

KSSM – 60S MM
The Sound Module Kit for Model Makers

The key components of the popular KSSM – 60S, are separated out as shown in the picture at right for easier access to control functions and to allow more flexible installation options.

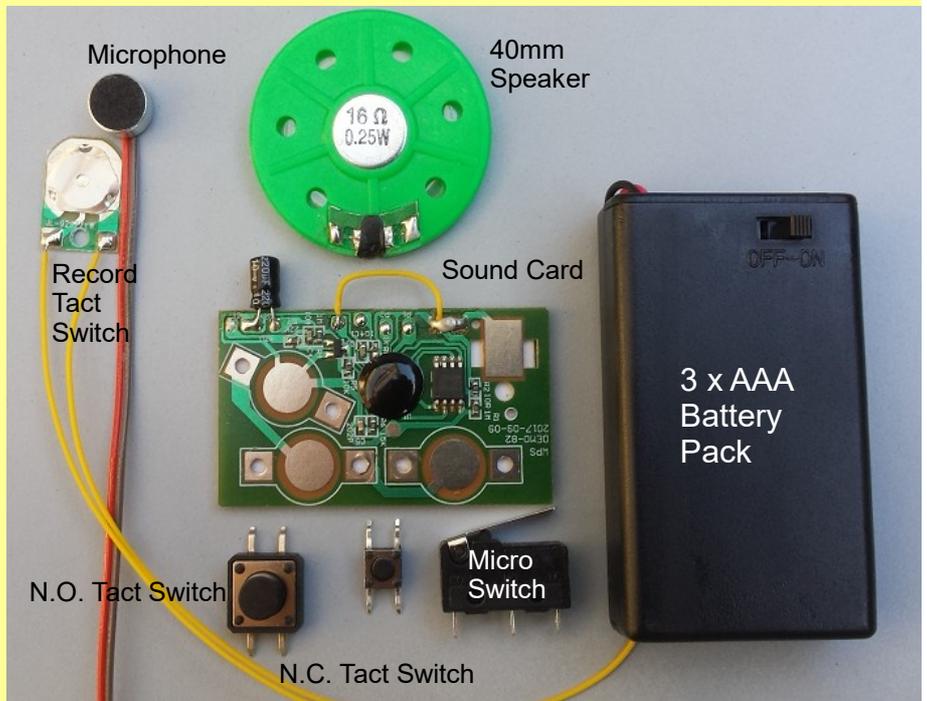
Control options are increased by the inclusion, in the kit, of a Normally Open tact switch, a Normally Closed tact switch and a micro-switch. A switched 3xAAA battery holder (batteries not included) uses readily available cells for a long operating life, especially in applications requiring operation over several hours.

