Certificate in Community Radio Technology

Studio Operations

6

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Module: 6
Studio Operations

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Certificate in Community Radio Technology

Courses	Modules	Units
Course I: Understanding Community Radio (3 Credits, 90 Hours)	**Module 1** Community Radio: An Introduction	**Unit 1 :** Community Radio: Concept and Evolution **Unit 2:** Context, Access and Equity **Unit 3:** Community Radio: Policy Guidelines **Unit 4:** Technology for CR: Guiding Principles
	Module 2 Setting up of CRS	**Unit 5:** Components of CR Station **Unit 6:** Radio Waves and Spectrum **Unit 7:** Basics of Electricity **Unit 8:** Power Backup and Voltage Stabilization
Course II: Community Radio Production: System & Technology (5 Credits,150 Hours)	**Module 3** Studio Technology	**Unit 9:** Basics of Sound **Unit 10:** Analog and Digital Audio **Unit 11:** Components of the Audio Chain **Unit 12:** Studio Acoustics
	Module 4 Audio Production	**Unit 13:** Audio Hardware and Field Recording **Unit 14:** Free and Open Source Software **Unit 15:** Telephony for Radio
	Module 5 Audio Post Production	**Unit 16:** Sound Recording and Editing **Unit 17:** Mixing and Mastering **Unit 18:** File Formats and Compression **Unit 19:** Storing and Retrieval
	Module 6 Studio Operations	**Unit 20:** Good Engineering Practices for Studio Setup **Unit 21:** Studio Equipment: Preventive & Corrective Maintenance **Unit 22:** Content Distribution: Alternative Mechanisms
Course III: Community Radio Transmission: System & Technology (2 Credits, 60 Hrs)	**Module 7** Radio Transmission Technology	**Unit 23:** Components of Transmission Chain **Unit 24:** Components of FM Transmitter **Unit 25:** Antenna and Coaxial Cable **Unit 26:** Propagation and Coverage
	Module 8 FM Transmitter Setup	**Unit 27:** Transmitter Setup: Step-by-step **Unit 28:** Transmission System–Preventive and Corrective Maintenance **Unit 29:** Transmission Setup–Good Engineering Practices
Course IV: Technical Internship (2 Credits, 60 Hrs)	**Module 9** Practical Internship Handbook	**Section A:** Introduction **Section B:** Activities to be Conducted During the Practical Internship **Section C:** The Internship Journal and Self-Assessment Paper **Section D:** Assessment of Internship **Section E:** Appendices

Video in the Module:

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About the Module

Module Description

Module 6 on studio operations is the last module of Course II: CR Production System and Technology. Module 6 deals with practical aspects of studio installation, operations and maintenance and content distribution using alternative mechanisms. After studying modules 3, 4 and 5 covering studio technology, production and post-production, it is important to learn the practical aspects of the studio operations. This module covers good engineering practices to be followed in installation and operation of the studios, preventive and corrective maintenance aspects to ensure that studio equipment give trouble-free service. This module also covers the study of alternative mechanisms for content distribution. It involves 37 hours of learning and has assignment and video to help your learning. It has three units. With this you will complete studying Course II and will be ready to take up Course III on Transmission System and Technology.

Module Objectives

After completion of the module, the learner should be able to:

- Demonstrate proper techniques of wiring, fixing of connectors, soldering and use of tools and equipment for studio work.
- Carry out preventive and corrective maintenance of studio and equipment installed therein.
- Describe different methods of content sharing using alternative platforms.

Units in the Module

- Unit 20 : Good Engineering Practices for Studio Setup
- Unit 21 : Studio Equipment: Preventive and Corrective Maintenance
- Unit 22 :Content Distribution: Alternative Mechanisms

UNIT 20

Good Engineering Practices for Studio Setup

Structure

20.1 Introduction

In Unit 11, you learnt about the working and use of the components of an audio chain, starting from microphones to programme production equipment such as audio mixers and digital work stations. However, in order to get the best performance from these equipment, it is necessary to follow certain good engineering practices during the installation stage itself. "**Good engineering practice**" is a term applied to all the activities related to the quality setup of a studio project. It means that each activity must be completed with perfection and precision. It is a skill which comes with practice. In this unit, you will learn about the good engineering practices involved in the installation, wiring, fixing of connectors, use of tools and equipment, and day-to-day operations in a community radio station especially with reference to studio equipment. In Unit 29, you will learn about the good engineering practices in respect of transmitter, RF cable and antenna system. In this unit, we shall focus on the application of good engineering practices in respect of the following topics:

- Tools and equipment
- Techniques of handling various tools
- Types of connectors
- Types of audio cables

In the video on "Working with Tools", you will get a chance to see the demonstration on the techniques of use of various tools for wiring, soldering, stripping and crimping. It will show various types of audio connectors along with the process and precautions required while fixing of these connectors. The video will also demonstrate the use of test and measuring equipment for checking the performance of the studio equipment. This will definitely help you in understanding the use of a right tool for a specific job.

The glossary at the end of the module shall be helpful in understanding the content of this unit.

You may need about 8 hours to complete this unit including answering the questions given in the Activities.

Key words: Audio/Line cable, Mic cable, RF cable, Connectors, Soldering, Tools

20.2 Learning Outcomes

After going through this unit, you will be able to:

- list, identify and describe various types of cables and their usage.
- list, identify and describe various types of connectors and their usage.

- describe the techniques of using soldering, stripping and crimping tools for wiring and interconnecting of cables in a studio setup.
- describe the process and precautions to be observed while fixing the cable end connectors.
- describe the use of various test and measuring equipment for checking the performance measurements of the studio equipment.

Let us begin with tools and equipment.

20.3 Tools and Equipment

For installation and testing of a CRS, it is essential to follow certain engineering practices in respect of wiring and fixing of connectors. Proper use of tools and equipment helps in achieving quality results. In this section, you are going to study about the list of various tools and equipment required at a community radio station along with the purpose and function of each item. Table 20.1 gives a list of the tools and equipment commonly used at a CRS.

Table 20.1: List of Tools and Equipment along with Field of Application

Sl. No.	Tools and Equipment (including test and measurements)	Field of Application/Use
1	Soldering irons of 40W and 100W with tips of various sizes	For soldering pins of audio cables and connectors.
2	Temperature controlled soldering station with accessories	For soldering joints on printed circuit boards etc. where controlling of temperature is important.
3	Set of screw drivers of assorted sizes	For opening the covers of equipment, accessories and connectors etc.
.4	Set of watchmaker's screw drivers	For opening and tightening of mounting screws of PCBs, miniature connectors etc.
5	Spanner set	For opening and tightening of nuts and bolts.
6	Hand drill with assorted sizes of drill bits	For drilling holes on PCBs and mounting plates.
7	Crimping tools	For fixing the lugs and connectors requiring pressure fitting.
8	Set of pliers (long nose, wire stripper, cutter etc.)	For cutting cables, stripping of cable insulations and fixing of connectors.

9	Multi meter (digital)	For checking voltages, currents and resistances of circuits.
10	Continuity tester	For checking continuity of wires and cables.
11	Phase tester	For checking the availability of phase voltage.
12	Light duty blower/ suction	For removing the dust from racks and cubicles
13	Light duty vacuum cleaner	For cleaning the delicate units such as PCBs.
14	Earth tester	For measurement of Earth resistance.
15	Megger (insulation tester)	For checking the insulation resistance between the live and earth wires.
16	Tong tester (Clip-on-meter)	For measuring the currents flowing through phase wires.
17	Sound level meter	For acoustic measurements of studios.
18	Audio Generator	For feeding audio frequencies at the required frequencies and levels to Equipment while doing the measurements.
19	Audio Analyser	For checking the performance measurements of audio equipment such as frequency response, distortion and signal-to-noise ratio.
20	Cathode Ray Oscilloscope	For studying and analysing the waveforms during repairs and trouble shooting.

In Table 20.1, you can see the function of each tool and equipment and their requirement for the installation of a studio set up in a CRS. The video on “Working with Tools” showing the use of these tools and equipment will make the concepts more clear. Good engineering practices here mean using these items with precision and perfection. However, you will be able to develop the necessary skills only by practice. Before going into the details, you should watch the video, which is available at http://tinyurl.com/nr5rtpc .

Activity 20.1

While viewing the video, you should note and identify the tools and equipment (including the test and measurements) along with their use. Write

down your observations on list of tools and their use as shown in the video and others described in the text of Section 20.3 above in about 100 words in the space provided. To do this activity, you may need about 15 to 20 minutes. This activity will help you appreciate in identification of various types of tools and equipment. This activity may also help you in understanding the necessity of proper tools for different types of applications.

Having learnt the identification and field of use of various tools, we will now proceed to discuss the techniques required while using these tools in the following section.

20.4 Techniques of Handling Various Tools

In this section and the subsections that follow, you will learn about the techniques of handling various tools required for soldering, stripping, crimping and fixing of connectors.

20.4.1 Soldering tools

In this subsection, you will learn about the various types of soldering tools, accessories and techniques required for making a good solder joint. There is a huge range of solder joints to be made in an installation starting from fixing of tiny chip resistors on circuit boards to large size VHF connectors. A large variety of soldering irons, tips and solder wire (metal) are available in the market. You have to choose a right tool for each specific job. In this section, we will focus our discussion on soldering and fixing of connectors on audio cables and soldering joints especially applicable only to CRS setups.

Figure 20.1 shows tools and accessories required for soldering.

