

Unit 29: Live Sound Techniques

Unit code:	A/600/6960
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

The aim of this unit is to develop skills in the use of live sound reinforcement equipment. Learners will become familiar with the sound equipment used in a music venue and will set up a sound system, use outboard equipment and set up monitor mixes.

● Unit introduction

Live sound or 'sound reinforcement' systems utilise many of the skills applied in the recording studio but with significant differences. Accepted practice in the studio does not always transfer effectively to the live sound environment where acoustic properties cannot be relied on or controlled in the way that they can in a recording studio. The success of a performance relies on the ability of the live sound engineer to use the audio equipment in real-time to create a workable mix on stage for the performers and out front for the audience.

Throughout this unit learners will develop knowledge of a live sound system from the microphones they use to the mixing console, the outboard, monitor system and main loudspeaker system. While experience of sound engineering for 'live' events in front of an audience is important it is recognised within the scope of this unit that these opportunities are not always available to learners in sufficient quantity. With this in mind the practical elements of this unit are focused on specific tasks such as setting up, connecting, placement and safety of equipment, establishing a working level in the monitor system and connection and use of effects processors and dynamic processors. Learners can work in small teams and individually to develop their skills and assessment can be managed within a classroom environment using a suitable sound system. Practice sessions and assessments including any live music event opportunities should be fully evidenced and learners should be encouraged to review the success of personal roles and their skill development. Health and safety procedures must be adhered to at every stage.

● Learning outcomes

On completion of this unit a learner should:

- 1 Know the sound reinforcement equipment requirements for a music venue
- 2 Be able to set up a sound system showing due regard for health and safety procedures
- 3 Be able to set up outboard equipment for live sound reinforcement
- 4 Be able to establish an on-stage mix for a performer.

Unit content

1 Know the sound reinforcement equipment requirements for a music venue

Live sound system equipment: microphones eg instrument specific, hand-held, headset, lapel, radio microphones; DI boxes; microphone stands; cables; front of house mixing console; power amplifiers; loudspeaker systems eg full-range, bi-amp, tri-amp, sub-bass, active, passive, flown systems, delay towers; monitor systems eg wedge, side-fill, in-ear, powered monitors; outboard equipment eg compressor, limiter, gate, graphic equalizer, effects processor, spectrum analyser

2 Be able to set up a sound system showing due regard for health and safety procedures

Sound system equipment: mixing console; multi-core cable; power amplifiers; loudspeakers; monitor system; microphone(s); cables; music player eg CD, MD, iPod, computer

Set up a sound system: equipment placement; equipment connection; main system sound-check; monitor system sound-check; use of mixing console; microphone choice

Health and safety procedures: safe sound levels; controlling feedback; lifting; carrying; electrical power distribution; hazardous substances; liquids; crowd safety; stage safety eg cables, equipment placement, exits, hearing protection

3 Be able to set up outboard equipment for live sound reinforcement

Outboard equipment: dynamic control eg compressor, gate, limiter; effects processor eg reverb, delay; cables; insert cable(s) 'Y-leads'

Mixing console settings and connections: gain; EQ; auxiliary sends; choice of aux type eg pre, post; effects returns eg auxiliary returns, stereo channels; Pan, channel fader, sub-grouping; inserts eg channel, sub-groups, main

4 Be able to establish an on-stage mix for a performer

Monitor system: pre-fader auxiliary send; graphic equalizer; power amplifier; loudspeaker; monitor types eg wedge, side-fill, powered, in-ear; microphone; music player eg CD, MD, iPod, computer; insert cable(s) 'Y-leads'

Monitor mix: sound quality; sound level; dynamic control; control of feedback; balance between sound sources eg voice, music playback, instruments; effects in monitor mix where appropriate

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 describe the sound reinforcement equipment requirements for a music venue [IE]	M1 explain how specific elements of sound reinforcement equipment are used in a music venue	D1 assess the need for specific sound reinforcement equipment in a music venue
P2 set up the sound system showing due regard to health and safety procedures with assistance [EP]	M2 set up the sound system showing due regard to health and safety procedures with only occasional assistance	D2 independently set up the sound system showing due regard to health and safety procedures to near professional expectations
P3 set up outboard equipment with assistance [EP]	M3 set up outboard equipment with only occasional assistance	D3 independently set up outboard equipment to near professional expectations
P4 set up an on-stage mix for a performer with assistance. [EP]	M4 set up an on-stage mix for a performer with only occasional assistance.	D4 independently set up an on-stage mix for a performer to near professional expectations.