Getting Started

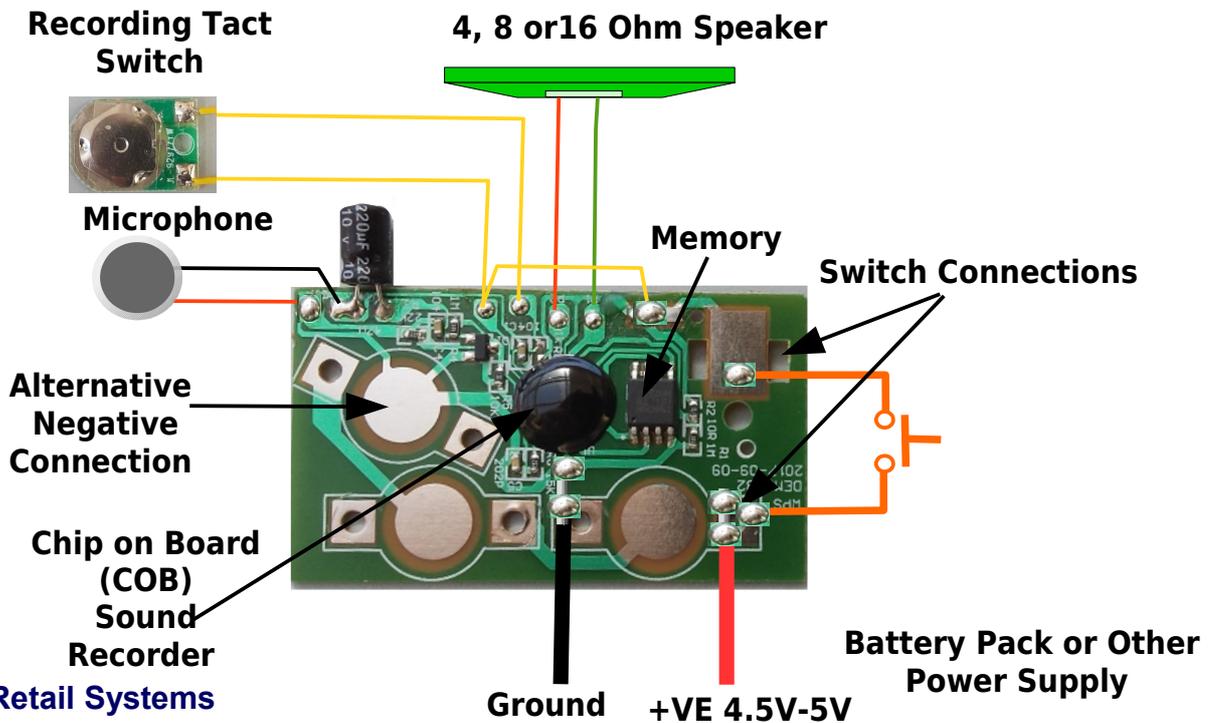
Before getting into the detail of what goes where, users are encouraged to check that everything has been included in the kit.

Using the picture above, you should have the following:

- | | |
|-----------------------------------|--------------------------------------|
| 1. Sound Playback Board | 4. 3xAAA Switched Battery Holder |
| 2. 9.7mm Electret Microphone | 5. Flat Record Tact Switch |
| 3. 40mm 16 Ohm Speaker with Leads | 6. 12x12mm Normally Open Tact Switch |
| | 7. 6x6mm Normally Closed Tact Switch |
| | 8. Low Force Micro-switch |

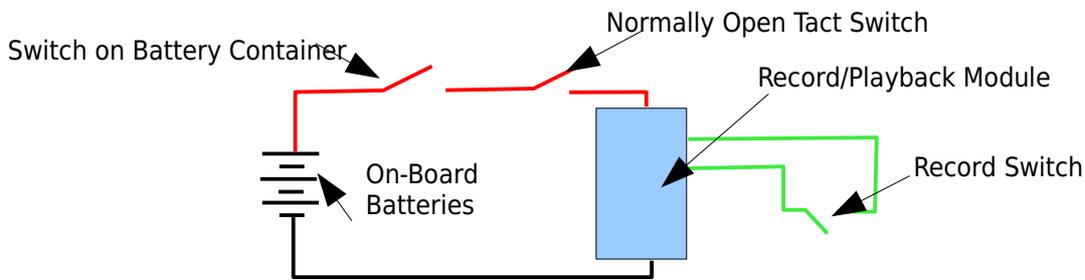


Assembly of the KSSM-60S MM. As can be seen from the diagram below there are very few connections to be made. The length of the connecting wiring for speaker, power supply and switches can be adjusted to suit the situation into which the module is being installed.



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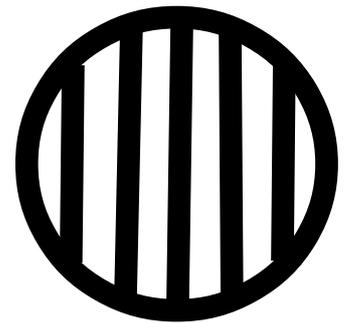
Perrin, Wright and Associates ABN 86 481 210 936
PO Box 5422 Clayton Victoria 3168
PH: 0432 502 755
www.kitstop.com.au email info@kitstop.com.au



To Record Content, point the microphone towards the sound source, press and hold the Playback Tact Switch, at the same time press and hold the flat Record Button tact switch. Immediately a “beep” will indicate that the module has started recording, erasing any previous content. Hold the switch ON for the duration of the recording. Lifting your finger will end the record with another “beep”. Similarly, if the recorded message reaches 60 seconds, it will sound a “beep” and end the record session.