Figure 20.1(A): *Soldering station*

Figure 20.1(B): *Soldering tools*

As can be seen in Figure 20.1(A), the list of tools consists of a soldering iron, solder wire, a side-cutter and a few soldering tips of different sizes. Different soldering jobs will need different tools and different temperatures too. For example, for replacing a resistor on a printed circuit board, you will need a fine tip, a lower temperature and finer grade solder. You may also require a magnifying glass to see the fine tracks on the PCB. On the other hand, for fixing an XLR connector, you will require a larger tip, higher temperature and thicker solder. Use of clamps and holders are also handy when you are soldering audio cables. Figure 20.1 (B) shows a temperature controlled soldering station with which you can do good soldering jobs at the required temperature such as on printed circuit boards.

While choosing a soldering iron for a particular application, you may have to consider the following important points:

- Wattage of a soldering iron.
- Adjustable or fixed temperature control settings on a soldering station.
- Portable or bench use type of soldering iron.
- Size of the soldering tip.

Soldering Accessories

In the process of soldering, you may require a large number of accessories which are helpful in doing professional jobs. Some of these accessories with their functions in described brief are below:

(i) Solder

It is the soldering metal which is used for making solder-joints. The most commonly used type of solder is rosin core. The rosin is a flux, which cleans as you solder. Rosin core solder comes in three main types – 50/50, 60/40 and 63/37. These numbers represent the percentage of tin and lead present in the solder as shown in Table 20.2.

Table 20.2: Composition of different types of soldering metal

Solder Type	% Tin	% Lead	Melting Temp (°F)
50/50	50	50	425
60/40	60	40	371
63/37	63	37	361

As can be seen in Table 20.2, the type of solder metal to be selected depends on the percentage of tin and lead used in them. Also note the melting temperature shown against each type of solder metal. Higher the percentage of lead in a solder, higher is the melting temperature.

(ii)Soldering Iron Tips

Tips of different sizes are available. Try to use the right sized tip for the specific job.

(iii) Soldering Iron Stand

It is a heat resistant cradle for your iron to sit in, so that you may not have to put it down on the bench while it is hot.

(iv) Magnifying glass

If you are doing work on PCBs (printed circuit boards), you may need to get a magnifying glass. This will help you see the fine tracks on the PCB. Soldering of small chip resistors are pretty difficult without a magnifying glass.

(v) Solder suckers

These are spring loaded devices that suck the melted solder out of the joint. They help in making a smooth and perfect solder joint.

Soldering Techniques

In order to have a perfectly soldered joint, it is necessary to learn soldering techniques. Soldering technique involves the following four steps:

Step 1: Preparation

Whatever you want to solder, it is necessary to make preliminary preparations such as opening the parts of a connector, cleaning the contact surface area with use of proper tools. Select a proper size tip. An oversized solder tip may even spoil the connector. Take necessary precautions to put the sleeves first on to the cable side before soldering so that these can be fitted to the connector after soldering.

Step 2: Stripping

Strip the insulation of the cable wire up to the length required for making the connection by use of a wire stripper or a knife. Be sure to cut the insulation up to the exact length required otherwise, the connections may create problems. The inner conductor may touch the outer while bending or pulling the cables.

Step 3: Tinning

After stripping the wires to a required length, you should ‘tin’ the wires and connector pins before you attempt to solder them. This process of tinning coats or fills the wires or connector-contacts with solder so that you can easily make a quick and smooth solder joint. Be careful not to overheat the wire, otherwise

cable insulation will also start to melt. The larger the copper core, the longer it will take to heat up enough to draw the solder in. Hence, it is advisable to use a higher temperature soldering iron for larger cables. Once you have tinned both parts, you are ready to solder them together.

Step 4: Soldering

Once you have tinned the stripped strands of the conductor, soldering job becomes easy. You simply need to place your soldering iron onto the contact to melt the solder. When the solder in the contact melts, slide the wire into the connector pin. Remove the iron and hold the wire still while the solder solidifies again. You will see the solder 'set' as it goes hard. This should all take around 1-3 seconds.

If it does not go so well, you may find that either the insulation has melted or the extra solder has made the joint thick enough which may not fit in the connector. If this is the case, you should de-solder the joint and start again. See Box 1 for important soldering tips.

Note It

Box1

Soldering Tips

1. Don't move the joint until the solder has cooled.
2. Keep your iron tip clean.
3. Use the proper type of iron and tip size.
4. Clean the contact-surfaces to be soldered thoroughly.
5. Don't overheat the contacts otherwise the cable insulation or the connector will get damaged.
6. Don't use excess solder metal; otherwise, spike or ball will be formed.

20.4.2 Stripping tools

In this subsection, you will learn the techniques of using stripping tools. Stripping means removing the insulation from the end of the cable and exposing the portion of copper core that is to be soldered. You can either use a wire stripper, side cutter, or a knife to do this. There are many types of wire strippers, and most of them work on the same line. Figure 20.2 (A) and Figure 20.2 (B) show the pictures of a wire stripper and a side cutter respectively.

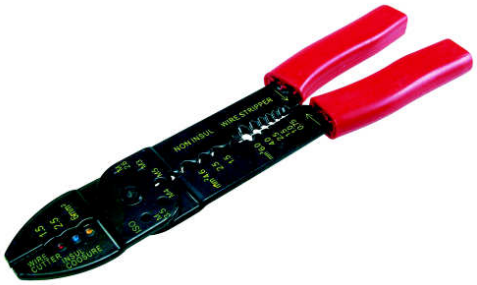

Figure 20.2 (A): *W*ire stripper

Figure 20.2 (B): Side cutter

As seen in Figure 20.2 (A), a wire stripper has got pre-set notches for different sizes of cables. Using a right notch will cut the insulation up to the preset depth only and not the strands of the conductors. Be sure to use a proper size stripper, otherwise, you are likely to cut some of the strands of the cable conductor. On the other hand, some people prefer to use a knife or side cutter as shown in Figure 20.2 (B). If you are using a side cutter, you have to be extra careful to cut only the insulation and not the copper conductor.

20.4.3 Crimping Tools

In some of the cases, we require to fix the lugs/connectors on the wires and cables, which may or may not require soldering. In such cases crimping tools are used. Crimping tools are the tools which are used to fix the lugs or connectors by putting a large pressure or a force on them. With a large force/pressure, the strands of a conductor and the sleeve of a lug are compressed to such an extent that the connection becomes a perfect joint.

For example, in case of larger size aluminium core power cables, use of crimping tools is essential as soldering of such cables is difficult. After stripping the insulation of a conductor, use the exact size of lug which just fits on it.

Use of crimping tool however, needs a caution. The lug size must not be more than the size of a bare conductor. The lug fitted on a cable must sit in the jaws of a crimping tool. The pressure applied by the lever-operated handle should be enough to compress the lug to a required pressure. It should not be too high to crush the lug or connector. For fixing lugs on power cables of higher sizes, usually a large lever-operated or even hydraulic crimping tools are used. However, in case of community radio stations, most of the connectors are fitted by soldered joints or by a light duty crimping tools wherever applicable.

Activity 20.2

To do this activity, you may need about 10 minutes to write down the answers in the space provided. This activity will help you in understanding the techniques of using the right tool for each specific job.

Question 1: Why are soldering guns not recommended for printed circuit boards and audio cables?

Question 2: What is the difference between a normal soldering iron and a temperature controlled soldering station?

Question 3: What does a 60/40 type of solder metal mean?

Question 4: What precaution must be observed while using a wire stripper?

Question 5: State a case where crimping tool is necessary.

Now let us move to the next topic, which is on the various types of connectors used in a CRS.

20.5 Types of Connectors

In the preceding sections of this unit, you learnt about the various tools and techniques used for fixing these connectors on cables. In this section and the subsections that follow, you will learn the following types of connectors that are used in a CRS setup:

- Audio connectors
- RF connectors

Let us discuss these connector types one by one.

20.5.1 Audio Connectors

A large variety of audio connectors are available in the market. Of these, the following 3 types of audio connectors are commonly used with audio equipment:

1. XLR connectors

XLR connectors are the most commonly used industry standard connectors. They are also called cannon conductors. The connectors are circular in design and available in 3 to 7-pin types. However, 3-pin XLR connectors are mostly used for feeding balanced mono or unbalanced stereo signals. Even the majority of professional microphones use the XLR connector.

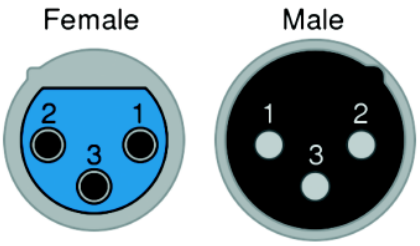

Figure 20.3 (A): *3-Pin* XLR cable connectors

Figure20.3 (B): *3- Pin XLR chassis connectors*

As shown in Figure 20.3 (A) and (B), XLR connectors are available in male and female versions in both cable and chassis mounting designs, comprising a total of four styles. A special feature with XLR type of connector is that the ground connection is established before the signal lines are connected. The pin details of a 3-pin XLR connector are given below:

- Pin 1 is the earth (or shield)
- Pin 2 is the +ve (or 'hot')
- Pin 3 is the -ve (or 'cold)

These pin details are necessary while fixing the connector on an audio cable. Shield is used to connect Pin 1 to the earth wire, whereas red wire is connected to Pin 2 and white /black wire to Pin 1.

