Configuration of Radio Stations and Media Centres

A practical guide to procurement
of technical equipment for
Community Media initiatives

United Nations Educational,
Scientific and Cultural Organization

In cooperation with

DaniCom & Niels Worsoe

Table of Content

1 INTRODUCTION

UNESCO and other organisations, which support media development activities in developing countries, receive a steady flow of requests for support to community radio and community TV initiatives. Most of these applications do actually deserve support, but administratively it is very cumbersome to perform reasonable assessments of the proposals and particularly the technical parts of the applications. Radio and TV equipment develops and changes even faster than other electronic devises, so UNESCO field staff cannot be expected to follow the technological developments in detail.

As a consequence of the rapid development it is often necessary to call on external experts in order to appraise even very modest project proposals, and the external fees can easily be out of all proportion to the cost of the original proposal. Thus, this handbook represents an attempt to give some very specific advice on which equipment to choose in different scenarios. This is not without pitfalls because we might see the technical innovation even before this publication is out of the print, and types, models and prices change – and they might vary significantly from one continent to another. Or even from one country to another.

Nonetheless, we do make the specific recommendations even to the detailed level of which particular model of microphone or speaker to choose, because this is essential information for non-experts. But our recommendations should not be taken too rigidly: a computer of type X can be just as suitable as type Y if the technical specifications are similar. Thus, our recommendations should be seen as tangible shopping lists for non-experts – but it is definitely possible to substitute the individual parts with others if you prefer to do so.

The principle of this handbook is that it should be made easy for the community media initiatives to get started although the initial budget might be very limited. We operate with modules, where the basic equipment is basically identical whether it is for a small community radio or for a regional station. Thus, upgrading is a matter of adding equipment – not substituting. In other words, it will never be a waste of resources to start with a modest technical solution, because it can always be expanded or upgraded.

A few words about the authors of this publication: Niels Worsoe (nielsworsoe@vip.cybercity.dk) has a background as a production technician and hardware developer in the Danish Broadcasting Corporation (DR), Baltic Media Centre and other broadcasting institutions. He has designed turn-key radio stations for UNESCO, UNHCR and other international clients as well as local radios in Denmark.

Per Oesterlund (per@oesterlund.com) worked as a radio and TV reporter and trainer for Danish Broadcasting Corporation for almost two decades but is now partner and senior consultant in the Media Consultancy company Danicom (www.danicom.net). Danicom was originally a division of DR but has been an independent company since 1998.

2 TECHNOLOGICAL DEVELOPMENTS

2.1 General Trends

Only a decade ago, professional or semi-professional audio and video equipment was highly specialised – and very expensive! The professional portable tape recorders used by most national broadcasters would cost more than 5.000 US$ and the studio equipment was even more expensive. Community stations would have to work with the cheaper cassette recorders, but even a decent quality cassette recorder would cost more than 1.000 US$. Furthermore, the advanced broadcast machines required highly specialised maintenance, and hundreds or maybe even thousand of expensive Studer or Revox recorders stand idle in radio studios in the developing countries because it has not been possible to get the essential spare parts.

The explosive development of digital consumer products, however, has changed this situation completely. Compact Discs – or CD's as they are now known to everybody – give a significantly better sound quality than even the best of the old tape recorders, and the CD's can be played over and over again without loosing quality like the cassette tapes, which simply loose the layer that contains the recordings. CD-players are also available at prices far below the cost of good cassette players – and at a fraction of the price of a professional tape player/recorder.

This is just one example of the general trend that the quality of the consumer product is so good that these machines replace the specially designed profession equipment. In the TV industry, the small DV cameras, which can be obtained for 1.000-2.000 US$ are replacing professional cameras, which cost up to 50.000 US$. And today standard computers equipped with appropriate software can perform all the editing tasks, which could earlier only be executed in highly specialised Radio or TV editing suites. An external soundcard, which costs less that 200 US$, can turn any standard computer into a recording and editing facility far more advanced than a normal radio studio built in 1990.

This general technological development has a number of positive effects. First of all the equipment has become drastically cheaper, because we are now talking about standard mass products, which can be bought in practically any country in the World. Secondly, daily running costs are reduced considerably because it is no longer necessary replace recording tapes with short intervals.

Finally, maintenance costs are reduced dramatically because the new digital equipment has fewer mechanical moving parts, which would otherwise wear and tear. Once a song or a radio programme is stored in a computer hard disc no mechanical parts except the hard disc itself must move in order to play the programme. Computer hard discs do break down and they do so relatively often – but a 120 Gigabyte replacement disc will cost less than 100 US$, and it only takes a few hours to learn how to replace a hard disc. There is no need for several years of training as a broadcast engineer.

2.2 The Modern Radio Studio

The brain in any modern radio studio is a computer. The sound parts can come from a number of different sources such as CD's, music cassettes, tape or Mini-Disc recordings, other computers or downloaded Internet files – or you can record your interview or song directly into the computer. Any modern standard computer can perform very complicated editing tasks as long as it is equipped with appropriate editing software and an interface (a sound card), which allows you to connect a

tape recorder, a microphone, a CD player or any other sound device. Today such an interface is basically a built-in feature in most of today's PC motherboards or the more professional one's are installed as a PCI card in the computer or could in some cases be a small box with a number of sockets for earphones, microphones etc. Prices vary but good quality in/external sound cards can be found at prices from 100-150 US$.

Fig. 1: Mobil Pre interface (sound card) from M-Audio seen from the front and the back

Basically the sound card turns the sounds into a computer file, and there are several different formats for sound files depending on the quality needed. In the normal music CD format, one disc can contain 10-12 songs – but if they are compressed to the MP3 format, a disc of the same size can contain up to 100 songs. Naturally, the smaller files do not have as many details, but even a trained music producer will find it difficult to hear any difference between the two formats. And smaller files are easier for the computer to handle, and it is easier to exchange programme material via the Internet. If programmes are compressed well, it only takes a few minutes to send even half-hour programmes to anywhere in the World.

If one wants more than just a couple of sound sources to be connected to the computer at the same time, it is necessary to have a mixer. In principle it is possible to use the digital facilities in the editing software in the computer to turn sound up and down or to change the balance between treble and bass etc.

It is, however, still more practical to have a physical mixer, and they come in numerous types, shapes and sizes. Some are better for music production than for radio, but most mixers would work fine. When choosing a mixer one should just make sure that there is a sensible relation between the price, the quality and the needs of the station.

Clearly a station with 24-hour broadcast and many different operators would need a more robust type than a small community station with less complicated productions.

Fig.2: Yamaha MG 12/4 mixer seen from back and front

Still many cables with expensive plugs are used in a radio studio, but that is about to change. At the moment different companies are experimenting with using the Ethernet protocols in both the studio and transmission environment in order to avoid all the many different cables. Using Ethernet you just have one net cable with cheap plastic plugs between the different pieces of equipment (See www.telos.com).

It has been possible for some time now to use digital mixers and digital cables. Starting with the AEV Digital Mixing Console and Soundcraft RM1D, both priced around 10.000 USD

Fig.3: AEV Digital Mixing Console

But it is still only high budget commercial and national stations and networks that have the funds to go fully digital. (See www.aeq.com, www.aev.net and www.studer.ch as examples).

Fig.4: Studer Digital Mixing Console

Right now by selecting analogue mixers assisted by PC´s with digitising soundboards for editing, sound file storage and playback, you have the better of two worlds for low budget Radio Stations.

The advantage of having a physical mixer is also that it will always be possible to broadcast even if the central computer breaks down – which it will do occasionally!

Once the sound files are inside the computer, one will need editing software to process the recordings. There are several different brands, and some are designed primarily for stand-alone computers, while other programmes are more suitable for networking several workstations in a bigger radio station. But all programmes have the common feature that it is possible to work with sound and sound bytes exactly the way that one can work with text in a word processing software. It is possible to select words or even parts of a word and move it around, make the sound louder or softer, and one can play recordings faster or slower. And naturally one can combine several different recordings. When the Beatles recorded their first songs it was done on a four-track recorder – today any standard computer can be turned into an 80-track recorder if that is what you need.

All editing programmes have a graphic user interface, which enables the producer to physically see how loud a sound is, and it is possible to see where a word starts or ends, so sound editing on a computer is quite easy to learn. The difficult part of computer editing is the basic knowledge about computers. If you have never operated a computer mouse or saved, copied or moved a file, it can be quite a job to start working on a computer – but the actual editing process is astonishingly simple. Even illiterate persons can learn the editing skills very fast.

Fig.5: Computer based editing at Luang Prabang Provincial Station. Lao PDR.

As mentioned above, one can use practically any sources to gather the sound. Although the sound processing is digital, the recording do not have to be digital. One can easily use sound from a cassette recorder – but the quality is not as good as in the new digital recorders.

The digital Mini Disc (MD) player/recorders were actually designed for the mass consumer market, but they never caught on like the CD. But they did change the possibilities of the broadcasting industry because the MD's proved excellent for radio production. The recorders are small and handy and the sound quality is superb. Furthermore, the actual discs can be used for recordings hundreds of times without loosing quality, and an experienced user can even edit interviews and other recordings directly on the MD.

The only real disadvantage is that recordings from a consumer MD cannot be transferred directly to a computer although the sound is basically a computer file. The manufacturers are trying to limit illegal copying of music and this construction of the MD is one of the ways of complicating the copy process. Unfortunately it also complicates copying of people's own recordings, so the reporters will have to play the recordings into the editing computer in real time. That means that it takes an hour to put a 60-minute interview into the editing programme. Professional Portable MD recorders like the HHB MDP 500 PortaDisc do not have this blocking. The same goes for professional studio MD recorders like the Sony MDS-E12. So if you intend to use MD as your favourite means of portable recording medium, you should invest in a couple of in-house recorders/ playback machines for fast transfer of sound from MD to PC.

Fig.6: Minidisk player/recorder from Sony, MZ-NF810CK

The new generation of consumer MP3-recorder/players do not have this transfer problem. The sound is simply recorded on an internal hard disc or a flash card inside the recorder, and the recoded sound files can be transferred directly into the editing software in the computer via a USB cable, a Fire-wire or a flash card reader.

Fig. 7: MP3 Reporter Set from Maycom

While the MD's have significantly less moving mechanical parts than the old tape recorders, the MP3 recorders have take a step further down that road. The MP3's are fully digital and there are no

moving parts that can break. This does not mean that they cannot break – because probably they will at some stage like all other electronic equipment. But they will not break as a direct result of working in dusty or humid conditions like the old analogue equipment has a tendency to do.

The problematic side of modern digital equipment is that it is practically impossible to repair, if or when it breaks down. It is very much a matter of using it for as long as it last and then replace it with new units when the old break. It might not be very ecologically friendly to enter such a buy and throw away culture, but it reduces maintenance cost dramatically. Instead of having full-time employed service technicians with specialised tools to clean and adjust recorder heads and other spare parts the radio stations can now afford to buy replacement units.

Any radio station would, however, need to have access to a computer specialist. As anybody, who works with computers will know, they do create problems regularly, and it is essential to have a person, who can troubleshoot the computer system. It is also important to avoid problems with computer viruses and incompatibility of programmes. Thus, there are two golden rules about computers, which are used for broadcasting purposes:

- Only install the programmes, which are absolutely essential for the production. For every programme you install the risk of performance problems increase.

- Editing computers should not be connected to the Internet in order to avoid viruses and no other files than sound files should be allowed in the computer.

2.3 Video Editing.

Video recording equipment has developed even faster than audio technology, and the high-end consumer – Prosumer - products have now reached a quality level, which makes them suitable for professional broadcasting. Most national TV stations are now using the DVC-Pro or DVCAM formats, for which one can buy camcorders from US$ 2.200. This technological development has made video recording and editing interesting also for local media centres, because it is possible to produce material for broadcast on regional or national TV channels.

Fig. 8: DVC Pro Camcorder AJ-D610WBPS1from Panasonic

The professional broadcasters do however also use the Mini DV format, which has become the standard video format for private users. A high-end DV camera operated by a professional camera man can produce footage, which live up to the highest profession standards and even amateurs can produce broadcast worthy material with this kind of small cameras. For community media initiatives, the DV format is excellent, because the cameras are affordable and relatively easy to operate, and the technical quality is beautiful.

Fig. 9: DV Camcorder DCR-VX2100 from Sony

Video footage can be edited in any modern computer as long as it is powerful enough – and you can even use your computer for both audio and video editing. This is primarily a matter of how much Ram and how much hard disc space the computer has, because video files are much bigger than sound files. As with audio editing it is possible to use a number of different software. At the moment it seems that Macintosh computers have a lead over ordinary PC's when it comes to video editing. It is, however, mainly a matter of taste and a matter of how advanced editing options you need.

3 CHOOSING THE RIGHT EQUIPMENT

When choosing the most appropriate equipment, two main factors have to be taken into consideration: First of all the needs of the community media initiative in question and secondly the available budget. We might all like to drive a fancy sports car, but maybe a bicycle is more suitable for our needs? Thus, in the following we will list a number of different solutions ranging from the most basic to an advanced radio station. And these solutions have the advantage of being modules that one can add on or combine in a number of variations. To stick with the example above it is actually possible to start with a bicycle and gradually turn it into a Jaguar sports car!

We will operate with the following main modules:

The Micro Radio Stations are everything from a small 250 mill Watt FM mono transmitter with a microphone to a PC operated system up to 1.000 US $. Here the main objective is to be on the air with information for the local community despite having none or very limited funds. The operating range is from 1 km to 10 km.

The Village Radio Station is a station built around a small mixing console with a PC with simple and free "On-air" and editing software and a 30 watt FM Stereo Transmitter. This station operates on a daily basis with ability to transmit from a few hours daily to 24/7. The operating range is up to 25km. Price range up to 10.000 USD.

The Community Radio Station is a station with one On Air and one Production Studio. 100 to 1.000 Watt FM Stereo Transmitter with an operating range up to 50 km. On air PC with Automation software and Production PC with production software. Classic on air audio console with built-in telephone hybrid. Production console with PC controlling software. Price range up to 50.000 USD.

The Regional Radio Station is a station that runs 24 hours 7 days a week with "On air" studio, Speaker studio and Production studios. On air console with "On air" PC and professional radio editing, filing and broadcasting software. 2 telephone hybrids and a Production studio with professional Multi track software. Editor PC and several PC editing platforms. All PC´s connected to a main server holding station sound files. The regional radio station can be upgraded with OB units or remote local radio or community radio studios. Transmitting power 2.000 watts, which provides a range up to 80- 100 km. Price range up to 100.000 US $.

Special Radio Stations are stations where special aspects are demanded. It could be low power FM; 12 volt operated with satellite Internet access, or highly mobile station with a capacity to transmit within an hour after reaching a new location. Most Special Radio Stations are custom built to exactly fit their purpose. **Portable reporter kits** consist of a portable recording unit: A MiniDisc, cassette tape, DAT, MP3 or Compact Flash Recorder, plus headphones and a microphone.

Mobile recording units are fully portable units for recordings in the field. The central component is a 12-channel mixer with speakers and headphones and a FM receiver/amp. 30 meters Multi cable, microphones, etc. Live material will be recorded on PC or other recording media. All equipment is fitted in flights cases for easy transportation.

