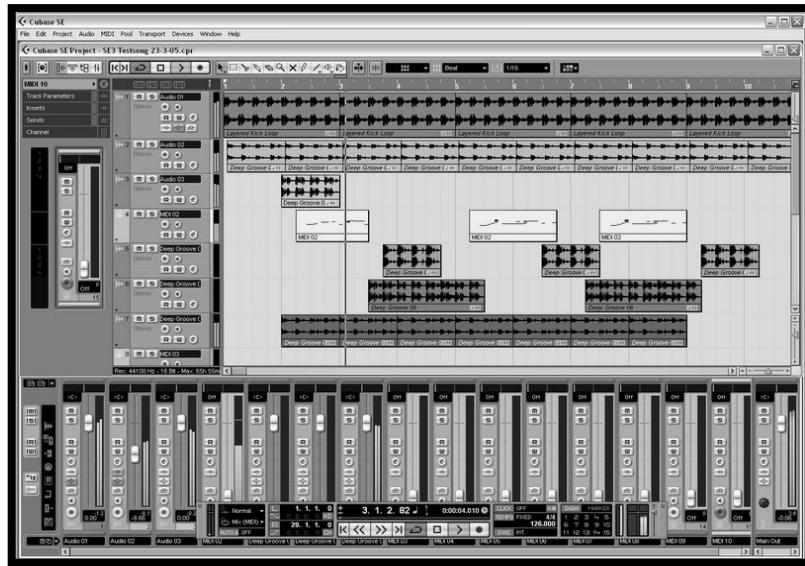


# EQUIPMENT FOR THE STUDIO

At the center of a MIDI home studio, are the synthesizers, a sampler, and a sequencer. Music software manufacturers have introduced to the market software synthesizers with amazing effects. The monitor and amplifiers will be necessary or only when needed. There will be a detailed emphasis on monitoring later in the manual. Since our home studio will be based on computers, we will rely on software editors and/or sequencers.



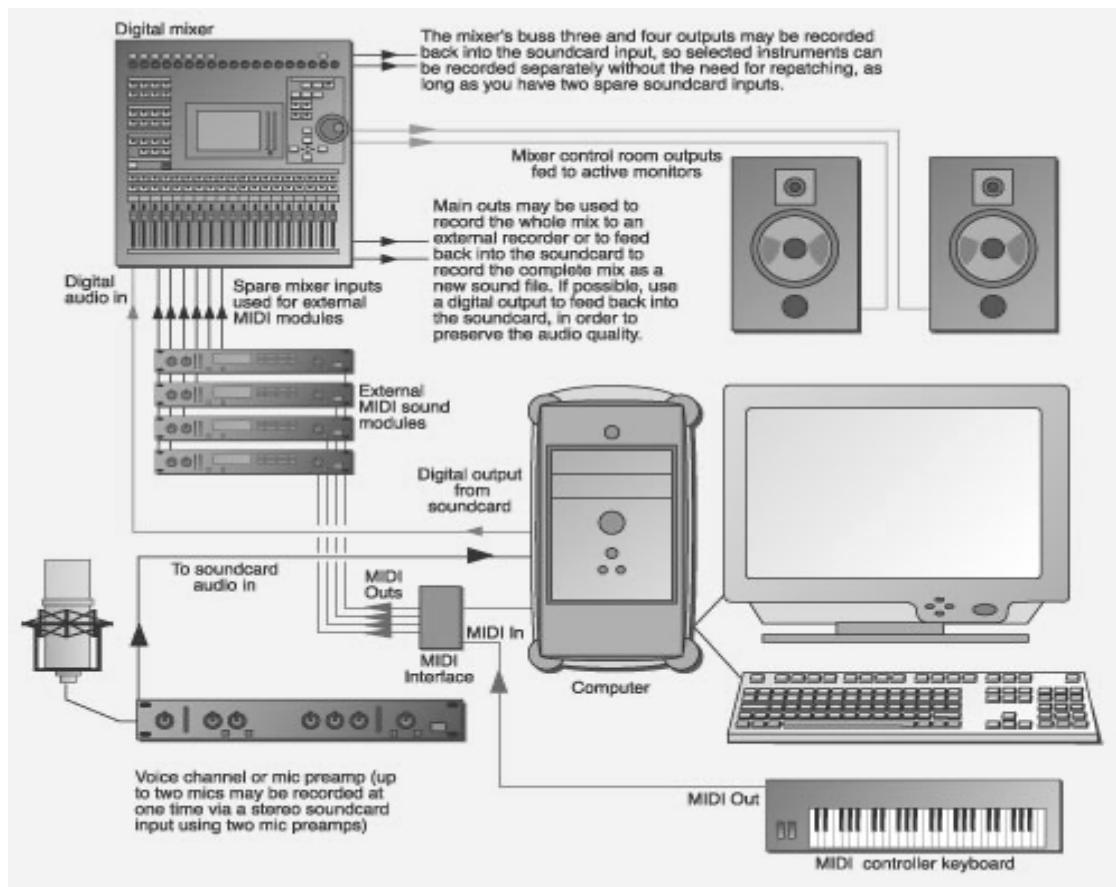
*An image of a software editor/sequencer*