2. RCA connectors

The second type of connector, commonly used in audio circuits, is called RCA connector. Such types of connectors are mostly used in consumer-level audio and video systems including home stereos, videos, DVDs etc. Figure 20.4 shows different varieties of RCA connectors commonly used in commercial audio equipment.

Figure 20.4: *RCA connectors*

As you may see in Figure 20.4, the design of these connectors is a simple non-locking male/female connection. The male plug has a centre pin surrounded by a ring, whereas the female socket has a corresponding hole for the pin and a slightly smaller surrounding ring. The connection is made by simply pushing the plug into the socket. It is wired the same way as a mono jack: the centre pin is the +ve, and the outer ring is the -ve or shield.

The most common colour convention used in this type of connectors is as follows:

- Yellow: For video signals.
- Red: For audio (right channel).
- White or black: For audio (left channel).

A common problem with RCA connectors is that the male centre pin can easily touch the female shield ring when making the connection. Also, being a non-locking connector, the connection can fall apart which sometimes causes the centre pin to stay in contact with the ring or other objects. This results in a nasty hum or buzz.

3. TRS (Tip-Ring-Sleeve) connectors

The third type of commonly used audio connector is called a TRS or a phone connector. TRS (Tip-Ring-Sleeve) connectors are known by many different names, such as phone plug/jack, headphone jack or audio jack. This nomenclature is mostly based on their use. The term “jack” is particularly common for this type of connectors. Figure 20.5 shows various types of TRS connectors.

Figure 20.5: *TRS (Phone) male connectors*

Note the size of TRS connectors as shown in Figure 20.5. The length, thickness, shapes and the three parts (tip, ring and sleeve) of each connector may be noted. Even though they may differ in size, shape and length, they are functionally the

same. These connectors are very common in audio equipment. The original 1/4" size was used in early telephone switchboards and has since become a standard connector for musical and other audio equipment. The jack is available in three sizes: 2.5mm (3/32"), 3.5mm (1/8") and 6.3mm (1/4") but the wiring for all of them is the same.

Connectors can be either mono (tip/sleeve) or stereo (tip/ring/sleeve). Some plugs are able to carry more signals for use with camcorders, laptops and other applications.

Stereo plugs can also be used to feed a single balanced audio signal instead of unbalanced stereo. Possible configurations are as given here:

	Unbalanced Mono	**Balanced Mono**	**Stereo**
Tip	Signal	Positive / Hot	Left channel
Ring	(Not connected)	Negative / Cold	Right channel
Sleeve	Ground / Return	Ground	Ground

20.5.2 RF (Radio Frequency) Connectors

In this sub-section, we will discuss various types of RF connectors used in a community radio station. The connectors that are used for carrying radio frequency (RF) signals are called RF connectors. The size and type of a RF connector typically depends on the size of cable to which it is connected, which further depends on the frequency of operation and the RF power passing through it. Various types of RF connectors commonly used are:

- N type (Neill) Connector
- EIA type (Electronic Industries Alliance)
- BNC type (Bayonet Neill Councelman)
- SMC (Sub Miniature Connector)
- TNC (Threaded Neill Connector)

For low power FM transmitters and antenna systems, usually 'N' type of connectors are used. For high power transmitters (above 1kW) and antenna systems, 'EIA' types of connectors are used. BNC types of connectors are common for radio and test equipment and upto exciter stage where the power is 10 to 30 watts. SMC and TNC types of connectors are commonly used for interconnecting the RF stages/modules within the transmitters.

All the above RF connectors are available in two types, namely chassis type and cable end type. Both types are further subdivided into two categories, namely male type and female type. Chassis types (usually female types) are used for mounting on panels of equipment. In field mostly, cable end connectors (usually

male type) are used for connecting them on cable ends. Figure 20.6 (A) and 20.6 (B) show N (male) and BNC (male) types of RF connectors.

Figure 20.6 (A): *N (male) type connector*

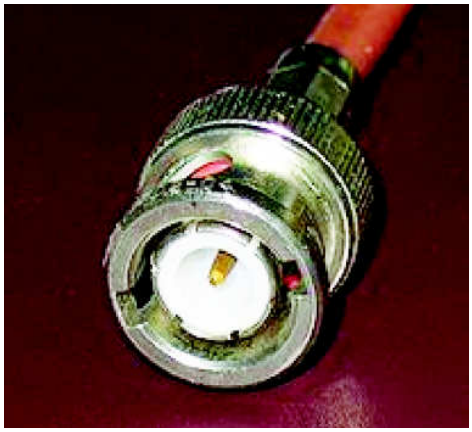

Figure 20.6 (B): *BNC (male) type connector*

As may be seen in Figure 20.6 (A) and (B), RF connectors are typically used with coaxial cables and are designed to maintain the shielding that the coaxial design offers. The ends of coaxial cables usually terminate with connectors. Coaxial connectors are designed to maintain a coaxial form across the connection.

Another important point about RF connectors is that they must have the same impedance as that of coaxial cables; otherwise there will be signal reflection and losses. In case of FM transmitters, almost all the RF connectors used are of 50 ohm impedance.

Activity 20.3

Imagine that you are working in a community radio station. From the details learnt so far in this unit, previous units, and from the various videos which you have seen, prepare a list of the different types of connectors used, starting from microphone to the antenna system and complete the table given below. Visualizing the audio chain in your mind may help you in answering this activity.

To do this activity, you may need about 20 minutes including writing down the answers briefly in the space provided.

This activity will help you in identifying and understanding the purpose of the use of different types of connectors required in a community radio station.

Sl. No.	Type of connector	Location	Purpose/Function

20.6 Types of Audio Cables

In this section, you will learn about different types of audio cables commonly used in community radio stations. We will also discuss special types of audio cables which are used as microphone cables.

There are two main types of audio cables that are most commonly used in interconnecting of different equipment in an audio chain:

1.Single core shielded cable

In a single core shielded cable, the single core is used as the +ve, or 'hot' and the shield is used as the -ve, or 'cold' line. The constructional details of a single-core shielded cable are illustrated in Figure 20.7.

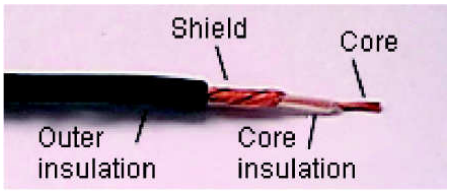

Figure 20.7: *Single-core shielded cable*

As shown in Figure 20.7, a single core cable consists of one inner conductor and a shield separated by an insulating material. The shield works as a second or a return conductor. The audio signal travels between the inner line called a hot line and an earth line. Unbalanced audio cables are commonly associated with the 1/ 4" TS and the RCA connectors and are used for unbalanced audio systems.

2. Two core shielded cable

A 2-core shielded cable has one core as the +ve line, and the other core as a –ve line. The shield is earthed. Figure 20.8 illustrates the constructional details of a 2-core shielded cable.

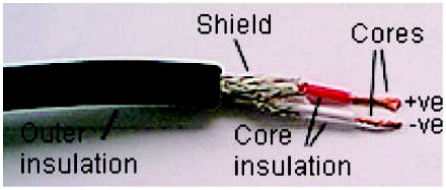

***Figure 20.8**: Two-core shielded cable*

Figure 20.8 shows that a 2-core shielded cable has two inner conductors and a shield; a *hot* line (positive), *cold* line (negative) and an *earth*. This type of cable is used mostly for the balanced audio circuits. The audio signal is transmitted on both the hot and cold lines, but the voltage in the cold line is inverted (i.e. the polarity is changed). Hence, it is negative when the hot signal is positive. It minimizes unwanted noise and interference in audio cables. This type of connection is very important in sound recording and production because it allows for the use of long cables while reducing susceptibility to external noise.

For example, if the power amplifiers of a public address system are located at a distance from the mixing console, it is a normal practice to use balanced lines for the signal paths from the mixer to the amplifiers. Many other components, such as graphic equalizers and effects units, have balanced inputs and outputs.

Balanced circuits use 3-pin connectors, usually the XLR or TRS phone connector. XLR connectors, for instance, are usually used with microphones whereas TRS jack plugs are usually used for mixer inputs and outputs.

Microphone cables

Microphone cables connect microphones to mixers (desk, consoles etc). Most professional mixers' microphone inputs are designed with "balanced" circuits to help decrease or eliminate noise and unwanted radio frequency interference (RFI).

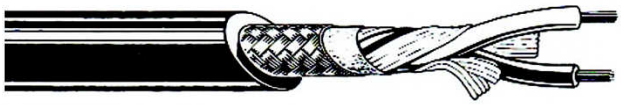

***Figure 20.9:** Twisted pair microphone cable*

As seen in Figure 20.9, a microphone cable consists of a twisted pair of copper conductors (typically 6 mm in diameter). These conductors are covered with one of three types of shielding: braided, spiral, and foil shielding. Braided shield is best for microphone cables whereas spiral shield is a little more flexible and less expensive than braided. Foil shields are unreliable in cables and are designed for portable use.

Good shielding in microphone cables help in preventing electromagnetic interference. Microphone cables are used to carry stereo audio signal of frequency range 20 Hz to 20 kHz having 50 ohm impedance from the microphone to mixing console.

Choosing the right microphone cable

Most professional Low-Z (low impedance) microphone outputs can easily be run up to 500 feet. However, Hi-Z (high impedance) microphones have the same roll off problems that guitar cables have and their lengths should be limited to 20 feet or less to avoid high frequency attenuation.