Link systems can be added to the mobile recording units for the ability to transmit live radio events back to the main station for FM Transmission. A link transmission system consists of an FM transmitter with antenna on a pump-up mast and a receiving unit with an antenna.
The transmitter is fitted in a flight case. The transmission antenna is fitted on a mobile pump-up mast of 12 meters, which can be stand-alone or be delivered with brackets for installation on a vehicle. The receiving unit can be placed at the main radio station and a transmitting hub can be added to increase the range of operation, which is up to 50 km.

TV Production

ENG kits consist of a Digital DV or DVCAM camcorder plus accessories such as tripod, microphones and basic lighting systems.

Postproduction of video recordings are carried out on digital computer based editing software. The two systems widely used are the Mac based Final Cut and Final Cut Pro and the PC based Pinnacle Liquid Edition Pro system.

3.1 The Micro Radio Station

A radio station in its most simple form is a microphone connected to a transmitter, and there are hundreds of self-build kits for the ingenious technician. These primitive transmitters vary much in performance and technical standards, sop they will not be considered in this manual. It is, however, possible to build a professional FM transmitter for prices from 150 US$, and in this chapter we will give two examples of Micro Radio Stations, which are absolutely professional with regards to technical quality.

Example 1

This is a very traditional set-up with a microphone connected to a small mixer. The output of the mixer feeds the FM Transmitter, which is connected to a vertical omni-directional antenna. The host can listen to the programme via the mixer and a set of headphones. A FM Walkman Receiver is included for the purpose of checking that the programme is actually broadcast. This is all you need to have a Micro Station, which comes at a total price of less than 800 US$:

- 1 FM Stereo Transmitter 1 Watt, (2 Watt ERP), with cable and antenna
- 1 Mixer
- 1 FM Walkman
- 1 Dynamic microphone
- 1 Headphone

Fig. 10: Veronica 2 watt FM Stereo Transmitter Package

Fig.11: Behringer UB 502 Mixing Console

This system is capable of reaching a small village and surrounding areas with a radius of approx. 2,5 km. It is operated on 100VAC – 250VAC or a 12 volt car battery. It has a small vertical antenna that can easily be mounted on a standard water pipe on top of a roof. This antenna comes with a 25-meter low-loss coax cable to be connected to the transmitter.

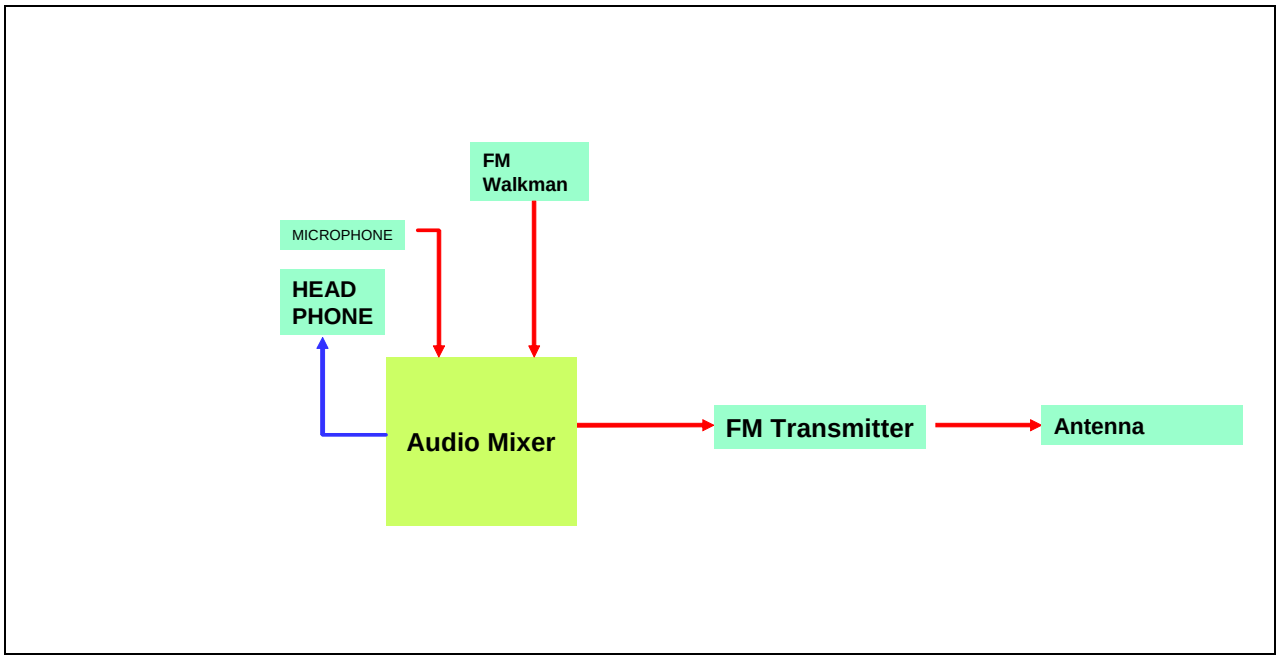

Fig.12: Diagram of the Micro Radio Station, example 1

Example 2
In this example the Micro Radio Station is a PC with a built-in FM Transmitter PCI card. The output of the PCI card is connected to a so-called booster amplifier of 5-15 Watts, and the booster is connected to the Vertical FM Transmitting antenna via a cable. A headset (headphones and a microphone) is connected to the PC.

Fig. 13: PCI MAX ULTRA transmitter from PCS Electronics

Free software such as Winamp operates the play list and the playback of sound files, and the editing software is bundled with the soundcard.

This is all you need for this type of Micro Station, which costs around 1.100 US$:

1 Computer with soundcard
1 PCI Ultra Max RM Transmitter
1 Booster amplifier 5- 15 watts
1 Headset

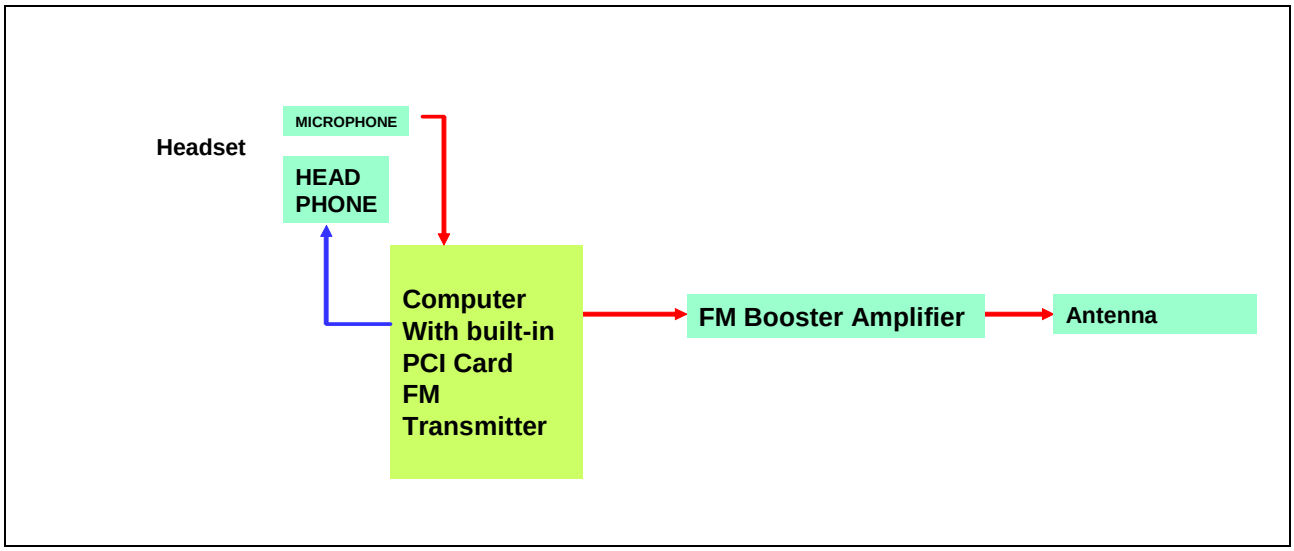

Fig.14: Diagram of the Micro Radio Station, example 2

This PC Micro Radio Station is capable of broadcasting music and other sound files 24 hours a day 7 days a week for a smaller area with a coverage radius of approx. 5 km.

3.2 The Village Radio Station

The Village Station is one step further up the technology ladder, but it is still a very simple configuration, which only needs a one-room all-purpose studio. It is a small but powerful radio station built of equipment that will last for years.

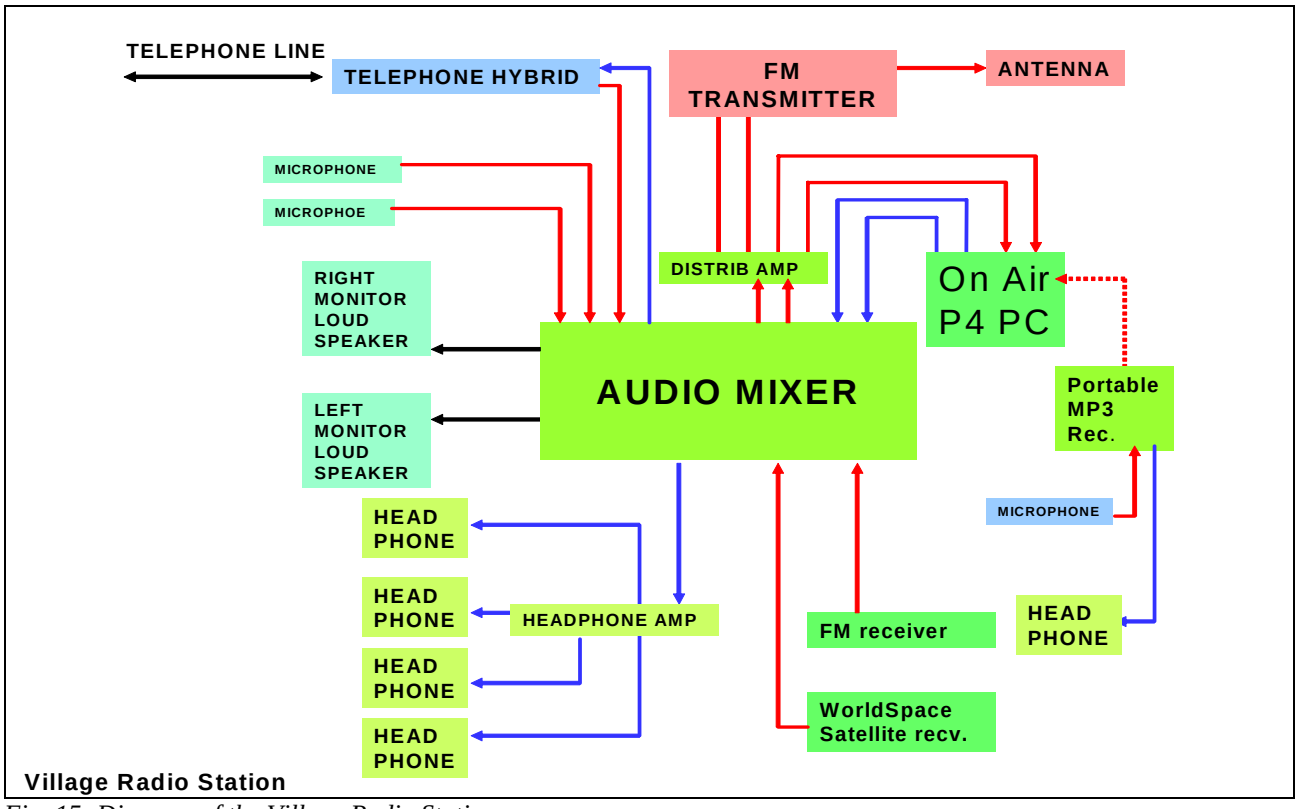

Fig. 15: Diagram of the Village Radio Station

It can be upgraded any time by using the existing equipment as the basic structure. You will just have to add more computers and/or more field recording equipment and maybe refine the software. In the recommended basic configuration the total price is approximately 7.800 US$. This price includes everything except a transmission mast.

The basic set-up is a small analogue-mixing console equipped with loud speakers, headphones and microphones. The mixer is connected to a computer, which has substituted all other costly recording and playback equipment such as tape recorders, CD players etc. It is, however, still possible to connect such other equipment to the mixer and the computer. All equipment is 220/110 volts mains supplied via an UPS 350 VA for voltage safety.

In principle it is possible to broadcast 24 hour a day from the Village Radio, but in the basic configuration all programmes must be conducted live in the studio since there is only one computer. For editing of programmes recorded in the field it is necessary to have a break in the live programmes, unless one chooses to spend 1.500 – 2.000 US$ to upgrade to software, which enables the producer to edit a programme on one part of the computer hard disc while another automatically broadcasts music or pre-recorded programmes (see www.radiohost.com).

Fig. 16: User interface of the Radiohost software

To keep the cost at a minimum in the basic configuration it is recommended to use free software like Winamp (www.winamp.com) for automated playing of music and pre-recorded programmes, while the software that comes with the sound card is used for editing. All sound card manufacturers provide some kind of editing software and most are absolutely okay for basic editing, but it is also possible to upgrade to professional software such as Adobe Audition (www.adobe.com). This is latest version of the programme Cool Edit Pro, which for years has been very popular in many

community radio stations, and it costs around 300 US$. For free CoolEdit Pro training see www.bbctraining.com.

Fig.17: User interface of Adobe Audition

Considering the limited budget for the Village Radio Station we recommend the Maycom MP3 Reporter kit with Compact Flash memory for interviews and recordings in the field (www.maycom.nl). It is a good choice because it is easy to record and edit on the MP3 recorder, and the recorded files can easily be transferred into the computer for editing or direct broadcast. It only takes a few seconds to transfer even an hour of recorded material.

A WorldSpace digital satellite radio receiver with permanent antenna has been included in the basic configuration in order to allow reception of international music, news and other information for re-broadcast. Producing national or international news is very costly for a small station and WorldSpace can be an easy way of meeting this demand. See www.worldspace.com for more detail.

For transmission a 30-watt FM Transmitter with a single omni-directional broadcast antenna is recommended. For people without much knowledge about FM transmission, medium range transmitters from Itel (www.itelcast.com) or DB Elettronica Telecomunicazioni (www.dbbroadcast.com) or RVR (www.rvr.it) are good choices, which have proven their reliability. It is, however, possible to find several less expensive brands, and it will be fine to buy a cheaper transmitter locally as long as you have access to people, who can maintain and repair the transmitter. Easy access to service facilities is far more important than the make of the transmitter. Like other electronic equipment a UPS must protect the transmitter.

It is possible to upgrade the Village Radio to become a complete Media Centre with Internet access, Internet Café and Video recording and editing facilities. An upgrade to a Village Media Centre may involve 4 PC Platforms for Internet and other PC use and a DV camera for ENG use. With the above-mentioned extra equipment the Village Media Centre - radio station included - will total approx. 15,000 US$.

Latest development is the www.worldvibrations.com radio station in a box. An almost complete radio station built like a computer. Basically it is like any other custom built PC with radio station automation software.

This WVRS need normal additional equipment like mixer, mics, headphones and speakers. However the WVRS is built and configured with integrated soft/hardware 100% for radio and is absolutely noiseless. WVRS is to be released the spring of 2004 at a price of 2.500 USD.

Fig.18: World Vibrations Radio Station

3.3 The Community Radio Station

The configuration of our Community Radio Station is based on the same principles as the Village Station, but some of the equipment is a bit more robust because there will be more wear and tear in a Community Station with more different producers – so we have created a real "work horse".

