Massachusetts College of Art and Design

Studio Foundation Department

Introduction to the Studio Foundation Sound Recorder Kits

Version 5, revised January 22, 2013

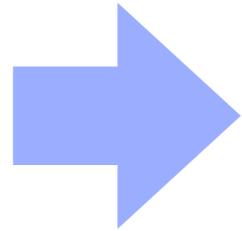Please send corrections and suggestions to david.tames@massart.edu
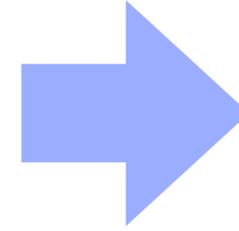
Contents

What is sound?

Sound is **vibrations of air particles** moving through the air...

→

... that moves a diaphragm in the microphone which in turn gets translated into an **electrical signal...**

→

...that is converted to a stream of binary data and **stored in a digital format** by the camera or audio recorder and stored as a digital file.

The digital file can be can be played back by a computer or media player through speakers or headphones which in turn reproduce the vibrations originally recorded.

Reflections
(sounds you don't want)
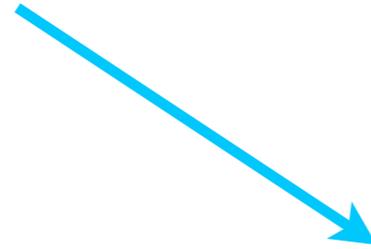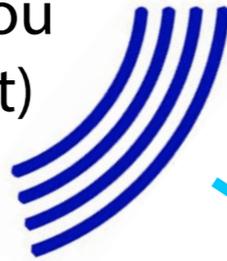
Source
(the sound you want)

Microphone

Noise
(more sounds you don't want)
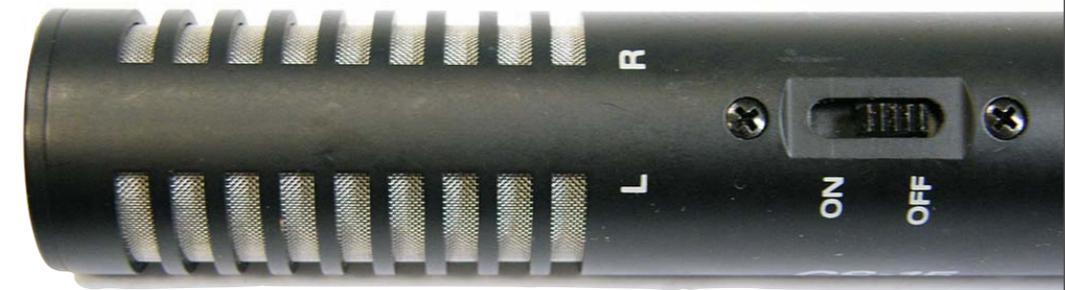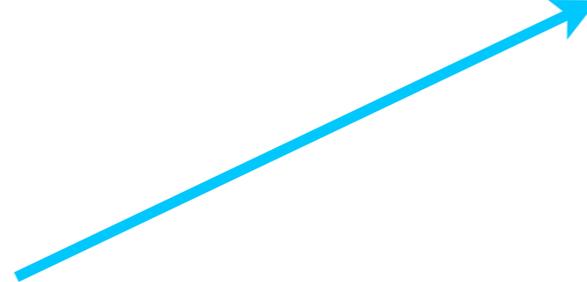
Bonus: distortion, coloration and noise are added by the microphone and additional noise might be added by cables and electronic circuits along the way (the reproduced sound is never identical to the original)

Studio Foundation audio kits

Roland R-09, **R-09HR**, and **R-05** digital audio recorder kits are available from the Studio Foundation Cage (the three models are very similar, this handout points out the salient differences).

The older **R-09** ▶ has an integrated Menu/Finder buttons unlike the R-09HR and R-05, plug-in power is selected via a switch on the back, it does not have a LIMITER, only Automatic Gain Control (AGC).

◀ The newest **R-05** is similar to the R-09 and R-09HR with some minor differences: input and headphone volume buttons are on the front, and connectors are in different positions. Like the R-09HR it offer a choice of Automatic Gain Control (AGC) or LIMITER. Plug-in power (for external microphones) is set via the configuration menu
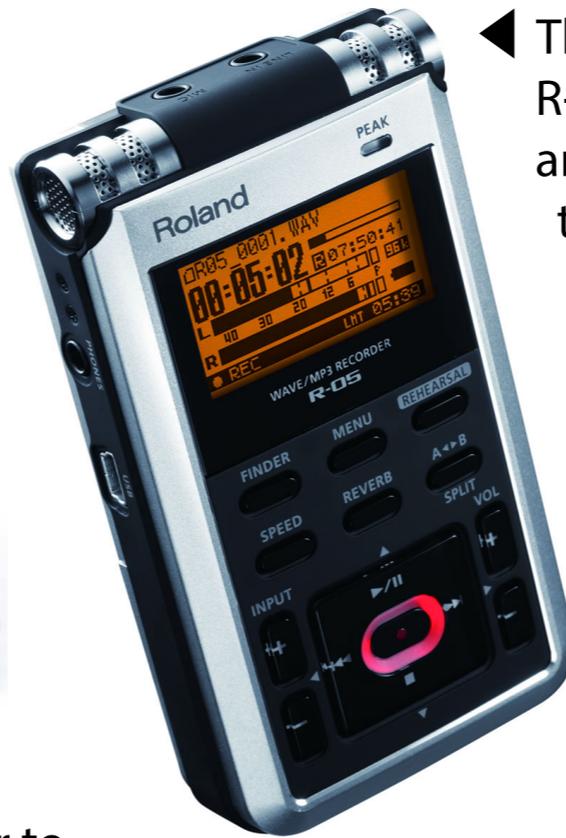
All kits include a 2 GB SD card, USB cable, headphones and two fully changed rechargeable batteries (which must be returned with the kit).

◀ The newer **R-09HR** is similar to the R-09 with some differences: mic and headphone jacks are in different locations, Menu/Finder are separate buttons, plug-in power is selected via a switch on the back, and offers a choice of Automatic Gain Control (AGC) or LIMITER.

◀ **Sony MDR-7506** professional headphones are available for check-out when editing in the TIME labs.

Roland R-09 and R-09HR kits include additional accessories: CS-15 cardioid stereo microphone with grip/stand adapter, Tripod, A/C adapter, case (with an integral tripod socket).

Comparison of the three recorders

	Edirol by Roland **R-09** (our classic recorders)	Edirol by Roland **R-09HR** (our newer recorders)	Roland **R-05** (our newest recorders)
Audio level control:	Automatic Gain Control (AGC) or manual, no Limiter function is available (enable AGC via switch on the back)	Automatic Gain Control (AGC) or manual with Limiter function (turn on/off via switch on back, choose which is enabled via INPUT SETUP menu)	Automatic Gain Control (AGC) or manual with Limiter function (turn on/off via switch on back, choose which is enabled via INPUT SETUP menu)
Plug-in power:	Enabled/disabled via INPUT SETUP menu.	Enabled/disabled via switch on the back.	Enabled/disabled via INPUT SETUP menu.
USB connector :	Behind bottom door (slide 1/2 way to access)	Behind rubber cover on bottom, pry to open	On the left hand side
Headphone jack:	On the left side	On the top side	On the left side
Power button:	Power button on the left side	Power button on the right side	Power switch is a slider on the right side
Finder and Menu buttons:	Combined, hold for 2 second to get to MENU	Separate buttons	Separate buttons
Input level adjustment:	On the left side of the recorder	On the left side of the recorder	On the front face of the recorder
Headphone level adjustment:	On the right side of the recorder	On the right side of the recorder	On the front face of the recorder
Kits includes:	R-09 recorder, USB cable, closed-ear headphones, SD card, freshly charged batteries, CS-15 external cardioid stereo microphone with boom pole adapter, (enable plug-in power to use), tripod, AC adapter, and recorder case, all ready to go in a carrying case	R-09HR recorder, USB cable, closed-ear headphones, SD card, freshly charged batteries, CS-15 external cardioid stereo microphone with boom pole adapter, (enable plug-in power to use), tripod, AC adapter, and recorder case, all ready to go in a carrying case	R-05 recorder, USB cable, closed-ear headphones, SD card, and freshly charged batteries, all ready to go in a lunch box.

Power on the recorder

R-09

R-09HR

R-05

1. To power on, press the **POWER** button (R-09 or R-09HR) and hold for a second or so; or slide the **POWER** slider (R-05) and hold for a second or so.