To Hear the Recorded Content, press and hold the Playback Normally Open Tact Switch. This returns the playback to the beginning of the recorded content and restarts the Playback. The module draws very little power from the batteries when not being used. However, if you need to leave the module unused for an extended time we recommend that you turn the Battery Module Switch to OFF

The pattern at the right is for a speaker grille to allow the sound to escape from the model.



The pattern of the grille is not really critical. If the graphics on the outside a model has dark areas, these may be cut out to allow for the speaker sound to come out without looking like a speaker grille.

In fact, provided the hole is larger in area than 3cm² it will go a long way towards harnessing the available power from the speaker.

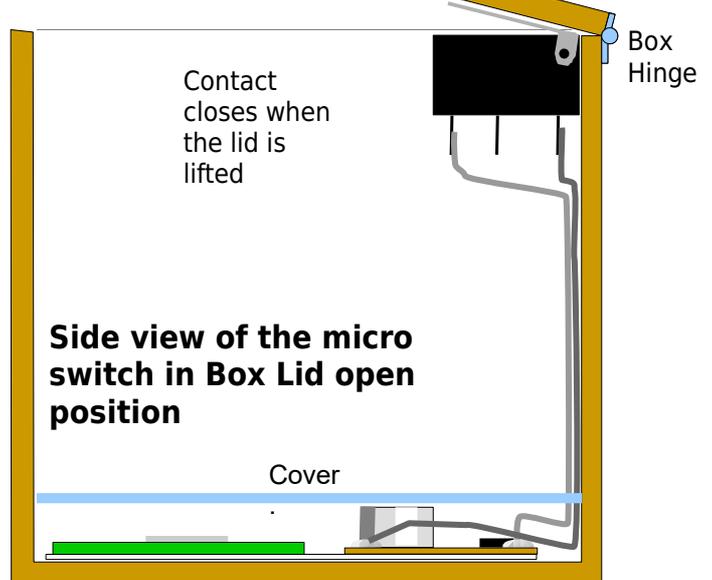
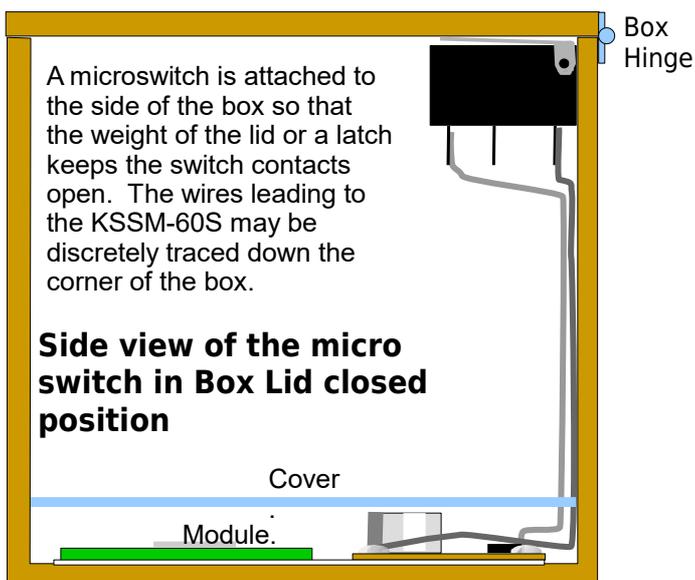
After recording the content, the Recording Tact Switch could be removed and re-used as a playback switch instead of the 12x12M switch supplied. **Ensure that the power is disabled before removing the Record Switch.** If this is not practical, cut only one connecting wire at a time. Cutting both at once will risk erasing the recorded content.

Re-use the record switch as a playback switch



The module is now ready to accept other switch types such as micro switches, pushbutton switches, magnetically operated reed switches, tact switches and MOSFET switches.