Microphone cables come in a wide variety of diameters. Nature enthusiasts need for their sound recordings small cables that will roll up into the compartment. To conserve space, Tape recorders use microphone cables about the diameter of a normal pencil (1/4"). Balanced mic cables are quieter than unbalanced mic cables because 1/2 of the signal travels on one of the two conductors and they tend to cancel out extraneous signals that jump on both conductors.

Activity 20.4

To do this activity, you may need about 15 minutes including writing down the answers in the space provided. This activity will help you in identifying different types of audio cables in respect of their constructional and functional details.

Question 1: What is the difference between the unbalanced and balanced audio systems?

Question 2: Why is working with balanced audio system better than unbalanced one?

Question 3: Why is shielding necessary in microphone cables?

20.7 Let Us Sum Up

In this unit on 'Good Engineering Practices', you have learnt that:

- For any project, certain good engineering practices are necessary to get the best quality and performance out of the Equipment installed in that project. Doing the right job in the right manner is a skill that comes only by practice.

- A variety of tools and equipment such as soldering iron, wire stripper and an audio analyser are used for installation, wiring and testing the performance of the Equipment. The video demonstration on use of tools and measuring equipment will further help you in developing the skill and confidence.
- Soldering, stripping and crimping are the techniques which are learnt mainly by practice. You have also learnt and understood certain precautions which are to be taken while soldering and fixing connectors. A little overheating can melt the insulation of the cable connector or the track of the printed circuit board thereby damaging the connector or the PCB.
- Various types of audio and RF connectors are used in the CRS. You have seen that selection and use of the right type of connector is very important.
- Various types of audio cables are used for the interconnection of components of the transmission chain. Both balanced and unbalanced cables are used depending upon the requirements of the circuit. Shielded audio cables help in minimizing the interference in audio signals due to RF pick up, noise and hum.

20.8 Model Answers to Activities

Activity 20.2

1: Soldering guns don't have temperature control and can get too hot easily. This can result in damage to circuit boards, melting of cable insulation, and can even cause damage to connectors.

2: In normal soldering iron, there is no method to control the temperature, whereas in the temperature controlled soldering station, the temperature can be preset to any desired temperature.

3: It means that soldering metal consists of 60% of tin and 40% of lead.

4: A proper size wire stripper must be used, which may only cut the insulation and not the strands of the conductor.

5: In case of power supply cables having aluminium conductor where soldering is not practically possible, lugs are fitted by use of proper size crimping tools.

Activity 20.4

1: In unbalanced systems the audio signal flows between one line and the earth, whereas in balanced circuits, the signal flows between two lines independent of the earth wire.

2: Working with balanced systems is better as they are less sensitive to noise and interference.

3: Since the output of a microphone is of very low level, shielding of the cable protects the signal from interference due to noise and hum.

20.9 Additional Readings

- *Electrical connector – Wikipedia, the free encyclopedia*. (n.d.). Retrieved March 3, 2014, from http://en.wikipedia.org/wiki/Electrical_connector
- *Florida Sound Engineering Co., Inc. | Welcome! | Home Page*. (n.d.). Retrieved from http://www.floridasound.com
- *Media College – Video, Audio and Multimedia Resources*. (n.d.). Retrieved from http://www.mediacollege.com
- *Pro Co Sound – On Stage with the Best*. (n.d.). Retrieved from http://www.procosound.com

UNIT 21

Studio Equipment: Preventive and Corrective Maintenance

Structure

21.1 Introduction

In Unit 11, you learnt about the functioning of equipment used in audio chain of a CRS studio. In Unit 20, you learnt about the good engineering practices used in installation, wiring and testing of studio equipment. In this unit, you will learn about the preventive and corrective maintenance aspects of studio equipment, which are essential to keep them in perfect working condition. This helps in timely detection and forewarning about the likelihood of occurrence of any major fault or malfunctioning of studio equipment which may result in service breakdown. Preventive maintenance implies regular cleaning, checking, testing and measurement of equipment to keep them in working order as per accepted norms and standards, which may help in preventing a major breakdown. Corrective maintenance can be defined as the maintenance which is required to bring the equipment back to the working order once it has failed or worn out. A regular preventive maintenance schedule such as weekly, monthly, quarterly etc. helps in achieving this purpose. In this unit, we will discuss the following issues:

- Importance of cleanliness and dust-free environment in studios
- Dressing of cabling
- Earthing of equipment
- Handling of microphones
- Ventilation and fresh air in the studio
- Maintenance of Digital Audio Work Stations (DAWs)

You may require about 6 hours of study to learn this unit including answering the questions given in the Activities.

The glossary given at the end of the module will help you in understanding the content of this unit.

21.2 Learning Outcomes

After completion of this unit, you will be able to:

- describe the importance of cleanliness and dust-free environment in the studios.
- explain the purpose of dressing of cables.
- underline the importance of earthing of equipment and check earth connectivity.
- describe the process involved in handling of microphones.

- discuss the issues related to the maintenance of AC plants and ventilation in the studios.
- describe the maintenance of DAWs.

Let us begin with cleanliness and dust-free environment.

21.3 Cleanliness and Dust-free Environment

We all know cleanliness is next to godliness. The studio environment is to be kept clean and dust-free because dust is one of the main enemies of broadcast media (including CDs/tapes) and playback/recording equipment. Cleanliness is absolutely necessary. No eating, drinking or smoking is to be permitted inside the studio premises. All rubbish must be thrown in the dustbins. Dust can damage console faders, switches, CD Players, DAWs and other switch gear. Dust is the enemy of electrical contacts and faders. Dust and dirt prevents the intimate contact of replay heads to media which is essential for the accurate retrieval of information. Dust can cause "head crashes" of computer hard discs which may lead to irretrievable loss of data. The effective prevention of dust and other kinds of dirt is, therefore, an indispensable measure for a broadcast environment. For this purpose, routine dusting with anti-static dusting should be done daily. A head cleaner or alcohol can be used for cleaning of fader contacts and switches. A schedule should be prepared for keeping the equipment clean and dust-free. For this purpose, the following guidelines may be followed:

- Use a light duty blower for suction of dust from equipment and racks.
- Clean all rack-mounted equipment in control room and studio.
- Clean all the tag blocks, patch cords and patch panels.
- Clean recording and playback equipment and all PCBs.

Activity 21.1

To do this activity, you may need about 10 minutes including writing down the answers in the space provided. This activity will help you in understanding the importance of cleanliness and dust-free environment in respect of preventive maintenance.

Question 1: Why is a clean and dust-free environment important for broadcast equipment?

Question 2: What steps should be followed for keeping the equipment dust-free?

Having learnt the importance of cleanliness and dust-free environment, we will now discuss dressing of cabling.

21.4 Dressing of Cabling

In this section, you will learn the significance of dressing of cables. Dressing of cables plays a very important role in preventive maintenance. Cable dressing means properly aligning and positioning the cables in a neat and orderly manner in the studio trenches and audio racks. Proper cable termination practices should be followed for the complete and accurate transfer of both analogue and digital information signals. All the cables should be properly identified and labelled. Extra length of cables should be avoided and cables should not be too long. However, enough slack in length should be left in case it needs to be re-terminated or rerouted for any reason. All the signal cables, except power cables, should be laid parallel and orderly bunched. Tie wraps or hook and loop straps should be used to secure the cables and they should be evenly spaced throughout the dressed length. Cable dressing ensures that cables used are neatly arranged and easy to trace, when required. All the audio wiring and power wiring should be laid separately; otherwise there may be hum generation. For this purpose, cable documentation should be done to keep track of types of cables laid, their destination, numbering for identification, the path followed and termination details. The following guidelines may be followed for cabling:

- Use separate paths for power and signal/audio cables so as to reduce the electromagnetic induction effect (EMI).
- Wherever the power and audio cables must cross, these should be laid at right angles to neutralize EMI effect.
- Cables should be properly tagged, strapped, identified and laid in trenches/racks.
- All signal/audio cables should enter from the left side of the rack at the back and power cables from the right side of the rack.
- Use contact cleaner for cleaning the contacts to ensure good contact.

Activity 21.2

To do this activity, you may need about 10 minutes including writing down the answers in the space provided. This activity will help you in understanding the necessity of dressing of cables.

Question 1: Why is dressing of cables needed?

Question 2: What guidelines should be followed while laying power and audio cables in a studio?

Now let us proceed to discuss the next section which is on earthing connections.

21.5 Earthing Connections

In this section, you will learn about the significance of earthing connection in a studio set up.

As a safety measure, earthing is essential and mandatory. Earthing connects the body of the equipment to the earth electrode. It is a physical connection between the exposed metallic parts of an electrical equipment/appliance and the earth, which is known to have zero potential. Proper earthing provides an alternative and easy path for leakage or faulty current to flow. It ensures that any exposed conductive part of the appliance does not reach a dangerous level of potential or voltage that endangers the user's life. For any electrical system to be safe, proper insulation and earthing must be provided for protection and safety of staff and equipment operations. Earthing is done to provide a conducting path to the ground for the fault current which may flow due to a short circuit. The body of the equipment is earthed so that fault current flows to the ground and the operator remains safe; otherwise the operator may get a fatal shock. For this purpose, a pit is formed by digging the earth and putting some charcoal and salt at the bottom and placing a metallic plate with an electrode over it, to which earthing copper or aluminium metal strip is connected. As a precautionary measure, there should be at least two independent earthing connection paths for safety of equipment and personnel. A proper earthing system should have least electrical resistance. Lower the earth resistance, better it is for the safety of equipment and personnel. The earth resistance can be measured using an instrument called 'Megger'.