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

This unit allows learners to develop knowledge and skills in both theory and in practice so it is important to plan, and possibly adapt, delivery to your physical resources, access to live performances and to the learner group. The outline learning plan and list of suggested assignments will give some direction when planning delivery but, for example, it may be suitable to run the written assignment at the same time as the practical assessments to give those learners not taking part during the session something to focus on. It is also very good practice to encourage learners to complete short tasks, peer observations or worksheets that can be designed to build upon their written evidence and underpin their practical skills.

In most cases it will not be until the learners connect the equipment and attempt, for example, to compress a signal or create a monitor mix that they will really start to understand the function of the equipment in a sound system. A good example of this is in understanding the difference between 'pre-fade' and post-fade' auxiliary sends for fold back and effects respectively. You can demonstrate, draw diagrams and explain but it is not until the learner sets up a monitor mix at a live performance event and makes the mistake of using a post fader auxiliary that the important difference is realised.

A number of input sessions should be planned to cover the range of equipment outlined in the unit content. This is an opportunity to introduce compression, EQ and the mixing console using examples of real equipment that can be shown to the learner group and used in demonstrations. It is important for learners to know what equipment is used in a large PA system, what the equipment does, how it is used and why. For example, showing a suitable compression setting for a chosen instrument or showing clearly how and why a graphic equalizer is used to fine-tune monitor mixes and combat feedback.

Practical sessions will take up around three quarters of the delivery of this unit so it is important to consider how skills will be developed effectively and how assessment can be carried out especially when managing large groups of learners. Planned 'practice' sessions can link directly back to the theory. Diagrams should be drawn of each item of equipment and important sections of the PA system such as the monitor system and outboard. Live sound is all about working in a live performance environment with performers, under pressure, with time constraints, safety procedures and technical issues. With this in mind it is important to run the assessment sessions within agreed time limits and with professional expectations in terms of sound quality and safety. It is also important to find opportunities for learners to run the sound or stage for live music events. With smaller groups or individual learners delivery and assessment can be based entirely around these live events through close supervision and regular recording of evidence as it is generated. It is important to note though that this unit can be delivered and assessed effectively without access to live music events.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to the unit.
Sound system theory/equipment (see unit content). Music venue case studies.
Assignment 1: Music Venue PA System – P1, M1, D1 <ul style="list-style-type: none">• Introduce assignment.• Write: research in class – case studies/internet/journals.• Improve: act on assessment feedback, resubmission of work where appropriate.
Equipment placement/connection/diagrams/health and safety. Practical demonstration/AV resources. Practice sessions/use of checklists/notes/track sheets.
Assignment 2: Rigging a PA System – P2, M2, D2 <ul style="list-style-type: none">• Introduce assignment.• Evidence: Individual and small group practical sessions.• Review: peer review and assessment feedback.• Improve: act on assessment feedback, re-run practical sessions where appropriate.
Equipment connection/settings/diagrams/practical demonstration. Practice sessions/use of checklists/notes/track sheets.
Assignment 3: Using Compression and Effects – P3, M3, D3 <ul style="list-style-type: none">• Introduce assignment.• Evidence: Individual and small group practical sessions.• Review: peer review and assessment feedback.• Improve: act on assessment feedback, re-run practical sessions where appropriate.
Equipment connection/settings/diagrams/practical demonstration. Practice sessions/use of checklists/notes/track sheets.
Assignment 4: Monitor Mix – P4, M4, D4 <ul style="list-style-type: none">• Introduce assignment.• Evidence: Individual and small group practical sessions.• Review: peer review and assessment feedback.• Improve: act on assessment feedback, re-run practical sessions where appropriate.
Review of unit and assignments.

Assessment

The evidence that the learners are required to produce for the unit reflects the type of knowledge and technical skills a live sound engineer needs to operate a sound system effectively.

Assessment for learning outcome 1 can be presented as a written report, website page, internet 'Blog' or oral presentation. It is not expected that this evidence be turned into a dry, written exercise but should be kept as close to the type of work someone in this area of the industry would produce such as a sound system company quoting for a new sound system. Any specific venue can be used as long as it provides sufficient scope in its requirement for a music sound system. The most appropriate type would be a large-scale pop/rock music venue or festival stage.

Assessment for learning outcomes 2, 3 and 4 should to be done through practical workshop sessions that allow learners to work in small teams and individually to develop their skills and knowledge. Each grading criteria can be assessed separately or in combination with each other depending on the delivery, resources and the learner group. Assessment can be done using pre-recorded material, a single performer or a full band. For example, a suitable set up for a workshop session would be a vocal microphone, an acoustic guitar and music playback from a CD player. It is also encouraged that learners are assessed during live music events but this is not essential. It is expected that some learners will generate suitable evidence during live events while others will need the focus that short workshop sessions will give them. It may not be suitable to rely solely on assessing these practical-based criteria in a live music performance context. Access to performers during workshop sessions is important to give learners a sense of realism. Use of pre-recorded multi-track material may also be appropriate.