2. Check the **battery level**: all white (all black on the R-05 display) = 100% full*

3. If using external microphone, make sure **Plug-In power** is ON (can be turned on via INPUT SETUP Menu on R-09/R-05 or the switch on the back of R-09HR)

R-09
R-09HR
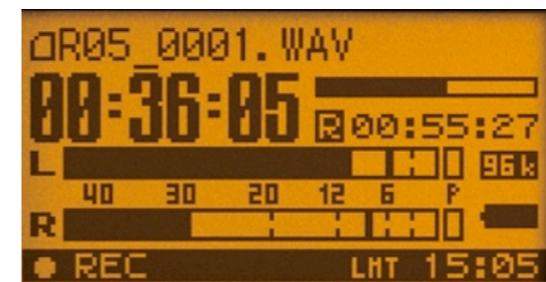
R-05

* For an accurate reading you must set the match battery type. Recorders are sent out with rechargeable Nickel Metal Hydride (Ni-HM) batteries (see slides 18-19 for more on recorder configuration)

Every time you check out a recorder from the cage, the first thing you should do is:

Format card & set recording settings

R-09

R-09HR

R-05
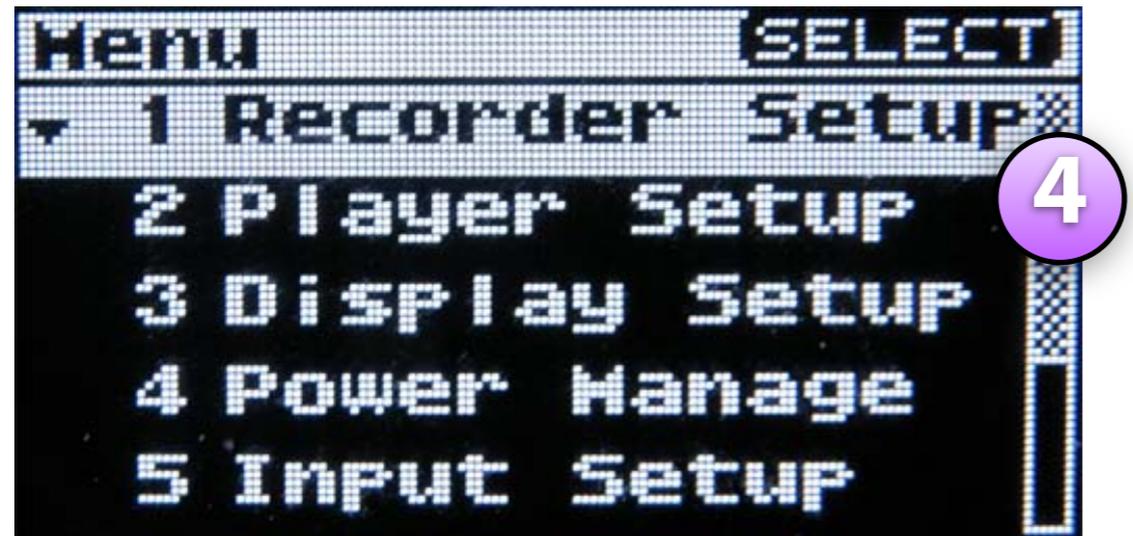
1. On the R-09: press the **FINDER MENU** button and hold it down for a moment until the SELECT menu appears or on the R-09HR or R-05: press the **MENU** button.

2. Navigate using the ▼ and ▲ buttons to select **9 SD CARD** and press ●REC

3. Navigate using the ▼ and ▲ buttons to select **FORMAT** and press ●REC,

4. Press the ▶▶ button to select **Yes,** then press ●REC (it will say, "Now Processing") when done, Press **MENU** to return to the menu

5. Navigate using the ▼ and ▲ buttons to select **RECORDER SETUP** and press ●REC

6. Press the ▶▶ or ◀◀ buttons to select the Sample Rate (**choose 48kHz**)

7. Navigate using the ▼ to select Record Mode, then press the ▶▶ or ◀◀ buttons to select Record Mode (**choose WAV-16bit**).

8. You can navigate back to the Sample Rate using the ▲ button, and then press **FINDER MENU** on the R-09 or **MENU** on the R-09HR or R-05 to return to the Menu.

See pp. 26-28 of the R-09 Owners Manual or pp. 34-36 of the R-09HR Owners Manual or pp. 31-42 of the R-05 Owners Manual for more information.

Your first recording

R-09

R-09HR

R-05

1. Press the ●REC button, the red ● flashes, indicating **Record-Standby** mode

2. If you are not using AGC (Automatic Gain Control)*, press the + or – **INPUT level** buttons to adjust the level of the recording so the meter in the display has peaks averaging between -12 and -6 (0 being the maximum level). More later on setting levels.

3. Adjust the **headphone volume level** to a comfortable monitoring level, this does not affect the level of the actual recording.

4. Press the ●REC button to start **Recording**

5. Press ■ when you're finished recording

R-09 and **R-09HR**

R-05
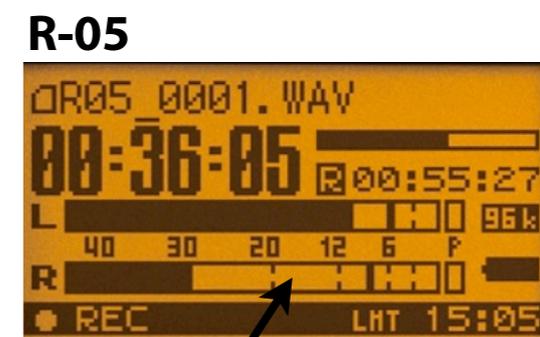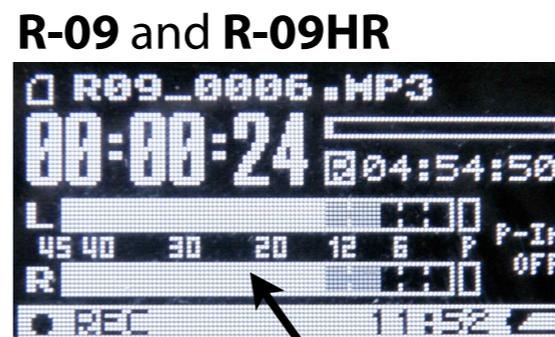
audio level indicators