Failure of earthing can result in:

- Danger to equipment and operating staff due to short circuit and malfunctioning of electrical switch gear.
- RF pick up from nearby radio frequency sources leading to noise and distortion in sound recording and broadcast.
- Following steps can ensure prevention of faults due to bad earthing:
- Regular inspection of earthing strip or cables.
- Watering of earth pits regularly to keep earth resistance within specified limits.
- Regular checking of continuity of earthing connection from equipment to earth pits.
- Measuring earth resistance every quarterly.

Activity 21.3

To do this activity, you may need about 10 minutes including writing down the answers in the space provided. This activity will help you in understanding the necessity of earthing in a studio setup.

Question 1: What is the importance of equipment earthing?

Question 2: What is the importance of checking continuity between the equipment and earth pits?

Having learnt the importance of earthing in studios, we will now discuss the next topic, which is on handling of microphones.

21.6 Handling of Microphones

In this section, you will learn about the practices to be adopted in handling of microphones. Microphones are costly equipment and extremely fragile. Microphones are very stable over long periods of time, provided that they are handled properly. The components of the microphone are fragile and can get damaged by misuse. The following practices should be adopted for proper functioning of microphones:

- Keep it clean. The microphone screen can get dusty. It should be cleaned regularly.
- All the microphones have a diaphragm in one form or the other. The diaphragm is exposed to the air. So it should be protected and handled carefully.
- High-sound pressure levels (SPL) can damage the diaphragm.
- Most of the microphones are made of metal, which can rust easily. To prevent rusting, a bag of silicone gel should be kept inside the microphone case.
- The ribbon microphones should be stored vertically because the ribbon inside the microphone is installed vertically. This prevents any slack in the ribbon if stored horizontally.
- Keep condenser microphones out of direct sunlight because high heat can damage the diaphragm.
- Phantom power, i.e., + 48V should be switched off or disabled before plugging in/out ribbon microphone.
- Microphones should not be installed too close to a loud/blaring instrument as this will damage the diaphragm.

Activity 21.4

To do this activity, you may need about 10 minutes including writing down the answers in the space provided. This activity will help you in understanding the precautions and instructions required while handling the microphones.

Question 1: What precautions should be followed while handling various types of microphones?

21.7 Ventilation and Fresh Air

In this section, you will learn that by maintaining the ventilation equipment properly, occurrence of a number of faults in studio equipment can be averted. An efficient ventilation system and its proper maintenance are essential for the broadcast studio environment. For this purpose, an air conditioning system is provided for cooling and dehumidification in the studios. This involves control of temperature, humidity, ventilation and movement of fresh air. Ventilation is a process by which stale air is removed and fresh air is supplied to the studios. Regular preventative maintenance of AC plants is, therefore, essential to ensure trouble-free operation of the studio equipment. It helps in improving the quality of programme production as well. Pre-season maintenance is also important. It can help to avoid a system failure in severe hot or cold conditions. While the system is in operation, the following monitoring checks should be carried out regularly as part of routine maintenance:

- Measure indoor dry and wet bulb temperature.
- Measure and adjust air flow.
- Check vent system for proper operation.
- Listen for any abnormal noise.
- Inspect, clean and change air filters.
- Inspect and clean blower assembly.
- Inspect for any gas leakage.
- Check thermostat settings.
- Check electrical connections.
- Lubricate moving parts.

Activity 21.5

To do this activity, you may need about 10 minutes including writing down the answers in about 50 words in the space provided. This activity will help you in understanding the techniques of maintenance of ventilation system including air-conditioning of studios.

Question 1: What are the monitoring checks to be followed for maintenance of AC plants and ventilation system at the studios?

21.8 Preventive Maintenance of Digital Audio Workstations

In the preceding section you learnt about the technique of maintaining ventilation system in the studios. In this section, you will learn the steps to be taken for maintaining the digital audio workstations.

As mentioned in earlier units, Digital Audio Workstations (DAWs) are used for recording and playback in broadcast studios. It is an high-end computer having large RAM and hard disk capacity with professional audio cards and professional audio software for programme production and playback. Preventive maintenance of DAWs is essential for reliable functioning. It helps to detect serious problems, prevent system crashes and reduce equipment down time. A regular periodic maintenance schedule should be drawn up to take care of the following issues involved in maintenance of DAWs:

- Scan the memory and hard disk of the DAW regularly to protect the system from any virus. For this, use a genuine professional antivirus software.
- Always keep the backup of important data and program files.
- Clean CPU fan, CPU, keyboard, mouse etc. to make the system dust-free.
- De-fragment the hard disk.
- Run system performance diagnostics to check the health status of the DAW.
- Always maintain system software and networking updates.
- Do head cleaning of CD drives periodically.
- Do cleaning of cards, subassembly units and other components at regular intervals.
- Check and maintain UPS and its batteries. Always make a habit to put the load on battery to ensure that the system is capable of working on battery backup during mains failure. Overcharges and deep discharges reduce the life of batteries.

Activity 21.6

To do this activity, you may need about 10 minutes including writing down the answers in the space provided. This activity will help you in understanding the techniques of doing the preventive maintenance of DAWs.

Question 1: How can you prevent virus attack to your digital audio workstation?

Question 2: Why should you take a regular backup of data?

21.9 Let Us Sum Up

In this unit, we have discussed preventive and corrective maintenance of studio equipment and system. In this process, you have learnt that:

- A dust-free and clean environment is very much essential in the broadcast studios. It helps in curtailing the occurrence of faults due to accumulation of dust.
- Dressing of cables with proper identification and termination helps in ease of cable tracing in case of cable faults.
- Maintenance of ventilation equipment and uninterrupted connectivity reduces the breaks in transmissions.
- Earth conductivity and continuity of earth connections to studio equipment and racks is important for protection of equipment and staff in case of short circuit and lightning. Earth resistance should be very low for this purpose.
- Microphones are delicate equipment. These are essential for recording and broadcasting of programmes and should be handled with care to prevent any damage.
- Regular preventive maintenance of AC plants and other ventilation equipment is to be carried out. This helps in controlling rise in temperature, humidity and improving ventilation in studios.
- Nowadays high-end computers, called Digital Audio Workstations, are used for recording and playback of programmes in broadcast studios. Regular maintenance of DAWs should be done to prevent their failure and loss of data stored on hard disks. Use of properly rated UPS systems and maintenance of batteries help in curtailing faults due to failure or variations in mains supply.

21.10 Model Answers to Activities

Model answers to questions given in Activities 21.1 to 21.6.

Activity 21.1:

1: Dust can damage console faders, disk heads of CD players and audio workstations.

2: Do not allow eating and drinking in the studios. Do routine dusting daily with anti-static duster. Use a head cleaner for cleaning of fader contacts and switches.

Activity 21.2:

1: All the cables should be properly identified and labelled as this helps in ease of cable tracing in case of cable faults and relaying.

2: All the audio and power wiring should be laid separately otherwise there may be hum generation due to electromagnetic induction.

Activity 21.3:

1: Proper earthing provides an alternative and easy path for leakage or faulty current to flow. This prevents danger to equipment and operating staff due to short circuit and mal-functioning of electrical switch gear.

2: To protect equipment and staff in case of short circuit and lightening, it is essential to regularly check continuity between earth connections and studio equipment.

Activity 21.4:

1: Microphones are delicate equipment. These are essential for recording and broadcasting of programmes and should be handled with care to prevent any damage.

Activity 21.5:

1: The following checks will be done:

- Measure indoor dry and wet bulb temperature.
- Measure and adjust air flow.
- Check vent system for proper operation.

- Inspect, clean and change air filters.
- Inspect and clean blower assembly.
- Check for any gas leakage.
- Check thermostat settings.
- Check electrical connections.

Activity 21.6:

1: Install anauthenticated anti-virus software and regularly update for latest virus definition database.

2: Regular data backup should be undertaken to prevent any loss of data due to hard disk failure.

21.11 Additional Readings

- Gookin, D. (2009). *Troubleshooting & maintaining your PC all-in-one for dummies: [6 books in one ; hardware, software, laptops, internet, networking, maintenance]*. Hoboken [NJ: Wiley.
- McCartney, T. (2003). *Recording studio technology, maintenance, and repairs*. New York: McGraw-Hill.

UNIT 22

Content Distribution: Alternative Mechanisms

Structure

22.1 Introduction

In unit 14, you learnt about the open source software used for recording, editing and playback of programmes in production studios. In unit 15, you learnt about the telephony application software for phone-in, SMS, IVRS etc. In Units 16 to 19, you learnt about the sound recording and editing, mixing and mastering, file formats and compression, and storing and retrieval of programmes in studios only. However, in this unit, you will learn about distribution and sharing of content using alternate platforms.

In an era of convergence of media, it may feel very restrictive to use only FM medium to reach to your audience. As we know the FM radio is bound by the geographical boundaries based on the transmission power. In the case of community radio in India we are bound by 50 Watts of power that roughly translate to a coverage radius of about 10 km. On the other hand, the technology is surpassing the geographical limitations. An email sent from a desktop can reach anywhere in the world in a matter of seconds, whereas a voice on FM radio may not reach beyond 10 km. As the technology advances you may realize that there are many ways to reach out to your target audience. Hence it would be useful for a community radio technologist to understand alternative mechanisms to broadcast in addition to the FM radio.