Below, we add a micro-switch to a gift box to initiate the playback when the lid is opened
The electronics may be mounted on the the bottom of the box, and concealed by a cover.



Replacing Batteries. Replace spent batteries immediately to avoid corrosive chemical leakages. The battery case cover is easily slid off by pressing the grip area on the case and sliding it forward. Replacement batteries are AAA Alkaline 1.5V type.

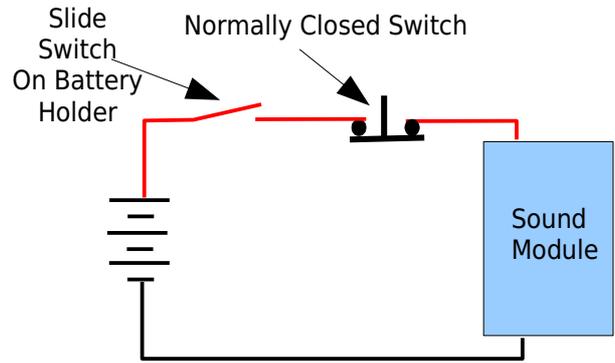
IMPORTANT: If storing your KSSM-60S MM-based Model for extended periods, remove the batteries.

One Touch Playing

In this mode, pressing a Normally Closed tact switch wired into the solder points instead of a micro-switch or a Normally Open Tact switch will simulate the the opening and re-closing of a switch.

When pressed, the switch opens, stopping whatever is playing and then when it closes again it starts the playing again from the beginning. The module plays out until the passage is completed and then goes into a low current (a few microamps) standby mode.

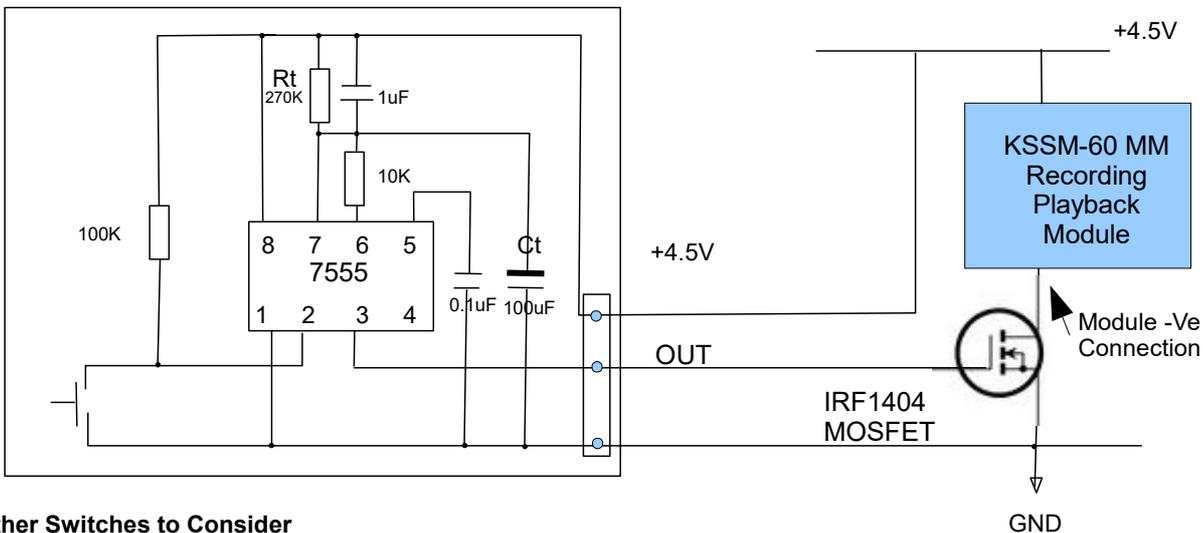
If it is thought that the player will not being used for a long period, a toggle or slide switch should be inserted in the power line so that the module can be turned off.



