

Getting Started With Recording

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Intro

The aim of this clinic is to introduce you to the world of recording. Learning about everything from interfaces to microphones will help you make wise investments in your recording gear. We will also go over a few techniques such as mic placement and getting an isolated studio quality recording. Feel free to ask me questions as we go along.

What Are you Going to Record?

The first thing you need to figure out is what you are going to record. Deciding this before you start to buy things will save you from making unnecessary purchases or spending money building up the wrong items in your arsenal.

There are generally three types of recordists. I have grouped them off here.

Group One – “The one-man-band” Many people fall into this group; Singer/Songwriters scartching down demos before hitting the studio; Music students recording their practices to study and improve; one-man-bands who layer everything bit by bit. A quality interface and great mic will get you far, headphones and a mic stand round out this groups shopping list.

Group Two - Recording yourself and others. This group is often filled by musicians in bands who record themselves or other bands. Equipment needs get a little more involved here. It's very easy to buy something that works well now, but only too soon you find yourself wishing you had more inputs or more mic preamps. Spend a little more money on the interface, couple choice mics (SM57, a vocal mic, and a couple small diaphragm condensers), a couple headphones and rent other mics, stands, and cables as need be.

Group Three – The Project Studio, is made up of aspiring engineers running project or home studios. Often recording on evenings and weekends, these budget studios make up more and more of todays recordings. Here an interface capable of recording 16 track, an 8 channel mic pre/converter, quality monitors, a handful of headphone, mics (same as above and rent when you need extras), and a good place to record are all requirements of a project studio.

Now that we have established these three groups we can start learning about recording.

Signal Flow

The most important aspect of recording to understand is signal flow. It is exactly what it sounds like, the flow of signal. Once you understand the signal flow it becomes simple to troubleshoot problems and improve your sound. A basic signal flow for recording a vocal would be like this

Source (Singer) > Microphone > Cable > Pre Amp > A/D Converter > Interface > Computer > DAW

This is often shorter as most interfaces combine preamps and converters in one device, but it is important to know they exist. As a rule you should always be looking for the shortest signal path. The more stops the signal takes, the more noise is added to the signal.

*** A note on troubleshooting. If a signal is not making its way from source to destination, look at the half way point of the signal flow. If signal is reaching that point, the problem must be in the second half, if not the problem is in the first half. This can save you a lot of time while troubleshooting. ***

Source

The source can often be the hardest part to control in your signal chain. First, if you are recording yourself chances are you are close to your computer, and that will add a lot of noise. Noise can also come from things like neighbors, air conditioning, fans or anything else that makes noise. Things like the Reflexion filter from SE will prevent the sound in the room from invading your recording. The background noise might not seem like a big deal on a single mic, but every mic will be multiplying the background noise.

Reduce noise on your recordings by placing the microphones closer to your source (though this can change the tone); use a reflexion filter; acoustically treat your room; or turn off anything that may create noise (air conditioning, fans, etc.) Isolating your sources becomes more important with every track you add. This is the first step to an excellent recording.

It is also important for each take to be recorded the same distance from the microphone. Many different techniques can be used to help the artist (the person you are recording). I usually get the performer to look at the mic and look at the wall behind the mic and find some landmarks to orientate themselves when they step back up to the mic, some people have a string hanging off the mic to measure the distance. However you do it, keep your artist in one spot.

Mics

Microphone choice is the single biggest factor of your sound. Choosing the wrong mic can lead to a muddy mix and unsatisfying results. With that being said choosing a good microphone is not difficult if you know what your dealing with.

Microphones can be divided by type into 4 categories: Dynamic, Condenser, Ribbon, and Boundary

Dynamic – Dynamic mics are excellent for loud sources like guitar amps and drums and are very durable making them perfect for live performance. In the studio dynamic mics are used mostly for amps and drums, thou occasionally for vocals or acoustic instruments. Due to the design these mics are not as sensitive as other mics. If there is any one dynamic mic to own it is the Shure SM57. This mic is often the go to mic for guitar amps. Other popular dynamic mics are the Sennheiser MD-421 for its large capsule and wide frequency range and the Shure SM58 for its rugged durability and vocal sound.

Condenser – Condenser mics can be divided into 2 categories: small diaphragm and large diaphragm. Large diaphragms are the standard vocal mic as they are very sensitive and will capture every nuance of the voice. Small diaphragm mics are used often for acoustic instruments or for capturing a whole drum kit or ensemble. All condenser mics require phantom power to operate. Phantom power is typically labled as +48V or simply phantom and is supplied either by battery or by the microphone preamp. Some popular large diaphragms are the Apex 460 tube mic which adds an analogue warmth, the Rode NT1A, and Audio Technica AT4050. Small diaphragms include the Rode NT5 stereo pair often used for drum overheads, or the AKG C1000S.

