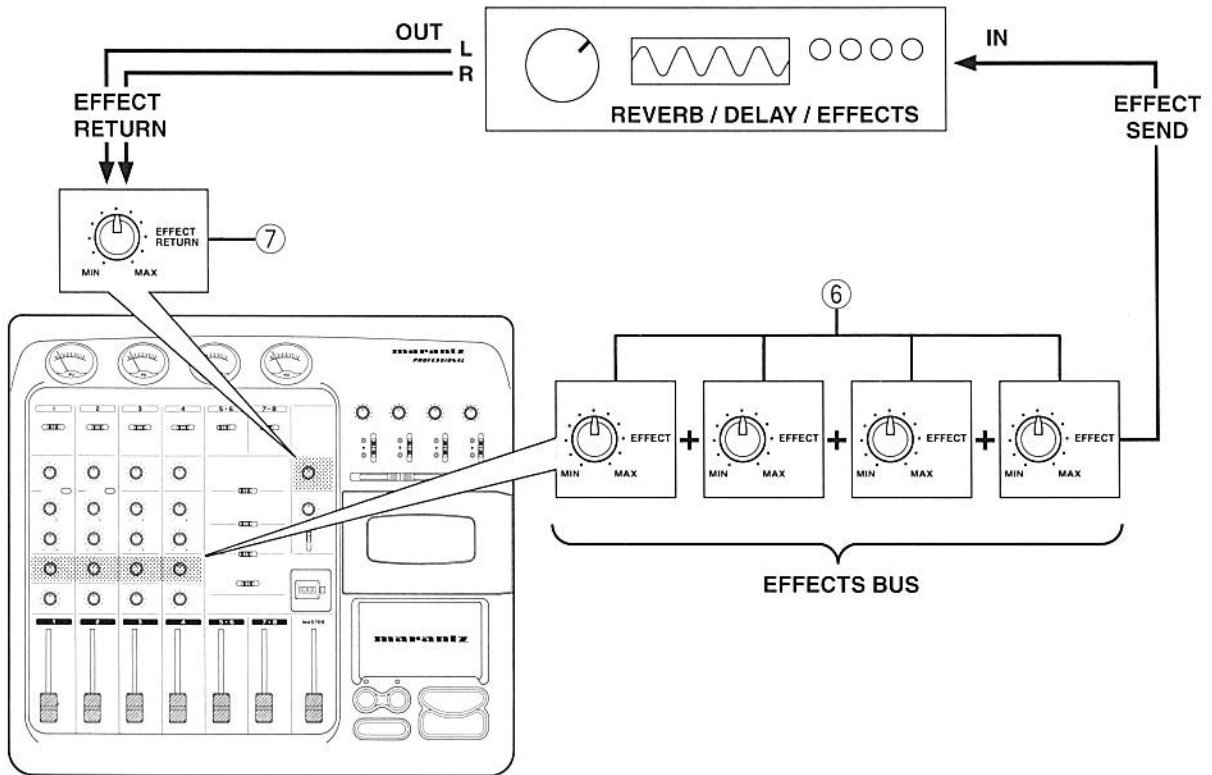
This means that you can amplify (turn up the volume of) the high frequencies (treble) by turning the HI EQ knob right-of-center, or attenuate (lower the volume of) the high frequencies by turning the knob left-of-center. When the knob is exactly in the center, the high frequencies are not being amplified or attenuated. At this point, the high EQ is said to be "flat".

The LOW EQ is a +/-12 dB shelving Equalizer with a hinge frequency at 100Hz, and a 3dB per octave slope.

This means that you can amplify (turn up the volume of) the Low frequencies (bass) by turning the LOW EQ knob right-of-center, or attenuate (lower the volume of) the low frequencies by turning the knob left-of-center. When the knob is exactly in the center, the low frequencies are not being amplified or attenuated. At this point, the LOW EQ is said to be "flat".



(Fig 17) : Effects Bus, Effect Loop, and Effect Return



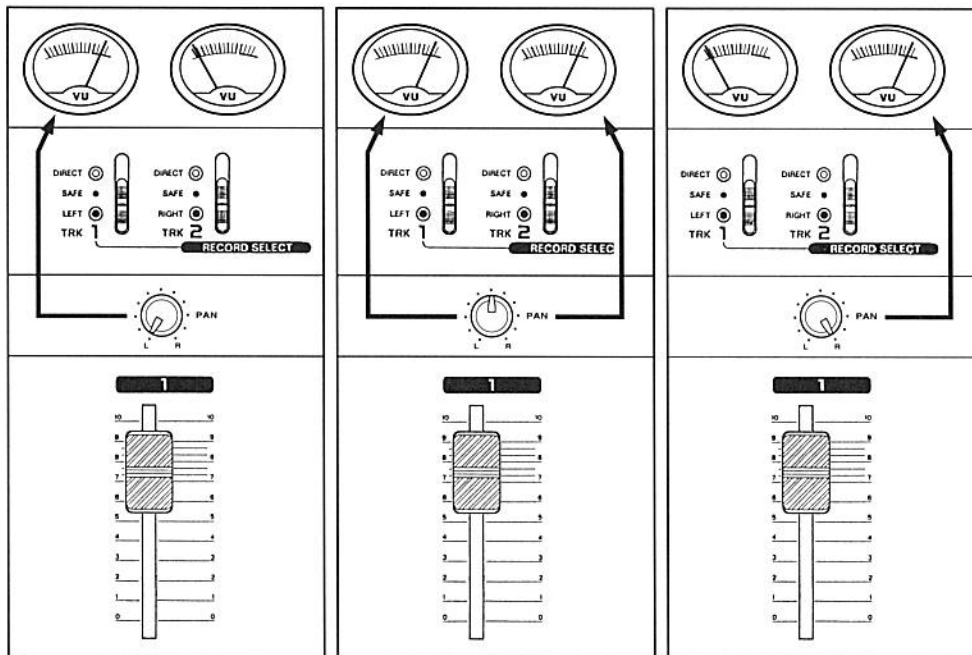
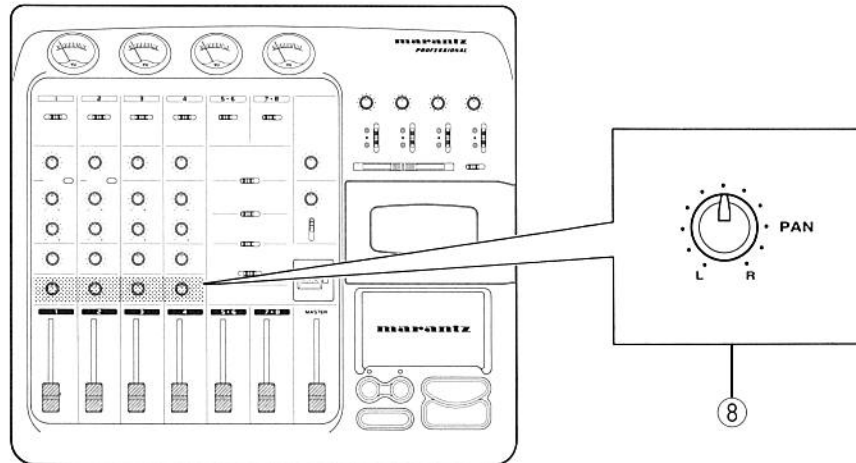
⑥ **EFFECT (Channel 1-4)**

With this control, each channel can individually adjust how much of its signal will go to the effects bus. Turning this control clockwise sends more signal to the effects bus. Turning it counterclockwise sends less signal to the effects bus.

⑦ **EFFECT RETURN**

After the signal leaves the effects bus, via the EFFECT OUT on the rear panel, it is processed by your effects unit, and the new, modified signal is returned to the PMD720. It enters the PMD720 through the stereo EFFECTS RETURN JACKS on the rear panel, and then SOME of it is mixed back into the stereo bus. HOW MUCH of this signal is mixed into the stereo bus, is controlled by the EFFECT RETURN knob.

(Fig 18) : Three examples of recording from the STEREO (L/R) BUS, using the PAN Controls



Recording on Track 1 from the LEFT BUS.

Recording on Track 1 and Track 2 from the LEFT and RIGHT BUSES.

Recording on Track 2 from the RIGHT BUS.

⑧ PAN

Channels 1-4 can be routed to both sides of the stereo bus. How much signal goes to the left side, and how much goes to the right side is controlled by the PAN (panorama) controls. This means two different things, depending on how you are using the PMD720 at the time.

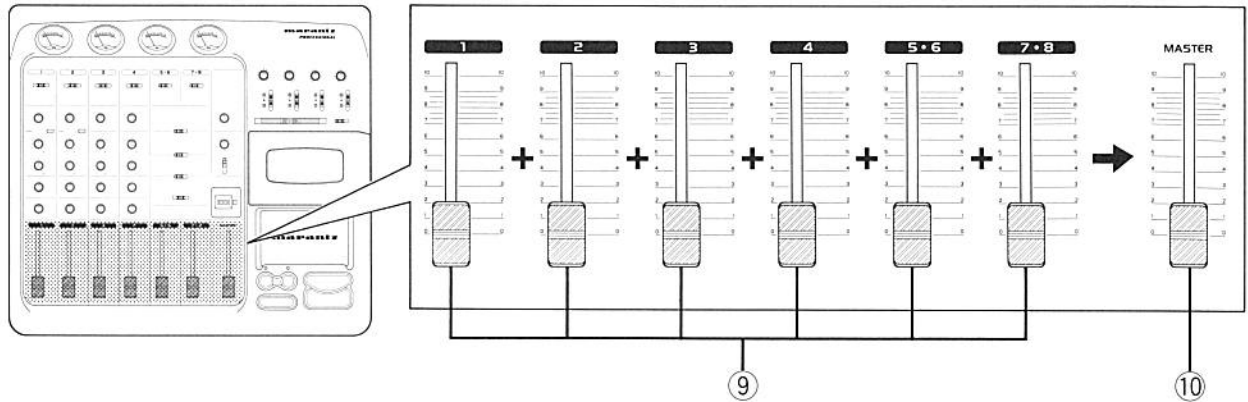
During recording:

If the RECORD SELECT switches are set to record from the LEFT (tracks 1 and/or 3) or RIGHT (tracks 2 and/or 4) busses, then the PAN control will determine how much signal is going to which tracks. For example, if tracks 1 and 2 are set to record from Left and Right respectively, then the PAN control will pan the signal continuously from track 1 to track 2. Panning hard left will record only on track 1, and panning hard right will record only on track 2. After recording, tracks 1 and 2 can, themselves, be individually panned anywhere in the stereo field.