An alternative way of initiating the KSSM-60S MM from a Normally Open Momentary Contact

The KSSM-60S MM requires power for the whole time of recording content. The following circuit is for a low power timer that takes a momentary contact closure and stretches the signal to full 60seconds of the maximum message length.

Other timing intervals may be selected by changing the values of R_t and C_t or inserting a potentiometer and padding resistor for R_t



Other Switches to Consider

As well as the tact switches used above, nearly all push-buttons featuring Normally Open or Changeover contacts may be used.

The Normally Open contacts of lever-type micro switches or magnetic operated (Change Over) reed switches may be incorporated within boxes or cupboards so that when the lid or door is opened the module can play back its message.

Sensor Modules as Triggers

Sensor modules such as our KSR501 PIR or the KSR504 Ultrasonic feature TTL outputs which may be easily adapted to drive the gate n-channel low voltage MOSFET. This results in an interface that has very good switching characteristics in the ON state and almost zero current drain in the OFF state.

Interfacing the KSR501 PIR

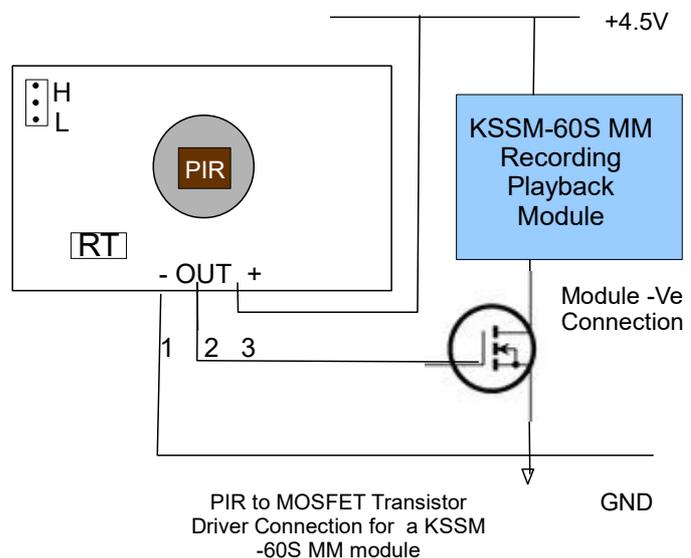
The drawing to the right is a simplified connection diagram. Here, the TTL output drives the gate of a low voltage MOSFET such as an IRF1404.

In fact, any N Channel MOSFET with an R_{dsON} of 0.5 Ohm or less and a current capacity of at least 100mA can be used to turn on the KSSM-60S.

In this configuration, the MOSFET acts like a switch whose ON resistance is negligible and whose OFF resistance is in the MegOhm region which is virtually an open circuit.

Furthermore, the MOSFET being a voltage driven device requires no current to drive it, making it ideal in battery powered applications.

One important aspect when driving the KSSM-60S with the PIR is to adjust its on-board timer to match the message or sound length



Interfacing with the KSR504 ULTRASONIC Sensor

This device can be used in two ways. A distance measuring mode and an object detection mode. We will use the latter to drive the KSSM-60S, however it will require a little more circuitry than the PIR sensor needs in order to achieve our aim.