A number of extra facilities have been added including an extra room for a combined speaker and production studio. We operate with a traditional set-up with a control room, which also functions as an on-air studio, and an additional speaker studio separated by a wall with a window. This gives the possibility of broadcasting undisturbed from one studio while colleagues prepare other program activities in the other.

A separate speaker studio with microphones, headphones and loudspeakers requires a mixing console in the control/on-air room, which has the capacity of handling talkback facilities between the control room and the speaker studio. For this purpose we have selected the renowned AEQ BC 312. The AEQ is a proven classic Radio console with built-in telephone hybrid for On Air telephone interviews.

Fig. 19: AEQ BC 300 Radio Mixing Console

The control room functions as the main on-air studio, when only one producer is running a live broadcast, and that can leave the speaker studio vacant for other purposes such as pre-recording of debates, music or the like.

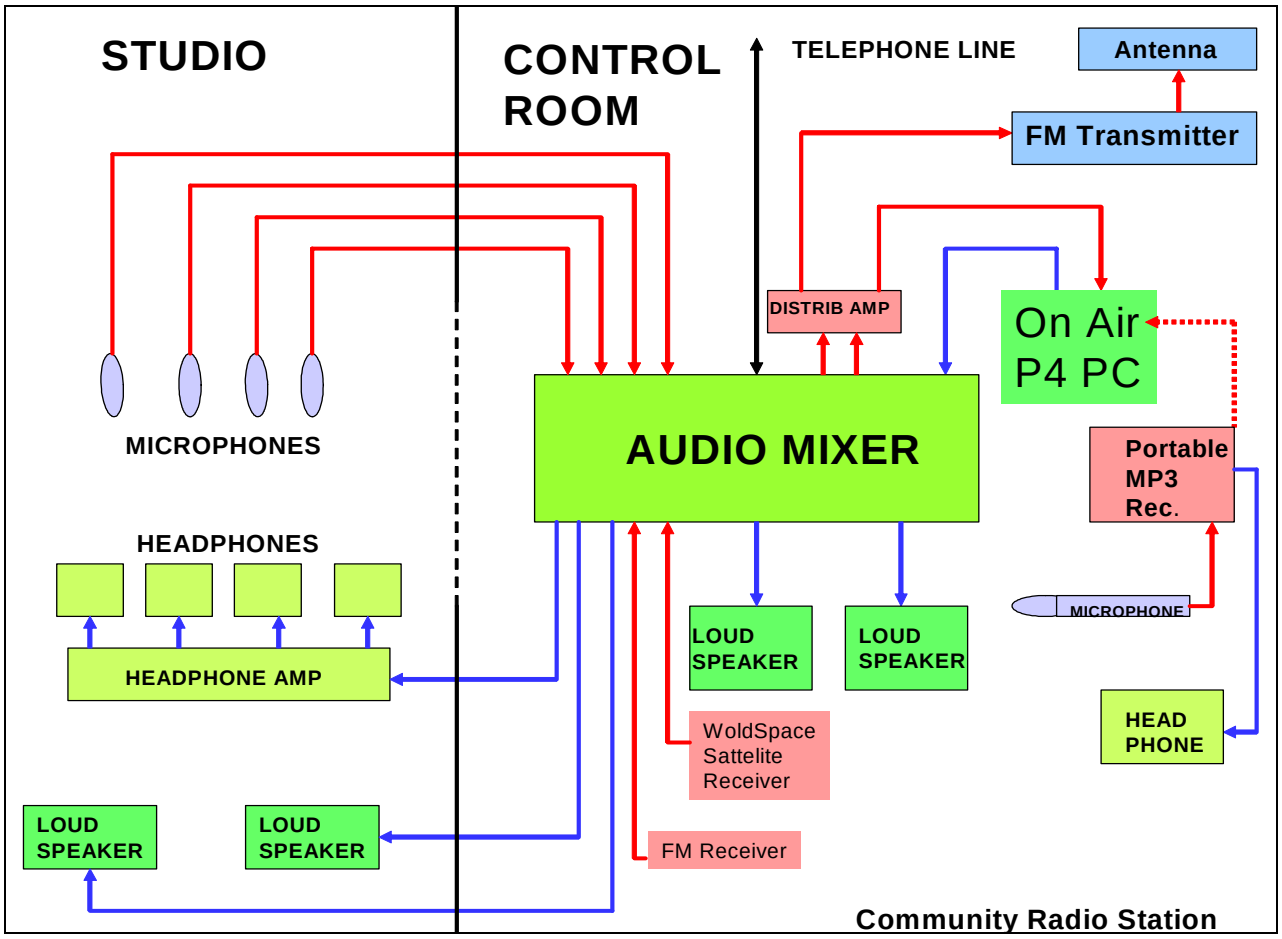

Fig. 20: Diagram of the Community Radio Station

Also in this configuration a PC with radio play-back and editing software is connected to the mixing console. The PC has substituted costly recording and playback equipment such as tape recorders and CD players. It is possible to operate the Community Radio with only one computer, but we recommend two, because it will create the possibility of pre-producing programmes on one computer while using the other for on-air.

In order to keep cost down it is recommended to use free computer software such as www.winamp.com for Play List broadcasting and ProTools free version editing software from www.digigram.com.

The output of the studio passes through a compressor/ limiter before reaching the transmitter ensuring best output performance with no distortions. All equipment is 220/110 volts mains supplied via an UPS 500 VA for voltage safety.

For a detailed list of equipment please refer to Chapter 4.

WorldSpace Satellite Receiver
We have included a WorldSpace digital satellite radio receiver with permanent antenna for the ability of receiving music, news and other information. See www.worldspace.com.

Reporter Kits for interviews and recordings in the field.
Considering the modest budget for the Community Radio Station and the MP3 capacity of the PC software we recommend 4 units of MP3 Reporter kits with Compact Flash memory for interviews and recordings in the field (www.maycom.nl). It is easy to operate and edit on the MP3 recorder, and recordings can be transferred directly into the studio or the production computer.

FM Transmitter
This set-up utilizes a very robust Plug and Play 150-Watt stereo FM Transmitter from Marti Electronics connected to a 4 bay omni-directional dipole broadcast antenna, which will increase the total actual output to around 1.000 Watt (ERP). The transmitter operates on 220/110 Volts mains supplied via an APC UPS 700 VA for voltage safety.

Total Cost
The total cost of the above-described Community Radio Station is approximately US$ 18.300

3.3.1 Community Media Centre

The Community Radio station can be upgraded to a Community Media Centre by adding extra equipment for Internet access and/or video recording and editing. The choice of upgrade depends totally on the local needs – and the available budget! Three or four additional computers, however, would be a reasonable suggestion. So would a DV digital camera for video recording: Please refer to the Media Centre Up-grade section Chapter 4 for choice of equipment and costs.

3.4 The Regional Radio Station

In this context a Regional Radio Station is defined as a media unit capable of producing and broadcasting 24 hours a day – 7 days a week. It is also capable of being the top news and information centre of a region. To set up such a station would require a construction team of experts and there will be a need for quite comprehensive staff training in operation as well as maintenance. Radio Station Automation, Live Broadcast procedures, editing software, computers, FM Transmitter and antenna configuration all require expert knowledge, and it is important to note that the total cots of approximately 100.000 US$ only covers the equipment.

The Regional Radio Station requires significantly more physical space than the smaller stations described in the previous chapters. Preferable the building complex with studio facilities and offices would have between 150 and 250 square meters and it would have the following rooms:

- Entrance and front desk
- Maintenance room / Air condition facility
- Editor’s room
- Control Room/On Air studio
- Speaker studio
- Production Studio
- Radio/TV Editing platforms in office space
- Wash room facilities
- Meeting room

The production facilities are centred around a small speaker studio, which is linked up both to the production studio on the one side and the combined control room/on-air studio on the other side The speaker studio has a window to both the on-air and the production studio in order to maximise communication during recording.

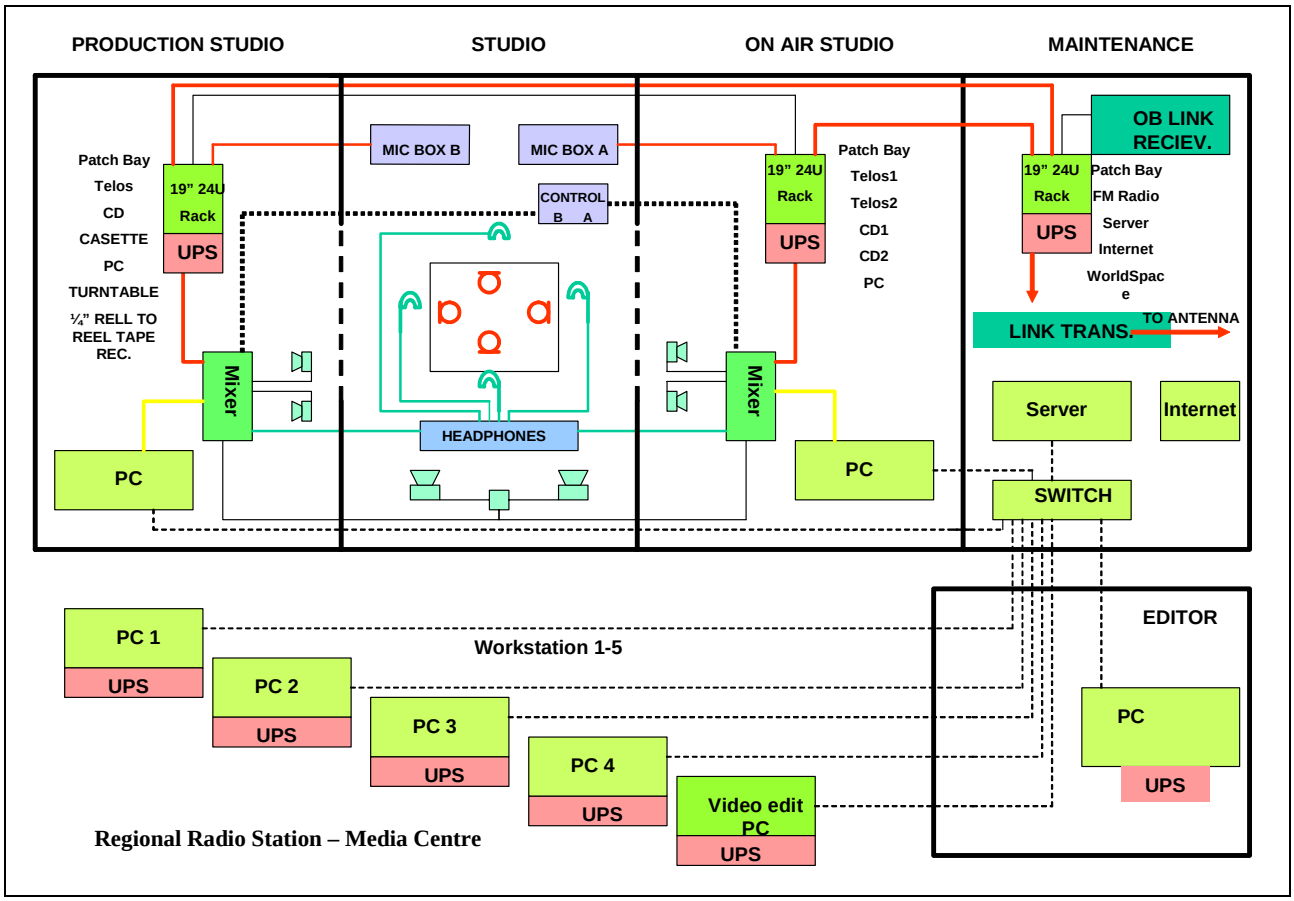

Fig. 21: Diagram of the Regional Radio Station

For field reporting and live broadcast away from the radio station, the following equipment is available:

- OB Unit
- 8 Reporter Kits.
- Link from studio to transmitter site
- Transmitter
- OB down-link from OB units to studio.

3.4.1 The Speaker Studio

The speaker studio is equipped with large diaphragm microphones, pop-filters and microphone stands, headphones and loudspeakers as well as breakout and communication boxes to the on-air and production studios.

Fig 22 : RODE NT1-A studio condenser mic

3.4.2 The On-Air Studio

The On-Air Studio has a standard mixing console with 4 microphone inputs plus 2 telephone and 6 stereo line input modules as well as control and talkback facilities between control room and studio. The studio is equipped with professional double CD players, cassette deck, 2 telephone hybrids, monitor speakers, FM Tuner, and Output Sound Processor.

Fig.23: AEQ BC 500 Radio Mixing Console

We have selected the renowned modular built AEQ BC 500 Mixing Console for this purpose. The AEQ BC 500 – equivalent to similar mixers from Soundcraft, Sonifex, D&R, AEV etc - is a proven classic Radio Console. Two Digital telephone hybrids for On Air telephone interviews added from Telos, which is a reliable USA manufacturer.

An alternative could be the Soundcraft S10 console, which has all necessary talkback and monitoring facilities for control-room and Speakers-studio built into the console. Please note that despite all the built-in features it is essential that a professional engineer installs the equipment on location.

The output of the on-air mixer passes through a sound processor (compressor/ limiter) before reaching the transmitter in order to ensure the best possible output performance with no distortions of the various links in the transmission chain, especially the FM Transmitter.

In order to ensure an optimal technical quality, a tuner to monitor the transmission from the FM transmitter is connected to studio monitors via the mixer console's monitor selector. Monitor loudspeakers throughout the radio studios and control rooms are Behringer B2031 Active Studio Monitors. By many audio enthusiasts they are considered the best buy for money.

Also in this configuration a PC with radio play-back and editing software is connected to the mixing console. The PC has substituted costly recording and playback equipment such as tape recorders but in this configuration CD players and cassette players have been added for On-Air safety in case of periodic PC breakdown.

The PC software used for recording, editing and controlling broadcast and sound files must be one of the professional editions developed especially for broadcast. There are several options but products like "VaultXpress" from Broadcast Electronics www.audiovault.com or "Simian" from Broadcast Software International www.bsiusa.com, are both good choices. Both systems are developed for live broadcasting around the clock seven days a week. So is the "CLAN" software from www.creamware.com.

A common feature for all the professional systems is that all sound files (music, interviews, commercials or entire programmes) are kept on a separate files server with access from all editing platforms. In practical terms it means that reporters/producers can finalise programmes on any of

the computers in the station and store the material in the central server. Then the programme host can find it at any time and play the programmes from the computer in the on-air studio.

It should be noted that all these professional systems work only to its full potential in combination with professional sound boards from Digigram (www.digigram.com), Audio Science from www.bsiusa.com or Luna from www.creamware.com.

Fig.24: User interface of VaultXpress

The latest feature in radio station automation software is the capability to let producers make voice-tracking for a music programme via the Internet regardless of the physical location of the producer.

An example: A radio station in Kampala, Uganda has 20 songs scheduled for a program tomorrow, but the popular DJ Mr. Haruna is in Sweden attending a course at Lund University.So via the Internet he imports bits of the of the program from the station in Kampala. With his microphone in Sweden Mr. Haruna records his words into his PC and fits the sountrack into the Kampala Radio Station playlist.

When Mr. Haruna has completed his recordings, his voice sound files are sent via internet back to Uganda and saved in the server of the radio station, and the next day the music and Mr Harunas voice will be broadcast as if Mr. Haruna was sitting in Kampala doing a live programme. See www.rcsworks.com also for full scale Radio Automation.