What is relevant to equipping a home studio is to put more effort and thought into the studio itself, and less into music and recording. One might envy the studios of Hans Zimmer, Herbie Hancock, and Klaus Schultze. You cannot get their equipment around the corner. One important point here is that less is more, and we can make music with as little as possible and then progress to bigger equipment later.

The idea is to buy gear that you can use in the long term. Of course, our home studio is based on our budget, but I can assure you that you can buy quality equipment at reasonable prices. So, do not sell unless you switch from music production to let us say, cave diving.

## *Is upgrading a necessity?*

Why do we have to buy a new device or software if we bought the right thing the first time? Hang on to your previous purchases, become skillful, and keep them unless we need upgrades that will enhance your skills and expand your creative horizon.<sup>4</sup>



*Image Source: Courtesy of Sound of Sound Magazine*

### A list of gadgets and items for the home studio

1. Software
2. Synthesizers and samplers (both software and hardware)
3. MIDI Interface (standard or USB interfaces, depending on needs)
4. Drum machines (software or hardware)
5. Monitor / amps
6. Computer audio interface
7. PC Soundcards
8. Microphone
9. Mixer (software or hardware)
10. Microphone preamps
11. Multi-track personal recorders
12. Effects (software or hardware)
13. Dynamic microphone processors and equalizer (software or hardware)
14. Stereo mix-down recorders.
15. Well, the list is endless.

Do we require all the above-mentioned? Not really. Remember that 'it is not what you have but having the **skill (hands-on with gear)** and **creativity and curiosity** and how you use it'.

## MIXER

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Take a glance in a music production magazine or a music store, and one could come across interesting possibilities as to the number of mixers, both hardware and software to select from.

First, the mixer is the hub of the recording studio. The option is up to us to choose a **software mixer or hardware mixer** depending on music taste or budget. It is wise to know that MOST of all the software sequencers have built-in mixer capabilities, quite powerful and hands-on. Thus, do we need hardware? Yes, it is practical to connect and combine your instruments, effects boxes, microphones, recorders, and even the monitor on the mixer. Another reason is convenience. A third reason is that it saves your computer's processing power.

Then, we should look at how many inputs (connections) channels we would need. Do we want to connect two microphones for different purposes? The experts recommend purchasing a mixer with a few extra measures, inputs, and outputs just for durability and expansion.

In addition, one must not forget the equalizer (EQ) section for balancing instruments and capturing room acoustics and reverb.

Finally, before we purchase a mixer, it must be tested, for example, listening for unwanted noises such as hisses and other surprises, when the faders are pushed up and down.

## MONITORS / LOUDSPEAKERS

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We can define a monitor/loudspeaker as one that accurately reproduces an entire audio range with fewer unwanted effects<sup>5</sup>. Well, if the above definition is too technical, we shall simply say that a monitor reproduces the sound of your music or audio.