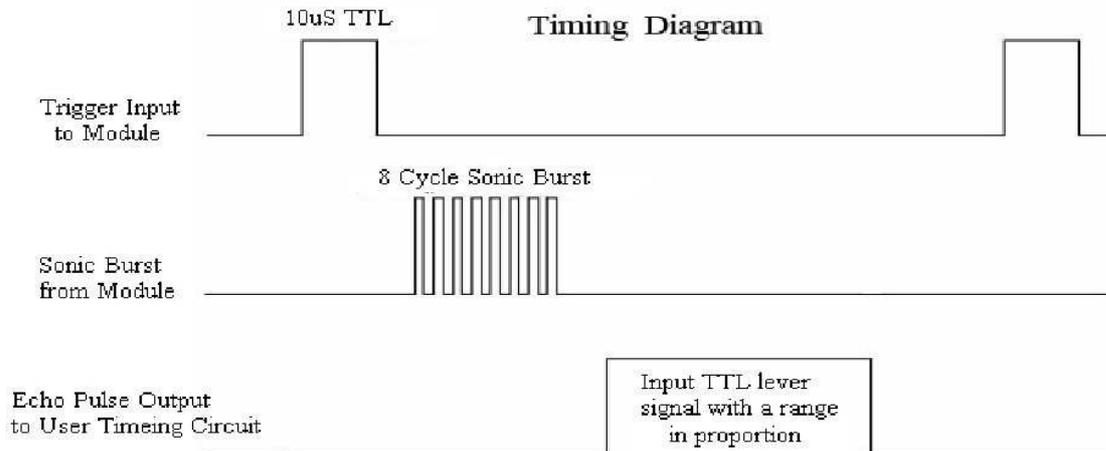


The interface to the KSR504 features 4 connections. +5V power, Send Control, Received Signal Out and Ground.

Applying a periodic High logic signal of 10uSeconds or more to the Send line will initiate a pulse stream of 8bursts of 40KHz sound after which the Receive output line will go HIGH. If the sound strikes a person or object some of its energy will be reflected (echo) back to the KSR504 where the receiver element will pick up the signal. And force the line to go LOW. It is this transition from HIGH to LOW which can be used to initiate a 30second (or other period) timer. From this we can see that we need to add two elements.

1. A periodic timer that sends out bursts of 40KHz pulses with a time interval sufficient to detect items moving into and out of KSR504 range.
2. A low resistance switch such as a MOSFET from the output line to turn on the KSSM-60S MM

For more details about the operation of the KSR 504 please contact us through info@kitstop.com.au



Adding an External Audio Amplifier to a KSSM-60S MM

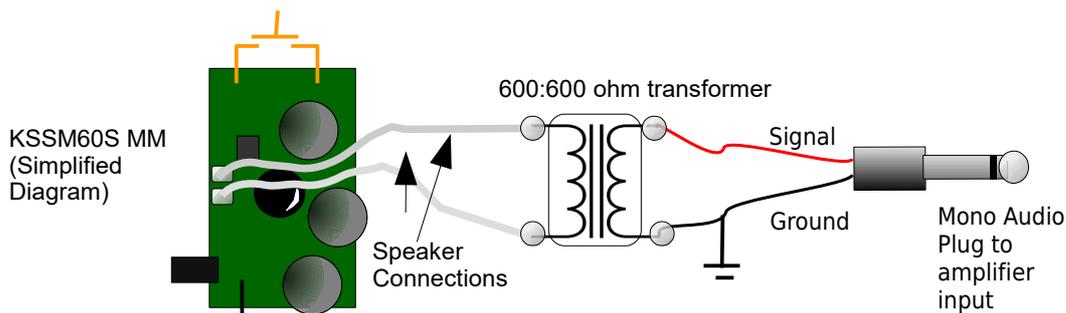
The KSSM 60S has a power output up to 500mW, with a speaker load of 8 Ohms. However, it can be adapted to higher powered audio amplifiers to provide more demanding sounds suitable for public space announcements and alarms.

The first thing to note about the output of the KSSM60S MM is that it is a bridge output. Such an output does not provide an Earth reference point and tying one side of the output to ground will short half of the "Bridge" and destroy the output amplifier.

The second thing to note is that although the KSSM60S's output is capable of driving into at 8 or 16 Ohms it is OK to have it drive into a higher load to conserve the module's power.

The simplest arrangement is by substituting an audio transformer for the speaker load. There are a few suitable types. For this exercise we will use a common 600:600 ohm transformer. This will protect the output of the module and also allow for an earth referenced audio signal for the following amplifier.

NOTE: To preserve battery life an isolating switch may need to be installed. If it is intended to use a common power supply to the amplifier it is strongly suggested that users consider the KSSM – 60S MM configuration for ease of use.



