

GRN Recording Options in the 21st Century

Noel Bachelor - January 2007

Audio recording technology has changed a lot in recent years, and there are now many possibilities for machines and systems which could possibly be used by our recordists. The explosion of digital electronics and personal sound means there are all sorts of devices capable of fairly good quality recording. Meanwhile, the DAT recorders used by many of our recordists are nearing the end of their lives. DAT recorders are no longer made, and parts supplies are also drying up.

What sort of systems could, or should be used by recordists? To answer that, first we need to look at the specific needs of a GRN recordist, and what are the advantages and disadvantages of the various systems with regard to those needs. Not every recordist has exactly the same set of skills, or operates under the same conditions, so there is likely to be some variation in equipment to cater for these differences. However the requirements are very similar for most recordists.

Needs:

Portability. This is fairly obvious, as our recordists travel a lot to remote locations. It is no longer a particularly difficult goal, as extraordinary quality recordings can now be produced with compact equipment.

Battery Power. Many recordists operate in areas where reliable mains power is unheard of. They need equipment that can operate reliably for several days away from mains power. Even those recordists who work in areas where mains power is commonly available need to be able to do quick set up recording work without needing to be tethered to a power outlet, and the ability to use battery power also gives more flexibility in choosing the specific location.

Reliability. It's not much good having a very small compact machine if it fails on you, or you lose the recording that you travelled across the country to record.

Capacity. Because a recording trip may take them across the country (or to a neighbouring country), recordists often plan trips of a few weeks, so the recording system needs to have the capacity to handle at least 20 hours of sound. The actual capacity required will vary depending on local factors.

Sensitivity. Many of the cheaper recording systems do not give adequate gain to permit full level recording from dynamic microphones such as we use in the field, or if they do, you get a lot more noise along with it. The designers of this gear often does not provide a lot of gain so that the noise from the preamps is not heard too much, but that can mean recordings are lower in level. A higher output condenser microphone may help overcome that, but condenser mics can fail to work in high humidity.

User Interface. This is an often overlooked aspect that can greatly affect the quality of the recordings achieved, and determine how quickly the recordist learns to do an excellent job of recording, or even whether he ever learns that. There are several facets to this, but the major items are:

- Metering:** A clear and reliable signal level meter with adequate resolution is a must if the recording quality is going to be consistently maintained.
- Record Level Control:** The machine must permit easy, fine control and trimming of the signal level.
- Clear display:** Recordists need to be able to see the information they need without having to squint in low light conditions.
- Easy Operation:** Recordists need the machine to take care of a lot of housekeeping such as file names and identifying the files for different jobs, so they can concentrate on other things during the recording session.

Quality. Good sound quality is much more common, and cheaper than ever before. Every recording system now boasts '24 bit quality', simply because no one makes lower resolution converter chips any more, as they would not be any cheaper to make. However, there is much more to a good quality recording interface than the digital specification. Typically, systems designed for maximum portability and minimal battery usage cannot afford the power it requires to track the sound signal accurately, so their real performance may be considerably less than the 'digital' specification may imply.

Although digital technology makes much smaller machines possible, the smallest machines still require a trade-off of quality and usability.

Types of Recording Systems.

Current audio recording systems can be broadly placed in 3 groups: Laptop Computer based systems; Flash memory based solid state recorders; and Hard Disk based recorders. Note that none of these are linear, tape based systems. Spinning disk drives are the only moving parts in any of them. Perhaps worthy of a brief mention (as an extra group) is Sony's MiniDisc: Despite the release of Hi-MD with greater capacity and the ability to record uncompressed data, this medium is really all but finished. The proprietary discs with (greater but still) limited capacity, and Sony's attempts at limiting piracy has really killed it.

Laptop Computer systems.

Every computer now comes with a built in sound card, and there are several audio software packages that may be used for recording on a laptop computer. However, the quality of the microphone inputs built into computers, and especially laptops means that an external sound interface is essential if you want any resemblance of quality. There are several USB sound interfaces with microphone inputs, and also some multichannel FireWire interfaces. The better ones have a headphone output for monitoring, and may have basic meters, though typically the recording software on the computer would provide metering. Of course the laptop computer must be considered as part of the package, and not every computer may be suitable.

Advantages: Instant editability. High resolution metering on the computer.