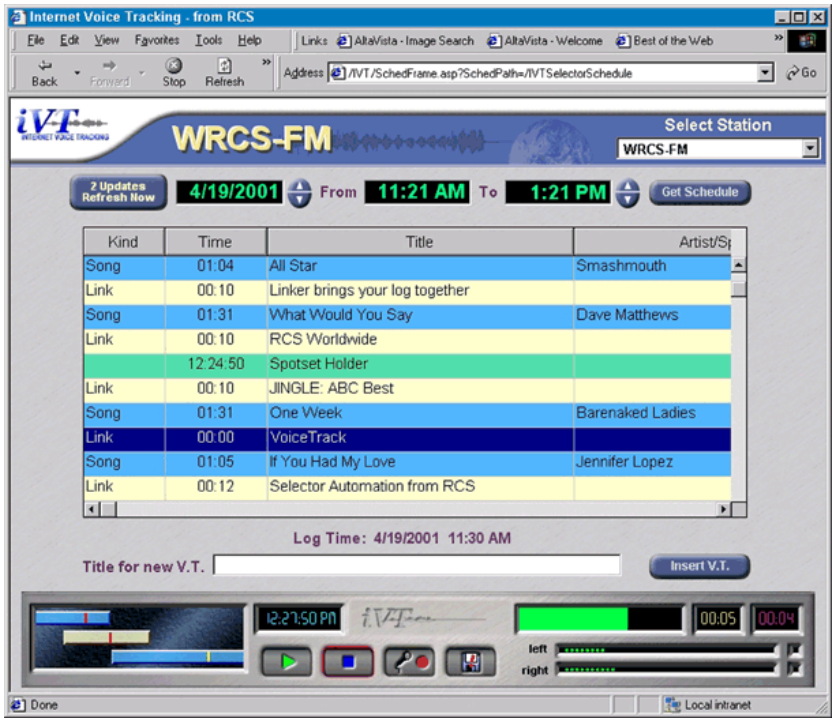

Fig.25: RCS works.com radio software fo Internet VoiceTtracking.

3.4.3 The Production Studio

Fig.26: Yamaha 01V96 Digital Audio Mixer

The production studio is designed for recording and editing of more complicated radio programmes than a normal PC editing platform can handle. It could be documentaries, music, radio dramas or discussions around a table in the speaker studio. The production studio could also be used for TV postproduction.

In order to perform these advanced tasks a professional production mixer must be combined with the production PC, and a good choice could be the Yamaha 01V96. It interfaces perfect with Nuendo and Pro Tools software. In this configuration we have chosen Nuendo as the software for advanced multi-track productions. The production studio PC can work with both Nuendo and whichever other system is chosen for the simpler editing and live broadcast control.

Monitor speakers and other studio equipment in the production studio is the same as in the On Air studio.

3.4.4 Other Facilities

The Editors Room

The Editors Room is intended for the journalistic editor, who can listen to and modify the sound files intended for broadcast. He/she is able to edit the play-list on the on-air computer.

The Maintenance Room

The Maintenance Room contains all the transmission and receiving equipment, file servers, mains supply, fuse boxes etc. and the main UPS for power safety for transmitting equipment.

For economical reasons it is good to have a separate UPS for each studio and each of the editing PC's. This is more cost-effective than one big central UPS.

Fig. 27: UPS from APC

WorldSpace Satellite Receiver

We have included a WorldSpace digital satellite radio receiver with permanent antenna for the ability of receiving music, new and other information. See www.worldspace.com

Reporter Kits for interviews and recordings in the field.

For interviews and recordings in the field we recommend the Marantz PMD 670 from www.marantz.com Eight Reporter Kits with Compact Flash memory is top-of-line equipment, which is to operate. It is even possible to perform basic editing directly on the recorder, and the sound files are easily transferred any of the computers in the Media Centre.

FM Transmitter

For the Regional Radio Station we recommend a 2.000-watts stereo FM Transmitter from RVR, Italy. The transmitter is 220/110 volts mains supplied via an APC UPS handling 5000 VA for voltage safety. The transmitter is connected to an 8-bay omni-directional dipole broadcast antenna, which raises the total output gain by 10,2 dB bringing the actual output signal to the equivalent of 10.000 Watts ERP. This system has the potential of reaching up to 100 km in radius if placed in a tower of 60 to 100 metres in a topographically advantageous location. FM transmission is depending on line-of–sight and that means that mountains, forests or buildings can block or minimise the signal. Thus, a transmitter reaches far longer in a flat area than in a mountainous region. For details of the transmission system, please refer to Chapter 4.

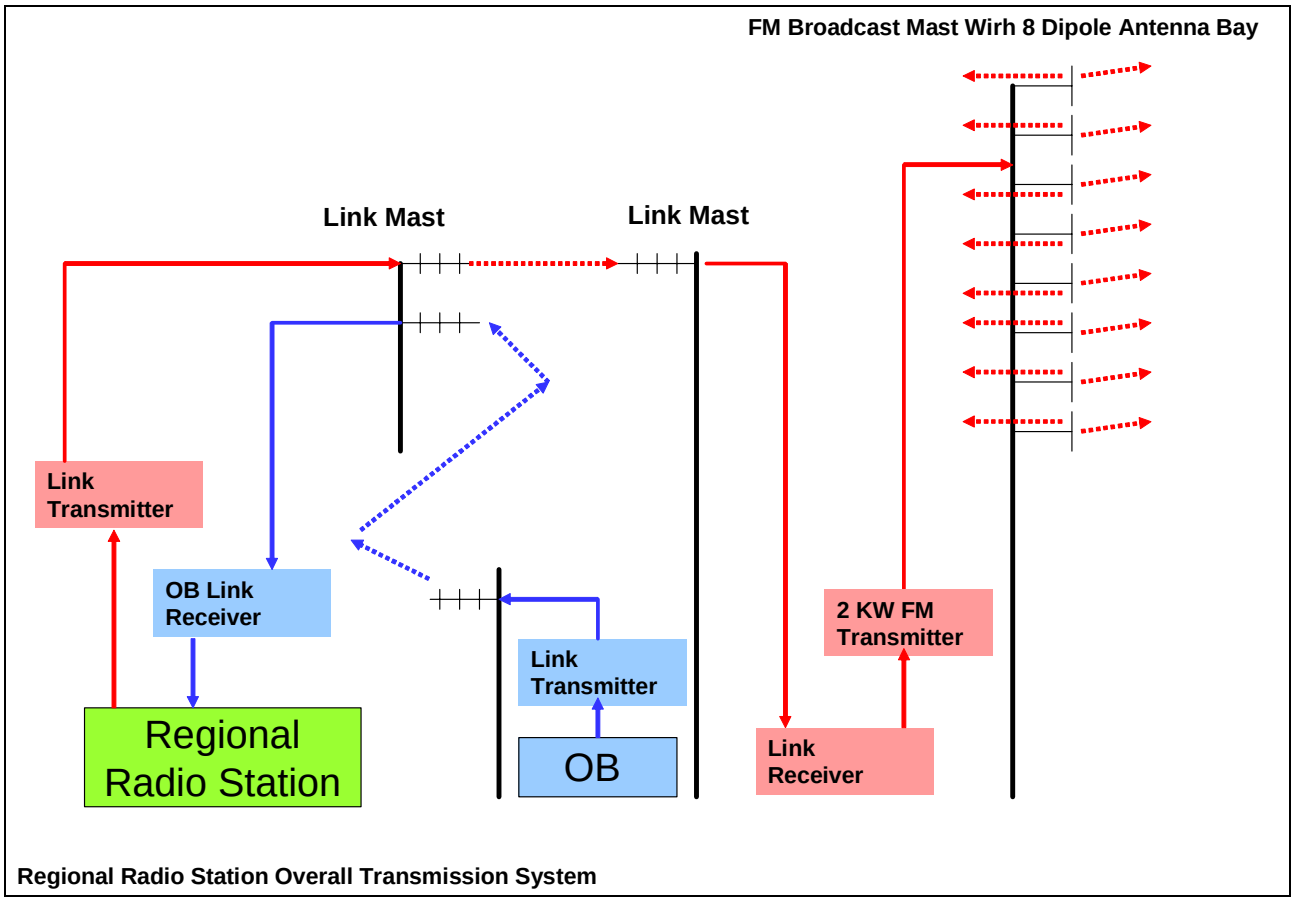

Fig. 28: Transmission system for the Regional Radio Station

3.4.5 Upgrade to regional Media Centre

As is the case with the Community Radio Station, the Regional Station can be upgraded to afully fledged Media Centre by adding extra equipment for Internet access and/or video recording and editing. The choice of upgrade depends on the local needs and budgets, but a number of additional computers (three to five) and a high-speed Internet access would be needed for the creation of a community Internet Café.

With a limited additional investment of approximately 10.000 US$, the Regional radio Station could also become a professional production facility for TV programmes and/or news items for regional or national broadcast. An additional TV package is described in Chapter 4.

3.5 Special Radio Stations

In remote rural areas or in regions hit by natural disasters or war the local infrastructure may be damaged or destroyed to an extent, which makes normal broadcasting impossible. For these purposes, a number of companies have developed different plug-and-play radio stations. One example is the Ramsey PXB35 “Radio Station In A Box”. At the price of US$ 3,296 it contains:

Fig. 29: Ramsey Box radio Station

- A Ramsey 35 watt FM stereo transmitter
- Integrated CD player
- Integrated cassette player
- Integrated audio mixer
- Professional microphone and cables
- Omni directional antenna and coax cable
- Installed and pre-wired in a high impact road case

See www.ramseyelectronics.com and www.broadcastwarehouse.com

Other manufacturers such as Pyramid Power Corporation (pdsatcom@intekom.co.za) and Danmon (www.danmon.dk) have specialised in turn-key radio stations built into containers. Danmon is also about to start production of the LastMileBox (www.lastmilebox.net), which is designed by Danicom for radio production and Internet connectivity in remote areas.

3.6 Portable Reporter Kits

For many years portable Reporter Kits for local radios used to be cassette tape recorders of the Walkman type and Sony and Marantz dominated the market for so-called professional cassette tape recorders. In the professional field among national broadcasters the Swiss Nagra ¼” mobile reel-to-reel recorder was for decades the absolute premier portable recorder, but after the development of the digital DAT tape, companies like HHB and Sony grasped a huge lump of the professional portable recording market, and for a while DAT became the new standard in the National radio station market, while the Mini Disc became the standard for local radios.

MiniDiscs are still a good choice, but in the past few years the new CompactFlash memory recorders have once again changed the entire portable recording market. Marantz is a frontrunner with the CompactFlash recorder in professional design at a price performance ratio that seems to beat most other companies. But also Dutch Maycom and renowned Denon have come up with popular models.

In this catalogue we have focused on two models in the various Radio Station configurations. For the smaller low budget radio stations the Maycom MP3 recorder has been selected. What is special for the Maycom recorder is that it comes with a microphone amplifier built into a small tube at the seize of a XLR plug, then by cable plugged into the line-in 1/8” mini jack socket. This amplifier feature makes it an ideal small professional recorder suitable for any professional microphone.
For details see www.maycom.nl.

The Marantz PMD 670 recorder is a professional CompactFlash memory recorder. The optimum choice for those Radio stations willing to spend more money.

In this manual we have selected this recorder or the Regional Radio Station. For details see www.marantz.com.

A good professional bag for the Marantz is highly recommended since its vinyl case is not for professional fieldwork.

Fig.30: Marantz PMD670P CompactFlash Recorder

Fig.31: The PortaBrace HB-10P bag

Bags for OB equipment has for some time been dominated by PortaBrace (www.portabrace.com). The HB-10P is tailor made for the Marantz PMD 670.

For microphones there are many choices: Some prefer omni-directional and others directional microphones for interviews. We have selected the Shure VP 64A Dynamic omni directional microphone for this configuration because of its good quality in relation to the price. For headphones we selected Behringer HPM 1000, and we recommend the same headphones and microphone for the other mentioned Portable recorders.

3.7 OB – and Mobile Recording Units

Mobile recording units are basically configured in two ways. The first and most expensive way is a custom built so-called OB Van (Outside Broadcasting) equipped with recording gear. Such a vehicle is normally also equipped with an FM Transmitter and a Pump-up mast with antenna.

Another and much cheaper way is to extend the existing Reporter Kit with a Mixer Monitor facility and 4-6 microphones – and maybe even a telephone hybrid and a wireless microphone. In combination with a portable FM Link transmitter, a pump-up mast and an antenna it will make up a fine OB unit.

To travel with this equipment on the road all recording and broadcasting equipment must be stored safely in transport boxes. Italian Proel (www.proelgroup.com) is a reliable manufacturer of reasonably priced flight cases. Having all the equipment in different boxes, however, requires one extremely important thing: GOOD ORDER.

If one box or even a single cable is missing it can be a catastrophe for the entire recording. In order to prevent such situations all boxes must be numbered and all equipment inside boxes must be bolted and hardwired. Every single cable must be fastened in one end to equipment, hence preventing loss of cables.

And do not forget to mark the cables with a numbers in the other end in order to save fowl-up time in set-up situations. Too many unprofessional recording units arrive in 20 different plastic bags and something is always missing.

Microphones, microphone stands, cables and all other single items with no attachment in one end must have their specific and marked place in a flight case. And the boxes must have a detailed list of content inside. These ideas about ”boxed recording gear” have been developed out of experience by professional Sound-rental companies- so take advantage of this knowledge and design it to your own needs.

We will give an example of an OB and Mobile recording Unit in 6 flight cases - this solution has the advantage that any vehicle or donkey can be used as means of transportation bringing the mobile recording equipment out to the scene of action.

Fig.32: Portable pump-up mast from Clark Masts Teksam Ltd.

Outside recording equipment must be constructed to be able to handle rough transport and more abuse than standard studio equipment. Some professional mobile equipment manufacturers and rental companies actually build and solder electronic components according to military standards. This helps avoid equipment failures at the most critical times, and in this configuration we have chosen equipment with such a good on-the-road reputation.

Box number 1

- Mixer: Mackie DFX 12.
- Monitor speakers: 2 Control 1 JBL Monitors
- Receiver: Denon DRA F 100.
- Wireless Microphone: Shure.
- UPS Power regulator: APC 500 VA
- Laptop PC: Dell Inspiron 5100
- Maxtor Firewire 200 GB HD
- Or Marantz CompactFlash Recorder

Fig.33: Mackie DFX 12Mixer

Box number 2

- 6 Shure BG.6.1 microphones in SKB 1200 Mic.Case
- 6 Proel microphone stands
- 220 Volt cable, 30 m

Proel 30 m. 8-way multicable

Box number 3

- 25 Watt RVR OB link transmitter

Box number 4

- Clark 12 m. pump-up mast

Box number 5

- Foldout tripod for pump-up mast

Box number 6

- RVR Antenna and antenna cable

See Chapter 4 for detailed prices and types.