Apart from understanding different technologies for communication, it is critically important to understand how we can forge a convergence of media. In other words, we need to understand how different technologies can feed into each other and make use of strategic advantages of available mediums like the Internet, mobile etc.

In addition to the use of alternative mediums, there is also a vast potential to sharing programmes, information and skills with other radio stations. With the growth of the Internet, sharing has become easier and there are quite a few ways of sharing content. In this Unit, you will learn about how to broadcast on Internet, share content and even create community owned communication infrastructure based on wireless technology. Therefore, in the process of learning of this unit, we will discuss the following topics one by one as given below:

- Internet
- Wireless Mesh Networking (WiMesh)
- Mobile Telephony

To complete this unit, you may need about 6 hours of study. The glossary at the end of the module will help you in understanding the contents of this unit.

22.2 Learning Outcomes

After going through this unit, you will be able to:

- describe various alternative platforms available for publishing and broadcasting.
- discuss strategic advantages and disadvantages of alternative platforms.
- analyse various methods of convergence of tools.
- list out and describe various content sharing methods.
- describe the fundamentals of wireless networking.
- discuss the use of mobile telephony as a broadcasting mechanism.

Let's now begin with the Internet.

22.3 Internet

All of you are more than familiar with the Internet. However, what we are going to learn here is the use of Internet as an alternative publishing medium or a medium to share content across the world and other community radio stations. It may be noted here that though Internet is a very powerful tool, its reach in the rural parts of India is still not upto the mark. The access of Internet is far less than what is desirable. Hence in the present scenario, it cannot be seen as an alternative to terrestrial radio but can be used as a supplement. In this section and the sub-sections that follow, we will discuss some of the more popular and technically advanced methods of sharing content over internet which include:

- Podcasting
- Streaming
- Social networking
- Content sharing sites

22.3.1 Podcasting or Audio Blogging

Podcasting is a method of publishing in which an audio or video file is stored on a web server and listeners can listen to the file either through a browser or by virtue of being a podcast client. This is a good example of push technology which works on publisher and subscriber model. There are many podcast clients available on the Internet for listeners as well as publishers. In addition, there are plenty of sites that allow you to create a podcast account. Using such podcast account, you can publish your audio or digital content on the Internet. You can

even embed a podcast link in your website so that a listener can listen to your audio on your website rather than going on to the third website.

The term podcast is a combination of two words Ipod — which is a popular audio device by Apple Inc — and Broadcast. Many users of the technology have opposed the term podcast as they say it gives undue credit to Apple which had very little to do with the development of the technology. Those who are opposed to the term podcast refer it as Audio Blogging.

The Audio Blogging or Podcast uses the unicast protocol. Unicast protocols send a separate copy of the media stream from the server to each recipient. This model, however, does not scale well when many users want to hear the same audio programme concurrently.

Podcast should not be confused with webcast which is a concept that refers to streaming technology. There is a basic difference between Podcast and Streaming. We will learn about it in subsequent paragraphs.

Podcast require a podcast server which could be similar to a web server. However, a specific programme should be running for any web server to act as a podcast server as well. It is possible to run a podcast server out of your own desktop computer but it may not be a very feasible option since you have to keep your desktop machine power on all the time. Also there are security risks if the protection provided along with podcast is not up to date.

The other alternative is to use one out of many hosted solutions. Many groups and companies provide hosted solution for podcast. Some of them charge monthly or yearly fees, whereas some are completely free of cost. You may choose one of them to suit your requirement.

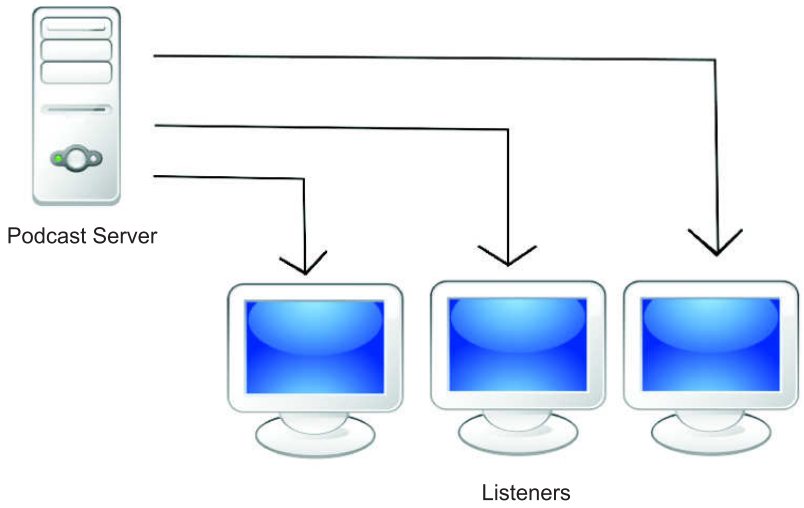

***Figure 22.1**: Unicast network*

Figure 22.1 shows a typical example of Unicast Network. As you can see in the figure, the server is putting out different stream of data for each listener.

22.3.2 Streaming

Streaming is the closest counterpart on Internet to FM broadcast. If you are doing a live broadcast on your FM based community radio, the listeners at the other end can receive your voice almost simultaneously. They can listen as you speak. In other words, they are listening on real-time basis. Similarly, in streaming over Internet, the audio content is delivered to the listeners on a real-time basis.

Unlike audio blogging, the streaming content does not need to be placed on the server but the listener can stream directly out of the publisher's desktop. Most audio streams use multicast protocol. This protocol sends a single stream from the server to all the connected recipients. This protocol was developed to reduce the server/network loads resulting from duplicate data streams that occur when many recipients receive unicast content streams independently.

Use of multicast protocol has certain limitations since the recipient does not have an audio-on-demand facility. For example, if an audio programme starts at 12 noon and a listener joins the stream at 12.30, he or she would lose half an hour of programme, just like in an FM radio. Also you cannot play back a content that is streaming. However, there are ways to mitigate this limitation by deploying caching servers or buffered media players.

Streaming requires a streaming server and a streaming client. Again, you have a choice of hosting your own server. What you need to consider here is that what kind of Internet bandwidth is available to you. Remember that a streaming server hosted at your own location would consume a lot of bandwidth and you may find it difficult to carry out your normal Internet work like checking emails or surfing a website. Also a low bandwidth will restrict the number of simultaneous listeners you can have. Needless to say, lower the bandwidth, lower the number of listeners. However, you can increase the number of listeners on a lower bandwidth if you are willing to compromise with audio quality. Alternatively, you may consider a hosted solution. There are many companies around the world which provide hosted solution. However, practically none of them are free. They charge nominal fees for a year or month.

There are several types of streaming servers. The prominent among them are Windows Media Services, developed by Microsoft and Darwin Streaming server developed by Apple Inc. Both these servers are proprietary and they do not come for free. ShoutCast is another streaming server developed by Nullsoft, a company that is known for its popular Winamp media player. ShoutCast is available free of cost but it is not an open source application. The Nullsoft has kept it as a proprietary solution. One of the most popular streaming server is called IceCast. The IceCast is the most versatile and is free of cost and also available in open source domain.

The server applications mentioned in the previous paragraph are to be installed on a server. Also, you will need a desktop software that will encode your audio and stream up to the server which in turn will stream down to the listeners.

It is noteworthy that, with growing number of smart phones in the market, the streaming audio has become one of the critical ways of distributing content. Any mobile phone that is running Android, Blackberry, Windows or IOX can receive a stream generated by servers.

Following is the list of clients available for Icecast server. Note that this is just an indicative list. You will find many more sophisticated and versatile clients across various operating systems. GRINS, a radio automation software promoted by Gram Vaani, also allows simultaneous streaming to Icecast server.

Source clients

The source clients that are known to work with Icecast 2 are given in Table 22.1 and Media players that support Icecast 2 are shown in Table 22.2.

Table 22.1: Source clients

Application	Platform	Download Link
IceS	Linux/Unix	http://www.icecast.org/ices.php
Oddcast/Edcast	Windows	Formerly at http://www.oddsock.org/tools
Edcast reborn	Windows	http://code.google.com/p/edcast-reborn/
Muse	Linux/Unix	http://muse.dyne.org
Darkice	Linux/Unix	http://darkice.sourceforge.net/
SAM2	Windows	http://www.spacialaudio.com
ezstream	Windows	http://www.icecast.org/ezstream.php
Nicecast	Mac OSX	http://www.rogueamoeba.com/nicecast/
IceGenerator	Linux/Unix	http://sourceforge.net/projects/icegenerator
Orban Opticodec-PC	Windows	http://www.orban.com/
freej	Linux/Unix	http://freej.org/
Traktor DJ Studio 3	MacOS X, Windows	Native Instruments
Savonet/ Liquidsoap	Linux/Unix, Windows	http://savonet.sourceforge.net/
DeeFuzzer	Linux/Unix	http://pypi.python.org/pypi/DeeFuzzer/

RoarAudio	Linux/Unix, Windows	http://roaraudio.keep-cool.org/roaraudio.html
RoarAudio PlayList Daemon	Linux/Unix, Windows	http://roaraudio.keep-cool.org/rpld.html
butt - broadcast using this tool	Linux/Unix, Mac OSX, Windows	http://butt.sourceforge.net/
Mixxx	Linux/Unix, Mac OSX, Windows	http://mixxx.org/
iCast	iOS	http://icast.anthonymyatt.net
MPD - Music Daemon	Linux/Unix, Mac OSX	http://mpd.wikia.com/wiki/Music PlayerDaemon_Wiki
KRADradio	iOS	Linux/Unixhttp://kradradio.com/

Table 22.1 gives a list of source clients using application with platform. Download link of each application is also shown along with them for easy reference.