During Mixdown:

Any channel, whether it is monitoring a track, or a "live" input, can be panned hard left, hard right, or anywhere in between. For example, a signal which was recorded from the right bus onto track 2, can be played back on channel 2, and then panned hard left, hard right, or anywhere in between.

(Fig 19) :Channel Faders and Master Fader



⑨ CHANNEL FADERS

The CHANNEL FADER is the second gain stage. Once a general level is set at the TRIM control, this fader can be used to make further adjustments to the volume of the signal. It is particularly useful during mixdown, when subtle volume adjustments may be needed in the middle of a performance. The signals from all of the CHANNEL FADERS are combined, and then go to the STEREO BUS. The total level of this combined signal is controlled by the MASTER FADER.

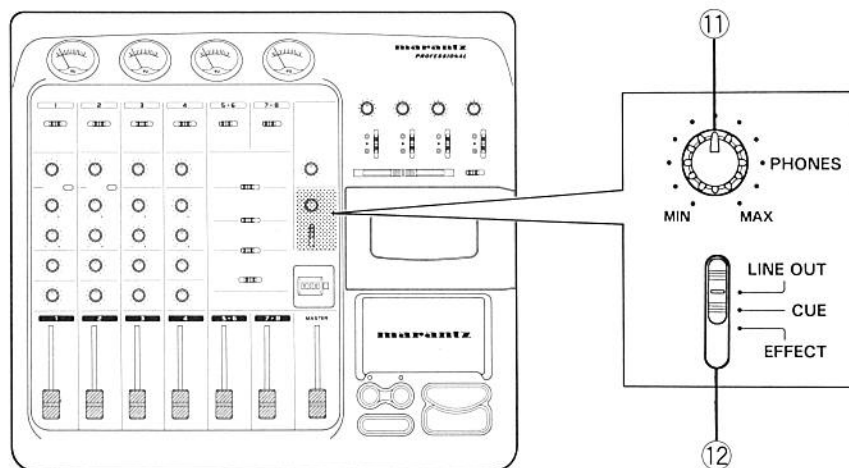
Even though they are located at the bottom of the panel, the channel faders actually get their signal after the TRIM, INSERT, and EQ, and before the EFFECTS, and PAN.

If you have set your TRIM controls well, your channel faders will all be roughly in the same place.

⑩ MASTER FADER

After all eight channels of the mixer and the effects return have been combined on the STEREO BUS, the master fader controls the master level of this combined signal which is then sent to the stereo line outs, and to the headphones.

(Fig 20) : Headphone Controls



⑪ PHONES LEVEL

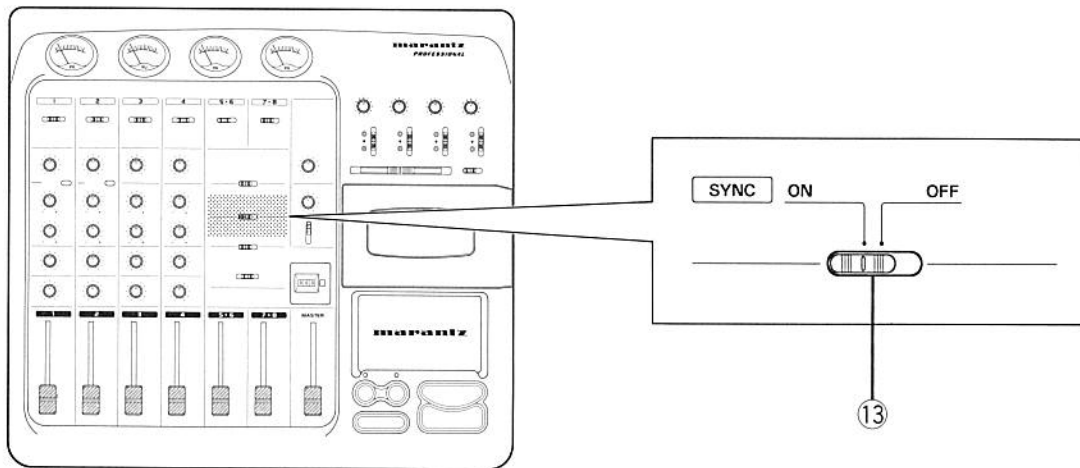
This knob controls output volume of the PHONES jacks on the front panel. The signal going to the PHONES can be switched with the PHONES SELECTOR switch. See Below.

12 PHONES SELECTOR

The PMD720 has two headphone jacks which can be switched between three sources. Depending on the position of this switch, the PHONES will monitor 1) the STEREO BUS, 2) the tape CUE combined with the STEREO BUS, or 3) the EFFECTS BUS.

Note that when the PHONES SELECTOR is set to CUE, both the Left and Right sides of the stereo bus are combined IN MONO with the tape cue bus, and the resulting MONO signal is sent to the headphones. The STEREO BUS will remain stereo, and any record or mixdown functions WILL be affected by the PAN knobs, even though it will not register in the headphones. To hear the effects of the PAN knobs in the headphones, the phones must be set to monitor the STEREO bus line out. For more information on the **EFFECTS BUS**, please see page 7. For more information on the **CUE BUS**, please see page 7.

(Fig 21) : Sync Controls



13 SYNC Switch

The SYNC switch re-routes the input and output of track 4 to the special SYNC IN/OUT terminals on the back of the PMD720. This allows a permanent connection to a MIDI or SMPTE synchronizer, without tying up mixer channels, and without tying up track 4 on non-SYNC recordings.

When the SYNC switch is ON, the input for Track 4 comes from the TRK-3/SYNC-IN jack, and the output from Track 4 goes through our special Sync Tone Isolation Circuit (STIC), and then to the TRK-4/SYNC-OUT jack on the back of the machine.

When the SYNC switch is off, the TRK-3/SYNC-IN and TRK-4/SYNC-OUT jacks output the recordings on tracks 3 and 4 respectively.

This switch is for re-routing signals to your external synchronizer. The PMD720 does not include a synchronizer.

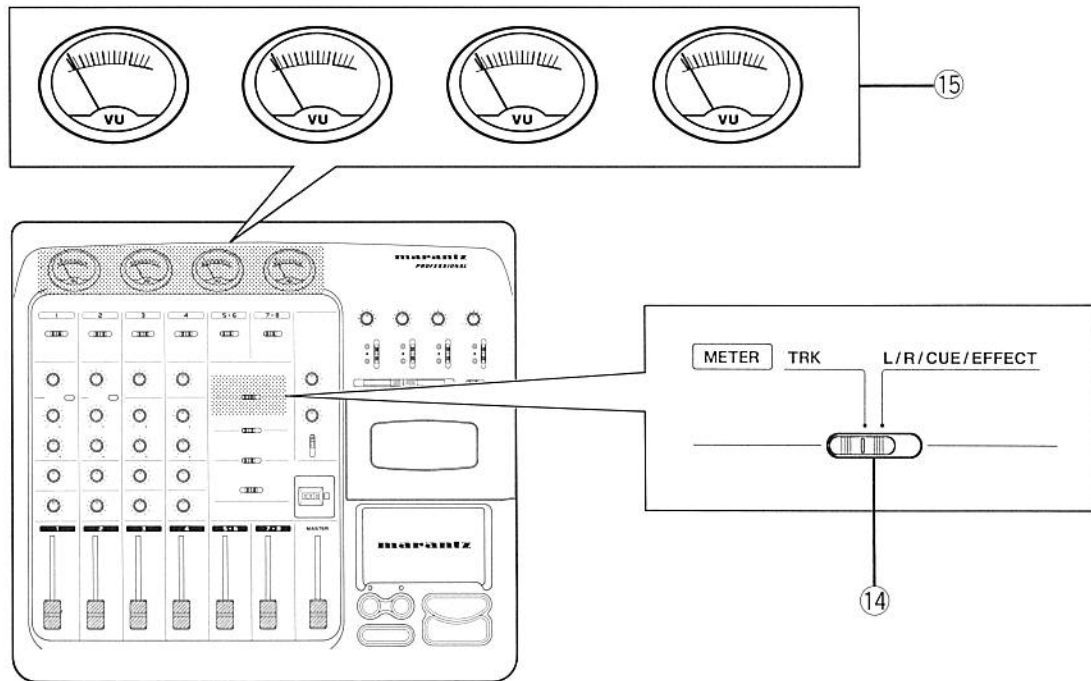
In SYNC mode, the controls should be set as follows.

	<u>At Recording.</u>	<u>At Playback.</u>
• SYNC switch	ON	ON
• RECORD SELECT switch - TRK 4	DIRECT	SAFE
• INPUT SELECTOR - Channel 4	—	OFF or MIC/LINE
• TAPE CUE control - TRK 4	—	0 (MIN)

• NOTE

Note that recording onto Track 3 at high levels while synchronizing may interfere with the SYNC output. If you are recording to Track 3, and are having trouble synchronizing, try recording to Track 3 at a lower level.

(Fig 22) : VU Meters



⑭ **METER SELECTOR**

This switch selects either of the two meter modes. With the switch in the TRK position, meters 1-4 show the signal recorded on their respective tracks. In L/R/CUE/EFFECT, meters 1-4 show the following:

- Meter 1 : Left side of the **STEREO BUS**
- Meter 2 : Right side of the **STEREO BUS**
- Meter 3 : Master output level of the **CUE BUS**
- Meter 4 : Master output level of the **EFFECTS BUS**

⑮ **VU METER**

These four large VU meters are backlit for easy viewing from a distance or in a dark studio.