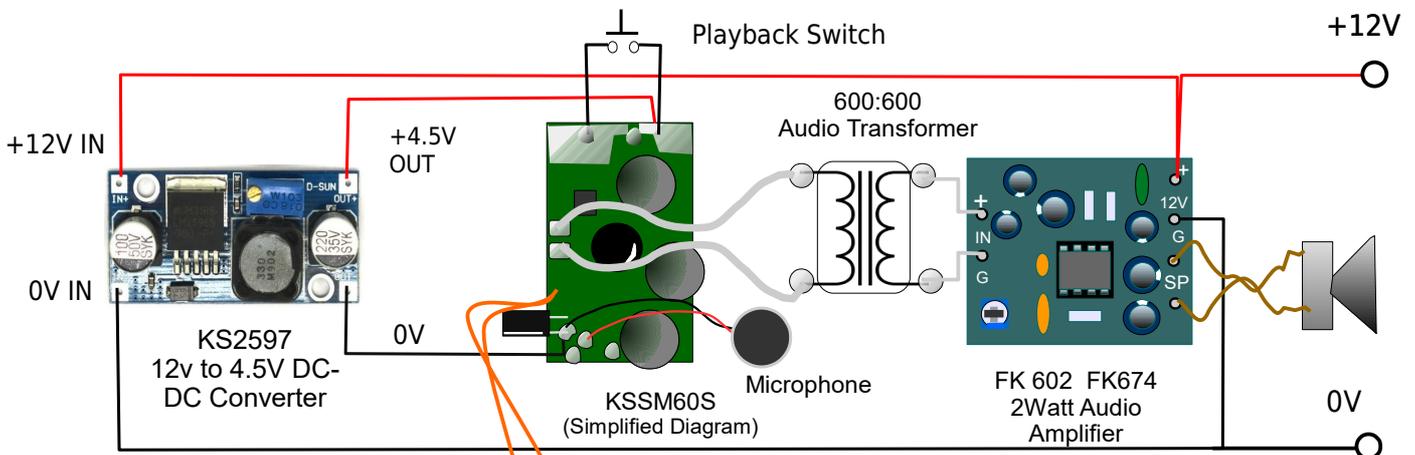
Adding an External Audio Amplifier to a KSSM60S (continued)

If the KSSM 60S is intended to be connected to an external amplifier and use the amplifier's power supply, a 4.5VDC power supply should be derived from the supply rail of the amplifier.

In the drawing below we show how the KSSM-60S can be added to a typical 9-12V powered amplifier such as our FK602.

In this case we substitute the playback leaf switch with a Normally Closed tact switch and instead of the speaker, we insert a 600 to 600Ohm transformer to couple the KSSM-60S to the amplifier input.

The power supply we have chosen is our DC-DC converter KS2597 Buck converter which can take any voltage from 7V-35V and efficiently supply 4.5V at up to 1Amp



Connecting your KSSM-60S MM Recorder to a DIY Amplifier



IMPORTANT
Before connecting the KSSM-60S -MM to any external power supply, remove the installed batteries. Failure to do that may result battery explosions

Improving the Recording Quality.

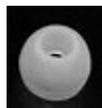
The KSSM 60S-MM takes in its audio content through its on-board electret microphone. The user simply puts the microphone in front of the sound source whilst recording. This is OK for most applications, however, there are times when ambient noise or even shaky hands can effect the recording quality.

Removing the microphone, to inject an audio signal directly from the audio output of a computer is, currently, not an option due to the 1V bias needed for the microphone.

If you've used earbuds to listen to content from your cell-phone or lap-top computer, you'll agree that the quality of what you are hearing is much better than what comes through their tiny speakers. If we couple one earbud signal that you are hearing, directly as possible into the KSSM-60S and monitor the signal via the other earbud we maximize the control over sound level with the minimum of signal loss.

Many earbud sets come with replaceable, soft, plastic adapters or ear tips.

They look a little like this.