To achieve P1, learners must describe the sound reinforcement equipment requirements for a music venue. They will provide a description of each item of equipment needed for a chosen venue and say what each key item is used for. Evidence is likely to be brief but should include all the essential equipment needed. Makes and models can be presented and diagrams showing equipment placement included but these may not well chosen or accurate.

To achieve M1, learners must explain how specific elements of sound reinforcement equipment are used in a music venue. This will be an explanation of at least four items or systems, but not necessarily all, the equipment. This could include, for example, the monitor system, radio microphones, mixing console and DI boxes. It is the accuracy and depth of explanation that is important not quantity. Technical features of the equipment could be covered to show how equipment is used. Explanation evidence is likely to answer questions such as how things work and why they are used.

To achieve D1, learners must assess the need for specific sound reinforcement equipment in a music venue. This could be done focusing on the equipment already being explained and/or could focus on what new or upgraded equipment is needed and why. Evidence should include assessment of quality and functionality with questions answered such as: How well does the equipment function? How useful are the features? What would happen without this equipment? There should evidence that some thought has gone into choosing specific items of equipment makes and models with reasons given.

To achieve P2, learners will set up the sound system showing due regard to health and safety procedures with assistance. The equipment set-up should match that listed in the essential resources section of this specification but focus here is on the main system, placement and connections not outboard and setting monitor mixes. Assistance can be given by the tutor and/or by working in a team with other learners. Learners must be aware of safety issues even if they do not follow them precisely and need reminding of them throughout.

To achieve M2, learners will set up the sound system showing due regard to health and safety procedures with only occasional assistance. It must be obvious that the learner is almost able to work independently. They should demonstrate a working knowledge of the sound system and attempt to work safely at all times. Learners may need some reminding of how to connect and place equipment.

To achieve D2, learners will independently set up the sound system showing due regard to health and safety procedures to near professional expectations. Learners will follow and enforce safety guidelines at all times and will operate in a professional manner throughout. No input from the tutor or other learners will be needed to effectively set up the sound system.

To achieve P3, learners will set up outboard equipment with assistance. It is expected that a minimum of a dynamic processor be set up as well as an effects processor. Connections or routing should be made and settings chosen for each item. Assistance can be given by the tutor and/or by working in a team with other learners. Learners may demonstrate no knowledge of what each control does but are able to get a signal through the processors with help.

To achieve M3, learners will set up outboard equipment with only occasional assistance. It must be obvious that the learner is almost able to work independently. They should demonstrate a working knowledge of the outboard equipment used but may need reminding how to connect the outboard and what each control does.

To achieve D3, learners will independently set up outboard equipment to near professional expectations. Settings on the outboard equipment should enhance the sound and the learner should demonstrate the ability to change or alter settings to suit the material. No input from the tutor or other learners will be needed to effectively set up the outboard equipment.

To achieve P4, learners will set up an on-stage mix for a performer with assistance. It is expected that a monitor speaker and amplifier, or powered monitor, be used with a graphic equalizer and a suitable aux send from a mixing console. At least two sound sources must be used to establish a mix. For example, voice and music backing track. Connections or routing should be made for the monitor system and settings made on the aux send and EQ. Assistance can be given by the tutor and/or by working in a team with other learners. There may be audio feedback due to high levels or inappropriate EQ settings.

To achieve M4, learners will set up an on-stage mix for a performer with only occasional assistance. It must be obvious that the learner is almost able to work independently. They should demonstrate a working knowledge of the monitor system used but may need reminding how to connect equipment and what each control does.

To achieve D4, learners will independently set up an on-stage mix for a performer to near professional expectations. Settings on the EQ and mixing console should enhance the sound and the learner should demonstrate the ability to change or alter settings to suit the material and avoid feedback. No input from the tutor or other learners will be needed to effectively set up the monitor mix.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, M1, D1	Music Venue PA System	Working for a sound system company you have been asked to choose equipment for a specific music venue.	Evidence comprising: <ul style="list-style-type: none"> written report internet 'Blog'.
P2, M2, D2	Rigging a PA System	Rig and sound check a PA system safely.	Evidence comprising: <ul style="list-style-type: none"> tutor observation learner notes.
P3, M3, D3	Using Compression and Effects	Connect and use a compressor and effects unit on a single vocal microphone.	Evidence comprising: <ul style="list-style-type: none"> tutor observation learner notes.
P4, M4, D4	Monitor Mix	Set up a monitor system and create a workable on-stage mix for a solo performer with backing track.	Evidence comprising: <ul style="list-style-type: none"> tutor observation learner notes.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Music and Music Technology sector suite. This unit has particular links with the following unit titles in the BTEC Music and Music Technology suite:

