



Technical Support Guide for online instrumental lessons



Supported by Nesta, Arts & Humanities Research Council and public funding by the National Lottery through Arts Council England



This is a technical guide for Music Education Hubs, Schools and other organisations participating in online music lessons. The guidance is based on the technical setup used during the Connect: Resound project.

The guide has been developed to help you to set up and use a package of equipment (hardware and software) which was trialled on the Connect: Resound project. It is a step by step guide to setting up, connecting and using the equipment in order to deliver and participate in online music lessons.

This guide can be read in conjunction with a short instructional video created as part of Connect: Resound:

<https://www.youtube.com/watch?v=1RSiKkPx730>.

The video talks you through all of the equipment and how to set it up. It is split into six sections and takes you all the way through from connecting the equipment to an example setup.

Please also refer to the Guides for Online Learning for Music Education Hubs and Schools, on the Connect: Resound website.

- 1 An introduction to the equipment**
- 2 Step by step guide to setting up the equipment**
- 3 FAQs and Troubleshooting**
- 4 Further information on the technology**
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1 An introduction to the equipment

The Connect: Resound action research project used a standard technical set-up to deliver the online teaching, in conjunction with the video streaming software, Skype. The setup comprised:

- Roland VR-3EX video/audio mixer and streamer
- 3 video cameras, 3 external microphones
- Internet enabled PC, using a wired broadband connection

The research team identified the following options as the most effective technical setups

- Internet enabled PC plus webcam (at the school) to Internet enabled PC plus Roland VR-3EX + 3 cameras + 3 mics (at the Music Hub);
- Internet enabled PC plus Roland VR-3EX + 3 cameras + 3 mics (school) to Internet enabled PC plus Roland VR-3EX + 3 cameras + 3 mics (Music Hub)

This technical guide assumes that you will be using the full equipment set-up, including the VR-3EX, 3 cameras and 3 microphones.

2 Setting up the equipment

Room set-up

It is worth taking some time to decide on where the **Connect: Resound** project is best delivered. Smaller rooms are often a lot better than the main school hall. This is due to the acoustics of a larger room, and the possibility of echo and high noise levels. You may find that using a space/ room with soft furnishings and carpets is a simple way of reducing sound bouncing around walls. Larger rooms may require solutions such as acoustic boards or foam tiles.

Things you need to have and to consider:

- A computer/laptop capable of running Skype. The system requirements aren't high. In practical terms just about any computer made in the last five years will be more than adequate;
- A classroom to run the lesson from;
- A good power supply;
- Good Internet connectivity: 1 Mbps (both upstream and downstream) is sufficient, but faster is better, especially if other users are sharing the same connection. You can check the speed of your Internet connection at www.speedtest.net;
- Speakers/headphones linked to the computer to enhance the sound quality.

Top Tip: Try not to run lessons in the school hall or a place with a big echo. This may help the student sound fantastic to start off with, but it won't help develop their individual tone. Aim for a room with a 'dry' acoustic.

The basic set up is that the three cameras and the three microphones all connect into the central control desk (the Roland VR-3EX), which is then connected to the computer. The program used to broadcast everything is called Skype.

By using multiple cameras, the teacher and student have a better view of an instrumentalist technique, such as posture, finger positions and embouchure. The multiple microphones help provide a good level of sound to enable such things as intonation and tone to be heard and discussed.

Connecting the Equipment

Please watch Part 2 of the video:

<https://www.youtube.com/watch?v=1RSiKkPx730>

for a full demonstration of how to connect all the equipment together.

A summary of the key points is provided below.

Step One: Connecting the Roland VR-3EX Central Control Desk

All the equipment is plugged into this audio/video mixer and streamer. It is called a VR-3EX and made by Roland.



What is the VR-3EX?

The VR-3EX is an all-in-one audio and video mixing desk with a built-in USB port for web streaming and recording, and is about the size of a telephone directory. The VR-3EX is an HDMI quality portable unit and ideal for streaming/broadcasting and recording music lessons. You can use up to four video channels, controlled by a touch screen, and a full 6-channel digital audio mixer (with optional effects).

Switching it on

- 1 Connect the mains lead to a mains supply.
- 2 Plug in the USB cable from the top of the VR-3EX into your computer.

Step Two: Connecting the Video Cameras

There are three cameras as part of the kit, all Henelec 30Z700 'DSP 300 x Colour Zoom cameras with automatic digital zoom. The cameras all focus automatically and can be adjusted very easily to suit the player and instrument/voice.

- 1 To connect the cameras to the VR-3EX there are three leads that need to be connected. The video will- show you where to plug these in:

- The composite lead plugs into the camera
- The red end of the lead plugs into the mains adapter (which then plugs into the mains board)
- The other, yellow, lead goes into one of the four video connectors.