Listen to your recording

R-09

R-09HR

1. Connect headphones to the headphone jack

2. Press ▶ to begin playback

3. Press the **+** or **–** VOLUME buttons on the side panel to adjust the playback levels

4. To move forward or backwards in the recording, press and hold the ▶▶ or ◀◀ buttons

5. When finished, press ■
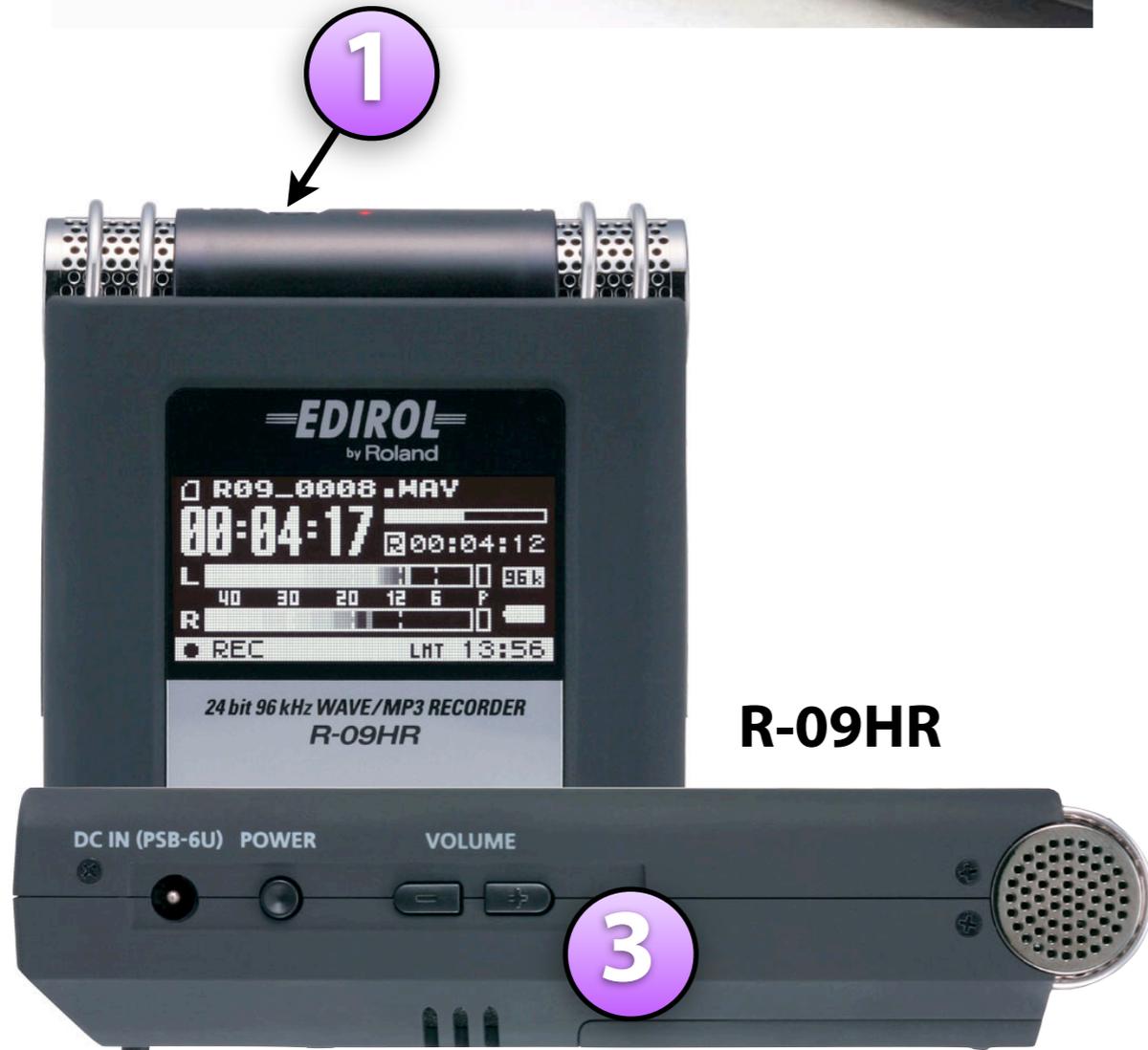
R-05

Selecting files for playback
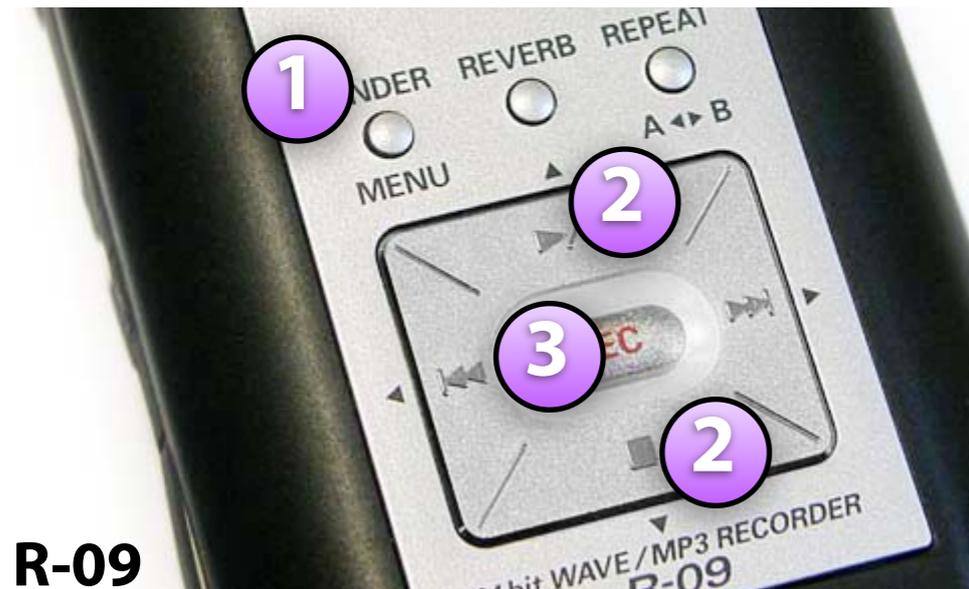
R-09
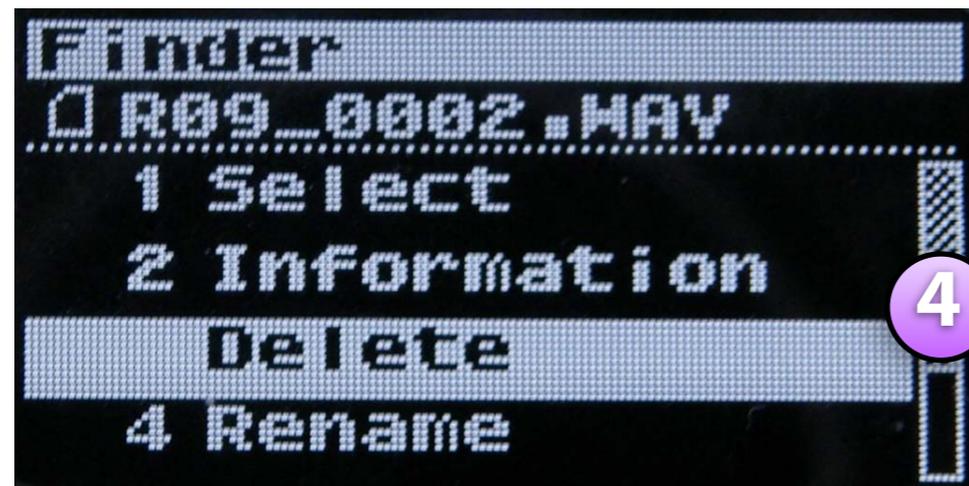
Each time you record, the recorder creates a new audio file on the SD memory card, to view and select individual files for playback:

1. Press the **FINDER MENU** button on the R-09 (or the **FINDER** button on R-09HR and R-05)

2. Navigate through the list up and down using the ▼ and ▲ buttons.

3. To play a specific file, press ●**REC** twice, then press ▶

4. For other options, press ●**REC** once, then navigate with the ▼ and ▲ buttons to select your choice (e.g. SELECT, INFORMATION or DELETE) and then press ●**REC**

Note: The recorder allows you to rename files, refer to the manual for how to do this, however, this is easier to do once you move the files to your project folder.

R-09HR ▶

◀ R-05

Compared to the R-09, the R-09HR and R-05 menus may have additional options, but the menu options are very similar.

Setting & monitoring levels

1. The audio level meters show you the audio signal level relative to 0, which is full scale. Numbers on the meter refer to dB (decibels, ratios used to measure sound)

2. Levels below -40 db are too low, the sound you are recording will be lost amongst the noise inherent in the system.

3. Levels with peaks that are dancing between -12 to -6 db on the meters is a nice happy medium, it's OK for soft passages to go down to -30 as long as you're getting some peaks in the vicinity of -12 to -6 db.

4. Levels that peak beyond 0 on the meters (full scale) trigger the "P" peak indicator and red PEAK light are too high. This means that the audio waveform peaks are being chopped off resulting in a harsh and raspy sound.

Source: Roland R-09 Owner's Manual, August 1, 2006

Notes:
1. These screens are of the R-09, the R-09HR and R-05 screens are a little different, but essentially the same;
2. The numbers on the meter refer to db (decibels, a unit of sound measure) below 0db "full scale" (the maximum level that can be recorded).

Setting & monitoring levels
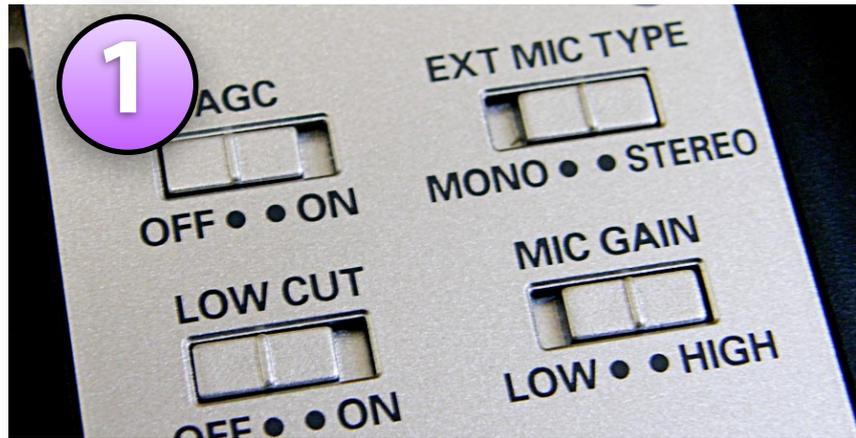
R-09

R-09HR

R-05

Sony MDR-7506 professional headphones are available for check-out from the cage for critical monitoring and editing..

1. **Adjusting levels manually** provides the best results, however, in a pinch, especially when recording with lots of variation between soft and loud you can't predict or control, turn on Automatic Gain Control (AGC) to let the recorder adjust levels automatically.