Level 1	Level 2	Level 3
		Music Events Management
		Concert Production and Staging

This unit also has links with the following National Occupational Standards:

Technical Theatre

- CPD1 – Improving your skills
- CPD2b – Ensure that you and your team keep up to date with the technical and production areas of the live arts
- HS1 – Working safely
- CPD4a – Contributing to technical production work for performance
- CPD4b – Overseeing technical production work for performance
- HS2 – Assessing risks (HSS6)
- HS5 – Controlling risks (ENTO HSS2)
- HS3b – Selecting and using safe systems for working at height (RC3)
- TP3.6a – Contribute to the planning of sound requirements for a production (C2)
- TP3.6b – Planning sound requirements for a production (C2)
- TP8.4 – Setting up and checking sound equipment (C6)
- TP14.1a – Getting in, fitting up and getting out (M4)
- TP20.4b – Supervising sound operation for a live performance in the theatre
- TP23.1 – Maintaining buildings or equipment (C12)
- TP5.6 – Sourcing sound equipment
- MTP2 – Cleaning up own work area.

Essential resources

Instrument and vocal microphones, DI box(s), microphone stands, cables, mixing console (minimum 2 aux sends pre and post fader), compressor(s), gate(s), effects processor(s), graphic EQ, full range PA loudspeakers (powered or with power amplifier), monitor speaker(s) (powered or with power amplifier), short cables for outboard, insert cables 'Y-leads' music playback device eg CD, MD, iPod, computer

Additional equipment preferred; multiple gates/compressors(s), multi-core cable, separate bass bins, crossover, multiple monitor loudspeakers, separate power amplifiers, cases for equipment, loudspeaker stands

A range of dedicated microphones and DI boxes should be available along with drums and other instruments to develop microphone technique. Access to proficient musicians and vocalists at certain times during delivery is also recommended. Multi-track playback facilities with 'live' recording will negate the necessity for musicians to be available for every practical session when mixing skills, application of effects, and use of equalisation are being practised. The sound system should be suitable for music performance. The Mixer should have facilities for sub-grouping, and equalisation of at least 3 bands, ideally with swept-mid capability. Both pre- and post-fade auxiliaries will be needed to cater for monitors (pre-fade) and effects (post-fade). Effects can be inboard or outboard with access to both reverb and delay effects needed. Control of dynamics – limiting, compression and gates can similarly be inboard or outboard.

Employer engagement and vocational contexts

Work in the fields of live sound engineering, stage technician, theatre sound and studio engineering.

Indicative reading for learners

Textbooks

Davis G and Jones R – *The Sound Reinforcement Handbook* (Hal Leonard, 2008) ISBN 9780881889000

Eargle J and Foreman – *JBL Audio Engineering for Sound Reinforcement* (Kendrick Books, 2008)
ISBN 9780634043550

Gibson B – *Ultimate Live Sound Operator's Handbook* (Hal Leonard, 2007) ISBN 978-1423419716

Stark H – *Live Sound Reinforcement* (Course Technology, 2005) ISBN 9781592006915

White P – *Creative Recording 1: Effects and Processors* (Sanctuary Publishing, 2003) ISBN 9781860744563

White P – *Basic Live Sound* (Sanctuary Publishing, 2000) ISBN 978-1860742712

White P – *Live Sound for the Performing Musician* (Sanctuary Publishing, 1998) ISBN 978-1860742101

Delivery of personal, learning and thinking skills (PLTS)

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	researching sound reinforcement equipment for a music venue
Effective participators	operating as part of a sound team, taking on roles and responsibilities, reacting and adapting to the needs of musicians and the audience.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Creative thinkers	operating a complex sound system and overcoming problems that may occur during a performance or sound check
Reflective learners	reviewing own progress in technical mastery of sound equipment
Team workers	setting up and operating sound equipment as part of a sound team. Working with musicians and other performers and technical crew
Self-managers	running sound checks and performances to time.

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	researching and choosing suitable items of sound system equipment
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	presentation of sound system equipment including pictures, technical data and connection diagrams
Present information in ways that are fit for purpose and audience	presentation of sound system equipment including pictures, technical data and connection diagrams.