2 The computer will automatically see the VR-3EX as a USB camera and audio source without the need for any additional drivers being installed.

3 The cameras can then be set up and positioned using the tripod stands that come with the package. The cameras have a variety of different settings and there is a separate camera set-up guide at the end of this guide.

Top Tip: Think about sticking numbered masking tape crosses on the floor for always getting the cameras positioned where you want them.

Step Three: Connecting the Audio

We used three microphones in the Connect: Resound project. The two main microphones are Rode NT5's, and the lapel microphone is a Rode Smart LAV+. The two Rode NT5 microphones should be used on microphone stands.

1 Position the two Rode NT5 microphones.

These microphones are used to capture the ambient instrumental sound in the room. These are 'overhead' microphones and will need to be placed on the provided microphone stands. They should be positioned a short distance apart with the microphones pointing towards the student/teacher and their instrument.

2 Attach the Rode NT5 microphones

Using two XLR cables, the NT5 microphones should then be connected into two of the four audio connectors on the VR-3EX.

3 Attach the Rode Smart LAV+ microphone (music teachers only. Schools, please go to point 4)

The Rode Smart LAV+ is a small but broadcast-quality lapel microphone, which can be attached to your clothing. The quality of sound captured and streamed is entirely dependent on the microphones and the acoustic within the room. The Rode microphones are very suitable for this project and are high quality at a very reasonable price.

The microphone comes with an extension lead together with a couple of adapters to convert the mini-jack into an XLR (microphone) input, suitable for the VR-3EX. You can watch how to connect these together in the VR-3EX Tech Guide Video.

Make sure you wear the microphone pointing downwards, i.e. away from your mouth. This will avoid getting those popping sounds from consonants such as 'p's when you speak!

The small Rode Smart LAV+ microphone needs to be connected first to a converter, and then into an XLR lead. This then plugs straight into the side of the VR-3EX, into one of the four audio connectors.

Top Tip: These Rode Smart LAV mics are tiny! Make sure that you look at the wiring and clip to ensure that it is kept protected whilst you wear it on your shirt, blouse or jacket.

4 Switch on the 'Phantom Power' switch

On the same side of the VR-3EX as the audio connectors is a 'Phantom Power' switch. This needs to be turned on to make the microphones work. This is very important!

Step Four - Configuring Skype

Please watch Part 3 of the video:

<https://www.youtube.com/watch?v=1RSiKkPx730>

1 Open a Skype account at www.Skype.com.

Once all the cameras and microphones are connected to the VR-3EX, it's time to connect the computer as well. Both the teacher and the school or pupil will need to open a Skype account if they don't already have one. Skype is a free computer program that allows video chat and calls from computers, tablets and mobile phones via the Internet to other similar devices. Skype accounts are free to use and simple to set up with just a user name and password.

2 Get the VR-3EX 'talking' to the computer by connecting the USB lead (as instructed in Step 1 of Connecting the equipment).

3 Open Skype and set it up to recognise the VR-3EX.

This is done by selecting 'Preferences' in the Skype menu. This will show you the microphone and camera feeds.

In the microphone menu, you need to select the 'VR3EX' option. This will then show the signal coming from the VR-3EX microphones.

Then select the camera menu, and select 'VR3EX' as well. This will now show the output from one of the cameras that is connected to the VR-3EX.

4 To initiate a teaching session, the teacher needs to video call the school, using Skype.

Top Tip: Always make sure you've got the 'phantom power' button switched on – otherwise the microphones won't work.

Step Five - Using the VR-3EX

Please watch Part 4 of the video:

<https://www.youtube.com/watch?v=1RSiKkPx730>

The VR-3EX is now all set up ready to go, but there are a couple of main functions you need to know about.

The right hand side of the VR-3EX is all about the cameras, and the left hand side is the 'Audio Mixer' and all about sound.

Right hand side (video)

There are currently three cameras connected to the VR-3EX, and the three different images should all show on the VR-3EX screen.

The image that the student will see is the image with a red box around it.

This image can easily be changed by either using the touch screen, or by using one of the main four control buttons beneath the screen.

Left hand side (audio)

The three microphones are connected into the side of the VR-3EX into one of the four 'Audio Input' sockets (the teacher's lapel microphone and the two NT5 instrument microphones). The VR-3EX is very similar to an audio mixer.

Each channel setting works the same, so:

For microphone one, plugged into the number one 'Audio Input', you first need to set the 'gain' knob. This should be positioned up to around the '2 o'clock' position.

Then the corresponding slider needs to be moved up to just over half way. At this point, a green light should be flashing on the microphone one setting that shows you're getting a signal through the microphone.

This will also show on the very bottom of the VR-3EX video screen to indicate it's working properly.

You need to set the 'gain' and the mixer slider for each microphone.