Problems: Glitches or dropouts. If the computer has too many other programs or services running on it, the audio throughput may be interrupted. The computer must be optimised for audio purposes to deal with the problem. Firewire connections better handle streaming data, so Firewire is typically used for multichannel recording systems to handle the greater data throughput. Greater setup time is required before a recording session. User interface usually requires keyboard shortcuts, or steering a mouse to 'buttons' - it is not as simple and immediate as a hardware 'Record' button. Reliable mains power is necessary, as it cannot operate for long on battery alone.

USB interfaces suitable for laptops:

Tascam US-122L.

Tascam have a range of these USB interfaces and controllers, which are designed for home recording (garage band) type use. This is the current basic two channel model. Reviews from users are not particularly encouraging. "for an amateur-good, not for serious engineers." US\$200 www.tascam.com



SoundDevices USBpre

Good quiet preamps with plenty of gain. Front panel meter resolution is suitable only to see you have a signal. Several of our recordists have successfully used them to make good recordings, though odd glitches sometime occur on playback if the computer is not fast enough. US\$550 www.sounddevices.com

Edirol UA-25

Edirol (Roland) have also had a few USB interfaces designed for garage band recording. Digital interfaces are not bit for bit accurate, as the signal is resampled. Earlier versions also incorporated SCMS to limit copying. The UA25 is an 'improved' version. Preamp gain is not suitable for quiet dynamic mics. Barnabus found its gain and record quality not adequate. US\$300 www.edirol.net



There are several other interfaces offering more channels, or without preamps.

PDA Systems

A subset or scaled down version of computer based systems are those based on a PDA 'palm top' computer. These involve a memory card sized soundcard used in a portable organiser computer. This combination gives many of the advantages of the computer based system, in a much more compact configuration. Large capacity memory cards are needed in the PDA for audio file storage

Maycom N-Trance

Newly available. Has a built in preamp, so microphone connects to the card inserted in the PDA. Preamp performance figures are not particularly high quality (s/n 76dB), but may be ok as a backup. Preamp gain may also be limited. An open source project has been started to produce a Linux driver. ~US\$600-\$700 (+ PDA & Memory cards) www.maycom.nl



PDAudio

This is based on an S/P-DIF digital interface CF card which inserts into a PDA. A complete recording system consists of a Windows Mobile PDA, a Core Sound PDAudio-CF S/PDIF digital audio interface card, the Mic2496 microphone pre-amp/A-to-D converter (attaches to the back of the PDA), and recording software. Prices for a recorder with two microphone inputs range from \$US900 to US\$1200. <http://www.core-sound.com>

Flash Memory Recorders

These machines are truly solid state recorders as there are no moving parts at all. The sound data is stored on memory cards using 'flash' memory, such as is used in digital cameras, USB drives etc. These machines cover quite a range of purposes, quality and prices. The range starts with small pocket MP3 players with built in memory, some of which have a microphone, and can be used to record notes. Dictaphones are usually a little larger with better stop-start record and playback control. These machines record 'compressed' audio data formats to get maximum capacity for lowest cost, with recording quality being the victim. Then there are the machines designed for casual quality recording of concerts etc. These often use removable memory cards, and can record a variety of data rates depending on the need, and can usually record wav files (as well as MP3). Some of the machines at this level are designed for use by reporters, so they are easy to use, and can capture a reasonable recording. Generally these machines are not expected to be used for lengthy recording sessions. Battery capacity and the recording media capacity usually limit the time these machine will record for. While you can swap cards for the machines with removable memory, and the memory cards are steadily dropping in price, sufficient cards for a lengthy recording trip must be budgeted for, and then managed.

MP3 players and dictaphones

There's quite a variety of commodity MP3 devices which have built in mics. The small cheaper ones will not record uncompressed wav files, and have limited built in memory. Some larger ones can take memory cards, and may record wav files. Prices start from \$30 or so to a few hundred dollars



HHB DRM85 FlashMic

A handheld microphone with built in recorder. Has 1Gig built in memory and connects via USB. AGC or manual level control, but not sure how. Clearly aimed at reporters recording a short interview. US\$1400 www.HHB.co.uk

iRiverH320 or H340

These are larger MP3 players with a small hard disk (either 20/40g). They also have microphone and line inputs, and can record wav files. Seems they might be a reasonably good casual recorder, which is obviously the target market. US\$500-600 www.iriver.com