Unless you want to indulge yourself in karaoke music, you can rely on hi-fi monitors, but for professional usage, the experts recommend studio monitors.

Below are the differences between a hi-fi monitor and a studio monitor.

### **Hi – fi speakers**

### **Studio monitor**

The sound or output might be impressive to the listener, but they are pre-designed to sound like that.	Sufficiently accurate on both on and off-axis.
	Very robust to handle a substantial amount of power
	Can produce very high SPL's (sound pressure levels)
	Can withstand the onslaught of uncompressed drum machines and high-pitched high-energy synth sounds and effects.

The next option is to go for active monitors or passive monitors. Let us see the differences below.

<b>ACTIVE MONITORS</b>	<b>PASSIVE MONITORS</b>
<b>Pros.</b>	<b>Pros.</b>
Built-in or self-powered. No need for an amplifier.	Less expensive to upgrade.
Reliable frequency response	
Can withstand electrical shock despite having an amp in them.	<b>Cons</b>
Takes less space in terms of ergonomics	No built-in powered amps.
Durable and versatile	Must sacrifice for cables and space
	Blows and not durable
<b>Cons</b>	
Expensive	

All those differences are spelled out; how do we choose a studio monitor? Simple. Just listen several times with your audio CDs in every genre at your disposal.

## COMPUTERS

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Computers, both hardware and software programs can be found in most, if not all, every living successful musician or DJ. You can name the genre. Hip-Hop, Rap, Mediterranean, Electronic, all jazz types, Dance and Techno Music, Classical Music, film-scoring. Why? The reason is that the computer can fulfill the major roles of MIDI Sequencing, multi-track audio recorder, stereo recorder onto CD, and in sampling and *synth editing*, or if one prefers, *additive synthesis*.

Does it entail a great deal of effort to set up our computer-based home studio? No, because we just want to enjoy our hobby of music production. In that case, now is the time to become aware of the benefits of relying on computers.

### 1. *Easier access*

The access to our computers grants us the opportunity to start, record, pause, and continue a project. Total control of time management rests in our hands.<sup>6</sup>

### 2. *User-friendly interface*

All is right there in front of us: mixer, recorder, editor, effects, etc. Computer-based systems allow seeing and working on whatever we want on the monitor (screen).

### 3. *Audio-editing capabilities*

The flexibility of copying, editing, pasting, and deleting sections are benefits found in a computer-based home studio. We simply need basic IT and basic music skills.

### 4. *System Integration*

With the increase in software synthesizers, plug-ins, and a lot more hardware, we can simply integrate all this, and the result is a powerful recording machine at our disposal.<sup>7</sup>

### 5. *Ready to burn our completed projects or share AIFF, WAV, MP3 files.*

Of course, we can burn our final projects with the CD-R burning capabilities of both the software editor and computer hardware, respectively.

What is then going to be needed to set up the computer system? This encompasses three items: the **computer, the audio-interface, and the software**. Since most of us already own personal computers (PCs) that is a good start. For others without any setup, the following components will be required:

### *The PC Platform*

- a. Get the software first then the PC or Mac powerful enough to run your programs. On the Windows environment, Inter Core processors to the latest is just enough. Between 1 and 3 gigahertz is adequate. Go for the latest and current from Intel or AMD.
- b. Get more RAM. Bye-bye to sdram and welcome to DDR3 and DDR4. 8 gb to 16 gb is just acceptable. Upgrade when necessary!
- c. 80 to 120 GB of hard-disc space as starters then upgrade when only necessary.

The **audio interface** is part of the hardware structure. This is just a **simple single card that plugs into your computer's expansion slot. The interface is where you connect your instruments and devices**. Do we need an audio interface? Well, yes and no.

YES. If we want to connect devices like instruments, recorders, mixers, effects, etc.

NO. Because we already had a soundcard when we bought the computer. We can rely on software editors, such as sound libraries and plug-ins. But it does not tell us the audio quality of the sound card.

### MY RECOMMENDATION

Depending on your budget and the boundaries you want to explore, start with the in-built sound card and upgrade when necessary.