Ribbon – Ribbon mics are an older more delicate style of microphone still in use today. Due to the design these mic are very delicate. Dropping or hitting this mic can snap the ribbon inside. Phantom power can also destroy this mic. They are popular for recording strings due to a roll-off of the high frequencies due to microphone design. This roll-off helps to tame the shrill sound of bow on string. While most popular ribbon mics are out of the budget of most recordists, budget ribbon mics have started appearing in great numbers and of all qualities. Try an ART M-Five on a guitar cab and see how you like it.

Boundary - Boundary mics are technically condenser mics, but perform a special function requiring a separate category. These mics are placed on flat surfaces and collect the sound reflecting off the surface. These are great for miking stages and are also used for kick drums. The most popular boundary Mic is the Shure Beta91

Now that you know the different kinds of microphones, we will cover the different ways that mic's pick up sound.

Omnidirectional - These mics, like the name implies, pick up equally from all around the mic. Great for room mics and acoustic instruments. They will exhibit even frequency response and give you a natural sound if you use them around a foot and a half or more the source.

Bidirectional - Pickup from the front and back of the mic in a figure-of-eight pattern. They pick up well in front and behind, but nearly nothing from the sides will get in. These mics are often used with stereo mic techniques.

Cardioid, Super Cardioid, and Hyper Cardioid - The cardioid pattern rejects sound from the rear, while super and hyper cardioid allow marginally more pickup from the rear but much less from the sides. Cardioid is the most common pickup pattern

*** DI's can cause a lot of confusion, but I will try to make it easy. If your instrument has active pickups, go with a passive DI and vice versa. There are exceptions to the rule, but stick to the rules and life is easy. Personally I always DI bass and guitar when recording. Bass parts on the majority of your favorite albums were probably DI'ed and miked. A DI'ed bass gives you a deep low bottom end, which can be accented with a mic'ed signal, more advanced engineers will play with the phase to enhance the bass further. A guitar part recorded DI can be run through amp simulators to support the mic'ed sound, or re-amped (running the recorded DI track back through a DI and into a guitar amp). Having the DI'ed signal is always handy. If you have the input available, record it. ***

Cables

You all know the saying that “You are only as strong as your weakest link”. The same is true in audio. While you don't need to go out and replace all of your cables with quad-core cables, it is important not to skimp out here. Buying cheap cables will end up costing you more time and money as you try to figure out why things aren't working. Even with digital cables, quality counts.

*** In pro audio there are three main levels of signal: Mic level, line level and speaker level. Mic level is typically around 2 mV, line level is around 300 mV to 1 V, and speaker level can be anywhere from line level up to 20 V. Be careful, connecting speaker level output to line level devices will damage sensitive recording equipment. ***

XLR – Used most often for microphones, but also used as a line level output. This is a 3 pin balanced connection. XLR cables have one male end and one female end, so they can be easily coupled.

1/4" – Used both for instruments and for connecting gear. 1/4" cables come in both balanced (TRS – Tip Ring Sleeve) and unbalanced (TS – Tip Sleeve) connections.

RCA – Mainly used as an unbalanced connection in consumer gear (home theater audio or video applications) but also seen in pro audio. RCA cables are used in DJ gear, SPDIF cables, and some

keyboards. With SPDIF not just any RCA cable will do. The impedance of the cable must be 75 ohms so just look for SPDIF on the packaging.

BNC – Seen most in video applications, in audio this is used for syncing digital gear via wordclock.

MIDI – This connects synthesizers and samplers to controller or sequencers. No audio travels down this 5 pin cable, rather a signal that tells the device to play a note.

ADAT – This is an optical format which can transmit up to 8 channels of digital audio down a single cable. Take care not to bend this cable hard as it can snap the optical cable inside.

Preamp

The mic preamp takes the output from the microphone, which is in the 2 mV range, and boosts it into the 300 mV to 1 V range. The preamp is also used to supply phantom power for condenser mics if required. Preamps can be either solid state or tube, the latter typically gives you a warmer, more 'analogue' sound. Preamps come in single channel units up to 8 channel racks. Preamps can range in price from \$50 dollars per channel to well over \$2000 dollars per channel. For those recording themselves, 1-2 channels will be ample. If you are recording a number of people, you will want at least 8 preamps. Drums alone can take up to 12 mics, though excellent drum recordings have been made with as few as 2 mics. If you are looking to have a project studio, make sure you have a minimum 8 preamps, 16 channels or more will give you the ability to track an entire band at once. If you are not recording drums often, look for an interface which has ADAT input so you can rent out gear to get the extra 8 channels for when you need them.