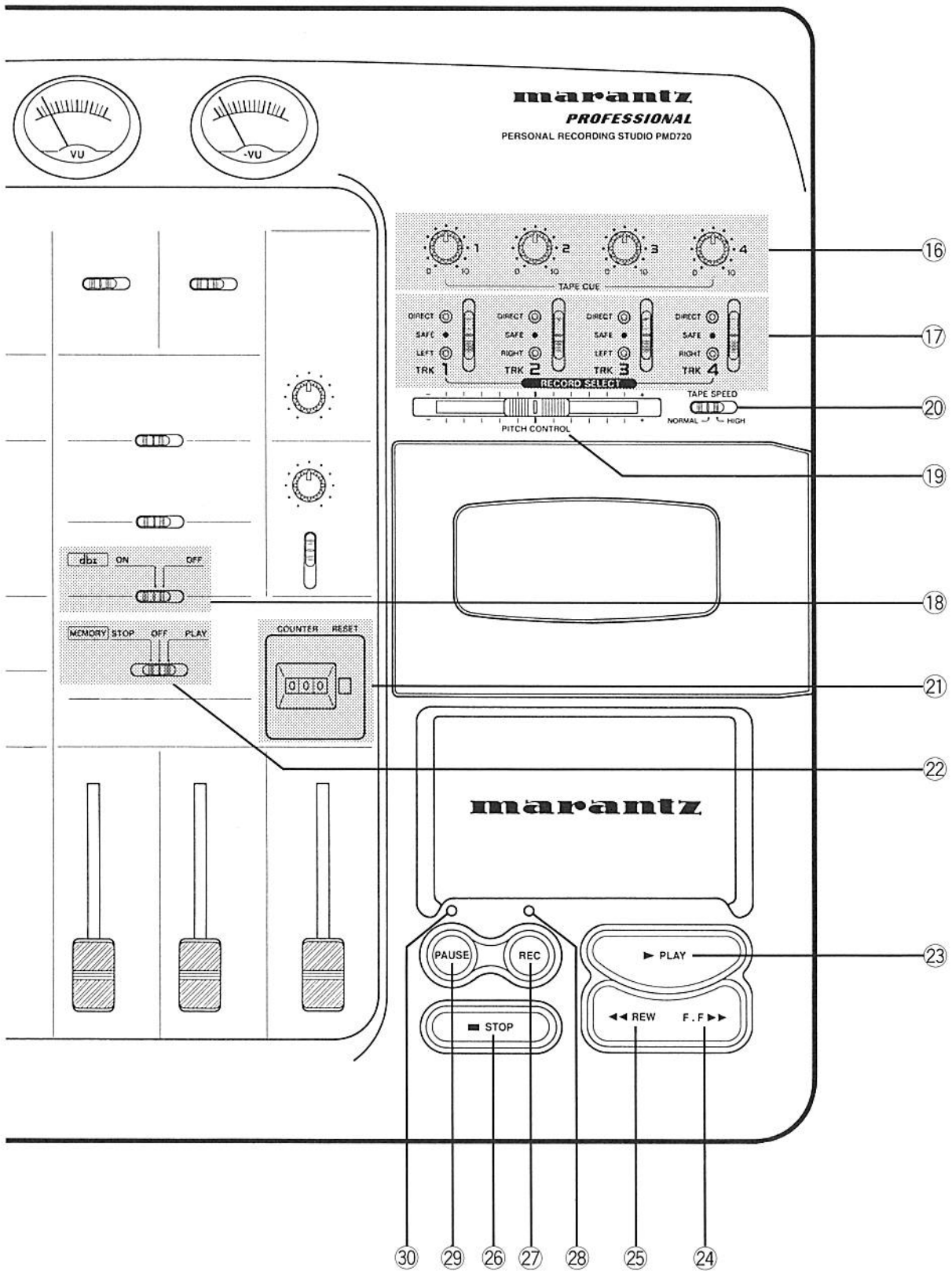
Each of these four meters serves double-duty, dependent upon the position of the METER SELECTOR ⑭. The chart below shows which signal the meters will display, dependent upon the position of the METER SELECTOR switch.

(Fig 23) : VU Meter Display Chart

METER SELECTOR:	THE METERS INDICATE:
TRK	<ul style="list-style-type: none"> - PLAYBACK Signal for all "SAFE" Tracks - Recording SOURCE Signal for all "ARMED" (L, R, or DIRECT) Tracks.
L, R, CUE, EFFECT	<ul style="list-style-type: none"> Meter 1: LEFT BUS OUTPUT Meter 2: RIGHT BUS OUTPUT Meter 3: CUE BUS OUTPUT Meter 4: EFFECT BUS OUTPUT

PMD720 Recorder and Transport Controls

(Fig 24) : Drawing of Recorder and Transport Controls

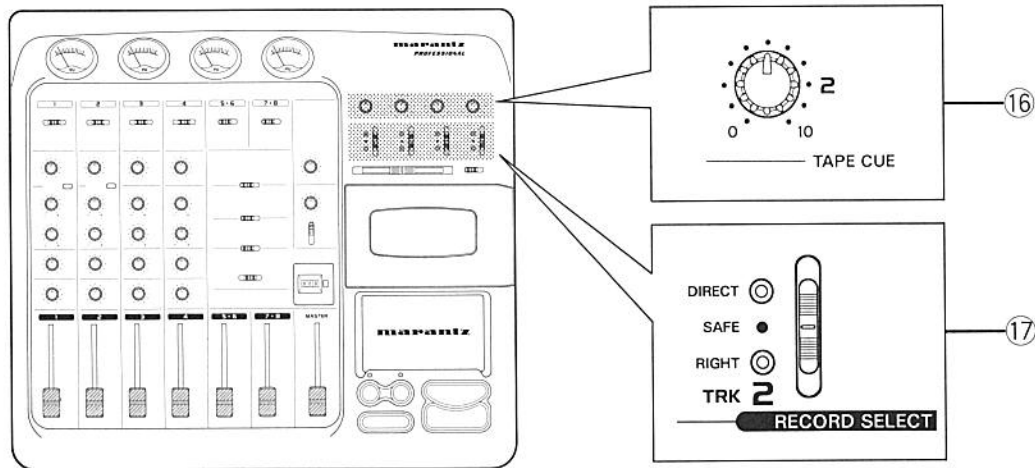


⑩ TAPE CUE

These controls adjust the level of each track going to the cue bus. This signal is then sent to the output of the PHONES when the PHONES SELECTOR switch is set to CUE.

The CUE BUS is a BUS in the PMD720 which allows you to listen to the four tape tracks, regardless of what is going through the six mixer channels.

(Fig 25) : Tape Cue Controls, Record Select Controls



⑪ RECORD SELECT Switches

These switches serve two functions. First, they arm and disarm each track for recording—i.e., they make it possible or impossible to record on a track. With a switch in the SAFE position, the track is SAFE (or “disarmed”). This means that you cannot accidentally record on that track. This is particularly important when you finally get “the perfect take” of a guitar solo, and you want to protect yourself from mistakenly recording over it. When a switch is in the LEFT, RIGHT, or DIRECT positions, it is considered “armed”. The indicator next to the switch turns red, and it is possible to record onto that track.

The second function the RECORD SELECT switches serve, is to designate a source for recording.

When a switch is set to LEFT (tracks 1 and/or 3), that track will record from the left side of the stereo bus. All channels panned to the center or left-of-center will have their entire signal recorded on that track. If a channel is panned right-of-center, it will be recorded, but at a lower level. How much lower is determined by how far right the PAN knob is set. If the PAN control is panned 100% hard right, then almost no signal from that channel will be recorded.

When a switch is set to RIGHT (tracks 2 and/or 4), that track will record from the right side of the stereo bus. Panning a channel right-to-left affects these tracks in the same way that panning left-to-right affects the tracks described above.

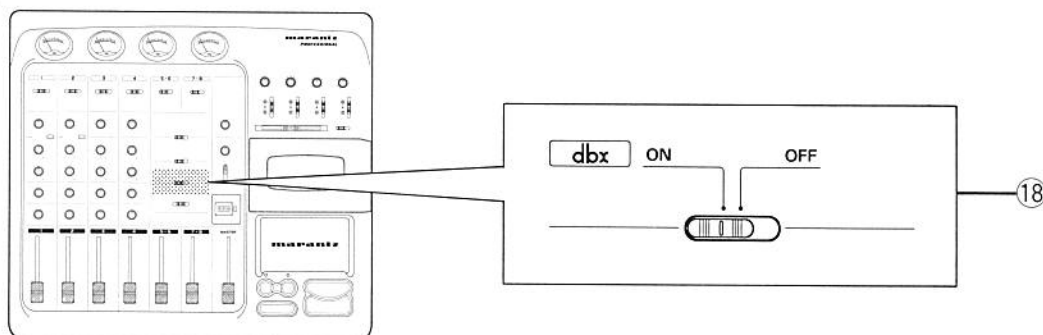
When a switch is set to DIRECT, it ignores the stereo bus, and records directly from the channel of the same number. In this case, because the sound is recorded before it goes to the stereo bus, the PAN knob has no effect on recording.

For example: if track 1 is set to record DIRECT, it will record directly from channel 1, regardless of the position of channel 1’s PAN control. If track 2 is set to record DIRECT, it will record directly from channel 2, etc.

Since channels 5/6 and 7/8 are stereo channels, routed to the STEREO BUS, they cannot be recorded DIRECTly to a track. In order to record these channels, you must record from the LEFT and RIGHT BUSSES, instead of DIRECT.

You may have figured out that—since the effects return goes to the STEREO BUS—you cannot record these effects DIRECTly to a track. If you want to record effects along with your regular signal, you may either a) record from the LEFT or RIGHT, instead of recording DIRECTly, or b) use the insert points to effect one channel without using the EFFECTS BUS or the STEREO BUS.

(Fig 26) : dbx Switch



18 dbx NR

This is the On/Off switch for the dbx noise reduction system. It is very important that tapes recorded with dbx on, be played back with dbx on. Also, tapes recorded with dbx off should be played back with dbx off.

When the dbx system is ON, the microprocessor automatically encodes all tracks being recorded, and decodes all tracks which are played. When dbx is off, no encoding or decoding is done to any tracks.

Playing encoded tapes with dbx off, or playing non-encoded tapes with dbx on will result in extremely poor sound quality, including abnormal dynamics and frequency response.

* dbx Noise Reduction System

The dbx noise reduction system is an **encode-decode** system of noise reduction. This means that a special process (described below) is applied to the tape while recording (encode), and the opposite process is applied when playing the tape back. Because there are two parts to this process, **you cannot play dbx encoded tapes on non-dbx equipment—nor can you play back non-dbx tapes when the PMD720's dbx system is switched on.** Either of these practices will result in very poor sound quality.

How it works:

dbx **compresses** the dynamics of the entire audio signal in a specific ratio—just like a compressor/limiter you may have in your rack. This allows the signal to be recorded at a higher overall level, because the musical peaks are suppressed. This is the encode process. As you might imagine, this sounds pretty terrible when played back on a non-dbx player.