### *The Macintosh Platform*

The Mac was designed with the musician, artist, entertainer, film producer, and any creative person in mind. That, for much of the past, the Mac has been the ideal tool for high-end professional audio applications.

Mac's have stereo audio recording hardware built-in which can be said to be of CD quality since it has the same 16-bit resolution and 44.1 kHz sampling rate.

If you can afford the latest G5 with its Intel Xeon processors, well you will be making music and videos at speeds only to be found in paradise. Yes, it exists!

### *How to decide*

Recently, it mattered not if you opt for a Mac or Windows-based system.

<b>Macintosh</b>	<b>Windows</b>
<b>Pros</b>	<b>Pros</b>
It is popular among professional entertainers.	Less expensive
More expansion potential	Can buy components on a gradual basis and build yourself a power workhorse.
Aesthetic	Becoming gradually popular in media production circles.
Latest Intel processors	
Durable	<b>Cons</b>
	Obsolete just after purchase.
<b>Cons</b>	Less popular among big-name musicians and producers.
Very expensive	
You cannot build yourself	

### *The software*

One will be surprised to know the numerous software in the stores and even shareware and freeware software on the Internet, which can be acquired or downloaded to run your music or audio project. Interestingly, they are affordable and powerful. One problem however is that most of the freeware software's development schedule has expired, thus, there are no guarantees of security or upgrading. Additionally, some require some payments after a 1-month free trial.

At this point, let us consider the MIDI Sequencer. We need to remind ourselves that MIDI permits two or more devices to communicate or synchronize with each other. MIDI sequencer software operates for example when you press a key on a keyboard, or other device, and becomes data such as note number, key velocity, after touch, etc. Thus, the function of the MIDI Sequencer software is simply to record data and allow the user to manipulate it in several ways.<sup>8</sup>

Currently, most convincingly priced software sequencers even have video editing possibilities. Thus, we can edit our famous Safari holiday captured on video with accompanying music.

## Software plug-in

What is a plug-in? Before we define plug-ins, ask any of your musician friends, amateur or professional alike, the sweetness of that guitar, and they will tell you that it is a plug-in instrument.



One school of experts defines a plug-in as a software application that can run within a host software program and widens the hosts' sonic capabilities.<sup>9</sup>

Another group also defines a plug-in as a piece of software that can be used en liaison with a master application to enhance a song or any audio project.<sup>10</sup>

Well, both panels of experts are totally right but upon the arrival of and the advance in information technology, software plug-ins are not just processors to enhance your sound but also sound libraries.

### The benefits and challenges of using plug-in applications.

PROS	CONS
Reasonably priced, same power, sound quality, and capabilities as high-end programs.	Installing numerous plug-ins may render your CPU Power slow. Thus, a power and fast PC will be needed.
Eliminates hardware devices and processors. Cost effective.	
Operates in real-time. Real-time means while the music is playing.	
Run as many as you want depending on RAM capacity and need.	

To summarise, we need the computer, reliance on the processing power, lots of RAM, and hard disk space for storage. Then is the audio interface to connect our instruments. Finally, the software in terms of the software MIDI Sequencer is also required to record and edit your project.

## MIDI / USB KEYBOARD

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To be able to play or record using your software MIDI sequencer, we will need the MIDI keyboard to carry out this task. Remember that the MIDI keyboard is soundless since we have plug-ins to provide the sound. But of course, we have the chance to hear what we are trying to achieve.

There are affordable MIDI keyboards in music stores. We can acquire MIDI keyboard that comes or is bundled with recording software. Besides, we can also lay hands on a 25-key MIDI Keyboard that would just fit in our backpacks plus a laptop. Furthermore, 49 key and 77 and 88 keys are also available, the latter two for weighted piano action.

## SYNTHESIZER

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A good idea if there is one in the cave or the loft. It is still usable even if spiders have established their colonies inside. We can also rent if we are looking for a certain or specific sound. Sometimes we might like a certain classic piano sound in a synth than in a plug-in. Welcome to the land of limitless possibilities. The advantage of a synthesizer is that it can serve two important purposes.