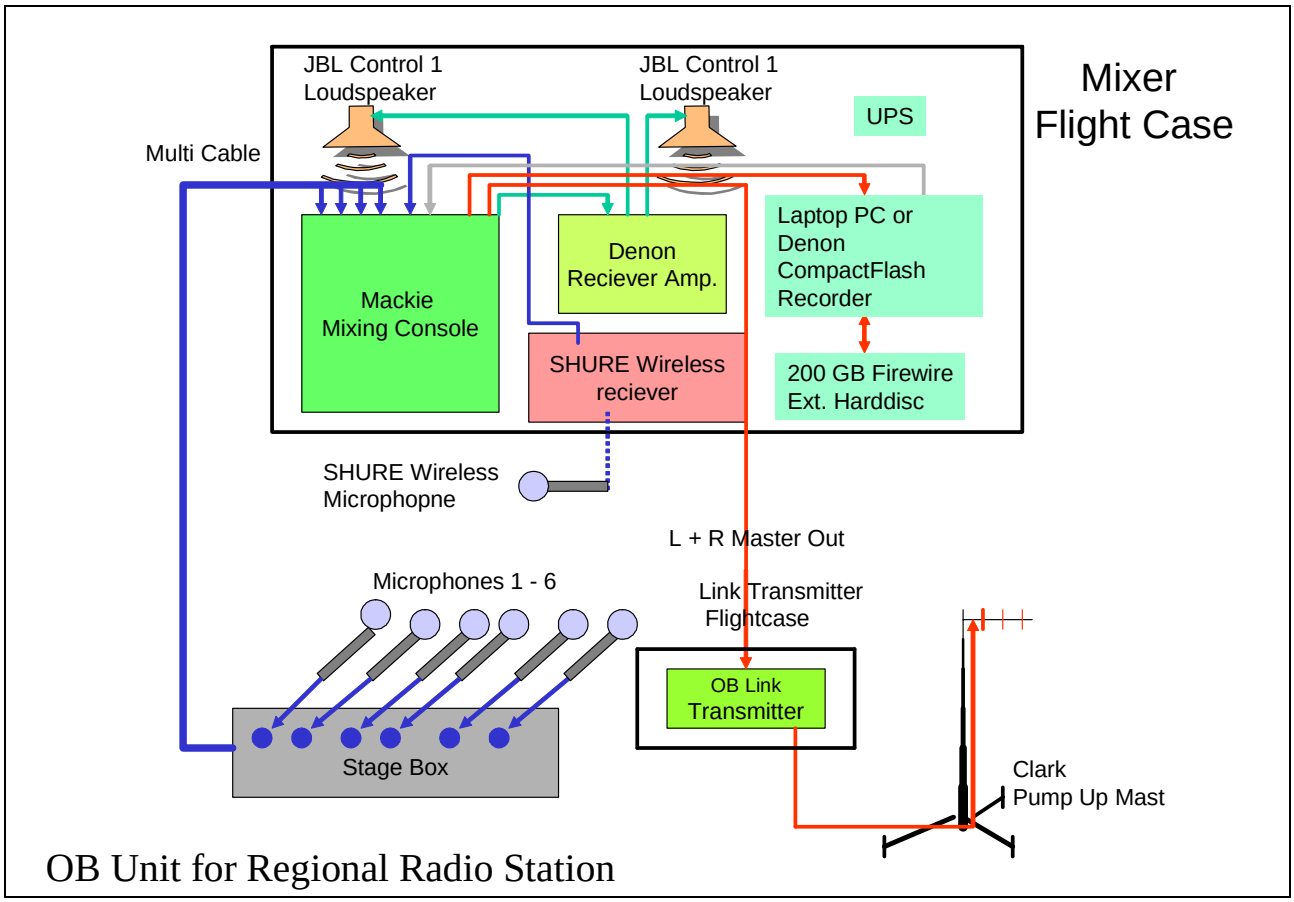

Fig. 34: OB Unit for the Regional Radio Station

3.8 FM Transmitters, Masts, Towers and Antennas

Transmitter companies specialize in two different ways of designing an FM Transmitter. One type is plug-and-play units, where all components are built into one box. Crown Broadcast (www.crownbroadcast.com) was leading in this field for several years supplying their transmitters with a superb manual for "do-it-yourself" people. Lately the 150 Watts Plug & Play transmitter from Marti Electronics (www.martielectronics.com) has followed and so have similar products from most other manufacturers.

Other systems for example by RVR (www.rvr.it) are composed by filling a 19" rack case with an Exciter and adding as many power amplifiers as needed until the required output is met. The plug-and-play systems are easier to install, but they lack the flexibility and easy service access of the other type. Broadcast engineers are divided in the views about which system to prefer – but it really is merely a matter of taste – or local availability of equipment. The different set-ups specified in

Chapter 4 should only be considered as reference points. Please check out systems and prices in your own area since they can vary a lot worldwide.

Many transmitter companies also manufacture FM Broadcasting antennas, while others only produce antennas. And some companies manufacture both antennas and masts, while some only make masts. When we use the word “masts” we talk about fixed masts and pump-up mast from 5 to 40 metres. Above this height, we use the term “towers”.

Except for installation of smaller mast systems it is a must to consult professional contractors when erecting towers for FM Broadcast systems. In most countries it is even compulsory only to use authorised or licensed companies. A professional installation is often also a precondition if you want to out an insurance policy on the equipment – and this is highly recommended because bad weather such as wind, ice and lightening can seriously damage the transmission equipment.

The topography of your landscape has a big influence on the reception of the transmitted signal, and this is another reason for checking with transmission experts. Instead of building very tall towers, which can cost fortunes, it might be abetter idea to use several smaller transmitters, which re-transmit the signal from main transmitter and carries it over mountains and other obstacles.

If you only operate with a small mast and want to install the equipment yourself, it is extremely important to follow the instructions carefully. And most important: tape all your outdoor plugs and connections with special bonding tape to make them watertight. Only approved tape delivered for this purpose must be used. Saving 10 US$ on tape can cost you thousands of dollars in ruined equipment. With regards to configuring antenna design and patterns you may get some help from software supplied by some antenna manufacturers such as Itel www.itelcast.com.

3.9 Link Systems

Most small radio stations have the transmitting tower just next to the radio studio. In some cases, however, the studios can be in a town in a valley and the transmission tower is placed on a mountain ridge 30 km away in order to give the best coverage. To get the signal from the studio site to the transmitting site one can use an FM link system, which consists of a small FM Transmitter situated at the studio site and a FM Receiver, situated at the Transmitter site. This system links the two sites together and therefore it is called a “Link system”. Normally it operates on frequencies outside the public FM band 88MHz-108MHz. Typically in the 450MHz band.

Today some companies manufacture digital link systems carrying several channels, and the another trend is to use microwave digital link systems. The next technology for link systems will most probably be TCP/IP PC net protocols and wireless Internet in point- to point transmission. This last system will bring cost considerably down.

In our OB mobile Recording system we also use FM Link systems to be able to reach back home to the Radio Station from a remote area. With a 12 Metre pump-up mast, a directional antenna and a 25-watt transmitter one should have a range of up to 40 km providing that there is line-of-sight or at least no major obstacles between the OB site and the Radio station. If more range is needed, it is possible to place a re-transmission unit in a high tower and reach the radio station via this middle point.

3.10 Portable Video Recording Systems (ENG)

When the renowned film director Steven Soderberg (known from “Traffic” and “Ocean’s Eleven”) made the movie “Full Frontal”, much of this film was shut by Soderberg himself using a Canon XL-1 miniDV Camcorder which now costs 3.100 US$. Later all recorded material was transferred to a Mac G4 Macintosh computer for editing with the software Final Cut Pro, which costs 899 US$.

Michael Grotticelli is the editor of the new "American Cinematographer Video Manual, Third Edition," available from www.cinematographer.com and on the www.sonyusadvcam.com website he writes: “…..*Soderberg is yet one more A-list director who gave digital a try, and found he likes it. "(He) doesn't have the same concerns about the 'look' of digital that every techno-guy has," Kramer (Steven Soderberg´s long time producer) said of the director's XL1s experience. "There's no reason for digital to be the poor step-child to film; like film it has its own advantages and disadvantages. When it's appropriate for a project, digital is the best tool to tell a story in the most efficient way. People, who are against using digital, need to get over that and accept it as another tool in the storyteller's arsenal. The equipment is too good to ignore."*

Our video equipment suggestions are designed after inspiration by this story from the real world! The number of brands and types of cameras is exploding, and most of the high-end consumer DV cameras are able to produce broadcast quality – but Chapter 4 we have listed some of the most common choices, and below we give a more detailed description of selected cameras as well as a suggestion for a full ENG (Electronic News Gathering) package for a Regional Media Centre.

3.10.1 Regional Media Centre ENG package:

Fig. 35.: SONY DSR-PD170P Camcorder

The central piece in the ENG package is the camera – or camcorder just to use the correct technical term. And the new DSR-PD170P camcorder from SONY provides high quality acquisition in the DVCAM format, as well as in DV, allowing up to 40 minutes recording on one tape Mini DVCAM tape or 60 minutes on the same tape in the DV mode.

The sound has often been a problem for the DV cameras but this model has a reasonable external microphone and professional connections for additional sound equipment. The LCD monitor gives a very good impression of the actual quality of the recordings, so it is possible to see right away whether the images are too dark or too light. This monitor works also in very bright light conditions.

Generally the automatic functions of the camera work so well that it is hardly necessary to use the manual functions. A trained cameraman, however, will enjoy all the manual functions such as focus, shutter speed, white balance, sound levels etc.

Wireless Microphone Systems

Adding a wireless microphone system to the camcorder greatly enhances the options for getting good quality sound. A microphone fixed to the main character in your programme gives good and clear recording no matter where he/she moves.

The wireless system is normally a so-called diversity system for best pick-up with the transmitter built-into the microphone or placed in a pocket size device.

The receiving unit is placed at the back of the camcorder and plugged into the camcorder via a cable. Sony, AKG, Sennheiser, Samson, Audio-Technica and Shure are best known brands, and they have systems from 300 US$ and up.

Fig.36: Samson Wireless Micro 32Combomicrophone system

Fig. 37: UL2-20 from Anton Bauer

Camera Light

Although the DV cameras generally operate far better in dark conditions than highly professional camcorders did just a few years ago, it is a good idea to include a camera lamp in the ENG package.

Tripod

The mobility of the small digital camcorders is one of their most attractive characteristics, and the built-in digital stabiliser makes it possible to film relatively steady shots even in a bumping car. It is, however, still necessary at times to use a tripod, which should also be part of the package. Because the camcorders are so light it is possible to use practically any tripod but the Libec TH-650 Light Tripod with fluid head is a good mid-range choice.

TV Monitor for fieldwork

The built-in LCD monitor on the camcorder gives a good impression on how the recording will look on a big TV screen, but it is still not always enough to judge whether a sequence is good enough for broadcast. Thus, having an extra monitor for viewing recordings from remote areas is a nice extra feature. The shown model here from Spinet operates on 12 volts, and a car power adaptor is included.

Fig.38: Spinet SKC-70WM, 7" LCD monitor

Bag

Finally, do not forget to include a good camera bag in your ENG package. A professional bag or maybe even a dust-proof flight case will make the equipment last significantly longer. It is a general experience that equipment is damaged more during transport than during actual recording use.

3.10.2 Digital Camcorders

The digital camcorders, which are interesting for community or regional media centres, come in three different systems: The DVC Pro format developed by Panasonic, the DVCAM from Sony and the mini DV format supported by all manufacturers. Today all systems in the relevant price range record on tapes, but hard disc recording is about to become just a common for video as is already the case for audio. One example is the new Panasonic DVC Pro camcorder AJ-SDX900 where the recordings take place on up to five SDRAM slot cards called P2, see www.panasonic-broadcast.com. This camcorder has no moving parts, except for the zoom lens motor.

Fig.39: Panasonic DVC Pro camcorder AJ-SDX900

Another recently released piece of revolutionary equipment is the Fire Store hard disc, which can be placed in the battery mount on the back of the camera. That makes it possible to record directly to the disc instead of a moving tape. First of all, this kind of technology will cut down on the use of the very expensive tapes, which should ideally only be used once in order to keep a high quality. Secondly, the transfer of recorded material into the editing computers is much faster.

Fig 40.: The Fire Store Hard Disc mounted on a JVC GY-DV5000/-5001 camcorder

Panasonic DVC Pro system
Most DVC Pro camcorders are in a price range, which is prohibitive for community media centres except the Panasonic AJ-D410AE DVCPRO Camcorder. It gives high quality digital component recordings at a price of 4.683 US$.

Fig.41: Panasonic AJ-D410AE DVCPRO Camcorder

Sony DVCAM system
Sony developed the DVCAM system and there several good camcorders are available. The Sony DSR-PDX 10P DVCAM Camcorder at 2.263 US$ is the cheapest DVCAM on the market. It is also able to record on Mini DV tapes in an astonishingly good technical quality. Another popular DVCAM camcorder is the SONY DSR-250P at 4.584 US$.

Fig42.: Sony DSR-PDX 10P DVCAM Camcorder

Fig.43: Sony DSR-250P DVCAM

1

DV System
Moving to the DV Camcorders there are many to choose from in this increasingly popular format for professional use - for example the Canon XL-1 Camcorder at 3.100 US$.

Fig. 44:Panasonic AG-DVC 30 Camcorder

Fig.45: Canon XL-Camcorder

The new Panasonic AG-DVC 30 Camcorder has a reputation for being very good for news gathering. It has a good picture stabilizer and a 16x Leica Dicomar lens and infrared night time mode.

Other popular DV cameras from Panasonic are the new version of the best-selling DVX100E, the Panasonic AG-DVX100 AE mini DV camcorder with Leica optics at 3.860 US$, and the AG-DVC200E DV Camcorder with Firewire output – price 3.340 US$

Fig.46: Panasonic AG-DVX100 AE mini DV

Fig.47: AG- DVC200E DV Camcorder

Fig48.: JVC Studio DV CamcorderGY-DV550U

JVC also makes a variety of DV cameras (see list in Chapter 4. Here we will focus on two interesting models: The first one is the world's first DV camcorder to offer studio camera capability in addition to an ENG camera and Iso-camera capabilities. It has a built-in 26-pin interface to connect to a CCU for remote controlled studio operation or backup recorder in the field. US$ 6.745.

The second JVC Camcorder to mention is the JVC JY-HD10. It is the world's first low-cost High Definition DV Camcorder.

Fig.49: JVC JY-HD10

3.11 Video Editing Systems on PC and Mac

For postproduction/editing of video material there are several popular systems, but we will concentrate on video editing software for standard Windows PC's and the Apple Mac computers. There are several software systems, and your choice will depend on your needs and your budget. All are digital non-linear editing systems, and for several years they have represented state of the art software in the price range below 999 US$.

Prices change all the time due to high competition in this market, so it is a good idea to check all relevant homepages on a regular basis for comparison of prices and details. Some of the most relevant sites are listed here:

- AvidXpress: www.avid.com
- Apple: www.apple.com
- Canopus: www.canopus.com
- Matrox www.matrox.com
- Adobe: www.adobe.com
- Sony Vegas: www.mediasoftware.sonypictures.com
- Pinnacle: www.pinnaclesys.com
- Ulead: www.ulead.com

3.11.1 Windows PC Software

At the time of the production of this guide, some of the most interesting offers were the following:

- Matrox RT.Xtreme Pro, PCI graphics card included, 999 USD.
- Matrox RT. 10 Suite, PCI graphics card included, 699 USD.
- Adobe Video Collection Standard, software only, 999 USD
- Adobe Premiere Pro, software only, 699 USD
- Sony Vegas, software only, 560 USD
- Sony Vegas + DVD, software only, 800 USD
- Pinnacle Studio 9 AV/DV PCI video card included, 250 USD
- Pinnacle Liquid Edition Pro, AGP graphics card and breakout box included, 999 USD
- Ulead Video Studio, software only, 99 USD
- Ulead Media Studio Pro software only, 495 USD
- Ulead Studio Quartet software only, 895 USD
- Canopy Storm2

All products use a PCI special graphics card except the Pinnacle Liquid Edition system. Here Pinnacle uses a special graphics AGP card combining the extra treatment possibilities with the speed of the AGP port. For Media Centres engaging in setting-up combined audio, video server based file sharing please contact Pinnacle Liquid systems.