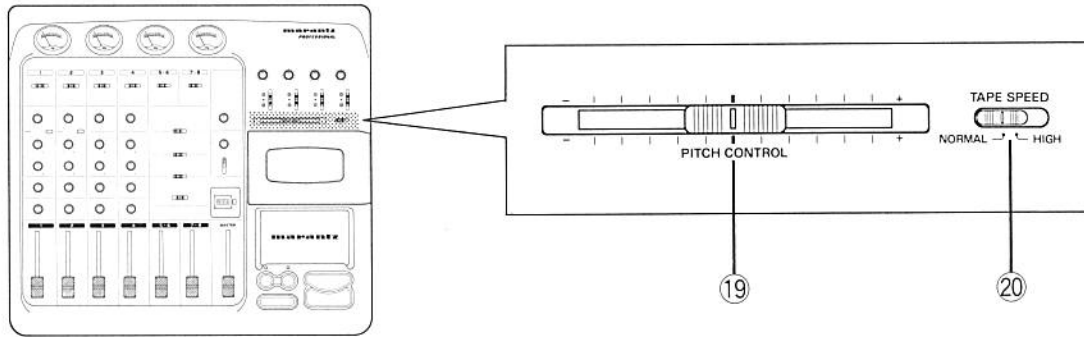
The decode process is the opposite. The compressed, recorded signal is **expanded** (decompressed) on playback. Two interesting things happen. First, the music is de-compressed, so the original dynamics return to the music! Secondly, when the music is expanded, the overall playback volume is decreased. You may remember that we had increased this level while recording. By lowering the overall level, we also lower the level of the mechanical and electrical noise created during recording.

dbx effectively lowers the volume of the noise without lowering the volume of the music!!

This noise reduction has several benefits:

- 30 dB of noise reduction
- Extended headroom
- Lower overall distortion at high recording levels
- Extra headroom

(Fig 27) : Pitch and Speed Controls



①⑨ **PITCH CONTROL**

This slider allows $\pm 10\%$ variation in tape speed, **and the associated pitch changes**. This can be used to correct tunings or for special effects. A center detente allows you to locate the "normal" speed by feeling for the center "click".

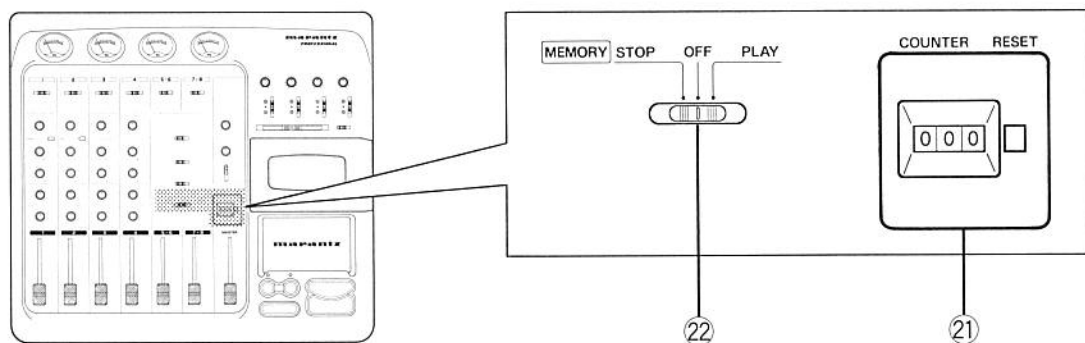
②⑩ **SPEED**

This switch selects one of the PMD720's two tape speeds. The higher tape speed provides lower noise, and better frequency response, so we recommend that all important recordings be made on high speed. On the other hand, high speed uses tape twice as fast as normal speed, so if long running time or conservation of tape are important to you, we recommend normal speed.

The two speeds are:

- Normal : 1 7/8 in/sec (4.76 cm/sec) 30 minutes on a C-60 tape
- High : 3 3/4 in/sec (9.5 cm/sec) 15 minutes on a C-60 tape

(Fig 28) : Counter and Reset Button



②① **TAPE COUNTER and RESET**

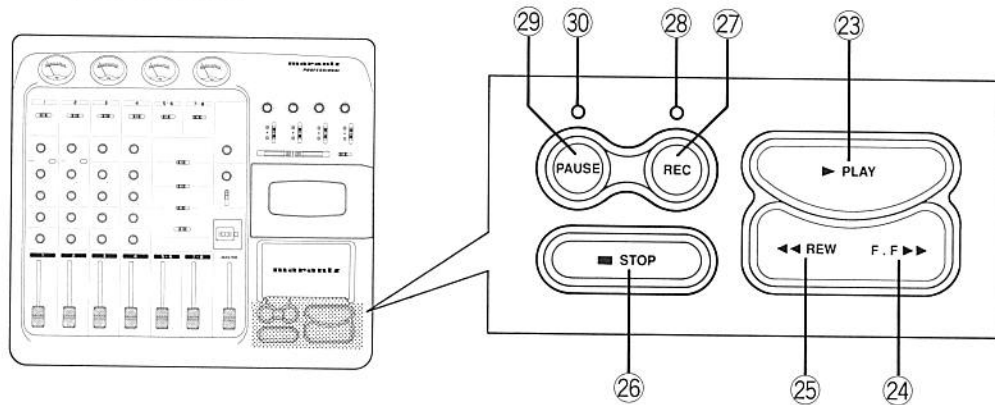
This display shows the current tape counter location. Press the RESET button to reset the counter to "000".

②② **MEMORY STOP and MEMORY PLAY**

When this switch is in the STOP position, the tape will automatically stop when the counter reaches "000". This is particularly useful for rewinding to a particular point on the tape. For example, at the beginning of a song, reset the counter and set this switch to STOP. When the song is over, press REWIND. The tape will rewind until the beginning of the song ("000" on the counter), and then automatically stop.

When this switch is in the PLAY position, it will automatically switch into PLAY mode when the counter reaches "000". This is useful for repeating a song or passage, in order to rehearse an instrument, a mix, etc.

(Fig 29) : Transport Controls



23 PLAY

Press this button to start playback of the tape.
If the tape is in record-pause mode, you can press this button to begin recording. See also #29. When the PLAY button and the FF (or REW) button are pressed simultaneously, the tape transport will enter cue (review) mode. You will now hear the contents of the tape played at the Fast-wind speed. This is very useful for locating a section of a partially recorded tape for playback or recording. Once in cue/review mode, releasing the FF/REW button will re-enter normal play mode. You can toggle cue/review and play modes by holding down the play button, and toggling the fast wind buttons.

24 FF

Press this button to FAST FORWARD the tape. (See also 'CUE' in 'PLAY' above.)

25 REW

Press this button to rewind the tape. (See also 'REVIEW' in 'PLAY' above).

26 STOP

Press this button to stop the tape.

27 REC

Press this button to enter record-pause mode. Then press play, or pause to begin recording.

28 REC indicator

This LED, located above the record button, can have any one of three values. Each value shows the status of the recorder.

RED You are currently in record-pause, or record-play mode, and tracks are selected (armed) by the RECORD SELECT switches.

GREEN You are currently in record-pause, or record-play mode, but no tracks are selected by the RECORD SELECT switches. If any track is selected, that track will immediately enter record.

NO LIGHT You are not in record mode, and cannot record, regardless of which (if any) tracks are armed with the RECORD SELECT switches.

29 PAUSE

During playback or record, this button will stop the transport, but it will not disengage the heads. To start the transport again, press the pause button again. This is called "releasing" the transport from pause mode. Pausing and releasing the transport allows you to start and stop the tape more quickly and accurately than is possible with STOP and PLAY.

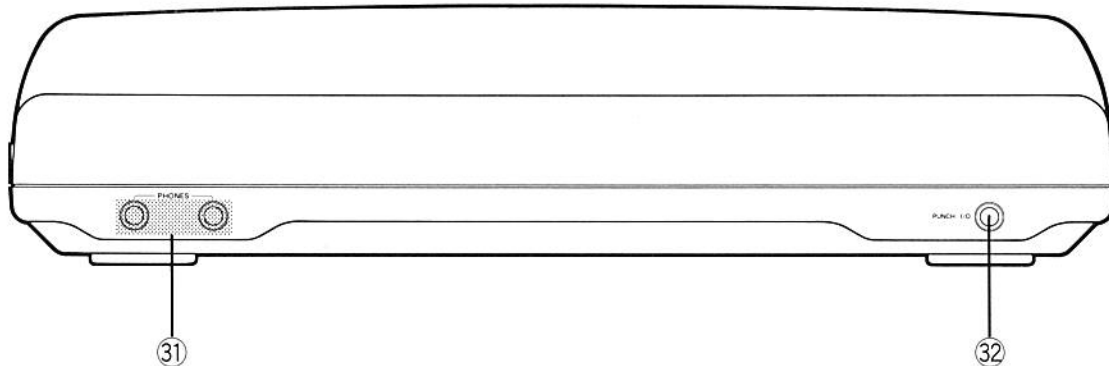
In record mode, engaging pause will stop the transport, but still allow you to monitor source signals on the VU meters, whereas pressing stop will not allow you to monitor source signals.

30 PAUSE indicator

This indicator is lit when the transport is paused.

Front and Rear Panel Connections

(Fig 30) : Drawing of front panel



31 PHONES

The PHONES jacks are stereo 1/4" (TRS) jacks, for connecting 2 pairs of stereo headphones. The PHONES can monitor the CUE, the STEREO BUS, or the EFFECT BUS. This is controlled by the PHONES SELECTOR. The level is controlled by the PHONES LEVEL control on the front panel.

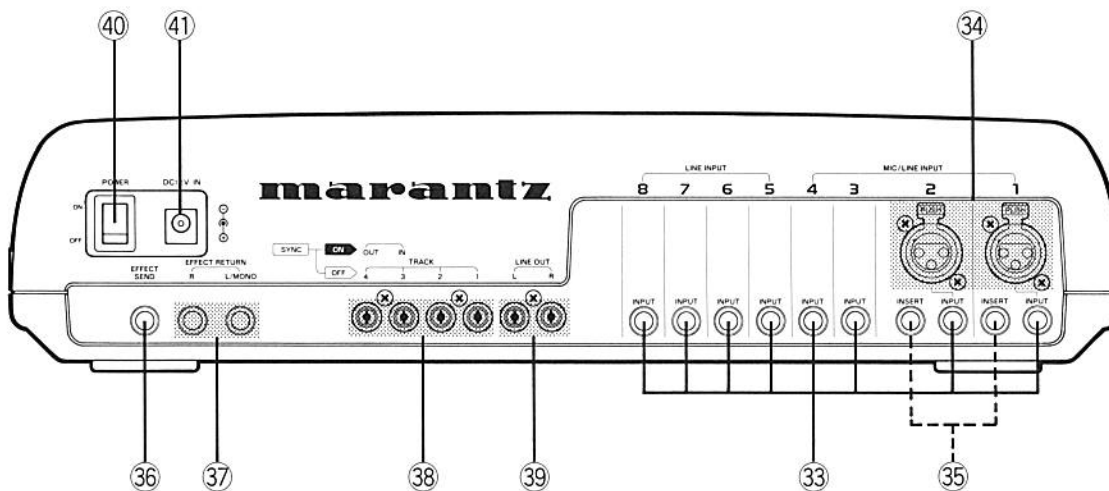
32 REMOTE PUNCH IN/OUT

The REMOTE PUNCH IN/OUT jack is used for connecting an optional PUNCH IN/OUT pedal. While overdubbing, a musician can punch in and out of record mode by pressing on this pedal, even if both hands are busy playing an instrument, etc.