*** While it is easy to have identical preamps, you wont have different tones to choose from. It would be like painting a picture with only a couple colors. While the microphone arguably makes the biggest difference in tone, the choice of mic preamp will color the tone as well. Having a range of preamps will give you a full pallet of colors to choose from. ***

A/D Converters

This is the step where the sound crosses from analogue to the digital realm. This step is often overlooked, as most people believe that all digital is made the same. This is an incorrect assumption. The process of converting voltage to zeros and ones is done by measuring the voltage anywhere from 44100 (44.1 kHz) times a second to 192000 (192 kHz) times a second. An inferior converter will do this conversion with far less accuracy than others. This is relevant for both ends of audio going into and coming out of your computer. Try listening to a song with the built in sound on your computer and then through an Apogee Duet and you will head what a difference quality conversion makes. There is a whole slew of technical terms and jargon regarding conversion, but there are only 2 you need to know. Bit depth is the scale of measurement. There are 2 common depths 16 and 24. Given the option I always use 24 Bit. You can think of bit depth like a mosaic, the more pieces you have the more detailed the picture. The second is sample rate, which is how many times per second the input is measured. I record only at 24 Bit, 44.1 kHz. While higher sample rates do increase quality, I find 44.1kHz to be more than adequate. Moving the mic half an inch will improve the sound more than 88.2 kHz.

*** Sync is important. When you have 2 converters measuring the incoming audio at different times will give you clicks and pops. These can be avoided with sync. Sync is normally established by word clock which is delivered over BNC, SPDIF, or ADAT. For sync to work properly you must have a master and a slave clock. Typically use your most expensive piece of gear for your master (unless you have a dedicated word clock generator). I always use BNC when possible for word clock as it is dedicated to that purpose. For best sync always make sure your word clock signal is not being carried on a cable also carrying audio at the same time. Refer to your manuals for details on your gear***

Interfaces

The interface is the single most important consideration when looking to invest in a recording set up. Most interfaces house the mic preamp and A/D converters as well as getting the audio in and out of the computer. Choosing something too small can leave you wishing for more and costing you more money as you find yourself having to upgrade. Going with too much won't leave you disappointed, but will cost you more. Finding the best interface for you will be worth the time spent researching and investigating. I will break the interfaces down by the three groups discussed earlier.

*** A note of warning. Before you purchase an interface, make sure it will work with your computer. Some computers don't have firewire, others do. If you have the most up-to-date operating system, make sure that the interface has drivers for your version of the OS as audio manufacturers are often much slower to respond to new operating systems than other device manufacturers. ***

Group One – Typically this group will only require an interface with one or two microphone preamps. Prices here range from \$99 up to \$499 dollars. The lower end of the scale is great for getting started in recording. You get the basics here, though be careful. The lower price point is often a reflection of missing features and corners cut. Some only record in 16 bit, some don't supply phantom power, so be careful when purchasing at this end of the scale. On the higher end you generally get 2 very clean mic preamps with high end converters which will last you for years and years. Other features to look for are MIDI input for connecting controllers and sound devices, and SPDIF in/out for getting extra inputs into your system.

Group Two – Group two can be the most difficult to find an interface for your budget. The biggest problem comes when you go to record drums as then can take many inputs to multitrack every drum. So you must decide before getting an interface what you want to record. Many popular songs have been recorded using as few as two mics on drums. This takes a little more time setting up as mic position becomes very important. This route will however allow you to get away with recording a full band on as only 8 inputs. However if you want to get more mics on the drums, you should look for an interface with ADAT inputs. That way when you need to track drums, you simply rent an 8 channel mic preamp and connect it to the ADAT input on your interface to get a full 16 channels of audio recorded at one time. While some interfaces will boast 8 preamps on board, adding a little flavor with external preamps is always nice. So don't get to hung up on finding an interface with 8 preamps on board.

Group Three – Here is where you will typically need all the horsepower you can get. Having 16 channels of input is almost a necessity. It's important to be able to capture a live off the floor performance of a live band. Multitracking drums will take up most of your inputs. You will most likely need to have an interface with eight analogue (mic or line level) inputs and one or 2 ADAT inputs. Some interfaces deal only in ADAT, with up to 32 inputs you will be able to track some of the larger bands. There are many different routes to go here from Firewire devices (I recommend against USB interfaces when tracking this many inputs. USB just can't keep up), to PCI card based systems like Pro Tools HD, Apogee Symphony, and many others.