2. If you are using an R-09HR or R-05 recorder, we suggest **enabling the LIMITER** which will gracefully curtail peak audio to avoid distortion. The LIMITER is turned on via the switch on the back of the recorder. However, the actual processor (AGC or LIMITER) use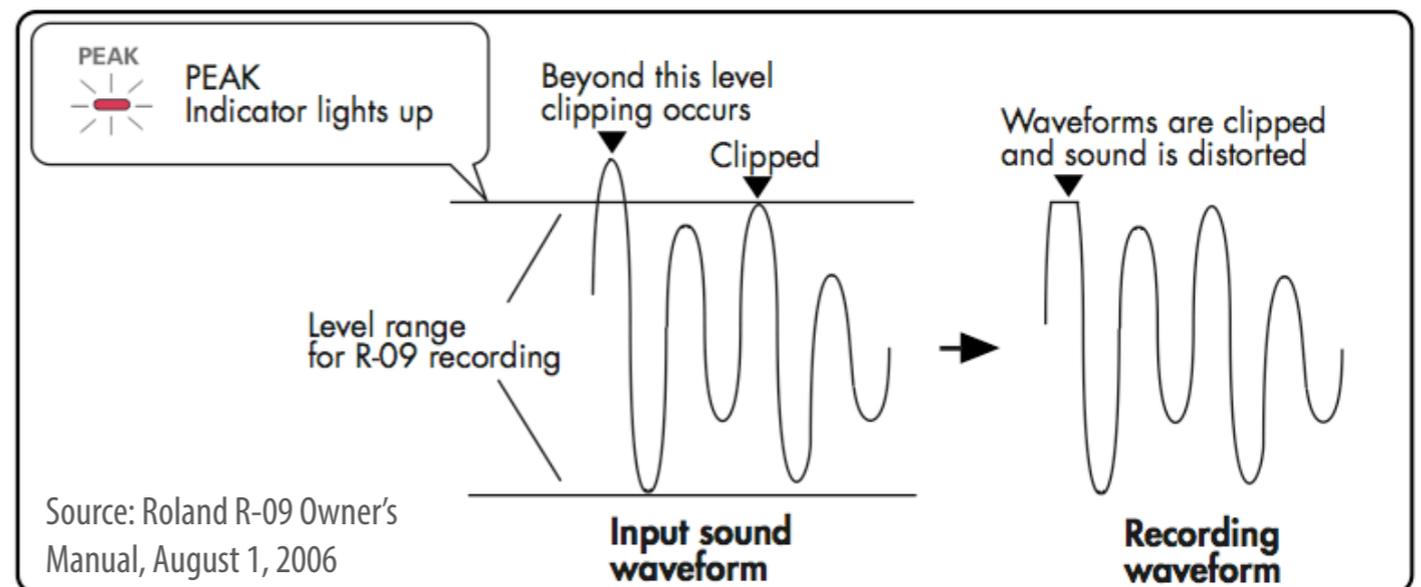d is determined by the choice selected in the Input Settings Menu on the R-09HR and R-05 recorders. The R-09 does not have a LIMITER.

3. Always monitor your recording with good headphones that provide sound isolation.

4. Most earbuds are not as good as professional headphones for monitoring, however, if you have to use them, use the type that provides good sound isolation. Professional earbuds do exist.

Setting & monitoring levels

Input Signal	Recorded Signal		
	Automatic Gain Control (AGC)	**Manual input settings with Limiter** (Limiter not available on R-09)	**Manual input settings without Limiter**
0 -6 -12 -20 -40 -45	*level of recorded signal is normalized*	*peaks of recorded signal are compressed*	*peaks of recorded signal are clipped*
What's going on?	AGC circuit is automatically raising the input gain during soft passages and reducing the input gain during loud passages, normalizing the audio levels in the recording.	A limiter circuit compresses the loudest passages of the input signal while not affecting the levels of softer passages.	The recorder is not doing any processing of the input signal.
Pros	You don't have to worry about setting levels, except to choose High or Low microphone sensitivity depending on the overall intensity of the sounds.	No pumping of the noise floor between loud and soft passages. Moderate peaks will be compressed without distortion.	The natural dynamics of the sounds you are recording are captured as faithfully as possible.
Cons	The dynamic range of the sound will be flattened, with softer sounds louder than normal and there will be pumping up and down of the background noise as loud passages come and go during the recording	The dynamics are somewhat flattened, impairing the natural dynamic range of the sounds being recording. You still need to manually set the appropriate microphone sensitivity and input levels.	If peaks above 0dBFS are encountered, the sound will have unpleasant raspy artifacts caused by clipped waveforms. It is extremely critical to set the right input levels to avoid the peaks.

Setting low cut and mic sensitivity

R-09

R-09HR

R-05
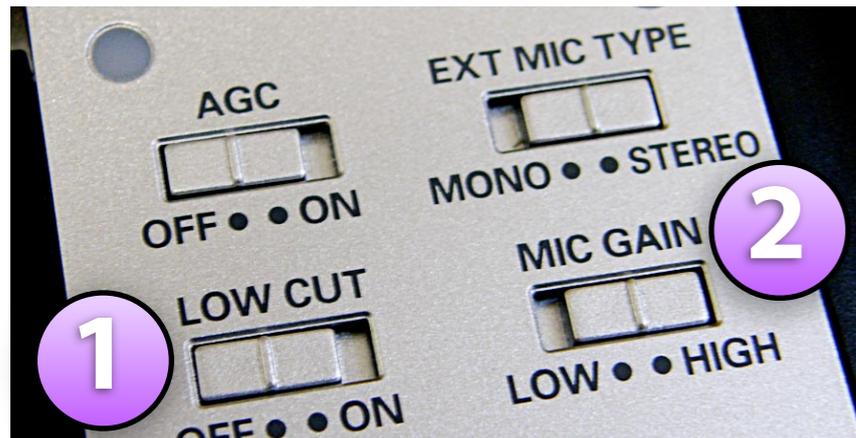
1. Turn the **LOW CUT filter ON** to eliminate low-frequency rumble. Good when recording dialog since it cuts low frequencies that are below the vocal range. Sometimes intense low frequencies will throw off your levels. Set the **LOW CUT filter OFF** when you actually want these low frequencies in your recording, e.g. recording low-frequency sound effects.

2. Adjust overall sensitivity with the **MIC GAIN** switch as needed:

   a. If audio levels are two high after adjusting the input levels, set **MIC GAIN** to the **L (LOW)** position to reduce the sensitivity of the microphone.

   b. If audio levels are two low after adjusting the input levels, set **MIC GAIN** to the **H (HIGH)** position to increase the sensitivity of the microphone.
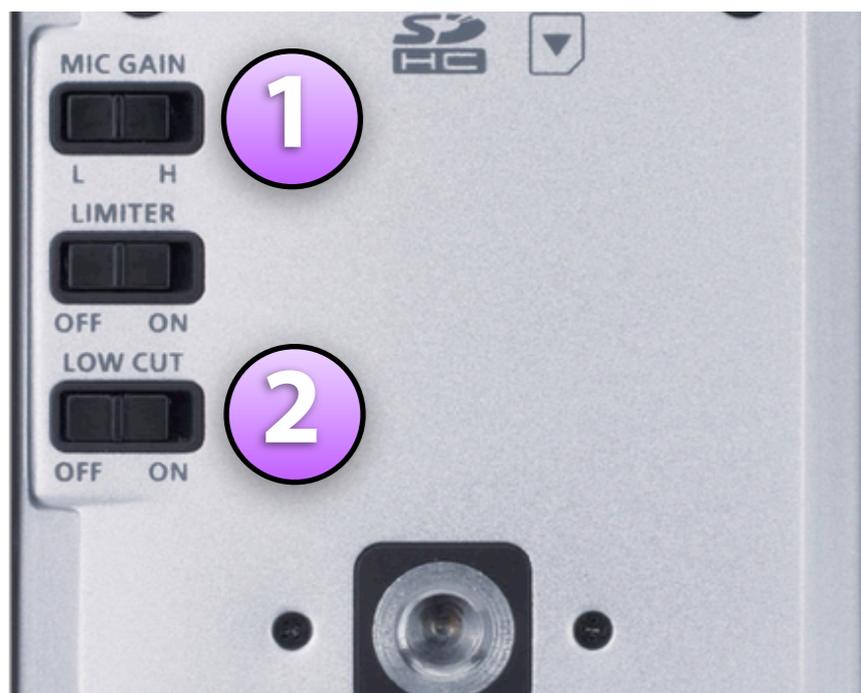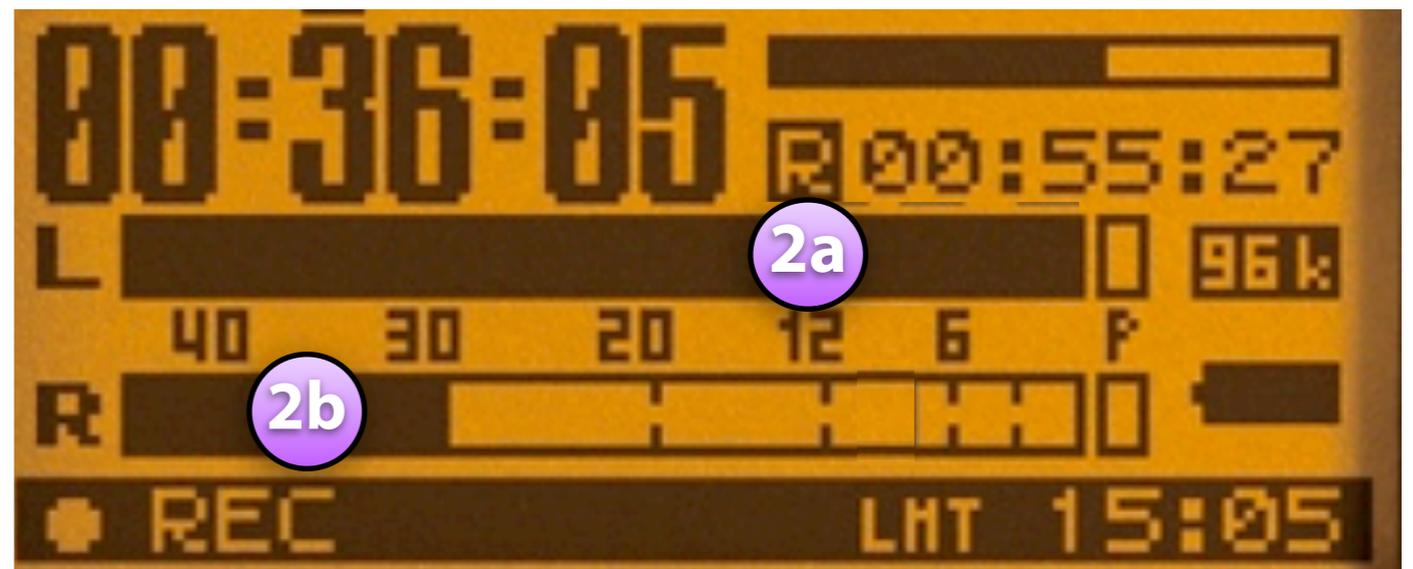
Display information during recording