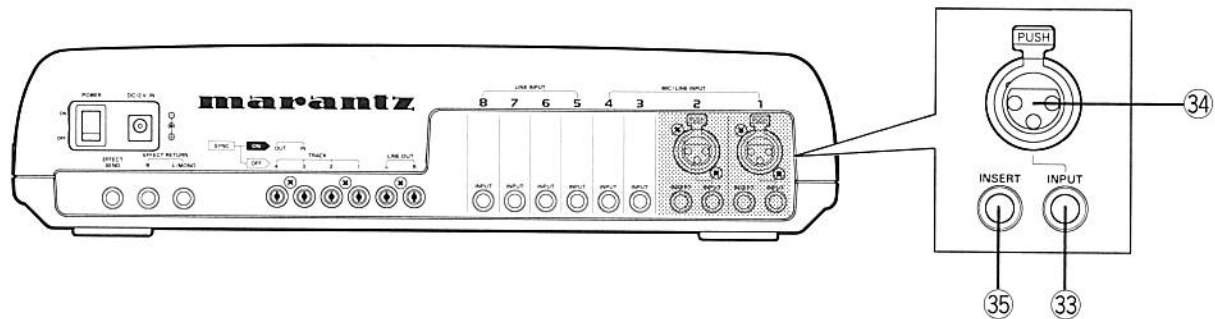
• ABOUT FOOTPEDALS –

The PMD720 is designed for use with a **normally open** momentary contact footswitch, such as the Marantz FP740PMD Remote Punch Pedal.

(Fig 31) : Drawing of rear panel



(Fig 32) : Mic/Line/XLR/Insert Jacks



③③ 1/4" MIC/LINE

There are four 1/4" MIC/LINE input jacks—one for each of the first four channels on the mixer. These inputs are high impedance inputs, and can accept high or low impedance microphones, or line level signals—such as synthesizers, electric guitar pre-amps, etc.

On channels 1 and 2, the XLR switch must be in the UNBAL (up) position to use these jacks.

Channels 5/6 and 7/8

Channels 5/6 and 7/8 are for line level signals only.

You will notice that channels 5/6 and 7/8 do not have PAN controls. Since these channels are stereo pairs, the signals in channels 5 and 7 are always panned hard left, and the signals in channels 6 and 8 are always panned hard right. The level of each stereo pair is controlled with the stereo fader.

If you connect a source to one side of a stereo pair, but not to the other side (e.g. channel 5 but not channel 6), the PMD720 will automatically pan that source to the center so that the stereo channel will act like a mono channel.

③④ XLR

The PMD720 includes balanced XLR inputs for channels 1 and 2.

The XLR switch ③ must be in the BAL (down) position to use these jacks.

If the XLR switch is in the UP/UNBAL position, the channel will expect its input from the 1/4" connector.

③⑤ INSERT

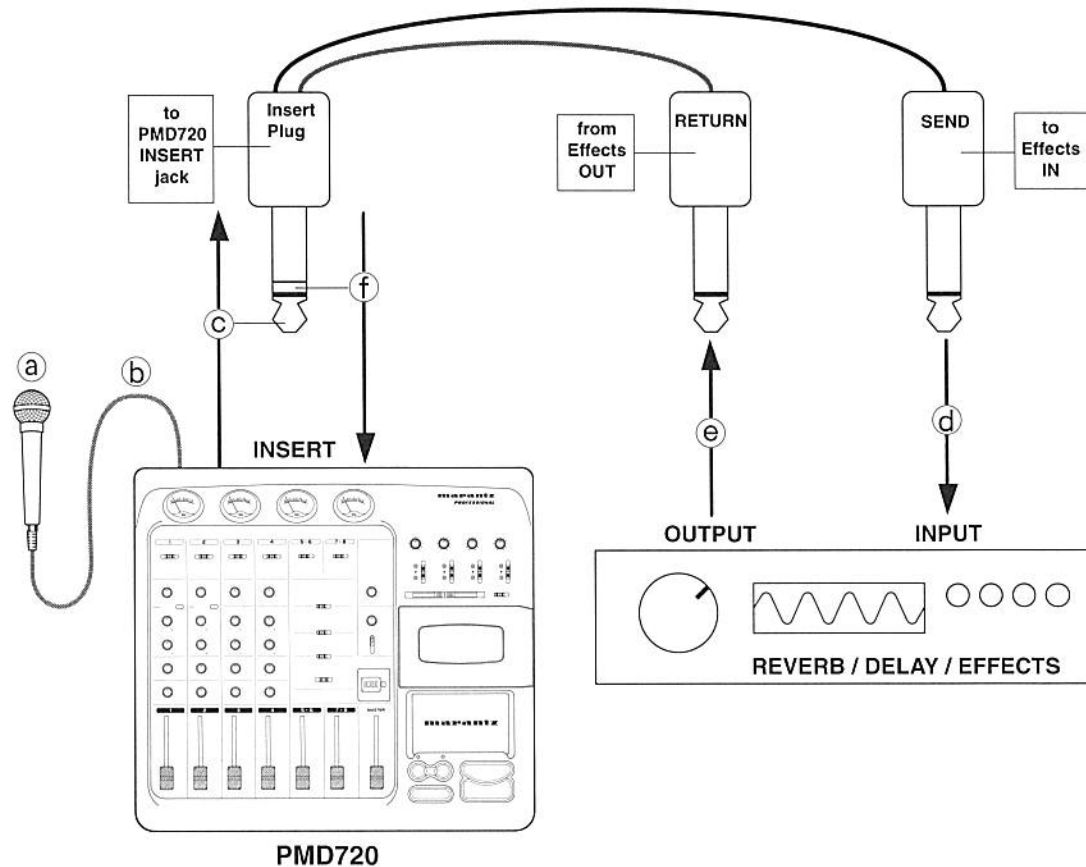
The INSERT jacks make it possible for an individual channel to be processed with external effects, without affecting other channels, and without hogging the EFFECTS BUS.

This is particularly useful for adding special effects to single instruments, without disturbing the other instruments. Examples include adding delay to vocals, compression to bass guitar, gated reverb to a snare drum, etc.

This is how it works. A signal enters the board at a 1/4" or XLR jack. It goes through the preamp and then gets sent out of the board on the special TRS (Tip-Ring-Sleeve) insert plug. The signal leaves the mixer on the TIP section of the TRS plug, goes through the external effects, and returns to the mixer on the RING section of the TRS plug. When it returns to the mixer, the new, effected signal continues through the channel to the EQ and channel fader, as if nothing special had happened.

Figure 33 shows how effects are connected to the PMD720 with a TRS insert cable.

(Fig 33) : Insert Wiring



Signal Flow for Insert Points:

- (a) Signal leaves microphone.
- (b) Signal enters PMD720 on XLR connector
- (c) Signal leaves PMD720 on Insert plug SEND (TIP of TRS plug)
- (d) Signal enters Effects device from Insert Send Plug
- (e) Signal leaves Effects device into Insert Return Plug
- (f) Changed Signal enters PMD720 on Insert plug RETURN (RING of TRS plug)

36 EFFECT SEND

The EFFECT SEND jack sends the effects bus signal (in mono) to external processing gear such as reverb. The output level for any individual channel can be adjusted by the EFFECT Control on that channel.

Special note: The EFFECT SEND utilizes a TRS (3-conductor) jack.

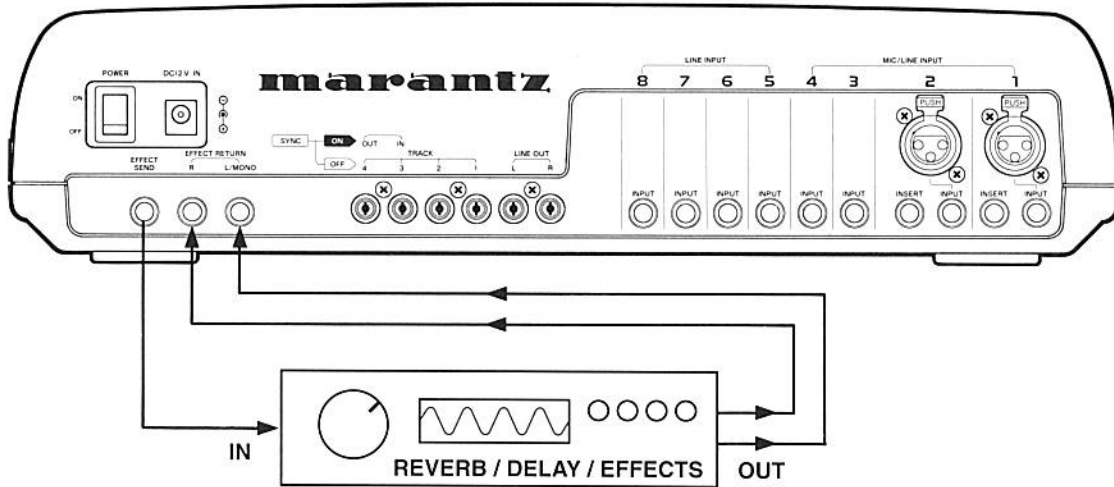
The ring section of this jack carries the signal for the CUE BUS. If you wish to access the CUE BUS for external cue monitoring, you can purchase a special adaptor to split this TRS jack into one TS cue jack, and one TS effects jack. If you do not need to use the cue output, you may use the EFFECTS SEND jack with a normal 1/4" TS mono plug, and ignore the special TRS capabilities.