1. It can serve as your MIDI Keyboard, and
2. You can rely on its built-in sound architecture, such as basic piano sound, basses, strings, pads, and so on.

## SAMPLER

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Earlier on, the sampler was mentioned as an integral part of the home studio. Since our home studio is computer-based, we 'can' also eliminate the hardware sampler and rely on software samplers.



*Image Source: Courtesy of Roland Music*

If you already have a hardware sampler, you can still acquire a few software samplers. The difference is that simple:

- The hardware sampler requires CDs and CDROMs besides programming your own sounds.
- Whereas the software version needs no requirement just the click of the mouse.

## MICROPHONES

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Unless you can sing a bottle to record your voice, you would be the first person to invent such a technique. Great! But we need the microphone to perform certain tasks such as the following:

- Recording your voice
- Recording an instrument such as an acoustic guitar or electric guitars
- Performing your first gig in front of your family, or even better in front of 10,000 people.

Please if you have a karaoke microphone; do not even think of using it to record your voice or your instrument, unless, of course, you want to be a karaoke performer. The reason is simple – karaoke microphones are hopeless. No offense here but just a professional fact.



*Image Source: Courtesy of Sound on Sound Magazine*

Since microphones are the source of our home studio, we need to delve deeper into the science of microphones and their applications.

The experts recommend a good all-purpose microphone to begin with and when the need arrives, we can subsequently get two or three more for diverse tasks. There are two ways of choosing a good microphone:

1. Look around at what the professionals use or even your fellow home studio owners.
2. Choose a lesser-known model that can still serve its purposes.

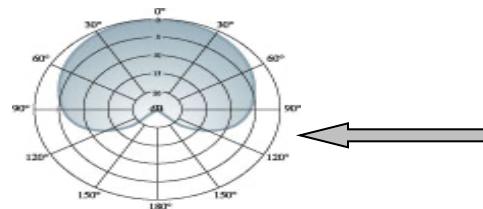
Now all, we shall look at some ‘necessary’ theoretical aspects of a basic microphone. In addition, a detailed explanation will be given of the different types of microphones and how they work, and which one suits a particular role.

*What is sound? How is sound created?*

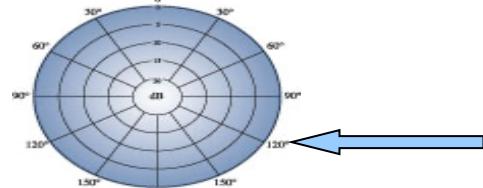
We create sound when a vibrating object, such as a string of a sitar causes the air surrounding it to vibrate within the frequency range of human hearing. This causes our eardrums to vibrate as soon as this reaches our ears, accordingly, as perceived by our central nervous system. At this juncture, we can reason that microphones pick up sounds by relying on transducers that alter motion into electricity.<sup>11</sup>

Thus, a microphone receives a tiny amount of acoustic energy, and converts it into an electrical signal that can later be amplified to a useful level by the application of the diaphragm.

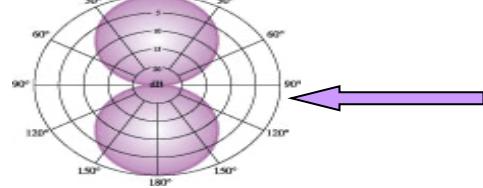
### **Patterns of Direction – Directionality**



Uni-directional pattern



Omni-directional or  
all-directional pattern



Front and rear directions

*Image Source: Courtesy of Sound and Sound Magazine*

One would not expect all microphones to pick up sound in the same way. Besides, the type of music or audio project at hand will also depend on the choice of microphone. All that said, well not all yet, let us see how microphones pick up sound based on directionality.

### CARDIOIDS OR UNIDIRECTIONAL MICROPHONES

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These microphones are designed to pick up sound from only **one source** or one direction.<sup>12</sup>

### OMNI-DIRECTIONAL MICROPHONES

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These types of microphones **pick up sound effectively from all directions**; in other words, we do not have to position the microphone directly at the sound sources.