To get all three microphones going through to Skype, you need to set the master slider up to just over half way.

This will trigger a strip of 'peak' flashing lights (green, amber and red). Position the slider so that it is mostly flashing in the amber.

If it is flashing red, the sound quality will distort, which you don't want. To rectify this, pull the microphone sliders down until you see amber lights instead.

This audio sound will now also be going through to Skype.

Top Tip: Think about using some cable ties to keep all the leads tidy and neat.

Example Setup

Please watch Part 5 of the video:

<https://www.youtube.com/watch?v=1RSiKkPx730>

The research team from the University of Hull, found that the best configuration for getting good results were:

- The complete Connect: Resound package (VR-3EX, 3 cameras, 3 microphones) at the teacher's end and the same at the students' location;

or

- The complete Connect: Resound package at the teacher's end and just a webcam and microphone at the students location.

The positioning of the microphones and cameras will vary according to the instrument or voice being taught.

The basic set-up would be to position the two NT5 microphones on their microphone stands at a distance apart, left and right of the instrumentalist(s). They will pick up the ambient sound of the music made in the room.

The teacher will be wearing the lapel microphone which will help to give clear, easy-to-hear directions.

The cameras can be positioned to show both a full image of the student, and close ups. All the cameras can be mounted on tripods to ensure you have the image you want.

Top Tip: You might want to consider having one of the cameras angled onto the sheet music that is being played. This would help on giving directions within the music on which passages are being worked on.

We would recommend that the computer is located next to the VR-3EX for full control of all aspects of the teaching.

Please be aware of health and safety, ensuring that no one will trip over any of the cables or leads. You can always tape the leads down with a strip of gaffer tape.

You may also wish to use headphones with your teaching as they are a good way of isolating sounds and sometimes aid concentration from students. They also help to prevent feedback through any online communication. They are easy to use and plug straight into the Roland VR-3EX. We would recommend any good quality high-definition lightweight headphones.

Delivering a lesson using the VR-3EX

Lesson times need to be adhered to so that both the teacher and student are in position ready to receive the Skype 'call'. To start the lesson, we recommend that it is the teacher who 'rings up' the student using Skype. The student then answers and the lesson begins. Always start the lesson making sure that everyone can hear each other on their computers. Please refer to the detailed guidance for schools and Hubs in the Connect: Resound toolkit for more advice.

3 FAQs and troubleshooting

Q: The microphones aren't working?

A: Check you have the 'phantom power' switch on, this switch is found on the left hand side of the VR-3EX.

Q: I'm only getting the computer's webcam image on the screen?

A: Check you have got the VR-3EX clicked in the Skype preferences menu.

Q: I am getting distortion on the audio?

A: Move the microphone sliders down until the flashing 'peak' lights are green.

Q: I keep losing my Skype connection?

A: There may be a few reasons for this, but start with checking your internet connection. It is also worth bearing in mind that if more students are using the internet at the same time as you are using it to deliver your music lesson, that this may affect your connectivity speed.

General help and technical support

If you experience any problems, need any help or would like some information about the costs and purchase of the Connect: Resound equipment, please get in touch with Jonathan at UCan Play.

jonathan@ucanplay.org.uk

4 Further information on the technology

More information about Internet strength

Obviously both the teacher and the pupil will need a computer/laptop with a good connection and strong signal. We use Skype as the main program that students log into for lessons, and help can be provided in checking that connections are stable enough to avoid any issues such as the signal being lost mid-lesson.

We would suggest that you test your internet connection speed. This may best be carried out by your IT staff because there are various browser checkers that can be used. A school's internet connection should be adequate, but this doesn't take into account other concurrent usage. If other people in a school are using the internet at the same time, it is worth bearing in mind that the available bandwidth will be reduced. If you find situations where connection speed is an issue, you may like to try to minimise other internet usage, as this may help.

More information about audio levels

Ensuring the input levels are set up correctly is essential for the best quality sound. As mentioned earlier in the 'Using the VR-3EX' sections, for each input you are using, turn the gain knob down to its minimum and move the channel slider to the bold line position (about $\frac{3}{4}$ of maximum). Then, while playing incoming audio, turn up the gain knob until the PEAK indicator briefly turns red when the input audio is at its loudest. At this point turn the gain knob back down a little to ensure that the PEAK indicator does not enter the red (which would mean the audio is distorting).

A noise gate and compressor are available on each channel to give you further control over the sound input levels if needed. These effects are accessed via the channel setup menu by pressing the setup button above each fader, then navigating using the touch screen and the VALUE knob at the top-right corner of the unit.

The gate effect suppresses quiet background noise by silencing the sound if the input falls below a certain volume. The threshold parameter determines the level below which the input will be muted - typical values for this setting are between -36 dB and -24 dB. You could use this to cut out any background noise or hum (e.g. from fluorescent lighting) that you did not want to send to your teacher/student via Skype.