37 EFFECT RETURN

The EFFECT RETURN jack receives the changed (effected) signal from the external effects. Even though the effects send is mono only, the EFFECT RETURN can accept stereo signals, or mono signals. Mono signals should be plugged into the left side of the stereo EFFECT RETURN. The amount of this signal which is mixed into the STEREO BUS, is controlled by the effect return knob on the front panel.

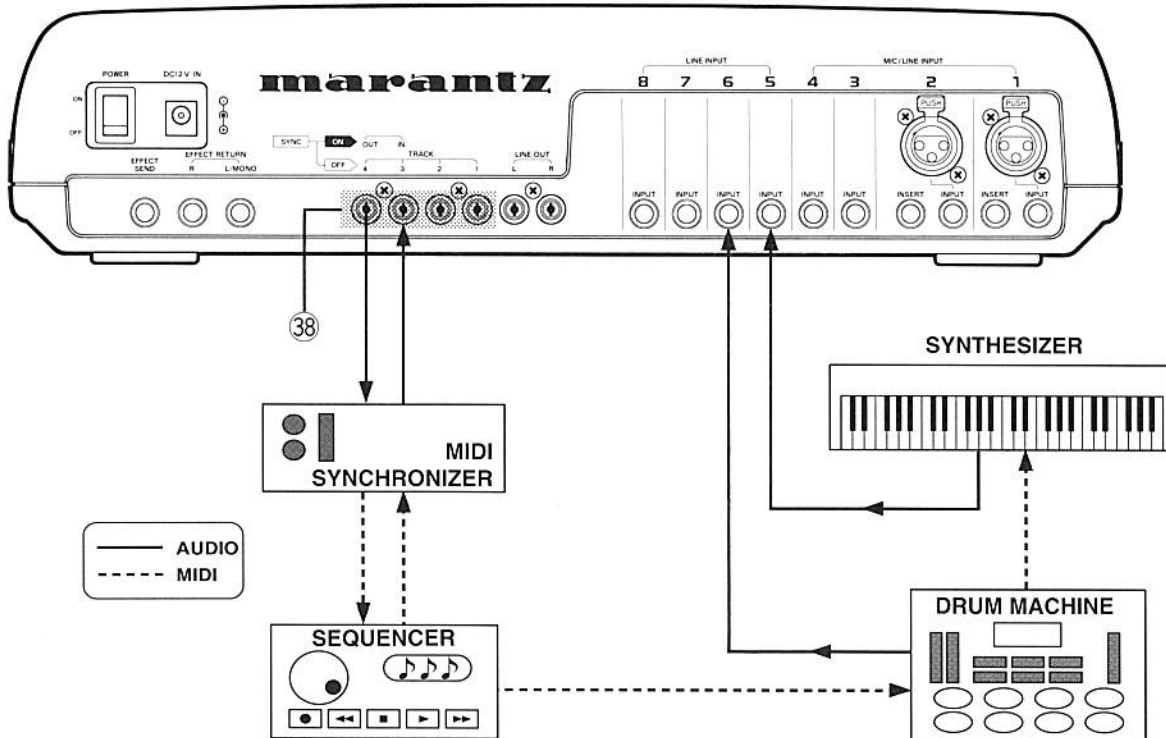
(Fig 34) : Effects Loop Diagram

PMD720



(Fig 35) : Simple Sync Wiring Diagram

PMD720



③⑧ SYNC I/O AND TAPE OUT JACKS

SYNC IN and OUT jacks are used to connect an external MIDI or SMPTE synchronizer to the PMD720. The TAPE OUT jacks are used to output the signal of an individual tape track—this is useful for sophisticated effects routing, and for mixing down tape tracks on a larger mixer. TAPE OUT 1 and 2 always carry the output of tape tracks 1 and 2 respectively. TAPE OUT 3 and 4 are switchable between track 3/4 output, and SYNC Input/Output, depending on the position of the SYNC switch.

When the SYNC switch is set to OFF:

TAPE OUT 3 and 4 carry the output of Tracks 3 and 4 respectively.

When the SYNC switch is set to ON:

TAPE OUT 3 becomes SYNC IN, the input terminal for a Synchronizer's SYNC tone.

TAPE OUT 4 reroutes the output of track 4 through the Sync Tone Isolation Circuit (STIC), to minimize crosstalk and distortion for SYNC tone playback.

The PMD720 Sync rerouting system is for use with an external synchronizer. No synchronizer is supplied with the PMD720, and the PMD720 cannot generate or chase SYNC signals.

③⑨ **LINE OUT**

The LINE OUT jacks send out left and right busses (The STEREO BUS). These jacks can be connected to a monitor amplifier or to the inputs of a master stereo recorder for mixdown. The signal at these jacks can be monitored by headphones when the PHONES SELECTOR is set to LINE OUT.

④⑩ **POWER**

When this Rocker switch is in the UP position, POWER to the PMD720 is ON, and the VU meters should light up. When the switch is in the DOWN position, the PMD720 is OFF.

④① **EXT DC IN**

The EXT DC IN jack is used to connect the AC adaptor to supply power to PMD720. DC input is 12V DC, 1.1A, positive polarity. If your power supply should ever need replacing, we recommend use of the Marantz DA740PMDU to ensure proper power levels, etc.

Advanced Recording Techniques

Punch In/Out

PUNCH IN and PUNCH OUT refer to entering the record mode when the transport is already in play mode, and then exiting record mode without stopping the transport. This is primarily used for overdubbing recordings, or for adding to unused portions of a track.

There are three ways to punch in and out of a recording.

Method 1: Punch Pedal

- a) Insert an optional PUNCH PEDAL into the Punch I/O jack on the front of the PMD720.
- b) Arm the tracks you wish to punch, by using the RECORD SELECT switches.
- c) Begin playback.
- d) Press the punch pedal to punch in.
- e) Press the punch pedal again to punch out.

Method 2: Record Select Switches

- a) Select SAFE on RECORD SELECT switches for all tracks.
- b) Press REC + PLAY keys to start playback. The REC indicator turns green.
- c) Now, changing a track from SAFE to DIRECT, L, or R will arm that track, and immediately punch it into record mode. The REC LED will turn red.
- d) Return the RECORD SELECT switch to the SAFE position. You have now punched out. The REC indicator turns back to green.

Method 3: The RECORD button

- a) Arm the desired tracks using the REC SELECT Switches.
- b) Press PLAY to start playback.
- c) Hold down the PLAY key, and press the REC key to punch in. The REC indicator will turn red. You are now recording on the armed tracks.
- d) Hold down PLAY and hit STOP to PUNCH OUT. The REC indicator will now turn off.

Track Bouncing

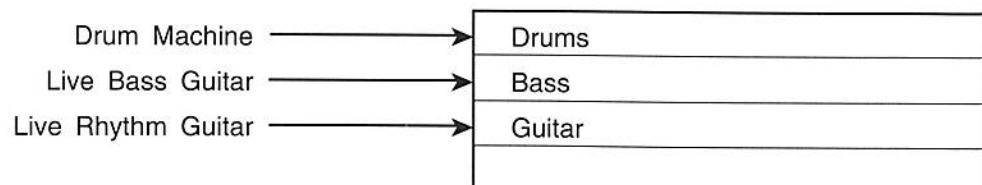
What is Track Bouncing?

Track Bouncing is a way of recording more than 4 tracks on a four track recorder. It is done by mixing pre-recorded tracks with live instruments, and recording the result on an unused track. There are now several instruments on the new track, and the old tracks can be used again for new things.

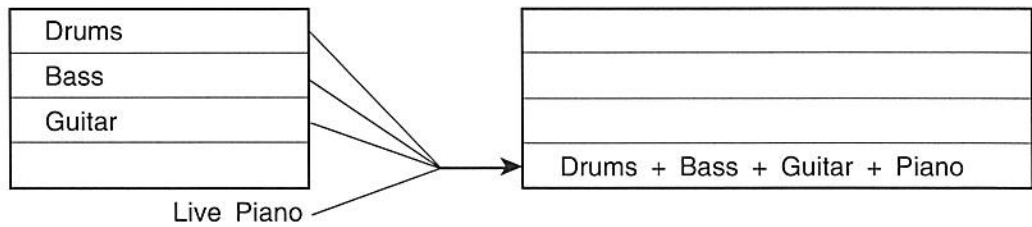
The PMD720 enables to you to bounce a maximum of 10 different instruments to 4 tracks, without using any other equipment, without bouncing any track more than once, and without recording more than one "live" instrument at a time. This means that you can retain good sound quality, have 10 sound sources, and play them all yourself—one at a time.

If all this sounds confusing, that is only because it is confusing! Since it's easier to show you than to tell you about it, you can look at the example below, where we record 10 sources, one at a time, to a four track recorder.

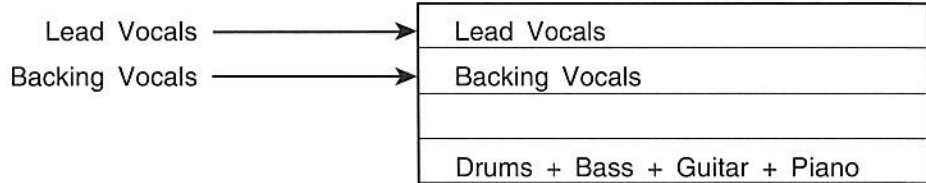
A. Record Live Drums (1), Bass (2), and Rhythm Guitar (3) to TRK 1, 2, and 3.



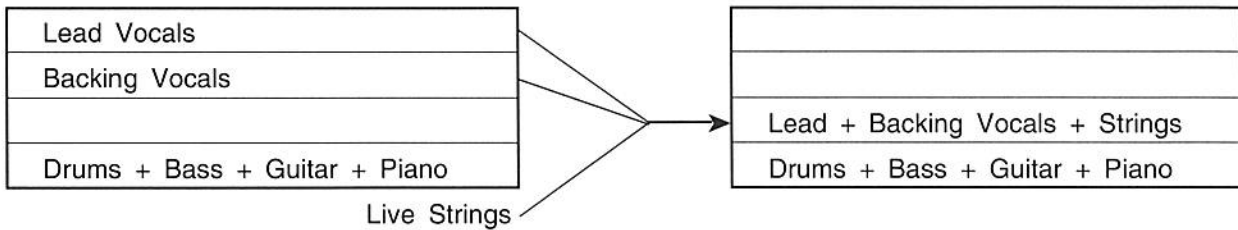
B. Mix Live Piano (4) with Recorded Drums(1), Bass(2), and Rhythm Guitar (3) and record this mix of all four instruments onto TRK 4.