3.11.2 PC Hardware

Most modern standard computers are able to handle the video editing programmes, but we recommend a Dual TFT 17" Monitor Dell Dimension 8300 PC with a P4 2,8 Ghz Processor, Intel chipset and120Gigabyte Hard Disc installed with Matrox Paraphelia 750 VGA card. It should be noted that for absolute top performance most companies recommend a Dual processor PC from Dell or Hewlett-Packard with minimum 3.0 GHz Xeon P4 Processor.

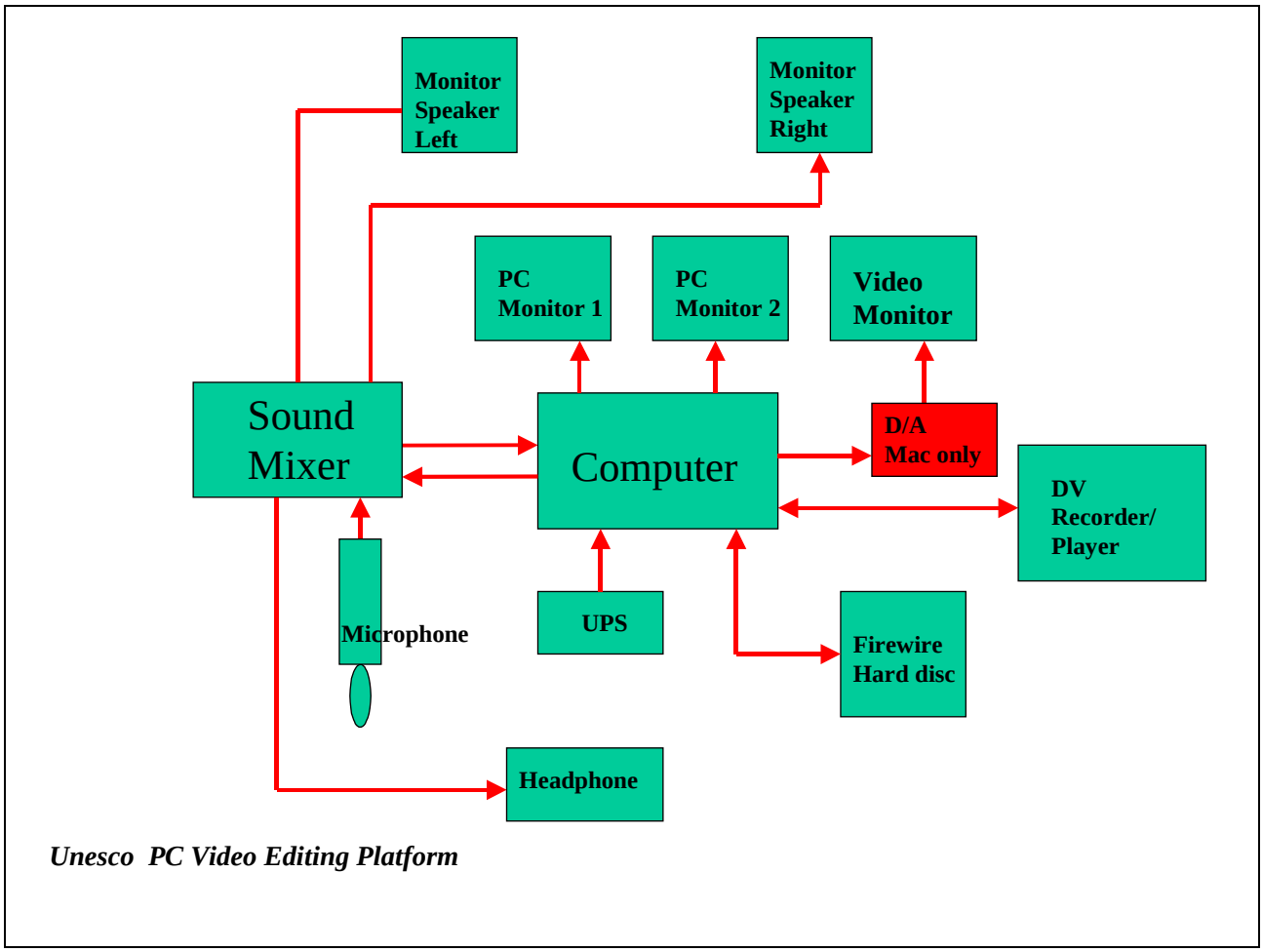

Fig. 50: Diagram of PC video editing unit

Most system suppliers recommend PC´s with 2 internal hard discs, one for program storage and one for video files. We also recommend a third external Firewire Hard Disc for storage of final video sequences. This third hard disc also acts as a back up facility, and more external discs can be added over time when needed.

It is important to check PC chipset for compatibility with video soft- and hardware, before you buy a computer, so make sure to contact the dealers so everything works fine together. In most cases it is good advice to make the software supplier recommend exactly what is the best PC configuration for that particular software. Buying soft- and hardware together as a tested certified system with warranty is the absolute best way to handle the matter for the beginner in the market.

Fig. 51: TFT Images from Matrox Dual head VGA Card

AVID systems
The Avid editing system is one of the most popular systems in the professional TV production field and it cost well beyond our limit of 999 US$. It is, however, in place to mention that Avid has marketed a light version for news reporters so they can record and edit material directly from a DV Camera into a Laptop PC. This material can be stored and later sent to a professional Avid unit for editing and fitting into a larger TV station file system.

So for local media centres, which deal directly with national systems using Avid, it could be worth considering Avid Xpress DV or Avid Xpress Pro, which in combination with the Avid Mojo DNA hardware box is a very fine system. Avid works for both PC and Mac platforms and the price range is around 3.000 US$.

3.11.3 Apple Mac Platform

For many professional TV editors the Mac platform combined with the Final Cut Pro software is the ultimate choice (www.apple.com). Actually Mac has 3 editing software packages: The home editing Imovie system, the semi-professional "Final Cut" Express at 299 USD and "The Final Cut Pro" at 899 USD.

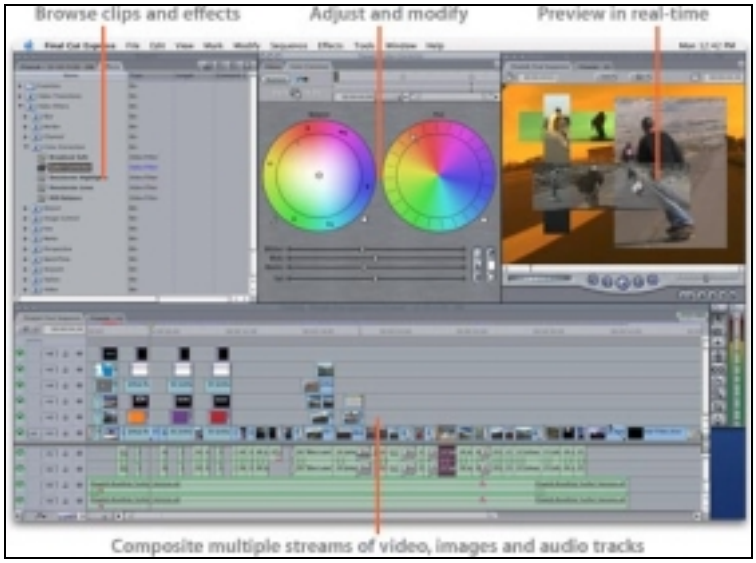

Fig.52: Apple Mac Final Cut Express 2 editing software

The IMovie system is a standard software, which is included in the Mac G4 computer starting at 799 US$ including the computer. The Final Cut Express and Final Cut Pro packages require a Mac G4 or preferably even a Mac G5. If you want top of the line, the MacG5 Dual processor is the choice – this is the fastest PC editing platform at all of all mentioned in this manual. A single processor Mac G5, with 2 TFT 17" monitors and Final Cut Express 2 can be found at 3.298 US$ and a dual processor Mac G5, with 2 TFT 17" monitors and Final Cut Pro 4 will cost around 6.999 US$

It is a good idea to consult Apple's homepage and find a local "Apple Video Solutions Expert" - an Apple certified dealer - to help configure the exact system of your choice.

4 TECHNICAL SPECIFICATIONS AND PRICES

This chapter contains detailed list of the proposed equipment for the various packages, but it is essential to stress once again that prices vary all the time, and some products disappear and others emerge. Thus, the lists must only be taken as suggestions – individual items can be freely interchanged with other similar equipment, which might be cheaper or easier to find in your local area.

UNESCO MICRO RADIO STATION						
Example 1						
www	**Brand**	**Type**		**Qty.**	**Price USD**	**Total**
			Studio Equipment			
www.behringer.com	**Behringer**	UB502	Mixing Console, 1 mono mic 4/3 stereo line	1	50	50
www.behringer.com	**Behringer**	XM2000S	Microphone, Dynamic	1	24	24
www.behringer.com	**Behringer**	HPM 1000	Professional headphone	1	15	15
www.sony.com	**Sony**		FM Walkman	1	20	20
			Total Studio		89	**109**
			FM Stereo Transmitter, Package	1	664	664
www.veronica.co.uk	**Veronica**	PPL Stereo	1 watt transmitter, with 110VAC-220VAC PSU	1	0	0
www.veronica.co.uk	**Veronica**		5/8´Vertical Omni-directional Transmitting antenna	1	0	0
www.veronica.co.uk	**Veronica**		Antenna cable 25 meters RG 213, with connectors	1	0	0
			Total Transmitting system			**664**
EXAMPLE 1 TOTAL						**773**
Example 2						
			Computer Equipment			
www.dell.com	**Dell**	Dimension	Computer	1	576	576
www.creative.com	**Creative**		Headset, (Headphone and microphone)	1	48	48
www.pcs-electronics.com	**PCS Electronics**	PCI Max Ultra	FM Stereo transmitter on a PCI card with software with 15 watt booster	1	328	328
www.veronica.co.uk	**Veronica**		5/8´Vertical Omni-directional Transmitting antenna, 25m RG213 cable, w. con	1	180	180
EXAMPLE 2 TOTAL						**1.132**

UNESCO VILLAGE RADIO STATION						
www	**Brand**	**Type**		**Qty.**	**Price USD**	**Total**
			Studio Equipment			
www.yamaha.com	**Yamaha**	MG 12/4	Mixing Console, 4/5 mono mic 4/3 stereo line	1	200	200
www.behringer.com	**Behringer**	TSM 87	Microphone, Condenser Mic 1" capsule	2	120	240
www.behringer.com	**Behringer**	Truth B 2031	Monitor Loudspeakers (Pair) w. amplifier.	1	300	300
www.behringer.com	**Behringer**	HPM 1000	Professional headphone	4	15	60
www.altoproaudio.com	**Alto**		4 - way headphone amplifier	1	144	144
www.d-r.nl	**D&R**	TH 1	Telephone hybrid 1	1	220	220
www.soundblaster.com	**Creative**	Audigy	Sound card	1	100	100
www.behringer.com	**Behringer**	Ultra Di Pro	4 way line box	1	130	130
www.proelgroup.com	**Proel**		Mic stands	2	45	90
www.proelgroup.com	**Cable Connector**		Shielded audio cable 100 m with 30 pieces, XLR male, 30 pieces female and 30 pieces RCA	1	153	153
www.dell.com	**Dell**	Dimension 4600	PC for audio editing P4 with 80GB HD RAM 512MB 128MB, DVD, CD-WR, 17"TFT Monitor. Win XP	1	1.070	1.070
www.altoproaudio.com	**Alto**		2 channel compressor/limiter	1	189	189
www.apc.com	**APC**	APC CS 350	UPS 350 VA	1	100	100
			Total Studio		2.786	**2.996**
			Satellite Receiver			
www.worldspace.com	**WorldSpace**		Digital Receiver	1	300	300
www.worldspace.com	**WorldSpace**		Antenna	1	50	50
						350
			Field Recording, Reporter set	4		
www.maycom.nl	**Maycom**	MP3 Reporter Kit	Portable Recorder	4	460	1.840
www.behringer.com	**Behringer**	HPM 1000	Professional Headphones HPM 1000	4	15	60
www.bswusa.com	**Audio Tech**	AT 804	Omni interview microphone	4	75	300
			Total Field recording			**2.200**

			FM Stereo Transmitter			
www.itelcast.com	**Itel**		Itel 30 watt transmitter	1	1.700	1.700
www.itelcast.com	**Itel**		Omni-directional Transmitting antenna	1	120	120
www.itelcast.com	**Itel**		Antenna cable 50 meters	1	300	300
www.apc.com	**APC**	APC CS 350	UPS 350 VA	1	100	100
			Total Transmitting system			**2.220**
TOTAL VILLAGE STATION						**7.766**

UNESCO COMMUNITY RADIO STATION						
www	**Brand**	**Type**		**Qty.**	**Price USD**	**Total**
			Studio Equipment			
www.aeq.com	**AEQ**	BC 312	Mixing Console with w. studio switch, built-in tel. hybrid	1	3.100	3.100
www.behringer.com	**Behringer**	TSM 87	Studio 1" capsule condenser Microphone	4	120	480
www.behringer.com	**Behringer**	Truth B 2031	Monitor Speakers (Pair) w. built in amp.	2	1.000	2.000
www.behringer.com	**Behringer**	HPM 1000	Headphones	6	35	210
www.altoproaudio.	**Alto**		4 - way headphone amplifier	1	144	144
www.soundblaster	**Creative**	Audigy	Soundcard	1	100	100
www.behringer.com	**Behringer**	DI 4000	Linedriver Ultra Di Pro	1	130	130
www.proelgroup.com		Mic stands	Microphone Stands	4	45	180
www.proelgroup.com	**Proel**		Shielded audio cable 100 m with 30 pieces XLR male, 30 pieces female and 30 pieces RCA	1	275	275
www.dell.com	**Dell**	Dimension 4600	Computer for audio editing P4 with 80GB HD RAM 512MB, CD-WR, 19" Monitor. Win XP	2	1.200	2.400
www.apc.com	**APC**	CS350	Uninterrupted Power Supply 350 VA	1	100	100
			Total Studio			**9.119**
			Satellite Receiver			
www.worldspace.com	**WorldSpace**		Digital Receiver	1	300	300
www.worldspace.com	**WorldSpace**		Antenna	1	50	50
						350
			Reporter Kit			
www.maycom.nl	**Maycom**	MP3 Kit	Portable Recorder	4	470	1.880
www.behringer.com	**Behringer**	HPM 1000	Headphones	4	90	360
www.bswusa.com	**Audio Tech**	AT 804	Reporter Microphone	4	75	300
			Total Field recording			**2.540**
			FM Stereo Transmitter			
www.martielectronics.com	**Marti**	150 WattsP&P	FM Stereo Transmitter	1	4.900	4.900
www.itelcast.com	**Itel**	Itel	Antenna Bay of 4 Omni directional Circular	1	1.021	1.021
www.itelcast.com	**Itel**	Itel	Antenna Cable 50 metres	1	300	300
www.apc.com	**APC**	CS 700	Uninterrupted Power Supply 350 VA	1	100	100
			Total Transmitting system			**6.321**
TOTAL COMMUNITY STATION						**18.330**