The compressor effect normalises the volume of the sound by automatically decreasing the volume if the input signal exceeds a certain level. For example, if you are playing a sound with a wide dynamic range between its loudest and quietest levels (e.g. a trumpet), you can turn up the volume using the fader to ensure the quietest parts are audible and the compressor will automatically adjust the volume during the loudest parts to prevent distortion. The threshold parameter determines the level above which the input is decreased. So if the threshold is set to -12 dB, any sound above -12 dB will be reduced in volume and any sound below -12 dB will be unaffected.

More information about the VR-3EX

Please be aware that there may be a slight time lag between teacher and pupil. This can be adjusted and improved on the VR-3EX, but please be aware that ‘counting’ alongside a pupil or playing at the same time in perfect sync with video is simply not possible with current technologies.

To make sure Skype is using the VR-3EX and not the computer’s built in microphone or webcam, first select Tools->Options from the main menu within Skype. In the options window select Audio settings and choose “VR3EX” in the Microphone drop-down. Next select Video settings and find the VR3EX in the Select webcam dropdown. In some cases it might be listed as just ‘USB Video Device’.

Please be aware that each Skype connection may have different latency issues. This means that lips and sounds might not initially synchronise up. There is a way of adjusting this within the VR3-EX using what is known as the ‘USB delay’. This setting is available within the setup page for each audio input. Please see page 38 of the Roland VR-3EX manual for more information about this. Through changing the value of this setting very slightly you can align the video image and the associated audio precisely. In tests so far, a setting of 300ms has been favourable.

Further camera setup information

We used cameras from the CCTV market for this project. Why? They are perfect for ‘streaming’ a video output for Internet use. They do not record anything themselves (like a commercial or domestic camcorder would on a SD-card or similar). However, because they are CCTV cameras they can be a little fiddly to set up. Fortunately, you’ll only need to do this once as they have an internal battery that saves the settings. If you need to adjust the camera image (e.g. the zoom or focus of the camera), the main information that you need is below:

At the back of the camera is a set of 5 buttons.

TELE and WIDE zoom in and out respectively, FAR and NEAR control the aperture - which effectively adjusts the focus (for the most part the camera’s auto focus will do its job, but for very close-up subjects you might need to make some manual adjustments with the FAR and NEAR buttons).

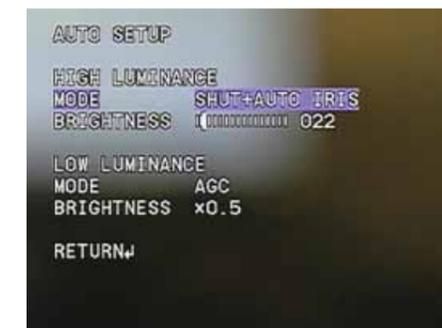
The MENU button accesses the camera’s various settings. When in the setup menu, TELE and WIDE buttons scroll through the menu, while the FAR and NEAR buttons change a selected option. Pressing the MENU button accesses sub-menus - for example in the image below, with LENS highlighted, pressing MENU will open the LENS sub-menu.



Normally you won’t need to change any of these settings in day-to-day use; however our recommended settings are shown below for reference:



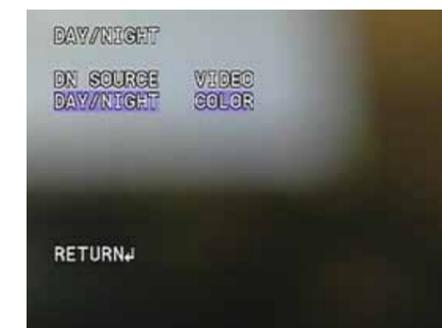
LENS sub-menu



SHUTTER/AGC sub-menu



PICT ADJUST sub-menu



DAY/NIGHT sub-menu



After making any changes, be sure to highlight SAVE ALL then press MENU so you changes are preserved when the camera is switched off:

5 Kit List

This is the complete Connect: Resound project kit list with costs (subject to change):

Item	Number	Value (£)
Video camera	3	£300
Video camera power unit	3	£30
Video camera power lead	3	£15
Full size tripod	1	£20
Desk tripod	2	£15
Rode Smart Lav + microphone	1	£45
Rode Smart Lav + TRRS to TRS adapter	1	£3
Rode Smart Lav + extension lead	1	£12
Rode Smart Lav + mini-jack to XLR converter	1	£3
Rode NT5 matched pair microphones + case	1	£150
XLR microphone lead (3m)	2	£16
Microphone stands	2	£50
6 socket plug board	1	£7
Roland VR-3EX	1	£1,600
Total		£3,037