Edirol R-09

Edirol's 3rd generation attempt at a compact hand held recorder has achieved reasonable quality for the money, and is getting fairly good reviews in the casual market. Some professional recordists are using this or the MicroTrack as an auxiliary recorder. Not seen as particularly rugged, though fairly reliable. Built in mics as well as miniplug mic and line inputs. Preamps as said to be a bit noisy. Records to SD cards and runs on AA batteries, which it consumes quite rapidly. US\$400 www.edirol.net

M-Audio Microtrack 2496

Records to CF memory card. Firmware is a bit flakey, and the machine has been known to lock up, and be unusable until the battery runs down. Recording quality is fairly good for a compact machine. Battery is built in, and charged via USB. Battery runs down if machine is not used for a week or so. Can be a useful auxiliary recorder, but should not be trusted as a primary recorder. Has 1/4" and miniplug mic ins, and RCA line outs. "Sounds good when you can actually get it to work" US\$350-\$400 www.m-audio.com



(Roland) Zoom H4

Looks like a 'Tazer' with the built in XY mics and wire guards. XLR mic inputs look like booster rockets. Records to SDcard, and runs for about 3 hours on a pair of AA Batts. Extremely small and hard to read LCD display on a small recorder. Record quality appears reasonable, though like most of these hand-held recorders, it may be fairly fragile. US\$300 www.zoom.co.jp

Sony PCM-D1

Everyone wonders who Sony thought the target market for this one might be. Overpriced as an amateur recorder, but not really meeting the needs of professionals. Seems aimed at being a yuppie toy. They do seem to be selling some though. Has built in XY stereo microphones, but no external mic inputs. US\$1800 bssc.sel.sony.com



Marantz PMD670 / PMD671

Built on the chassis of their earlier MiniDisc recorder, these machines record to CF cards, and connect with USB. Preamps are still noisy like previous models. A reasonably competent recorder, but not great. US\$700.

The PMD671 records at higher resolution, maybe better quality. Higher data rate would be wasted if they use the same preamps. US\$1100 www.d-mpro.com

Tascam's HD-P2 is a broadly similar machine, built on the chassis of their DA-P1 DAT recorder. Much quieter preamps than the Marantz devices. Includes SMPTE timecode and records on CF cards. A (possibly future) hard disk version would be worth investigating. US\$1000



Marantz PMD660

A new, smaller recorder from Marantz. Records on CF cards. Connects via USB. Reports indicate the preamps have still not improved adequately, and doesn't provide enough gain for a dynamic mic, unless you yell into it. Operates from 4 AA batteries, instead of a proprietary NiMh pack like other Marantz recorders. US\$500 www.d-mpro.com

Nagra ARES-P11+

High quality solid-state audio recorder principally designed for radio journalists. Records to PCMCIA or CF cards in an adaptor. Runs for 3 hours on 5 AA batteries. Built in mic, or external mics via a 5 pin DIN connector. Optional software gives on board editing capabilities. US\$2500 www.nagraaudio.com



Nagra ARES-M

A newer compact audio recorder for radio journalists. Records to 1G built in memory. MP2, MP3 or WAV files. Runs for 10 hours on 2 AA batteries. Built in mic, or external mics. Connects via USB. On board audio editing capabilities. US\$1200 www.nagraaudio.com

Hard Disk Recorders

These machines are generally a little larger than flash memory recorders, or at least the smallest ones are of necessity larger than the smallest flash recorders, due the fact that they have to fit a hard disk inside. Most of these machines record to a 2.5" hard disk drive designed for laptop computers. The hard disk gives a much greater recording capacity than flash recorders, with a lower cost per megabyte, and it is usually built into the machine, so the recording media is effectively included in the price, with sufficient capacity for any recording trip.

The hard disk does have moving parts, but unlike DAT machines, no alignment is ever required, and the only 'servicing' work really is the expected replacement of the hard disk every few years. Any competent computer technician can assist with that.

Most of these machines are designed for more professional use, with high quality inputs and better metering and recording ergonomics. Fitting these bits in also make the machines larger than many of the consumer type flash recorders. Most connect to a computer via firewire. Some larger consumer machines also use a hard disk, as they are essentially a high capacity MP3 player with recording ability. (See iRiver H320 above.)