UNESCO REGIONAL RADIO STATION						
www	**Brand**	**Model No.**	**Description**	**Qty**	**Price USD**	**Total USD**
			ON AIR Studio			
www.aeqbroadcast.com	**AEQ**	BC-500	On AIR- Mixer, 4-2-6 Control Room and Studio Monitoring	1	6.000	6.000
www.rodemic.com	**Roede**	NT 1	Roede Condenser Studio Microphone	4	180	720
www.denon.com	**Denon**	DNC-630F	CD Player Denon	1	200	200
www.denon.com	**Denon**	DN-770R	Tape-Deck Double Denon	1	200	200
www.telos-systems.com	**Telos**	Telos one	Telephone hybrid Digital Telos One	2	650	1.300
www.proelgroup.com	**Proel**	ST232, 23850	Mic Stand	4	15	60
www.behringer.com	**Behringer**	HPM 1000	Headphone	6	15	90
www.behringer.com	**Behringer**	HA 8000	Headphone Amp. 8 channels	1	130	130
www.behringer.com	**Behringer**	B 2031	Studio and Control Room Monitors, Truth B 2031 (PAIR)	2	400	800
www.behringer.com	**Behringer**	B 2031	PFL and Solo Monitors,Truth B 2031 (PAIR)	1	400	400
www.verbatim.com	**Verbatim**	VERBATIM	CDR Verbatim 80 minutes	250	1	250
www.neutrik.com	**Neutrik**		Patch bay Neutrik	2	100	200
www.proelgroup.com	**Proel**		Patch cords Proel	24	3	72
www.proelgroup.com	**Proel**		19" Rack	2	125	250
www.proelgroup.com	**Proel**		Studio Furniture	2	800	1.600
www.proelgroup.com	**Proel**		Assorted Mic cables, 10 m. Multi cable and plugs	1	500	500
www.apc.com	**APC**	CS 350	UPS 350 VA	2	100	200
			Studio Analogue Total USD			**12.972**
			Production Studio			
www.yamaha.com	**Yamaha**	01V96	Production Digital Mixer, Yamaha 01V96	1	2.199	2.199
www.rodemic.com	**Roede**	NT 1	Roede Condenser Studio Microphone	2	180	360
www.denon.com	**Denon**	DNC-630F	CD Player Denon	1	200	200
www.denon.com	**Denon**	DN-770R	Tape-Deck Double Denon	1	200	200
www.telos-systems.com	**Telos**	Telos one	Telephone hybrid Digital Telos One	1	650	650
www.proelgroup.com	**Proel**	ST232,23850	Mic Stand	2	15	30
www.behringer.com	**Behringer**	HPM 1000	Headphone	2	17	34
www.behringer.com	**Behringer**	B 2031	Studio and Control Room Monitors, Truth B 2031 (PAIR)	1	400	400
www.behringer.com	**Denon**	B 2031	PFL and Solo Monitors, Truth B 2031 (PAIR)	1	400	400

www.denon.com	**Denon**	DP-DJ151	Turntable Denon DP-DJ151 with RIAA amp.	1	600	600
www.revox.com	**Revox**		1/4" Reel to reel Tape Recorder, Revox	1	700	700
www.verbatim.com	**Verbatim**	VERBATIM	CDR Verbatim 80 minutes	250	1	250
www.neutrik.com	**Neutrik**		Patch bay Neutrik	2	100	200
www.proelgroup.com	**Proel**		Patch cords Proel	24	3	72
www.proelgroup.com	**Proel**		19" Rack	1	125	125
www.proelgroup.com	**Proel**		Studio Furniture	1	800	800
www.proelgroup.com	**Proel**		Assorted Mic cables, 10 m. Multi cable and plugs	1	500	500
www.apc.com	**APC**	CS 350	UPS 350 VA	1	100	100
			Total Production Studio			**7.820**
			Computers and Peripherals			
www.dell.com	**Dell**	Power Edge 1600SC	Dell MB, P4 Xeon, 2,4 Ghz with 3 x 120GB HD, RAM 512MB , CD-WR, 15" TFT Monitor 10/100/1000 Mb LAN. Win NT 2000 Server	1	2.000	2.000
www.dell.com	**Dell**	Dimension 4600	Computer for audio editing P4 with 80GB HD RAM 512MB, CD-WR, Low noise PSU, 17" TFT Monitor. Win 2000/XP/ME	8	1.070	8.560
www.creamware.com	**Creamware**	CLAN	Creamware CLAN Regional Radio Station Software	1		0
www.audiovault.com	**BE**		Vault Express, Regional Radio Station	1	4.500	4.500
www.3com.com	**3COM**		Cabling network and ports	1	150	150
www.minolta.com	**Minolta**		Printer Laser	1	400	400
www.behringer.com	**Behringer**	Creative	Loudspeakers for workstations Creative, Behringer Headphones	5	40	200
www.minolta.com	**Minolta**		Flatbed scanner	1	400	400
www.apc.com	**APC**	CS 350	UPS 350 VA	10	100	1.000
			Computers and software Total USD			**17.210**
			FIELD PRODUCERS Reporter Kit, 8 Units			
www.matantz.com	**Marantz**	PMD 670PKG	Portable Flash Rec. w. bag, Headphones and Mic	8	699	5.592
www.shure.com	**Shure**	VP 64A	Microphones Dynamic Omni-directional	8	75	600
www.behringer.com	**Behringer**	HPM 1000	Headphone	8	15	120
www.portabrace.com	**Porta Brace**		Bag for recorder	8	423	3.384
			Total Field Producers Reporter Kits USD			**5.592**

			Outside Broadcasting (OB) Mobile Unit			
www.altoproaudio.com	**Mackie**	DFX 12	6 mono mic, 4 stereo	1	265	265
www.shure.com	**Shure**	BG 6.1	Microphones Shure BG 6.1	6	100	600
www.shure.com	**Shure**	UT2458	Shure wireless SM 58 system	1	400	400
www.dell.com	**Dell**	Inspiron 5100	Laptop, P4 with 40GB HD RAM 512MB, CD-WR, Win XP	1	1.250	1.250
www.maxtor.com	**Maxtor**	Firewire HD	200 GB + Firewire box	1	259	259
www.denon.com	**Denon**	DRA F100	Denon Receiver / amp. DRA F100	1	200	200
www.jbl.com	**JBL**	CONTROL 1	Control Monitor JBL Control 1	2	150	300
www.proelgroup.com	**Proel**		Custom built flight case for mixer equipment, all wired	1	1.000	1.000
www.proelgroup.com	**Proel**	MC 1	Multicable 30m with stagebox, 6 Mic floor stands w. boom.	1	400	400
www.skb.com	**SKB**	FC 1	Flight case 19" rack for computer and monitor	1	0	0
www.skb.com	**SKB**	FC 2	Flight case for Mixer, Receiver, Wireless mics, Speakers	1	0	0
www.proelgroup.com	**Proel**	FC 3	Flight case for Mics, stands and cables	1	0	0
www.proelgroup.com	**Proel**	C1	30 m 220 volt cable	1	0	0
www.apc.com	**APC**	CS 350	UPS 500 VA	1	150	150
			Total studio equipment			**4.824**
			OB FM Link Transmitter System			
www.rvr.it	**RVR**		RVR Link FM Stereo Transmitter 25 Watts with Antenna	1	4.000	4.000
www.clarkmasts.com	**Clark**	CLARK 12	12 metre pump-up mast Clark self supported	1	3.500	3.500
www.clarkmasts.com	**Clark**	Tripod	Tripod fold out base fro12 metre pump-up mast Clark	1	2.300	2.300
www.skb.com	**SKB**	Roll X	Flight case for FM Transmitter	1	120	120
www.proelgroup.com	**Proel**	FC 5	Custom built Flightcase for Antenna and cable	1	500	500
www.proelgroup.com	**Proel**	FC 5	Custom built Flightcase for Pump -up mast	1	500	500
www.proelgroup.com	**Proel**	FC 5	Custom built Flightcase for Tripod	1	500	500
			Total Transmitting equipment			**11.420**
			OB FM Link Receiving Unit at Radio Station			
www.rvr.it	**RVR**		RVR FM Stereo Link Receiver	1	4.000	4.000
www.apc.com	**APC**	CS 350	UPS 350 VA	1	100	100
_			**Total Link Receiving**			**4.100**
			Studio link to Transmitter			
www.rvr.it	**RVR**		Link from studio to transmitter, stereo generator incl.	1	8.000	**8.000**

			2.000 watts Stereo FM Transmitter, 10.000 Watts ERP			
www.rvr.it	**RVR**		RVR FM Stereo Transmitter 2000 Watts	1	17.500	17.500
www.rvr.it	**RVR**		Antenna 8-bay Dipol system	1	5.100	5.100
www.rvr.it	**RVR**		Including 150 m. 7/8 Cellflex cable and connectors	150	3.600	1.200
www.apc.com	**APC**	SU5000RMI5U	UPS 5000 VA 5U Rackmount	1	2.750	2.750
			Total Transmitter			**26.550**
TOTAL REGIONAL RADIO STATION						**98.488**

		REGIONAL MEDIA CENTRE TV EXTENSION				
			DVCAM TV ENG Unit			
www.sony.com	**Sony**	DVCAM	DSR-PD170P DVCAM Camcorder	1	3.389	3.389
www.libec.com	**Libec**	TH650	Libec Tripod	1	180	180
	Spinet	SKC-70WM	7" TFT Monitor, 12 volts	1	323	323
www.samson.com	**Samson**	Micro 32	Wireless mic system combo. Lavalier, handheld	1	460	460
www.portabrace.com	**Porta Brace**		Camera bag	1	240	240
www.antonbauer.com	**Anton Bauer**	UL2-20	Camera lights	1	159	159
			Total ENG Unit			**4.751**
			Post Production Editing Unit			
www.pinnaclesys.com	**Pinnacle**	Video edit	Liquid Edition Pro, Video Card and software	1	999	999
www.hp.com	**HP**	PC	XW 6000, Dual 2,8 GHz P4 Xeon , Audigy, Dual 17" TFT	1	3.760	3.760
www.maxtor.com	**Maxtor**	Firewire HD+HD	2 x 200 GB + Firewire box	1	410	410
www.rodemic.com	**Roede**	NT 1	Rode Condenser Studio	1	180	180
www.k-m.de	**Konig Meyer**		Mic stand	1	50	50
www.behringer.com	**Behringer**	HPM 1000	Headphone	2	17	34
www.behringer.com	**Behringer**	UB 802	Audio Mixer 2 mics 4 line, Portable	1	50	50
www.behringer.com	**Behringer**	B 2031	Studio and Control Room Monitors, Truth B 2031 (PAIR)	1	400	400
www.sony.com	**Sony**	SSM-14N5E	14" Colour Video Monitor	1	584	584
www.sony.com	**Sony**	DSR-11	DV and DVCAM studio recorder/player/PAL/NTSC	1	1.760	1.760
www.apc.com	**APC**	CS 350	UPS 350 VA	1	100	100
			Total TV Post Production Editing Unit			**8.327**
TOTAL ENG AND TV POSTPRODUCTION EDITING UNIT						**13.078**

EXAMPLES OF TV/VIDEO EDITING SYSTEMS				
Apple Final Cut Express				USD
www.apple.com	**Apple**	Video edit	Final Cut Express 2, Software	299
www.apple.com	**Apple**	Laptop PC	Power Book	1.700
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
		Total		**2.409**
Apple Final Cut Pro				
www.apple.com	**Apple**	Video edit	Final Cut Pro 4, Software	999
www.apple.com	**Apple**	PC	Power Mac dual G5	2.999
www.lge.com	**LG Electronics**	L1715S	17" TFT Monitor x 2 (Attack time: 16 ms.)	930
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
www.canopus.com	**Canopus**		Firewire D/A breakout box	490
		Total		**5.828**
Matrox RT.X10 System				
www.matrox.com	**Matrox**	Video edit	RT .X10, Video Card and software	699
www.dell.com	**Dell**	8300	Dimension 8300, P4 2,8 GHz	1.500
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
		Total		**2.609**
RT .X100 Xtreme Pro System				
www.matrox.com	**Matrox**	Video edit	RT .X100 Xtreme Pro, Video Card, Adobe Premiere software	899
www.dell.com	**Dell**	8300	Dimension 8300, P4 2,8 GHz	1.500
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
		Total		**2.809**

Pinnacle DeLuxe System				USD
www.pinnaclesys.com	**Pinnacle**	Video edit	Studio AV/DV DeLuxe, Software, PCI card, breakout box	376
www.dell.com	**Dell**	PWS 360	2,8 GHz P4. 2 x 17"TFT Monitor DVD RW. Audigy	2.800
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
_		**Total**		**3.586**
Pinnacle Liquid Edition Pro System				
www.pinnaclesys.com	**Pinnacle**	Video edit	Liquid Edition Pro, Video Card and softwrae	999
www.hp.com	**HP**	PC	XW 6000, Dual 2,8 GHz P4 Xeon , Audigy, Dual 17" TFT	3.760
www.maxtor.com	**Maxtor**	Firewire HD + HD	2 x 200 GB + Firewire box	410
		Total		**5.169**
Editing software only				
www.adobe.com	**Adobe**	Video edit	Adobe Video Collection, Premiere, Aftereffect, Cool Edit Pro	799
www.canopus.com	**Canopus**	Video edit	DV Storm 2 SE Bundle	999
www.ulead.com	**Ulead**	Video edit	Ulead Video Studio	99
www.ulead.com	**Ulead**	Video edit	Ulead Media Studio Pro	495
www.ulead.com	**Ulead**	Video edit	Ulead Studio Quartet	895
www.sony.com	**Sony**	Video edit	Sony Vegas 4.0	560
www.sony.com	**Sony**	Video edit	Sony Vegas 4.0 + DVD	800

Digital Video Cameras				USD
www.sony.com	**Sony**	miniDV	DCR-TRV 950 miniDV	1.795
www.sony.com	**Sony**	miniDV	DCR-HC85	?
www.sony.com	**Sony**	miniDV	DCR-VX2100	2.999
www.sony.com	**Sony**	DVCAM	DSR-PDX10P DVCAM Camcorder PAL	2.263
www.sony.com	**Sony**	DVCAM	DSR-PD170P DVCAM Camcorder	3.389
www.sony.com	**Sony**	DVCAM	DSR-250P DVCAN Camcorder	4.584
www.sony.com	**Sony**	DVCAM	DSR-390PL DVCAM Camcorder PAL	7.137
www.panasonic.co.jp	**Panasonic**	DV	AG-DVC7 DV Camcorder	950
www.panasonic.co.jp	**Panasonic**	DV	AG-DVC200E DV Camcorder PAL	3.340
www.panasonic.co.jp	**Panasonic**	DV	AG-DVC30E DV Camcorder PAL	?
www.panasonic.co.jp	**Panasonic**	DV	AG-DVX100AE miniDV Camcorder PAL	3.860
www.panasonic.co.jp	**Panasonic**	DV	AG-DVX100E miniDV Camcorder PAL	3.127
www.panasonic.co.jp	**Panasonic**	DV	NV-MD9000EN miniDV Camcorder PAL	1.158
www.panasonic.co.jp	**Panasonic**	DVCPRO	AJ-D410AE DVCPRO Camcorder PAL	4.683
www.canon.com	**Canon**	DV	XL-1s miniDV Camcorder	3.100
www.canon.com	**Canon**	DV	XM2 miniDV Camcorder	2.095
www.jvc.com	**JVC**		GY-DV 300U	2.199
www.jvc.com	**JVC**	DV	GY-DV 300E Professional Camcorder PAL	2.904
www.jvc.com	**JVC**	DV	GY-DV 301E Professional Camcorder PAL	3.111
www.jvc.com	**JVC**	DV	GY-DV 5000PKGE Professional Camcorder PAL	6.024
www.jvc.com	**JVC**	DV	GY-DV 5001E Professional Camcorder PAL	6.024
www.jvc.com	**JVC**	DV	GY-DV 5001PKGE Professional Camcorder PAL	6.534
www.jvc.com	**JVC**	DV	GY-DV 550E Professional Camcorder PAL	6.745
www.jvc.com	**JVC**	DV	JY-HD 10 HD World's first low-cost HD Camcorder	3.405
www.jvc.com	**JVC**	DV	GR-HD1 HD Camcorder	2.395