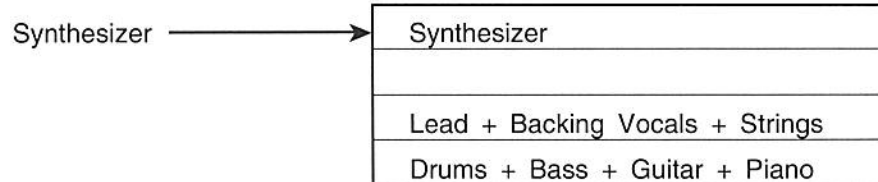
C. Record Live Lead Vocal (5) and Backing Vocal (6) onto TRK 1 and TRK 2.



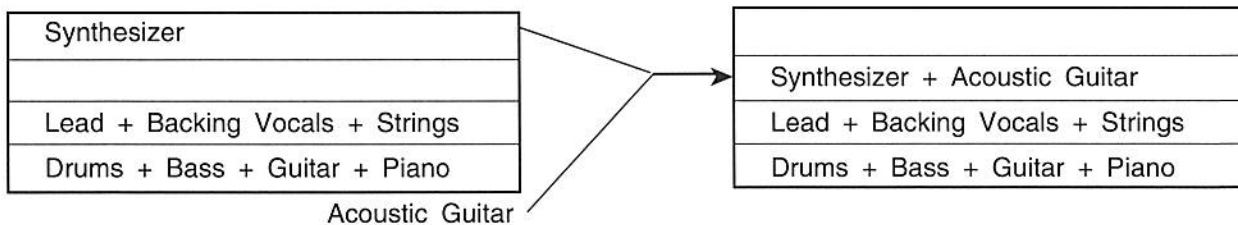
D. Mix Live Strings (7) with Lead Vocal (5) and Backing Vocal (6) and record this mix of three instruments to TRK 3.



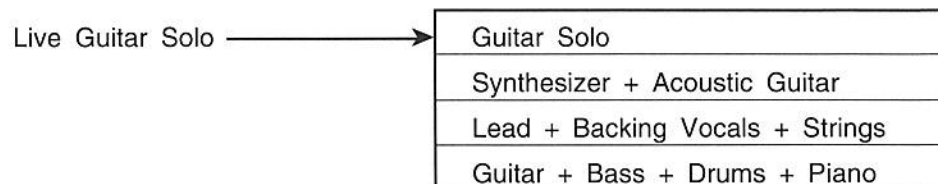
E. Record Synthesizer (8) to TRK 1.



F. Mix Live Acoustic Guitar (9) with Synthesizer (8) and record this mix to TRK 2.



G. Record Guitar Solo (10) to TRK 1 and you have recorded 10 tracks to the PMD720.



TRACK BOUNCING: NOTES AND CAUTIONS

- * It is possible to bounce and re-bounce tracks an infinite number of times, for an infinite number of usable tracks. However, each time you bounce a track, you are re-recording a tape track, and you add some tape noise. The loss of sound quality due to this noise is called "generation loss", dbx noise reduction should always be used during track bouncing to minimize noise and generation loss. We recommend re-recording (bouncing) tracks only once for the best sound quality.
- * When tracks are combined during the bouncing process, they are recorded in mono. Therefore, it will be impossible to change tone, volume, or effects on individual instruments after the bounce. Be sure that the mix of instruments is correct, and that any processing or effects you may wish to include on individual instruments is done, before combining them and bouncing to a new track.

Hands-on Track Bouncing

Let's walk through the first steps of the above example. Try to follow along on your PMD720 using whatever instruments you may have around.

Record Instruments 1, 2, and 3 onto tracks 1, 2, and 3 respectively. Be sure to set the RECORD SELECT switches to SAFE as soon as you are done recording.

Now we start track-bouncing.

a) Set the INPUT SELECTOR Switches as follows.

Channel 1: Tape
Channel 2: Tape
Channel 3: Tape
Channel 4: Mic/Line

You will notice that we are listening to:

TRACK 1 (a recording of instrument 1) on CHANNEL 1,
TRACK 2 (a recording of instrument 2) on CHANNEL 2,
TRACK 3 (a recording of instrument 3) on CHANNEL 3,
and a "live" instrument 4, on CHANNEL 4.

- b) Set all the PAN controls at the Center, or somewhere to the right of center. All four of these channels are now combined on the RIGHT BUS. Notice that the PAN control does NOT need to be turned all the way to the Right. The same signal will go to the right bus regardless of whether the PAN control is in the center, or right of center. Less signal gets sent to the RIGHT BUS, as you turn the knob LEFT of center.
- c) Set the PHONES SELECTOR switch to CUE, but turn all four TAPE CUE knobs down to 0. Since tracks 1-3 are going through mixer channels 1-3, you will not need to turn these CUE controls up.
- d) When you press PLAY, you should be able to hear Tracks 1-3 on channels 1-3 respectively, and your new live instrument #4, on channel 4.
- e) Re-adjust the channel fader and EQ for each channel, until you have a good mix. When the mix is good, re-adjust MASTER fader that the VU meter indicates an optimum recording level. Remember small peaks are OK, but the idea is to stay close to 0 dB, as much as possible.
- f) Rewind the tape to the beginning of the song.
- g) Set the RECORD SELECT Switch for Track 4 to "R" so that you will record the RIGHT BUS onto track 4. If you were bouncing to tracks 1 or 3, you would set the RECORD SELECT switches to "L", and you would pan your channels to the Left.
- h) Press the REC and PLAY buttons to start recording.

- i) When you have finished recording, set the RECORD SELECT switch for track 4 to the SAFE position, and rewind the tape.
- j) To monitor the playback, pull the MASTER fader down to 0, rewind the tape, press play, and turn up the TAPE CUE control for TRACK 4 ONLY. You should now hear the new combination of instruments 1-4 on track 4.

If you are working with sequencers or other musicians, you can add more than one “live” instrument during each bounce—simply use the unused mixer channels.

Further track bouncing follows the same process. After recording on tracks 1 and 2, you will bounce down to track 3 on the LEFT BUS. Then record track 1, and bounce down to track 2 on the RIGHT BUS.

You can refer back to figures 43-A through 43-G to get an overview of what you are doing.

MIDI SYNC

The following discussion assumes a rudimentary familiarity with MIDI, sequencers, and synthesizers.

MIDI Sync is a special way of making MIDI sequencers and drum machines work "in time" with the PMD720. It requires some special additional hardware, but it has great advantages.

You can sequence as many different tracks of music, as you have MIDI sound sources. The musical information for all of these tracks is stored in the memory of the sequencer—not on tape.

ONE track of the tape is used to synchronize the operation of the Sequencer with the PMD720. No matter how many tracks you have on the sequencer, only one track on the PMD720 is used. No matter how complex your synthesizer rig is, you still have three tape tracks for vocals, acoustic instruments, etc.

When all of these sequenced tracks are "in sync" with the PMD720, they sound and work just like tape tracks. Because they act and sound like tape tracks, but do not use up "real" tape tracks, they are called VIRTUAL TRACKS. The process of recording and synchronizing sequencer tracks with tape is called VIRTUAL TRACKING.

For example, you can have 16 (or more) VIRTUAL TRACKS for the Kick Drum, Snare Drum, Tom-Toms, Cymbals, High Hat, Cowbell, Trumpet, Saxophone, Trombone, Shaker, Hand Claps, Piano, Organ, Bells, Cello, Violins, Violas, Double Bass, Vibraphone, and a GONG. All of these sounds come from synths and samplers. If they were on tape, they would take up 16 tape tracks—the equivalent of 4 PMD720s. Since we are using the sequencer instead of tape tracks, this complex setup uses only 1 tape track to synchronize the MIDI sequencer and the PMD720. Even with all of these instruments, three tape tracks are available for acoustic instruments and vocals.

For a complex setup like this one, you will need a submixer with 16 channels to mix your synthesizers, samplers and drum machines. The Line-Out of that mixer will later be mixed into the PMD720's STEREO BUS, through one of the PMD720's stereo line inputs.

In addition to having more tracks to work with, there are other advantages to virtual tracking. First, since the music is in computer-data form, you can edit it. You can add a chorus, or fix a wrong note, without re-recording the entire take. Secondly, since the music is never committed to tape before the final Mixdown, you never lose quality due to recording and re-recording. In one sense, these instruments are recorded "live" to the stereo Master Tape.

This is how the whole thing works: First, the sequencer tells the SYNC box what time it is (measured in musical measures, beats, and pulses). The SYNC BOX records (or STRIPES) this special timing information (called an FSK tone) to tape. Later, the PMD720 plays back the FSK tone into the SYNC Box, and the SYNC box tells the sequencer what time it is. Once the Sequencer knows what time it is, it knows what to play back. Since the tape is now controlling the timing in the sequencer, it will play back in perfect time with the tape.

It is interesting to note that the cost of an entire MIDI system, including 16 channels of MIDI sound sources, a sequencer, a submixer, a PMD720, and a sync box all together, is less than the cost of a 16 track recorder (not to mention the cost of a recording mixer, microphones, instruments, and musicians to play them all!)