R-09 and R-09HR

R-05
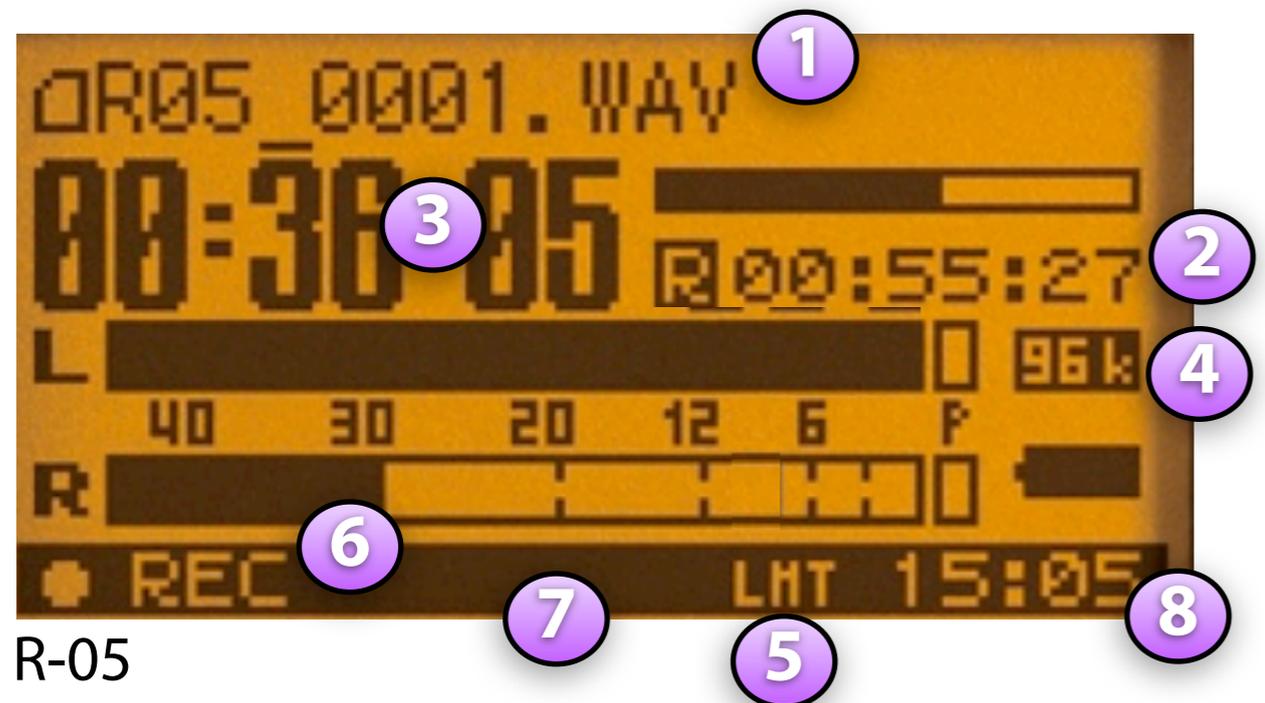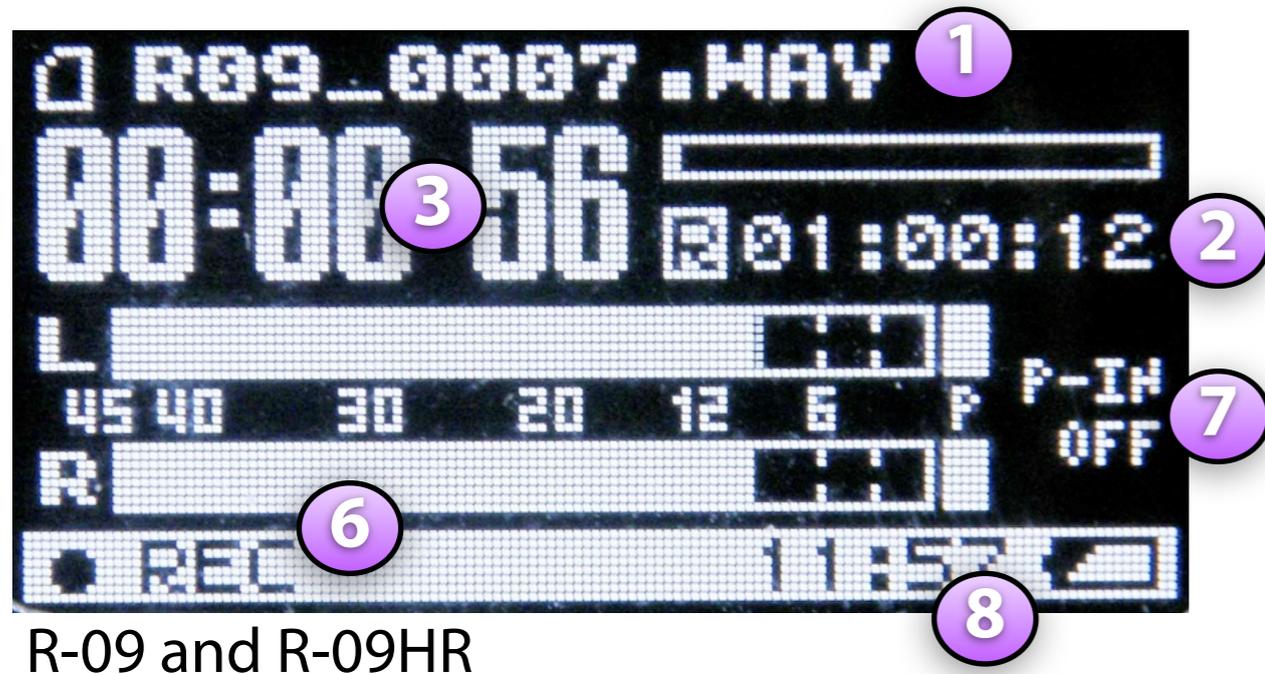
1. Current file name

2. Time remaining for recording on SD card*

3. Elapsed recording time

4. Sampling Rate (not shown on R-09)

5. Limiter status (not shown on R-09):
   on R-09HR displays: `LMT` if on or `LMT` if off;
   on R-05 displays: `LMT` if on, or `LMT` if off.

6. Record-Standby / Record Status

7. Plug-in power status (not shown on R-09):
   on R-09HR displays ON or OFF;
   on R-05 displays `P-IN` if on or `P-IN` if off, but
   only when external microphone is selected.

8. Current time of day

   * Most recorders in the cage have a 2GB SD card installed,
   allowing for 166 minutes of recording time when the
   recorder is set to sampling rate: 48 KHz and recording
   format: WAV-16-bit. Note, however, that some recorders
   have a 1GB SD card, so the recording time will be
   reduced to 96 minutes when using those recorders.

Using the external microphone

1

2

3

4

1

R-09

R-09HR

The older **R-09 and R-09HR kits** come with a CS-15 external cardioid stereo microphone. R-05 kits do not include an external microphone, however, small shotguns and lavaliere microphones are available as separate checkout items, check with the cage monitor on duty for more information.