SoundDevices 722 - Fairly compact machine, records 2 channels to built in HD, removable CF or external firewire drive. 40G HD gives 120 hour capacity. Excellent preamps and record quality. Good metering and control, good file management, which has got better with recent firmware. Long menu presents lots of customisable options, though can be confusing for novices. Solid aluminium and stainless chassis. Connects via firewire. Powered by video camera type Lilon battery, or external supply. US\$2350 www.sounddevices.com



SoundDevices 744T - Four channel (2 preamps) version of 722, with timecode, designed for sound for film. US\$4350. Other versions are 702 & 702t, which are similar to 722, but no hard disk.

Fostex FR2

Fostex have never built particularly compact machines, and this is an example. Not really sure which category to put this in as it records to removable PCMCIA hard disks, or CF cards. Connects via USB. Has a built in speaker. Runs for 2 hours on 4 AA batteries. It's about 4 times the size of a 722 (one user described it as the size of a phone book). US\$1300 www.fostex.com



Sonosax Minir82

A very compact machine, recording to a micro HD & CF, 2 mic ins, 8 channel digital. Small size needs adaptor squid for connectors. Manual is 'preliminary' and riddled in Frenghish ~US\$6000 www.Sonosax.ch

HHB Portadrive

A 6 channel timecode enabled location sound recorder. Records to 40G HD. Lots of connectability and compatability with multiple digital interfaces. About the size of a Nagra 4, and weighs 5kg. US\$14500 www.hhb.co.uk



Fostex PD-6

Location recorder. 6 Channels on DVD. US\$8500 www.fostex.com

Aaton Cantar - Military look, but very good record ergonomics. Records 6 channels to internal HD, and/or external Firewire drives 10-15 hours on NiMh Batteries Cast Alloy case. US\$15000 www.aaton.com



Zaxcom Deva - An established timecode enabled, hard disk multitrack recorder for the film industry. Has been through more than 4 versions since first built in 1996. Current versions Record 8 channels (4 preamps), with optional DVD drive. Connects via firewire, but uses it's own audio file format. Many users are moving to SD744T. ~US\$10000 www.zaxcom.com

NagraV - Almost the size and weight of a traditional Nagra, records two channels to a removable laptop hard disk. Good record ergonomics, but is much larger, and quality is much lower than SD recorders. Transfer of files by pulling the disk drive, and connecting it to computer. US\$7300 www.nagraaudio.com



Suitable machines for GRN:

There is no perfect machine for all GRN recording needs, though the SD722 comes very close. Stand alone recorders have a distinct advantage in the heat of battle. You simply plug in mic and headphones, power it up, and hit the record button and you're rolling. The sound devices 722 recorder clearly offers the best features and performance for price.

Getting a recording session started with a computer is much more involved, and more can potentially go wrong. However, the ability to edit immediately does have advantages, especially if you are not sure what you have recorded will work, or you need assistance from speakers of the language to do major editing. The software used for recording provides the user interface, but clicking the mouse on a screen button is not as simple and reliable as a large hardware button on the face of a recorder. Few laptops have screens bright enough to use outdoors in full sun, and recording location sound effects or impromptu music etc is not so practical.

PDA recorders are an interesting idea, and the PDA could also be used for notetaking, email and other uses. However, they do have shortcomings as a recorder. The PDAudio device is often criticised for all the cabling required between the various boxes, and the fragility of the various connectors. The Maycom N-Trans reduces this by putting the preamp in the card, at the expense of preamp quality.

Auxiliary/Backup Recorder

In the tape days, recordists commonly carried a portable cassette recorder as an auxiliary machine. It was used to make field copies of recordings for evaluation, but could also serve as a backup recorder if required, or when requested by others, to record materials that we did not want to handle further.

Some of the flash memory recorders can usefully serve a similar role. If a recordist generally works with a laptop computer, a flash recorder can give the ability to do more spontaneous, casual recording, and can be used in places where you'd rather not unpack your computer. It can also do this role even when a 722 is used as a primary recorder, though it would then more typically be seen as a backup recorder.

Supportability

One issue that must always be considered when purchasing recording equipment is the ability of our technicians to be able to support it, and assist with any problems the recordist may have. Although the range of possible equipment we could use is much wider than ever before, we cannot expect our technicians to be able to provide remote help via email for someone who has problems with a device that they have never even seen. So, just like with many other equipment choices, it's always safest to consult our techs before purchasing something, and don't be surprised if they recommend a machine that they have at least some experience with.

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