Table 22.2: Media players that support Icecast streaming

Application	Platform	Download Link
foobar2000 (mp3 + ogg vorbis)	Windows	http://www.foobar2000.org
winamp 2.x, 5.x (Not 3.x) (mp3 + ogg vorbis)	Windows	http://www.winamp.com
XMMS(mp3 + ogg vorbis)	Linux/Unix	http://www.xmms.org
Zinf(mp3 + ogg vorbis)	Linux/Unix, Windows	http://zinf.sourceforge.net
MPlayer	Linux/Unix, Windows, Mac OSX	http://www.mplayerhq.hu
Xine	Linux/Unix	http://www.xine-project.org/home
VLC	Linux/Unix, Windows, Mac OSX	http://www.videolan.org

Figure 22.2 is an example of Multicast Network. As you can see in the figure, the media server is putting out one stream and the same stream is being tapped by multiple users

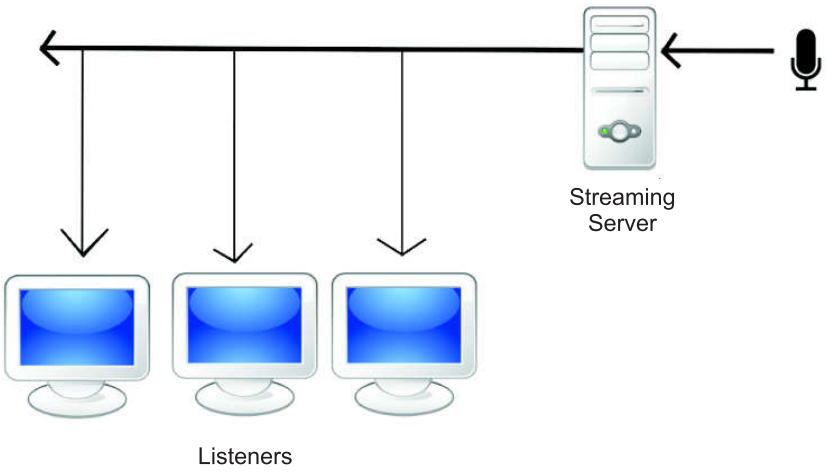

***Figure 22.2**: Multicast network*

Activity 22.1

Search for an audio blogging portal and note one blog on the community media course you have undertaken. You can search for free blogging sites on your search engine and choose the one you like. Also write the name of the blog writer and the website searched.

To do this activity, you may need about 15 minutes including writing down the answer in the space provided.

This activity will help you in understanding and using the alternative platforms available for content distribution.

22.3.3 Social Networking Sites

Social networking sites have become very popular in the past few years. Sites like Facebook, Youtube, LinkedIn or Myspace have millions of users who can turn out to be your listeners if you know how to use the social networking sites effectively. Though there is no single formula to be effective on these social networking sites which are very dynamic and evolving, some suggestions are given below to help you in making use of these sites.

- Popularise your radio station by having a dedicated page on social networking sites like Facebook, Twitter, Pinterest or MySpace. You can even publish your schedule on these sites and write about the programmes your station is broadcasting.

- Put a direct link to your podcast or live stream (you will learn about live stream later on in this unit).
- Use these sites as a feedback mechanism if your radio station is broadcasting in the areas where your listeners have Internet access.
- You can even upload audio or video giving glimpse of your programme on these sites.

22.3.4 Content Sharing Sites

Content sharing in a multi-lingual and diverse country like India is a very complex concept where not only the language but even the dialect matters. Even otherwise the core concept of the community radio is community-specific programming which limits the use of content sharing among the community radio stations.

Sharing of content goes a long way in enhancing the scope of learning. It is not only about sharing content but it is also about sharing ideas, concepts, formats and style. Internet plays an important role in exchange of programmes among the community radio stations.

There has been a slow start to the idea of content sharing in India. The first portal that came up was EK duniya anEK awaz. Available at http://www.edaa.in, it is now publishing user generated content in 26 languages. You can upload the content for free as all the content uploaded on the site is available for free under creative common license. Yet another initiative called Manch has been launched in 2013 for encouraging content sharing and collaboration among community media practitioners. The site is available at http://manch.net.in.

Activity 22.2

Write a blog on the current important event of the day. Publish your blog on a social networking site and see your popularity by seeing the comments of friends and users.

To do this activity, you may need about 15 minutes including writing down the blog in about 50 words in the space provided.

This activity will help you in understanding the method of sharing the content of the blog written by you with your friends and listeners.

22.4 Wireless Mesh Networking (WiMesh)

Many believe that Wi-Fi Mesh Networking, which is also known as WiMesh, can make our world more connected than it is today. This emerging technology can seamlessly connect vast geographical area in the most humane way. Some experts also assert that WiMesh is more a sociological project than a technical one.

A wireless mesh network, in very simple terms, can be described as a network of hundreds or even thousands of wireless devices which are capable of transmitting as well as receiving RF signals. The most commonly used device in a mesh network is the commonly available Wi-Fi routers, which are used in offices or homes for distributing Internet connectivity. These routers in a mesh network are called nodes that talk to each other. These nodes not only transmit data generated by its owner but also help passage of data generated by other nodes. Nodes use the common Wi-Fi standards known as **802.11a, b and g** to communicate wirelessly with users, and, more importantly, with each other. Radio signals generated and received by the Wi-Fi devices are at a higher frequency of 2.4 GHz and 5.8 GHz as against 88 MHz to 108 MHz in FM.

There are multiple uses of such networks. Imagine your office or a home Local Area Network that is expandable to your entire village or even city. In that case you can easily run a community radio over Internet or you can even run a community TV. You can have a telephone system that does not cost you when you receive or make a call. You can easily give Internet access to most remote areas or run tele-education programme in a school or even run a tele-medicine programme in your village. The usage of such a network is of immense value but the cost is negligible.

The most important advantage of such network is the fact that you do not require a license from the Government since frequency spectrum of 2.4 GHZ and 5.8 GHz have been de-licensed almost in all the countries including India.

Figure 22.3 shows how a small village can form a wireless network. All the houses in a village are wirelessly linked to each other. Each house is having at least two wireless access points. Note that there is also Internet gateway. Similarly, the second image in Figure 22.3 shows how many villages which have their own wireless network can be linked to each other.

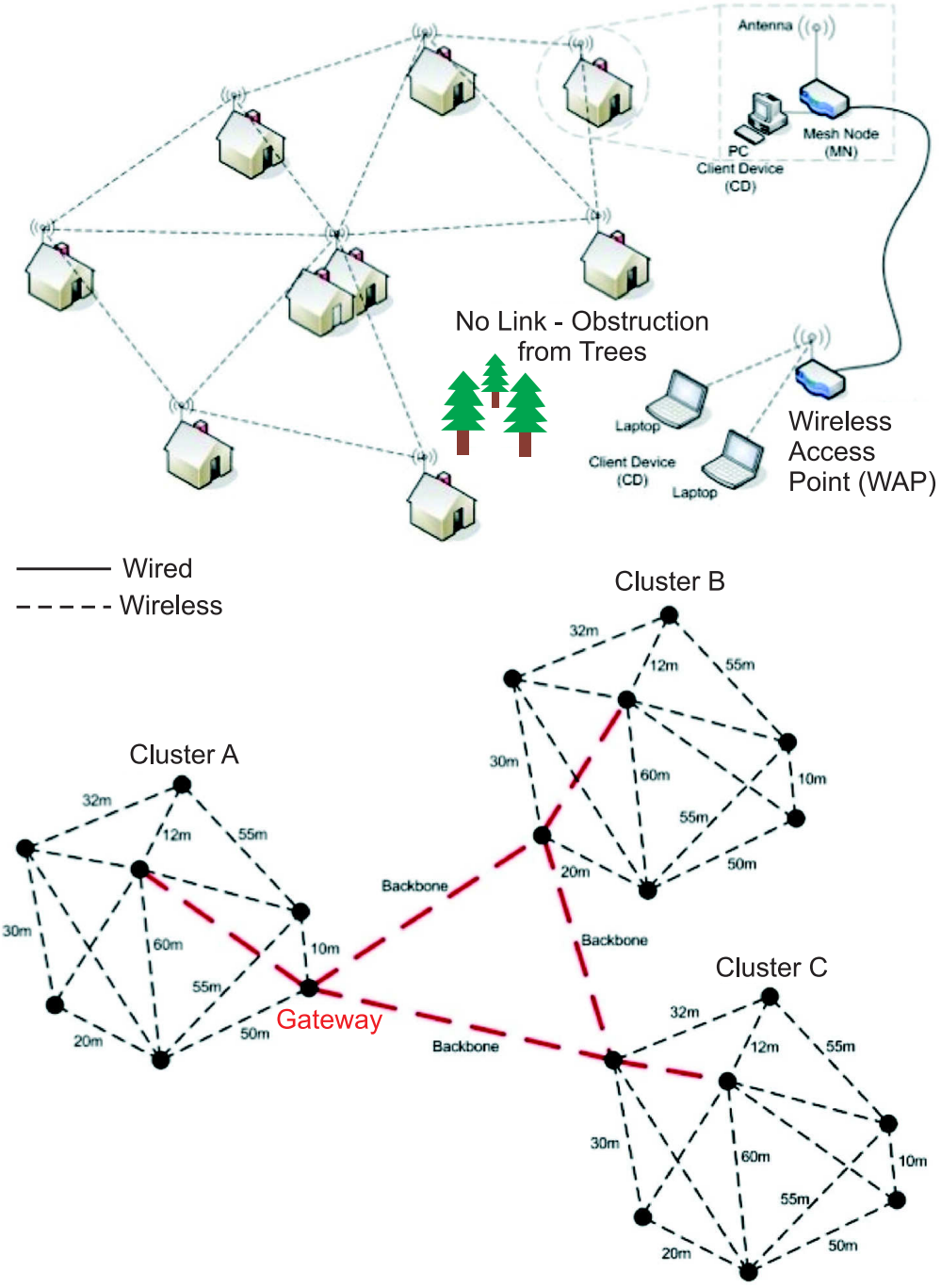

Figure 22.3: *Clustered mesh with backbone*

Activity 22.3

Prepare a small map, using any mapping site like http://maps.google.com for a possible mesh network in your neighbourhood. You will have to find out your location on the google map and other locations which you want to cover under your network. Once you have identified the locations, draw a line linking them.