1. The mic w/ foam windscreen makes it easier to place the mic where it needs to be. Turn on "plug-in power" (This is done via MENU setting with the R-09; via switch on the back of the R-09HR) to power the mic. Plugs into top of recorder.

2. The stand adapter can be used as a small pistol-grip.

3. An adapter ring is threaded into the base of the stand adapter. Leave it in to attach to a boom pole with a 3/8" tip, remove it to attach to a mic stand with a 5/8"-27 tip.

4. If you set EXT MIC TYPE to "MONO" (this is selected with the switch show on the R-09 or via the MENU on the R-09HR) the input of the left channel is routed to both the left and right channels on the recorder.

Microphone placement

Try to record **close to your source** because sound intensity falls off rapidly, for example, doubling the distance from the source cuts the intensity to a fourth of what it was before.

Keep in mind you're actually recording:

1. The **direct sound** from the source,

2. The **reflected sound** from surfaces close to the source (reverberation), and

3. the **background noise**

Rule of thumb:
Place the microphone three to four times closer to the source than to any sources of noise or reflections.

Reflections (Reverberation)

Source

Background Noises
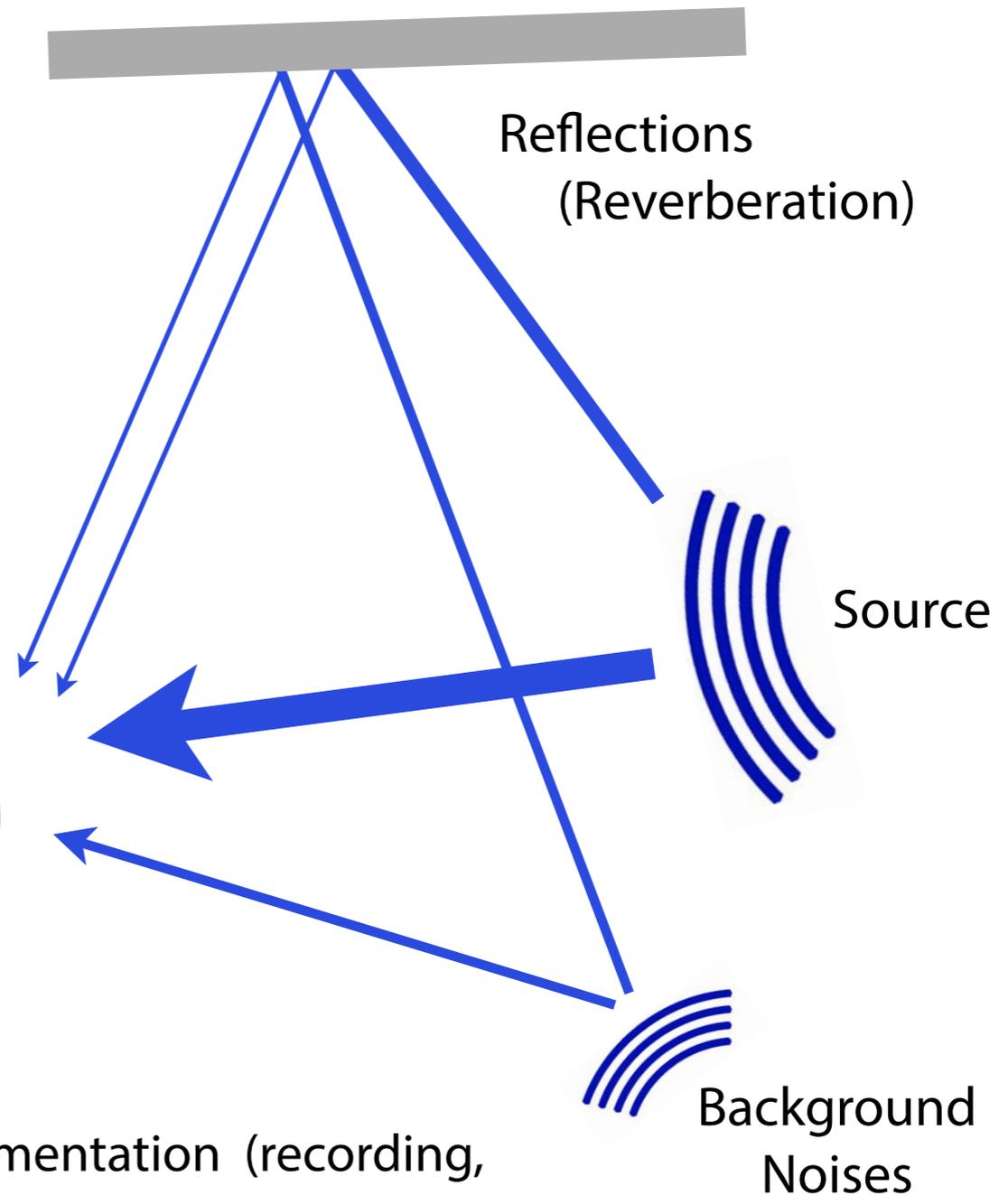
Through experimentation (recording, listening, reflecting on what your recorded, repeating the process under various circumstances) you will begin to understand the nuances of microphone placement.

Microphone placement

The recorder has a built in stereo microphone with two capsules in an X-Y configuration. **Each of the microphone capsules has directional characteristics.** If you want to record in stereo, point the front of the recorder towards your source. In a situation in which you want the best mono recording, you'll need to take into consideration the directional characteristics of the built-in

Source

LEFT directional microphone

RIGHT directional microphone

Polar pick-up patterns

Source

LEFT directional microphone (Channel 1)

For **stereo recording** with the built-in microphones, point the top of the recorder towards the source.

Front face

Microphone capsule orientation

For the best quality **mono recording** into channel 1, point the left microphone towards the source (point the recorder about 60 degree angle towards the source and favoring the front face of the recorder)*

* Note: In Adobe Premiere Pro you can take a stereo audio track and choose to map either the Left or Right channel to both the Left and Right channel, allowing you use only the Left or Right channel as a mono recording.

Audio formats and sampling rates

Analog audio signals are digitized and stored in a digital file structured in a particular format. The **WAV audio file format** encodes data using lossless compression. Lossless means there is no change to the audio as a result of encoding into this format. This is the format we'll use for TIME assignments.

The **MP3 audio file format** uses a lossy compression algorithm. Lossy means there are noticeable differences between the original and the compressed version. MP3 was designed to reduce the amount of data required to represent the audio recording and still sound acceptable, however, it does not sound as good as uncompressed audio. An MP3 file created using a bit rate setting of 128k bits per second will result in a file that is about about 1/10th the size of the same file stored in the WAV audio format. MP3 compression techniques use psychoacoustic models to discard or reduce precision of signal components less audible to human hearing, and

recording the remaining information in an efficient manner. This is relatively similar to the principles used by JPEG, an image compression format.

The recorders can record files in the WAV or MP3 audio file formats using one of several sampling rates including 44.1 kHz (the audio CD standard) and 48 kHz (the Digital Video standard). In addition, the bit depth (number of digital bits used in encoding each sample) can be set to16-bits or 24-bits. With these recorders there is no practical difference between 16 and 24 bit

recordings in most circumstances, so stick with 16-bit recording, which will be compatible with Final Cut Express.

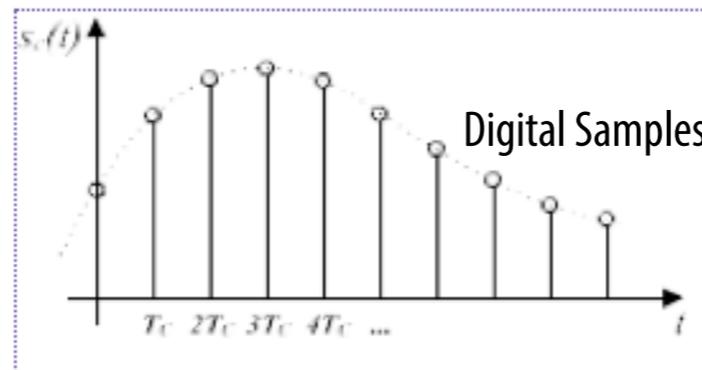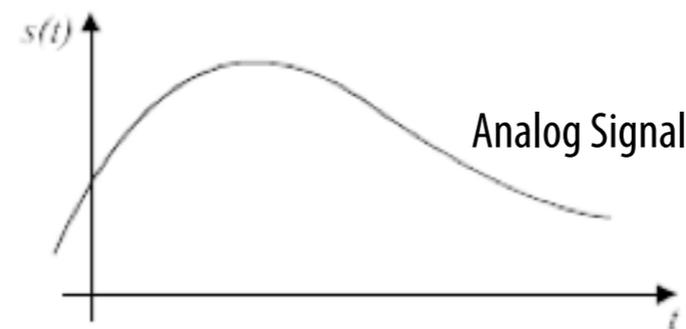The recorders can record to MP3 files at several data rates (64kbps to 320kbps). The higher the rate, the better the quality of the sound. MP3 is idea to use when minimal file size is the priority, for example, recording a lecture or when sharing files that will be downloaded over the web. You can always convert high quality audio to MP3, so **work with WAV files** for recording and editing and convert to MP3 later if needed.