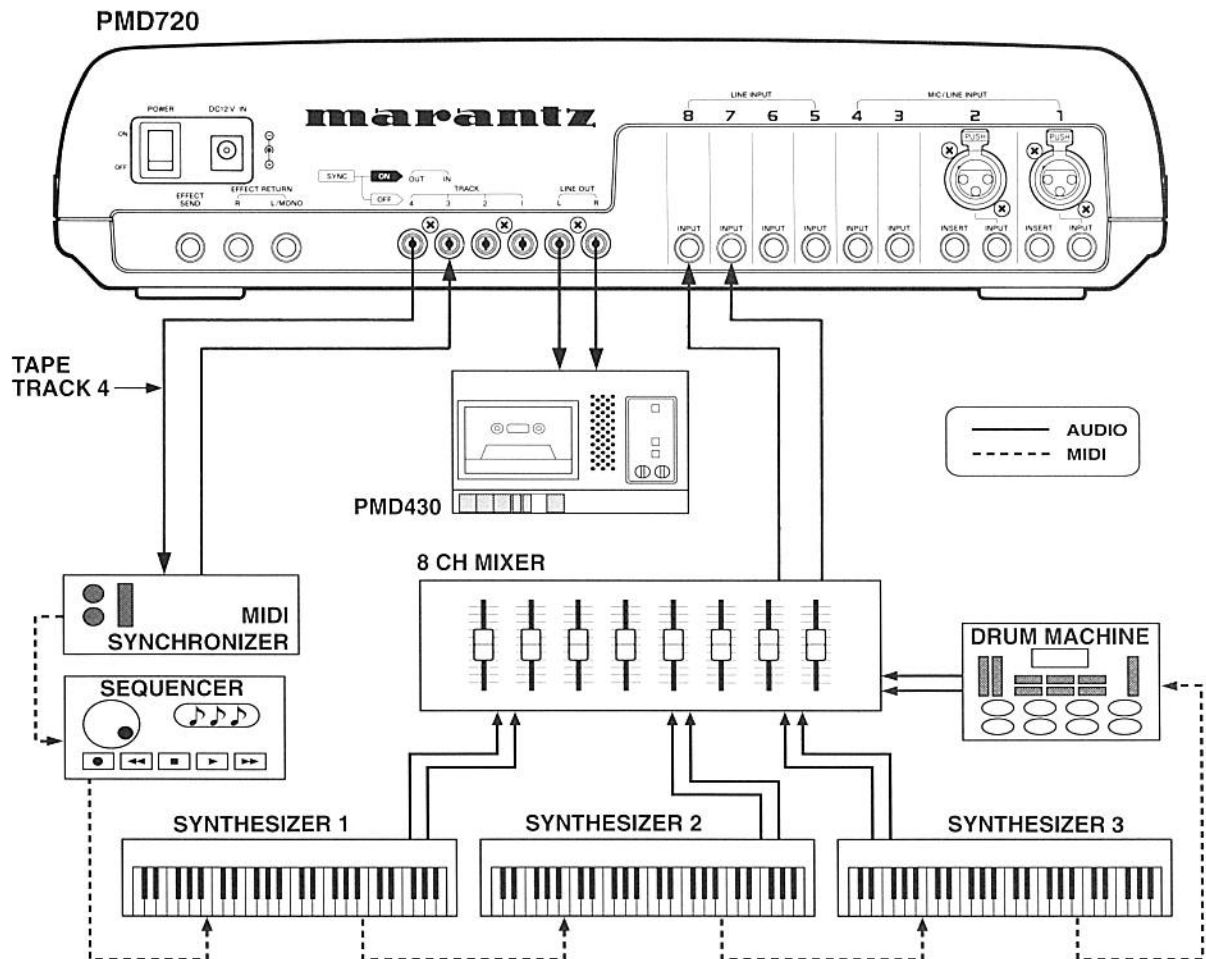
Below is a fairly simple example of how the process works. Be aware that you have a lot of flexibility here, depending on the MIDI gear you own.

THE SPECIFIC STEPS IN THIS PROCESS CAN VARY GREATLY, DEPENDING ON THE MIDI GEAR YOU OWN. THIS EXAMPLE SERVES ONLY AS A CONCEPTUAL GUIDE. YOU STILL NEED A GOOD WORKING KNOWLEDGE OF YOUR OWN GEAR.

THE STEPS:

1. Write a song (or other music), program your synths, drum machine, and sequencer. This is all written as one step, because it has nothing to do with the PMD720. What do we know about writing songs anyway?
2. Connect your gear to the SYNC BOX, and then to the PMD720. See figure 35 page 35. Set the SYNC BOX to RECORD (sometimes called STRIPE) an FSK signal onto tape.
3. Turn the SYNC switch on the PMD720 to the ON position, and set the track 4 RECORD SELECT switch to DIRECT.
4. Press RECORD, and then PLAY, to start recording SYNC signal on track 4.
5. Press PLAY on your Sequencer or Drum machine.
6. When the Sequencer (or drum machine) has finished playing, wait a few seconds, and press STOP on both the Sequencer, and the PMD720. Set track 4's RECORD SELECT switch to SAFE.
7. Re-Set your SYNC box to LISTEN to the tape and create MIDI timing information.
8. Set your sequencer to CHASE (listen to) the SYNC BOX's timing information.
9. When you play the tape again, the Sequencer will CHASE the tape's timing info, and play all of the VIRTUAL TRACKS.
10. Now you can record your ACTUAL TRACKS (vocals, acoustic instruments, etc.) Do this just as if all of the VIRTUAL TRACK information were one big track 4, and you are now overdubbing on tracks 1-3. When you think about it, that's almost exactly what's happening.
11. If you originally had 16 sequencer tracks, you now have a 19 track composition on a 4 track recorder. Furthermore, it probably has better sound quality than if each instrument had a tape track!!

(Fig 36) : Connections with several MIDI sources, submixer, and mixdown deck.



12. During Mixdown, you can directly connect a synth to the PMD720 (as in fig 35 Page 35) or many MIDI sources can be combined in a submixer, and the submixer can be mixed into the PMD720's stereo bus. (as in Fig 36)

CARE AND MAINTENANCE

This section describes the care and maintenance tasks that must be performed to optimize the operation of your Marantz PMD720.

MAINTENANCE

Head Cleaning

If the heads are not cleaned for a long period, dirt or dust may be deposited on the heads and capstans, causing degraded high-frequency characteristics, volume drop or degraded recording and erasure. To prevent this, clean the heads, etc., periodically as follows.

1. Turn the power off.
2. Open the cassette holder.
3. Clean the parts which come in contact with tape, including the heads, capstans, tape guides, pinch wheels, etc., with a cotton swab soaked in a commercially available head cleaning solution.

Head Demagnetization

When the deck has been used for a long period of time, the head may be magnetized and noise may be generated. If the head is extremely magnetized, the high frequencies in recorded tapes could even be erased.

To prevent this, demagnetize the heads and capstans periodically (every 20 hours of use) using a commercially-available head demagnetizer. (For directions, please refer to the instruction manual supplied with your head demagnetizer.)

Caution:

Be sure to turn the power of the cassette deck off before using a head demagnetizer.

CLEANING OF EXTERNAL SURFACES

The exterior finish of your unit will last indefinitely with proper care and cleaning. Never use scouring pads, steel wool, scouring powders or harsh chemical agents (e.g., lye solution), alcohol, thinners, benzine, insecticide or other volatile substances as these will mar the finish of the equipment. Likewise, never use cloths containing chemical substances. If the equipment gets dirty, wipe the external surfaces with a soft, lint-free cloth.

If the equipment becomes heavily soiled:

- dilute some liquid soap in water, in a ratio of one part soap to six parts water
- dip a soft, lint free cloth in the solution and wring the cloth out until it is damp
- wipe the equipment with the damp cloth
- dry the equipment by wiping it with a dry cloth.

REPAIRS

Only the most competent and qualified technicians should be allowed to service your PMD720. Marantz and its factory trained warranty station personnel have the knowledge and special equipment needed for repair and calibration of this precision instrument.

In the event of difficulty, call the toll-free telephone number listed on the face of the warranty to obtain the name and address of the Marantz Authorized Service Center nearest you. In many cases, the dealer where you purchased your Marantz unit may be equipped to provide service. Please include the model and serial number of your unit, together with a copy of your purchase receipt and a full description of what you feel is abnormal in your PMD720's performance.

Bouncing from one track to an adjacent track, produces a high pitched whining noise.

1. Check that the recording level is not too high.
2. Check that the gain of HI EQ is not too high.
3. Always use dbx noise reduction while track bouncing.

TECHNICAL SPECIFICATONS

Tape Type	Phillips Compact Cassette Type II (CrO ₂ 70µs)
Head Configuration	4 Track 4 Channel Permalloy REC/PLAY head 4 Channel Ferrite Erase head
Frequency Response (Assumes Chrome Tape)	
Standard Speed	40Hz-12.5KHz ±3dB
High Speed	40Hz-16KHz ±3dB
Channel Separation	Greater than 55dB (at 1KHz)
Erasure	Greater than 70dB (at 1KHz)
S/N Ratio (dbx ON)	85dB
Distortion	Less than 1.5%
Motor	DC Servo x 1
Tape Speed	Standard (1 ⁷ / ₈ ips) High (3 ³ / ₄ ips)
Pitch Control	±10%
Wow and Flutter	Less than 0.15% WRMS
Fast Wind	110 sec (C-60)
Dimensions:	
Width	16 ¹ / ₂ inches (420mm)
Height	3 ⁵ / ₈ inches (93mm)
Depth	15 ¹ / ₈ inches (384mm)
Weight	9.2 lbs (4.2 Kg)

Specifications subject to change without prior notice.

TROUBLESHOOTING

Many problems can be easily solved without consulting your dealer or a Marantz service representative. The following tips should help you rectify a number of these problems yourself.

If the problem cannot be remedied after the following check, please consult your dealer or nearest Marantz service agent.

The tape does not travel.

1. Check that the power cord is plugged properly.
2. Check that the POWER switch is set to ON.
3. Check that the PAUSE button has not been pressed.

Recording is impossible

1. Check that the protection tabs of cassette tape are not broken.
2. Check that the recording level is set properly.
3. Check to be sure that a track is properly selected.

Sound is distorted.

1. Check that the recording level is not too high.
2. Check that the tape heads are not dirty.
3. Check that the tape type is CrO₂.
4. Check that the TRIM controls are adjusted correctly.

Sound is unstable.

1. Check that the head is not dirty.
2. Check that the pinch wheels (capstans) are not dirty.
3. Check that the cassette is not defective.
4. Check that the tape is wound properly.
5. Check that the dbx switch is set properly according to the tape.

Noise is noticeable.

1. Check that the head is not dirty.
2. Check that the head is not magnetized.
3. Check that the dbx NR switch is set properly according to the tape.

Hum interferes with the sound.

1. Check that the connection cords are connected properly.
2. Check that there is not any source of magnetism (TV, motor, transformer, etc.) placed near the system.
3. When this unit and amplifier are stacked, hum noise is sometimes generated depending on the amplifier model. In such a case, place the components to positions where interference does not occur. The same condition also applies to the position relationship between this unit and a TV.

Cannot record on desired track.

1. Check the PAN control setting.
2. Check the RECORD SELECT switch setting.

The effect sound is distorted or unnoticeable.

1. Check the balance of the effector's input level and this unit's output level.
2. Check the Effect Return Level.

During tape sync, it does not synchronize.

1. Check the SYNC switch and the SYNC out control.
2. If you are recording to track 3, be sure the signal is kept low. Because track 3 is so close to track 4 on the tape head, the signal you are recording to track 3 may interfere with the playback (sync) signal from track 4.

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