Camera Light and Lighting Kits				
www.walkart.net	**Swit**	SC 200	A For Panasonic DVCPro, B Sony DVCAM	199
www.walkart.net	**Swit**	S 712	Light kit in box, 2 focus light, battery and charger	540
www.cool-lux.com	**Cool Lux**			
www.frezzi.com	**Frezzolini**		Camera lights	from 160
www.Lowel.com	**Lowel**			100
www.smithvictor.com	**Smith Victor**			50
www.bescor.com	**Bescor**			15
www.antonbauer.com	**Anton Bauer**			160
Tripods for Video Cameras				
www.schactler.com	**Schactler**		0220 System DV 2 II Tripod	799
www.vinten.com	**Vinten**		VIN-3AP1 VISION 3 SYSTEM	1.338
www.libec.co.jp	**Libec**		TH-650 Light Tripod, Camera weight up to 5kg.	180
www.manfrotto.com	**Manfrotto**		Bogen/Manfrotto at least 50 types	150-900
www.sony.com	**Sony**		VCT-870RM Remote control in handle	135
www.slik.com	**Slik**		504QF II	119
www.slik.com	**Slik**		SDV-30 Medium Travell	27
www.velbon.com	**Velbon**		601 With PH 458 Fluid head	65
www.velbon.com	**Velbon**		738 Pro	190
TV Monitors				
www.sony.com	**Sony**		PVM 14L1 13" Colour Video Monitor	450
www.sony.com	**Sony**		SSM-14N5E Colour Video Monitor	584
www.jvc.com	**JVC**		JVC TM-A13SU 13" Colour monitor	199
www.jvc.com	**JVC**		JVC TM-H1700 GU 17" Colour Monitor	650
www.panasonic.co.jp	**Panasonic**		CT 1388YD 13" Video Colour Reference Monitor	199
www.panasonic.co.jp	**Panasonic**		CT 2088YD 20" Video Colour Reference Monitor	290
Video Recorders, VTR`s				
www.sony.com	**Sony**	DV,DVCAM	DSR-11 Recorder	1.760
www.jvc.com	**JVC**	DV, miniDV,DVCAM	BR-DV3000E Professional DV Editing VTR, PAL	1.734
www.panasonic.co.jp	**Panasonic**	DV, miniDV,DVCAM	AG-DVC2500E DV Professional DV VTR PAL/NTSC	1.899

List of Radio Station Products and Manufacturers				
www	**Brand**			**From USD**
Mixing Consoles				
www.altoproaudio.com	**Alto**		Standard Allround	100
www.behringer.com	**Behringer**		Standard Allround	100
www.alesis.com	**Alesis**		Standard Allround	
www.mackie.com	**Mackie**		Standard Allround	150
www.behringer.com	**Soundcraft**		Professional On Air - and production Radio	450
www.aeq.es	**AEQ**		Professional On Air - and production Radio	3.500
www.alice.uk	**Alice**		Professional On Air - and production Radio	10.000
www.d-r.nl	**D&R**		Professional On Air - and production Radio	
www.sonifex.com	**Sonifex**		Professional On Air - and production Radio	7.000
www.audioarts.com	**Audioarts**		Professional On Air - and production Radio	
www.autogram.com	**Autogram**		Professional On Air - and production Radio	
www.arrakis.com	**Arrakis**		Professional On Air - and production Radio	
www.seemaudio.com	**Seem**		Professional On Air - and production Radio	9.000
www.studer.ch	**Studer**		Professional On Air - and production Radio	20.000
www.yamaha.com	**Yamaha**		Standard all round, Production with PC Mutitrack control	200
www.fostex.com	**Fostex**		Production mixer and 4-8 Track digital rec.	
www.tascam.com	**Tascam**		Standard all round, Production with PC Mutitrack control	
www.roland.com	**Roland**		Production mixer and 4-8 Track digital rec.	
www.axeldigital.com	**Axel Tech**		Mixer semi and Pro	
www.aev.net	**AEV**		Professional On Air - and production Radio	
Monitor Loudspeakers				
www.behringer.com	**Behringer**		Studio, OB, PC	299(pair)
www.jbl.com	**JBL**		Studio, OB, PC	299
www.fostex.com	**Fostex**		Studio, OB, PC	149
www.yamaha.com	**Yamaha**		Studio, OB, PC	229
www.mackie.com	**Mackie**		Studio, OB, PC	349
www.creative.com	**Creative**		PC	15
www.tannoy.com	**Tannoy**		Studio,OB, PC	370
www.genelec.com	**Genelec**		Studio,OB, PC	

PA Systems				
www.califone.com	**Califone**		30 watt. Highly mobile very small "one box" reach 500	150
www.bswusa.com	**Mackie**		Mixer, speakers, 1200 watts, 4 mics,stands, cables	2.200
www.fender.com	**Fender**		Portable sound systems 12 volt	170
www.fender.com	**Fender**		12 volt battery pack	
www.proelproaudio.com	**Proel**		PA Live	
www.fbt.com	**FBT**		PA Live	
www.bswusa.com	**JBL**		JBL speakers, Soundcraft mixer, AKG Mics	
Telephone Hybrids				
www.d-r.nl.	**D&R**		Passive analogue and digital	250
www.telos.com	**Telos**		analogue and digital	260
www.sonifex.com	**Sonifex**		analogue and digital	
www.jk-audio.com	**JK Audio**		digital	
Microphones				
www.akg.com	**AKG**		All types	
www.shure.com	**Shure Inc.**		Dynamic, Electret condenser	
www.rode.com	**Rode**		Condenser Large diaphragm	220
www.behringer.com	**Behringer**		Condenser, Dynamic	
www.audiotechnica.com	**Audio Technica**		All types	
www.sennheiser.com	**Sennheiser**		All types	
www.electrovoice.com	**Electrovoice**		Dynamic, Electret condenser	
www.sony.com	**Sony**		Dynamic, Electret condenser	30
www.beyer.com	**Beyer**		Dynamic, Electret condenser	
Headphones				
www.akg.com	**AKG**			
www.sennheiser.com	**Sennheiser**			
www.denon.com	**Denon**			
www.sony.com	**Sony**			
www.behringer.com	**Behringer**			
www.koss.com	**Koss**			
www.beyer.com	**Beyer Dynamics**			
www.shure.com	**Shure**			

Processors, Compressors and Limiters				
www.behringer.com	**Behringer**			
www.tcelectronics.com	**TC Electronics**			
www.altoproaudio.com	**Alto Pro Audio**			125
www.innovonics.com	**Innovonics**			
www.ramseykits.com	**Ramsey**			
www.verinica.co.uk	**Veronica**			
www.orban.com	**Orban**			
Computers				
www.apple.com	**Apple Computers**		Mcintosh based OP system	
www.dell.com	**Dell Corp.**		Win based op system	
www.hp.com	**Hewlet Packart**		Win based op system	
www.compaq.com	**Compaq Corp.**		Win based op system	
www.creative.com	**Creative**		Win based op system	
www.ibm.com	**IBM**		Win based op system, servers LINUX	
www.asus.com	**Asus Tech**		Win based op system	
www.msi.com	**MSI**		Win based op system	
DVD,CD, MD, DAT, Cassette tape Players / Recorders				
www.united.com	**United**		DVD player plays all CD formats MP3	75
www.sony.com	**Sony**		CD, Minidisc, Dat, Casette	check
www.denon.com	**Denon**		CD, Minidisc, Dat, Casette	check
www.tascam.com	**Tascam**		CD, Minidisc, Dat, Casette	check
www.panasonic.co.jp	**Panasonic**		CD, DAT	check
www.fostex.com	**Fostex**		CD, Minidisc, Dat, Casette	check
www.superscope.com	**Superscope**		CD, Casette	check
Reel to reel 1/4" tape recorders				
www.studer.ch	**Studer**			
www.revox.com	**Revox**			
www.akai.com	**Akai**			
www.tascam.com	**Tascam**			3.000
Turntables				
www.stanton.com	**Stanton**		Analogue w.stylus	150
www.denon.com	**Denon**		Analogue and Digital output, with stylus	350
www.technics.com	**Technics**		Analogue w.stylus, instant start	570

Digital Portable Field Recorders				
www.maycom.com	**Maycom**		FlashDisc	
www.denon.com	**Denon**		FlashDisc	
www.marantz.com	**Marantz**		FlashDisc	
www.hhb.co.uk	**HHB**		DAT, Minidisc	
www.fostex.com	**Fostex**		muiltitrack	
www.sony.com	**Sony**		Minidisc	250
www.sharp.com	**Sharp**		Minidisc	200
www.sonifex.com	**Sonifex**		PCM CIR HD	
Operating systems and basic PC				
www.microsoft.com	**Microsoft**	Basic	win 2000, XP,ME, NT, 2000 Server, Office.	150
www.linux.com	**LINUX**	Basic	Operating system, Red Hat	
Radio and sound edit software				
www.winamp.com	**Winamp**	Sound play	Play back sound files and Play list.	Free
www.radiohost.com	**Radiohost**	Onair etc.	Automatic and live	
www.jazler.com	**Jazler**	Onair etc.	Automatic and live	
www.audioenhancedps.co.uk	**Audioenhance**	Onair etc.	Automatic and live, Non commercial special price	
www.audiovault.com	**Broadcast Electronics**	Onair etc.	Audio Vault,Vault Express	
www.arrrakis.com	**Arrakis**	Onair etc.	Some down loads are free	
www.creamware.com	**Creamware**	Onair etc.	CLAN, Developed for regional Radio stations, Live	
www.bsiusa.com	**Broadcast Software Intnl.**	Onair etc.	Professional, Training by phone is provided.	1.499
www.aeq.es	**AEQ**	Onair etc.	MAR4Win, Professional, Training at AEQ essential	
www.studer.ch	**Studer**	Onair etc.	Professional linked to Studer hardware	
www.dalet.com	**Dalet**	Onair etc.	Professional for Reginal and National Broadcasters	
www.synthrillum.com	**Synthrillum**	Sound Edit	CoolEdit, Worlds most popular	70
www.steinberg.com	**Steinberg**	Mutitrack rec	Cubase, Nuendo, Semi and Professeional	450
www.digidesign.com	**Digi Design**	Mutitrack rec	Pro Tools, Professional	
www.adobe.com	**Adobe**	Soundedit	Audition	

Soundcards				
www.soundblaster.com	**Creative**		Soundblaster LIVE, Audigy 1, 2, Extigy.	
www.terratec.com	**Terratec**			
www.creamware.com	**Creamware**		LUNA,	
www.steinberg.com	**Steinberg**		VSL 2020	
www.rme.com	**RME**		HDSP Series	
www.digigram.com	**Digigram**			
www.yamaha.com	**Yamaha**			
XLR Plugs, cables and patch bays				
www.proelproaudio.com	**Proel**			
www.neutrik.com	**Neutrik**			
www.switchcraft.com	**Switchcraft**			
www.delron.com	**Delron**			
Microphone stands				
www.proelproaudio.com	**Proel**			
www.k-m.de	**Konig Meyer**			
FM Transmitters				
www.ramseykits.com	**Ramsey Kits**		Low Power and building kits, low cost.	
www.itelcast.com	**Itel**		All types, low to medium cost Transmitters and links.	
www.dbbroadcast.com	**DB Elettronica**		All types, low to medium cost Transmitters and links.	
www.rvr.com	**RVR**		All types, low to medium cost Transmitters and links.	
www.crowmbroadcast.com	**Crown Broadcast**		Low - medium power. Plug and Play Transmitters	
www.telefunken.com	**Telefunken**		All powers, Analogue and Digital, Expensive, High Pro.	
www.schaublorentz.com	**Schaub Lorentz**		Measuring, Digital.	
www.martielectronics.com	**Marti**		Plug and Play Transmitters. STL Link systems	
www.broadcastelectronics.com	**BE**		Heavy duty medium and High power Transmitters.	
www.bext.com	**Bext Corp.**		All types, low to medium cost Transmitters and links.	
www.rohdeschwartz.com	**Rohde Scharwtz**		All powers, Analogue and Digital, Expensive, High Pro.	
www.veronica.co.uk	**Veronica Co.**		Low power, Low cost.	
www.pcs-electronics.com	**PCS Electronics**		FM PCI card	
www.sbs.co.uk	**SBS**		Medium cost transmitters	
www.harris.com	**Harris Corp.**		High End transmitters	

FM Transmitting Antennas				
www.ramseykits.com	**Ramsey Kits**		Building instructions for "do it yourself people"	
www.aldena.com	**Aldena**		Low to medium power, medium cost	
www.itelcast.com	**Itel**		Low to medium power, medium cost	
www.armstrong.com	**Armstrong**		Low to High Power.	
www.dbbroadcast.com	**DB Elettronica**		Low to medium power, medium cost	
www.vhfteknik.se	**VHF Teknik**		Low to medium power, medium cost	
www.andrew.com	**Andrew Corporation**		Low to High Power.	
www.radiostructures.co.uk	**Radio Structures Ltd.**		Various low power	
Masts and towers				
www.clarkmasts.com	**Clark Masts Teksam Ltd.**		Pump up masts for mobile use	
www.racal-antennas.com	**Racal Antennas**		Pump-up	
www.radiostructures.co.uk	**Radio Structures Ltd.**		Different wind- and pump-up masts	
Satellite Receivers				
www.worldspace.com	**WorldSpace**		Digital reception of music and new etc. From satellite	
Cases and furniture				
www.proelproaudio.com				
www.skbcases.com			Airtight Waterproof. Pick out foam ABS, stainless steel	
www.portabrace.com			World leading designer of blue nylon cases	
World wide Radio Station Equipment				
www.canford.uk	**Canford Audio**		Equipment and parts	
www.bswusa.com	**Broadcasters Supply Worldwide**		Equipment and parts	
www.richardson.com	**Richardsson Corp.**		Equipment and parts	
www.harris.com	**Harris**		Turn key Installations	
www.broadcastwarehouse.com			Equipment and parts	
www.danmon.dk	**Danmon**		Turn key Installations	
Links to other relevant sites				
www.bbctraining.com			Training and free on-line training courses DV, CoolEdit etc	
www.danicom.net			Media Development and training	
www.tomshardware.com			PC testing and much more, world leading	
www.prostudio.com			World Portal and site of all types of equipment magazines	
www.computervideo.net			Magazine reviews of Cameras, editing software etc.	
www.globalmediapro.com			Purchase equipment	
www.bhphotovideo.com			Homepage in everything, links to all relevant audio and video websites	