> **The Bottom Line**
> For your TIME assignments, set the audio recorder to:
> - Sampling Rate: **48 kHz**
> - Record Format: **WAV, 16-bit**
> this is the digital video standard we recommend for your field audio recordings.

Image by Kordas, source: http://en.wikipedia.org/wiki/Sampling_rate, released under the terms of the GNU Free Documentation License

Common audio file formats

A *codec (Compressor/Decompressor)* is a method of compressing (encoding) and decompressing (decoding) audio that make it easier to store and play on a computer. There are many popular codecs in use, including:

AIFF

WAV

AIFF (or AIF) and **WAV** (or Wave) are uncompressed file format suitable for field recording and editing.

These file formats are lossless: they don't degrade the quality of the audio signal in the encoding / decoding process, on the other hand, they are very large compared to AAC and MP3 files.

Configure your recorder to record in the WAV format for best results.

AAC

MP3

AAC (Advanced Audio Codec) and **MP3** (MPEG Layer 3) are compressed file format suitable for distribution of audio due to their compact size.

These file formats are lossy: they degrade the quality of the audio signal in the encoding / decoding process.

Avoid using these formats for your master recordings and editing.

Copying audio files to the Mac

R-09

R-09HR

R-05
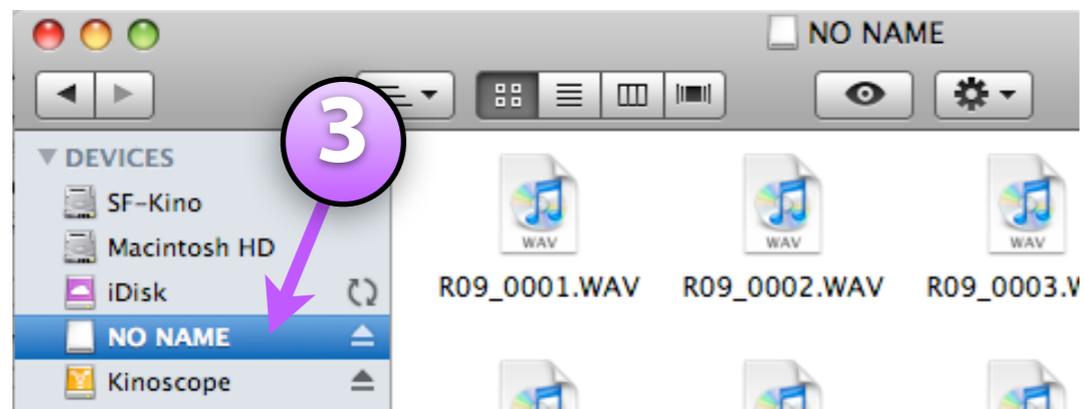
1. With the recorder turned off, open the bottom of the R-09 to reveal the USB socket, on the R-09 the door slides, on the R-09HR it's a rubbery door you pry open, with the R-05 the USB port is on the left hand side.

2. **Connect** the end of the **USB cable** with the small connector to the recorder and the other end to the Mac

3. **Turn on the recorder**, the display will show "USB Storage". A volume will appear on the Mac desktop (as well as the Sidebar) named "NO NAME" or "Untitled", double click on the icon (or single click on it in the sidebar) to open

4. **Select** the desired files and **drag** them to a **folder** located in your project folder on your external hard drive

5. When you're done, **eject** the recorder from the desktop by right-clicking and choosing "Eject" or dragging the disk icon to the trash can

6. **Disconnect the USB cable** (and close the bottom door if using an R-09 or R-09HR)

R-09 Configuration

Hold the FINDER/MENU button for two seconds to enter configuration menu

Category	Menu/Effect	Value (Default value in bold)		Procedure
Recorder Setup	**Sample Rate** Rate Sets the sampling frequency when recording.	**44.1**/48		p. 74
	Rec Mode Sets the song type (recording mode) when recording.	MP3 / **WAV**	64/96/128/ 192/224/320 / **16**/24	p. 75
	Max File Size Sets a limit on the file size of the file generated during recording.	64MB/128MB/256MB/ 512MB/1GB/**2GB**		p. 76
Player Setup	**Play Mode** Sets the order songs are played back.	SINGLE/**SEQUENTIAL**/ SHUFFLE		p. 77
	Repeat Sets whether to use repeat playback.	**OFF**/ON		p. 78
Display Setup	**Brightness** Adjusts the display brightness.	1–**5**–10		p. 79
	Peak Hold Sets peak hold for the Level Meter.	**OFF**/ON		p. 80
	Display Timer Sets the time to wait for some input before darkening the screen.	**OFF**/2/5/10/20		p. 81
	Rec/Peak LED The [REC Indicator] and [PEAK Indicator] can be linked to the Display Timer settings. When the display goes dark, the [REC Indicator] and [PEAK Indicator] also turn off.	**OFF**/ON		p. 82
Power Manage	**Auto Power Off** Sets the time to wait for input before turning off the power.	OFF/3/5/10/15/**30**/ 45/60		p. 83
	Battery Sets the battery type used.	**ALKALINE**/Ni-MH		p. 84
Input Setup	**Rec Monitor Sw** Turn on when monitoring the input sound with headphones during recording. Turn off when not monitoring.	OFF/**ON**		p. 85
	Plug-in Power Set to on when connecting a plug-in powered microphone (compact condenser microphone that requires a power supply when used with a PC or other device) is connected to the MIC jack. 2.5 volts are supplied.	**OFF**/ON*		p. 86
Date & Time	Sets the date and time.	—		p. 87
SD Card	**Information** Shows information about the SD memory card.	—		p. 88
	Format Formats the SD memory card.	—		p. 19
Factory Reset	Initializes the R-09.	—		p. 89

Source: Roland R-09 Owner's Manual, August 1, 2006

*Set ON if using external mic.
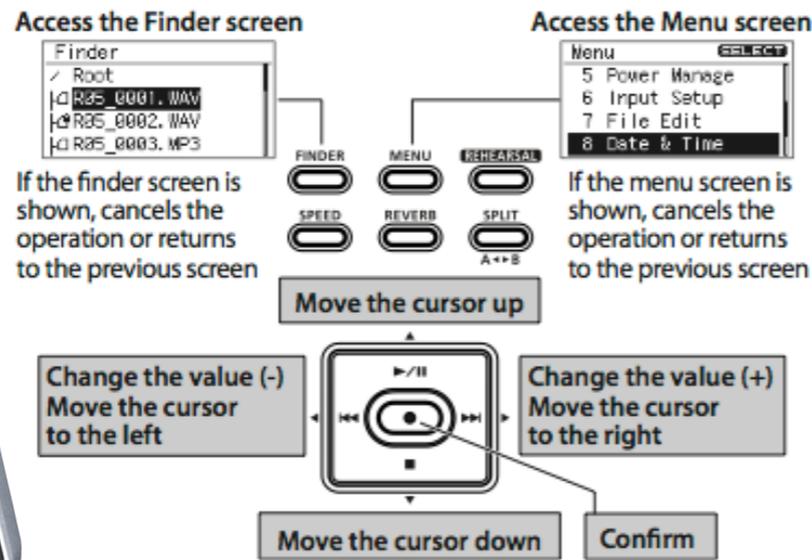
Recommended settings are circled