Label them on the lines similar to that shown in Figure 22.3.

To do this activity, you may need about 30 minutes including writing down the answers in the space provided.

This activity will help you in understanding the use of mapping sites for creating a mesh network in your neighbourhood.

22.5 Mobile Telephony

In this section, you will learn how a mobile phone can easily be used for distribution of digital content. It is a well known fact that if there is any communication medium in the hands of the largest number of people in India, it is the mobile phone. Using mobile phone for distribution of digital content or even broadcasting is a reality that a radio technician today cannot afford to ignore. Though there are many possibilities, a few tried and tested ways of distributing content on mobile phone include:

- Caller tunes
- IVR based audio repository

We will briefly discuss them here.

22.5.1 Caller Tunes

If you have a short but very catchy audio clip which you may want to convert into a caller tune for mobile phones, you can create a page on your website to list such caller tunes for listeners to download on their mobile phones. You can even use social networking sites like Facebook or Twitter to draw listeners to your caller tunes. Film industry has been using caller tunes to popularise songs and dialogues of movies for quite some time now. It is one of the low cost options of content distribution. The caller tune eco-system spreads on its own. Having downloaded once, a user can easily transfer it to friends and colleagues via bluetooth or USB.

22.5.2 IVR Based Audio Repository

IVR stands for Automatic Voice Response. When you call a bank or your mobile company, you must have heard an automatic voice prompting you to select a number for the kind of services you require, for example dial 1 for banking service, dial 2 for credit card services etc.

This technology is in use for many years to give information to listeners. However, in the community media domain, it is also used for collecting information from listeners and playing it back to other listeners. An open source technology, called Asterisk, has made it very easy to configure an IVR system. Using Asterisk, you can configure an IVR prompting listeners to record their message on to the server. In the next stage you can review or edit the message recorded by a listener and play back to other callers. Asterisk is a software that can be installed on Linux or Unix based system.

The advantage of this is the fact that you have millions of potential listeners because of deep penetration of mobile in the society. On the other hand, the disadvantage is that you are dependent on telecom service provider. Also each call to the IVR server will cost the caller unless the cost is absorbed by the host organisation.

In India, there are two such experiments currently in operation and we will briefly discuss them. CGNet Swara was launched in the predominantly tribal region of Chhattisgarh and it acquired considerable popularity at least in the minds of media thinkers. CGNet Swara publicized a mobile number. A listener is expected to give a missed call to that number and the number will call you back. Once a listener gets a call, he or she can record a message, news or even a song. This recording would be reviewed by community editors and put into a bulletin for the day. At a specific allotted time of the day, a listener can give a missed call to the number again and get a call back from the server. In this call, the day's bulletin is read out to the listener. You can get more information on CGNet Swara, which is now supported by Microsoft, at http://cgnetswara.org.

A similar experiment was initiated by Gramvaani Community Media Pvt Ltd called Mobile Vaani. Mobile Vaani also uses Asterisk based IVR system to collect and publish information in rural Jharkhand. You can see more details about Mobile Vaani at http://gramvaani.org.

Activity 22.4

Using the Internet sites, prepare a list of five community radio stations in India, which are streaming on Internet. Also note the type of media server being used by them.

To do this activity, you may need about 15 minutes including writing down the answers in the space provided.

This activity will help you in learning the advantages of using streaming on the Internet.

Sl. No.	Name of the community radio station using streaming on the Internet.	Details of websites	Type of media server used
1			
2			
3			
4			
5			

22.6 Let Us Sum Up

In this unit, we looked beyond the conventional FM transmission as a method of broadcasting and sharing content. It is believed that with the growing trend towards digitalisation, the analogue FM transmission will become obsolete and digital transmission of data and voice will take over. Though there are many impediments in the path of complete digitalisation, it is imperative for a radio technician to understand the trend and undercurrents.

We understood the importance of Internet in community media in general and community radio in particular. As a community radio technician you can help your station in garnering maximum listenership by making effective use of social networking sites to the content sharing sites. Do not forget audio blogging. It may appear to be a relatively non-exciting mode of communication but has a huge potential.

On the other hand, streaming is closest to FM broadcasting in terms of effort and methodology. From the listener's point of view, listening to FM radio and Internet radio is almost the same barring the difference in technology, receiver and cost. While FM radio is cheap to listen but restrictive in terms of its reach, the Internet radio is comparatively expensive to listen but has no geographical restriction. It is always beneficial to run the Internet radio and FM radio in parallel.

Wireless Mesh Networking is one of the emerging areas and holds a great promise for the future. The model, which is the most participatory in nature, is being adopted by many communities across the world. In this model, the community is in the centre and its members own and operate the communication infrastructure. It requires a very high level of community motivation, mobilisation and capacity building. The advantage of WiMesh is that you are not restricted to radio alone. You can do many things, such as run a community TV station, run a local telephone exchange, provide access to Internet, facilitate tele-medicine and tele-education to rural population, etc where these are needed the most. And most important of all, it brings a sense of connected community.

On the other hand, the mobile-based communication model is also a fast emerging solution. It is riding on rapidly growing number of mobile users across the world among rich and poor communities even though based on the current experiments in India, it may be stated that it has a limited functionality and it has a recurring cost factor.

22.7 Model Answers to Activities

Activity 22.1

While searching for free blogging sites, you may have come across sites like blogger.com, wordpress.com or weebly.com. These are all good sites and you can choose whichever you like. But it would be useful to choose one which has topics similar to the one you want to write on.

Activity 22.2

Once you have written your blog, you inform your friends and colleagues and encourage them to have a look at it. Remember, every click on your blog will be recorded by the blogging server and would help you in gaining popularity.

Activity 22.3

While trying to make a map, you might have noticed that there are differences in geo-locations as recorded by google map and the actual. One of the better ways of finding accurate geo-location is to use Global Positioning System device which are available in the market. These devices are expensive though. You can probably use your mobile phone if it has a GPS sensor or even assisted GPS system. Look at the technical specification of your phone to determine if you could use your phone.

Activity 22.4

While looking for the streaming community radio station, you would notice that most of them are using Icecast or Shoutcast servers. These are the most popular media server.

22.8 Additional Readings

- *Building a Rural Wiremesh Network, A Do-It-Yourself guide to planning and building Freifunk based mesh network Meraka Institute*. (2007). Retrieved from http://wirelessafrica.meraka.org.za
- *Description of Mobile Vaani*. (n.d.). Retrieved from http://gramvaani.org
- *Example Community Broadband Wireless Mesh Network Design*. (2007, June 20). Retrieved from http://www.tranzeo.com/products/docs/EnRoute500-Mesh-sample-design-report.pdf
- *Welcome to CGNet Swara*. (n.d.). Retrieved from http://cgnetswara.org
- *Wireless Networking in the Developing World*. (2006, January). Retrieved from http://wndw.net/pdf/wndw3-en/wndw3-ebook.pdf

Additional Activity

In order to improve your knowledge and skill further on the use of alternative mechanisms for content distribution, write a comparative analysis of various content sharing sites. It would be useful to have your thoughts also recorded in the analysis.

Glossary

Audio	means the audio frequency signals lying in the range of 20 Hz to 20 kHz.
Audio Blogging or Podcasting	is a term used for publishing digital content on the Internet.
Audio Cable	means cable used for carrying audio frequency signals.
Audio Connector	means connector used in the audio frequency range.
Content Sharing Sites	are the Internet sites that are designed specifically for sharing content of community radio.
IVR	stands for Interactive Voice Response.
Line Cable	means an audio cable used for connecting the input channels to the mixer.
Microphone Cable	means a cable used for connecting output of the microphone to the mixer or any other recording equipment.
RF	means radio frequency used for transmitting of programmes. In our case, it means frequencies transmitted by stations in FM band (88MHz to 108MHz).
RF Connector	means connector used in radio frequency range.
Social Networking Sites	are Internet sites that run on user-generated contents.
Solder	means a solder metal (wire) used for soldering the joints.
Streaming	is a term used for live transmission of data over the Internet.
WiMesh (Wireless Mesh Networking)	is a community-owned network of Wi-Fi nodes.

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