Computer

A lot of people get hung up on what kind of a computer to use for audio recording. The truth is it does not matter as much as some people believe. What does matter is you have a computer that meets the specs required by the software and hardware you plan to use. When new operating systems come out, such as Windows 7 and Mac OS X 10.7 and you get a new computer or upgrade your operating system, you may find yourself in a situation when your hardware or software will not work (this generally happens less on a Mac). Unfortunately this is one of the struggles of computer recording. Waiting until your system fully supports these new operating systems before upgrading will save you endless hours of re-installing software and scouring the internet to figure out why your system is crashing. Also some software is only available on one operating system or another, so again make sure your system supports what you want to do.

One thing to consider if you have a tower computer is getting a second hard drive for your audio work. This makes it a lot easier on your hard drive (extending the life of the drives) as well as giving you a place to back up your work in case your audio drive goes down. Backing up your drives is very important. Nothing is as heartbreaking as working on a project for countless hours only for your drive to crash and you lose everything. If you are doing work for a client, you better back it up to two or more locations.

*** This note is for PC users. Often when you get a new computer it will be full of stuff you don't need, extra programs running at startup and taking precious resources from your audio software. You have two options here. Purchase a computer designed for audio that comes optimized for audio work, or optimize the computer yourself. Typing "optimize pc for audio" in Google will take you to a selection of links with instructions for doing this yourself. Following the tips on those sites can make substantial differences in how well your computer runs. ***

DAW (Digital Audio Workstation)

Much like computers, everyone has their favorite DAW (recording software). While some have features you won't find elsewhere, you can accomplish almost all tasks with any software you choose. Some general guidelines, however, are as follows: if you are looking to do a lot of MIDI sequencing, consider programs such as Sonar for the PC, Cubase for either platform, or Logic or Digital performer on the Mac. For more audio

based tasks Cubase works well or Pro Tools which has been the standard since nearly the beginning of computer recording. If you are mainly recording your own work, then the software choice is pretty well open. While each software package is different, learning one well is all you need. If you are in a situation where you are bouncing work back and forth with someone, much time can be saved by working in the same DAW as your collaborator. If running a major studio consider Pro Tools as it is likely that clients coming in with existing sessions will be working on Pro Tools, and if it is to be sent off for mixing at a professional studio, they will probably be working off a Pro Tools system.

Tips

The following are a list of tips for getting a good recording once you have established your signal flow. These are not listed in any order of significance.

1. When placing a microphone, put headphones on and move the mic until you get the best sound
2. Recording at a bit depth to 24 bit and your sample rate at 44.1 kHz or higher will give you the best sound
3. Set levels while recording to average between -18 dBFS (sound level in the digital domain) to -12 dBFS. This will help prevent digital clipping. Which never sounds good.
4. DI and mic cabs. Recording the bass via DI when tracking a whole band can prevent the bass from bleeding onto every mic. This signal can be re-amped later for the-amped sound.
5. Recording vocals with a reflexion filter can get studio quality vocals in most rooms.
6. Learn keyboard shortcuts in your software to save time. The smoother you can work, the less like work it seems.
7. Don't skimp on microphones. Start with one good condenser microphone and an SM57.
8. Don't fiddle with EQ too much. If you don't like how it sounds, change it at the source.
9. Listen to professional recordings and reference your sounds against theirs.
10. Practice. I am always working on something. Even if its just taking a friends track and recording it. The more you do the more you know.
11. Along with practicing, keep learning. I am always reading a book on audio, and have a subscription to an audio magazine. Between the two I am always learning something new and trying out on my next session.
12. Just keep going. Every time you record something you should learn something new. Every mix should be better than the last.
13. Talk to others either in person or on forums to share and exchange tips.
14. Listen to your work on different speakers to ensure that you aren't missing anything. Some speakers of rooms will hide things you will hear on other speakers.

RESOURCES

There are a number of excellent resources out there for audio. Check them out when you have a chance, you will learn a lot.

Books

The Art of Mixing: A Visual Guide to Recording, Engineering and Productions, Gibson
Zen and the Art of Mixing, Mixerman
Modern Recording Techniques, Huber & Runstein
Manuals, All of them.

Magazines

Sound on Sound, www.soundonsound.com
Mix Magazine, www.mixonline.com
EQ, www.eqmag.com
Tape Op, www.tapeop.com

Internet

www.soundonsound.com; Browse old issues, keep up on current product news and participate in their excellent online forum.
www.gearslutz.com; Rude name, great forum
www.kvraudio.com; A great site with free resources and plugin's