R-09HR Configuration

Press the MENU button to enter configuration menu

Category	Menu/Effect	Value (Default value in bold)		Procedure
Recorder Setup	**Sample Rate** Rate Sets the sampling frequency when recording.	**44.1**/48.0/88.2/96.0		p. 84
	Rec Mode Sets the song type (recording mode) when recording.	MP3 / **WAV**	64/96/128/ 192/224/320 / **16**/24	p. 85
	File Name Sets how file names are assigned.	Date/**Name**		p. 86
	Max File Size Sets a limit on the file size of the file generated during recording.	64MB/128MB/256MB/ 512MB/1GB/**2GB**		p. 87
Player Setup	**Play Mode** Sets the order songs are played back.	SINGLE/**SEQUENTIAL**/ SHUFFLE		p. 88
	Repeat Sets whether to use repeat playback.	**OFF**/ON		p. 89
	Preview Monitor Sets whether sound is played from the monitor speaker.	OFF/**ON**		p. 90
	Speed Sets the playback speed when the [SPEED Button] is pressed.	50%, 60%, **70%**, 80%, 90%, 110%, 120%, 130%, 140%, 150%		p. 91
	Rev Type Selects the reverb type.	**HALL1**/HALL2/ROOM/ PLATE		p. 92
	Rev Depth Sets the depth for the reverb	1–**10**		p. 93
Display Setup	**Brightness** Adjusts the display brightness.	1–**5**–10		p. 94
	Peak Hold Sets peak hold for the Level Meter.	OFF/**ON**		p. 95
	Display Timer Sets the time to wait for some input before darkening the screen.	OFF/2/**5**/10/20		p. 96
	Rec/Peak LED The [REC Indicator] and [PEAK Indicator] can be linked to the Display Timer settings. When the display goes dark, the [REC Indicator] and [PEAK Indicator] also turn off.	**Normal**/Power Save		p. 97
Power Manage	**Auto Power Off** Sets the time to wait for input before turning off the power.	OFF/3/5/10/15/**30**/ 45/60		p. 98
	Battery Sets the battery type used.	**ALKALINE**/Ni-MH		p. 99
Input Setup	**Rec Monitor Sw** Turn on when monitoring the input sound with headphones during recording. Turn off when not monitoring.	OFF/**ON**		p. 100
	EXT Mic Type Changes the type of the microphone connected to the microphone jack.	MONO/**STEREO**		p. 101
	Limiter/AGC Sets the function of the LIMITER/AGC switch.	**Limiter**/AGC		p. 102
	Low Cut Freq Sets the frequency to apply Low Cut	100 Hz/**200 Hz**/400 Hz		p. 103
Remote Control	**Remote Control** Sets whether to accept remote control operations.	Disable/**Enable**		p. 104
Date & Time	— Sets the date and time.	—		p. 105
SD Card	**Information** Shows information about the SD memory card.	—		p. 106
	Format Formats the SD memory card.	—		p. 27
Factory Reset	Initializes the R-09HR.	—		p. 107

Source: Roland R-09HR Owner's Manual, October 1, 2007

R-05 Configuration

Access the Finder screen

```
Finder
  √ Root
  ├ R05_0001.WAV
  ├ R05_0002.WAV
  └ R05_0003.MP3
```

If the finder screen is shown, cancels the operation or returns to the previous screen

Access the Menu screen

```
Menu                    SELECT
  5  Power Manage
  6  Input Setup
  7  File Edit
  8  Date & Time
```

If the menu screen is shown, cancels the operation or returns to the previous screen

FINDER · **MENU** · **REHEARSAL**
SPEED · **REVERB** · **SPLIT** (A↔B)

Move the cursor up

| Change the value (-) Move the cursor to the left | Change the value (+) Move the cursor to the right |

Move the cursor down | Confirm

Recommended settings are circled

Category	Menu item / Effect	Value (default value: bold)
Power Manage	**Auto Power Off** Specifies the time after which the power will turn off if no operation has been performed. (Units: seconds)	OFF, 3, 5, 10, 15, **30**, 45, 60
	Battery Specifies the type of battery that is installed.	**alkaline**, NI-MH
Input Setup	**Rehearsal Time** Specifies the length of time that will be used to automatically set the recording level (p. 45).	Manual, 30sec, **1min**, 3min, 5min
	Rec Monitor Sw Specifies whether the audio input will be monitored via headphones during recording.	OFF, ON
	EXT Mic Type Specifies the type of mic that is connected to the mic jack (p. 53).	Mono, **Stereo**
	Plug-In Power Turn this ON if you've connected a plug-in powered mic (a small condenser mic that requires power to be supplied, such as used with a computer). A voltage of 2.5 V will be supplied (p. 53).	OFF, **ON**
	Limiter, AGC Specifies the function of the [LIMITER] switch (p. 49).	**Limiter**, AGC
	Low Cut Freq. Selects the frequency of the [LOW CUT] switch (p. 50).	100 Hz, **200 Hz**, 400 Hz

| Category	Menu item / Effect	Value (default value: bold)
Recorder Setup	**Sampling Rate** Specifies the sampling rate for recording (p. 42). * You can't select 88.2 or 96.0 if Rec Mode is set to MP3 or WAV+MP3.	**44.1**, 48.0, 88.2, 96.0
	Rec Mode Specifies the type of file for recording (p. 41). * You can't select MP3 or WAV+MP3 if Sampling Rate is set to 88.2 or 96.0.	**WAV-16 bit**, WAV-24 bit, MP3-64 kbps, MP3-96 kbps, MP3-128 kbps, MP3-160 kbps, MP3-192 kbps, MP3-224 kbps, MP3-320 kbps, WAV+MP3 (WAV-16 bit+MP3-128 kbps)
	Pre-Rec Specifies whether Pre-Rec will be enabled (p. 50).	**OFF**, ON
	File Name Specifies how the file name is to be assigned.	Date, **Name**
	Auto Rec Start Specifies the Auto Rec Start setting (p. 51).	**OFF**, 2sec, 5sec, 10sec, Level1, Level2, Level3
	Split Type	64MB, 128MB, 256MB, 512MB,

| Category	Menu item / Effect	Value (default value: bold)
Player Setup	**Play Mode** Specifies the order in which files will play (p. 64).	SINGLE, **SEQUENTIAL**, SHUFFLE
	Repeat Specifies whether Repeat will be enabled (p. 64).	**OFF**, ON
	Speed Specifies the playback speed when [SPEED] is pressed (p. 67).	50, 60, **70**, 80, 90, 110, 120, 130, 140, 150
	Rev Type Specifies the type of reverb (p. 68).	**HALL1**, HALL2, ROOM, PLATE
	Rev Depth Specifies the depth of reverb (p. 68).	1–**10**
Display Setup	**Contrast** Adjusts the contrast of the characters in the display.	1–**5**–10
	Backlight Adjusts the brightness of the display backlight.	OFF, 1, **2**, 3
	Display Timer Specifies the time after which the display backlight will be darkened if no operation has been performed. (Units: seconds)	OFF, 2, **5**, 10, 20
	Rec/Peak LED Specifies whether the REC indicator and PEAK indicator will also go dark in conjunction with the Display Timer.	**Normal**, Power Save
Language	Selects the language shown in the display.	English, Japanese
File Edit	Switches whether the original unedited file will be retained when executing a file editing operation (Divide, Combine, or Trim).	OFF, **ON**
Date & Time	Specifies the date and time (p. 30).	—
SD Card	**Information** Displays information about the SD card.	—
	Format Formats the SD card (p. 34).	—
Factory Reset	Resets the R-05 to the factory-set condition.	—

Source: Roland R-05 Owner's Manual, 2010

Additional sound resources

Books
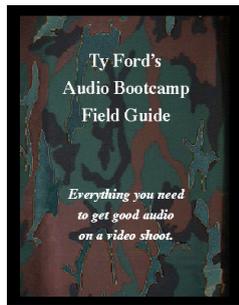
Audio Bootcamp Field Guide
by Ty Ford
Concise introduction to professional sound recording.
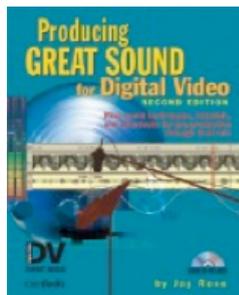
Producing Great Sound for Digital Video
by Jay Rose (second edition)
A comprehensive introduction to sound recording for digital video.

R-09, R-09HR, R-05 Owner's Manuals
Available for download from the SF web site,
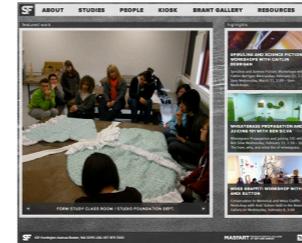**sf.massart.edu**

Sound Art: Beyond Music, Between Categories
by Alan Licht and Jim O'Rourke
Traces the history of sound art
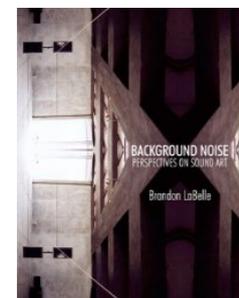
Background Noise: Perspectives on Sound Art
by Brandon LaBelle
Argues that sound art should be at the center of contemporary art and culture

Websites

sf.massart.edu
You can download TIME handouts and more from the Studio Foundation web site (from the home page on Resources, then choose TIME)
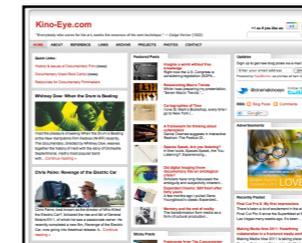

filmsound.org
An excellent resource for learning about film sound, applicable to video, run by Sven Carlsson, a media teacher

dvinfo.net
A "real-names, real-information" video production discussion site founded by Chris Hurd

kino-eye.com
David Tamés' blog, topics includes documentary, new media, technology, and more, check out the "Documentary Video Boot Camp" section

freesound.org
A wonderful source for open-source sound effects, and a place to share interesting sounds you've recorded.