### FIGURE-OF-EIGHT MICROPHONES

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Such microphones pick up sound from front and rear but not from the sides.

*The proximity effect.*

Cardioids and figure-of-eight microphones exhibit the proximity effect, which causes a **boosting of low frequencies (bass) when the sound source, a voice or an instrument, is very close to the microphone.**<sup>13</sup>

## DIFFERENT TYPES OF MICROPHONES

### DYNAMIC MICROPHONE

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Inside the dynamic microphone is the moving coil (diaphragm) that moves forward and backward when it is responding to sound.



Benefits	Caveats
Rugged and affordable	Presence of inertia in the diaphragm minimizes high frequency efficiency
Can be used live as well as in the studio	Requires lots of amplification to make it usable
Can tolerate high levels of sound pressure	
Require no power supply	
Less sensitive and durable	

### RIBBON MICROPHONE

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This microphone has similar engineering characteristics to the condenser. The only difference is that in place of the coil is an aluminum ribbon.

Benefits	Caveats
Technological progress has improved the durability and rigidity of the aluminum ribbon.	There are some misconceptions about the versatility and stability in the music and media circles.
Also ideal for subjective applications, such as recording classical string sections.	

### CONDENSER MICROPHONE

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The main feature found in the condenser microphone is the capacitor or two metal plates, instead of coil or aluminum.



Condenser microphones are widely acclaimed because of the storage of an electrical charge. The principle of capacitance has enabled manufacturers to build really good and sensitive microphones, ideal for vocals and other delicate instruments.

Benefits	Caveats
Well-known. Major recordings have been undertaken with condenser microphones.	Can suffer loss of sensibility when used in humid environments.
Prices have dropped making them available to budget studio owners.	
Exceptional performance.	
Less inertia renders diaphragm more responsive to high frequencies.	
Frequency exceeds the range of human hearing at both the high and low end of the audio spectrum.	

## ELECTRET MICROPHONE

Have a built-in power supply. Some condenser microphones are also electrets.

## ACCESSORIES OF THE MICROPHONE

Cables – prevent electrical interference from other electrical appliances.

Phantom powering – the most popular way of powering a capacitor microphone is to use the phantom power found on most mixers to maximize the potential of the microphone.

## USING THE MICROPHONE TO RECORD YOUR VOICE, YOUR GUITAR, OR ANY OTHER INSTRUMENT

### *Vocal recording*

Professional studios rely on condenser microphones to record vocals, specifically for reliability and durability and a wide frequency response. Inversely, dynamic microphones perform poorly at high frequencies and do not suit soft-voice performers. Rock singers adore dynamic microphones since they sing quite loudly.<sup>14</sup>

Thus, the bottom line is to capture the precision and accuracy of your purpose or choice.

### *Frequency Response and Range*

One problem with condenser microphones is the effect of sibilance (a whistling sound accompanying 's' and 't' sounds). However, these issues can be corrected.

1. One suitable approach is to use a dynamic microphone for performers known to suffer from sibilance, or
2. Place the microphone backward so that you can sing over rather than directly into the microphone.

### *Handling Excessive Noise*

To reduce noise, microphones must be mounted on a solid stand, and shock mount cradle when necessary.



### *Pop Shields*

Since some folks' experience problems with popping on the explosive 'p' and 'b' sounds, sound engineers recommend using pop shields. The shield simply intercepts any unwanted vibrations trapped within moving air.



### *Positioning*

First, the general rule is not to stand too close to the microphone otherwise one might sound like a hippo. After years of experience, we can do so. Normally, a working distance between 6 to 18 inches is recommendable since the microphone is placed above or just below the singer's mouth.

### *Room Acoustics*

Our home studios could be acoustically unfriendly for vocal work. Another solution for singers is positioning themselves in a corner of your room, with deadening material like foam/mattresses placed behind them. Any sound reflected from the rest of the room and bounced back into the wall is absorbed by the deadening material before it can be sucked back into the microphone.