By turning the "mushroom" shape inside out, we create something that looks like this

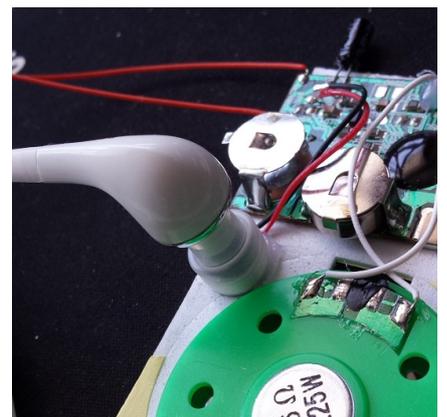


Putting the inside-out ear tip back onto the ear bud will give us this:



When this is fitted snugly over the electret microphone like this, it gives us great acoustic coupling and effectively shuts out unwanted ambient noise.

Not all ear-tips are created equally. If the ones you have are larger than 9.7mm internal diameter it may be necessary to hold the microphone in place with adhesive tape or pad it out to size with double sided foam tape. Leave the non-adhesive paper in place.



Improving the Sound Level

The 40mm 16Ohms 0.25W speaker supplied with KSSM 60S MM may sound a little sharp if pushed to its limits by the modules on-board 1-2 watt amplifier IC. We are not suggesting that the module be allowed to drive at this level. However, by the substitution of an inexpensive 40mm 8Ohm 0.5W speaker we can obtain a higher, slightly richer audio output. (For more details about this option, email us at info@kitstop.com.au).

Here's another couple of tricks you might try

Speakers transmit sound through the air by their cones pushing and pulling air in accordance with the electrical signal they are given.

This pushing and pulling results in opposite pressures of air on either side of the speaker cone. These pressures if allowed to meet, and this is easily the case with a 40mm speaker, will tend to cancel each other out. Thus reducing the apparent loudness to the listener. The design of the speaker attempts to minimize this effect but with a some simple modifications we can significantly improve the loudness.

Both of these tricks involve "baffling" which is what we do when we separate the sounds from the front and the back the speaker.

Note: This is not a lesson in enclosure design. Designing special enclosures for this size of speaker may be like putting a two stroke motor mower engine into a Ferrari. All show and no go!

Trick 1. We call this a "baffle ring". It is made up from a 40mm diameter cardboard 18mm ring cut from a toilet roll. This is then "deadened" by a layer of 18mm wide double side tape.

Fitting this ring over the front of the speaker, focuses the sound forward in a narrow "beam" so that the listener hears more of what is being emitted. This is assisted by the 18mm width of the baffle ring, sufficiently separating the speaker's back and front sounds.



Trick 2. A Cardboard Speaker Enclosure. In fact, just about any box that can hold the speaker would do. Even as small as a matchbox. Yes!! It takes a bit of care and some nibbling at the box so that the speaker frame just peeps through the box's sides but it can be done.

If you don't have a matchbox you can make one from the many templates published on the web. In this case, you can dimension the box just a little wider to more easily fit the speaker.

Disassemble the matchbox and use the template for the speaker opening found previously in these notes. Leave the tray end down until the speaker is in place, then with the speaker wires trailing out of the speaker box, close the tray and seal the box using adhesive tape.

Other boxes may be used as can cardboard tubes.

Makers are encouraged to experiment with different configurations including additional speakers. Either 2x 8Ohms in Series or 2x16Ohms in parallel.



Imagine It – Make It

These notes might end here but it is just the beginning of an inventive journey. Here are a few ideas to get your creative spirit fired up.....

DIY Doorbell Push the button and play your own greeting or tune

Add Life to artworks– Press the button to hear a song or something about the artist

Gift and Music boxes - lift the lid and hear a favorite tune favorite quotation.

Record a moment – Baby's first words - Add a message to a trophy – Talking Portraits of Loved Ones

Add sounds to railway models – Level crossing bells – Sounds of Trains passing

Talking or Singing Birthday or Special Occasion Cakes – Build a module into the cake's base

Soft Toys – Add sounds to a favorite toy

Build a model Spooky House or a Tardis or Batman Car or

Superhero Costumes - Add hydraulic or other mechanical sounds to add realism.

Science Fair – Let the display tell the viewer about itself.

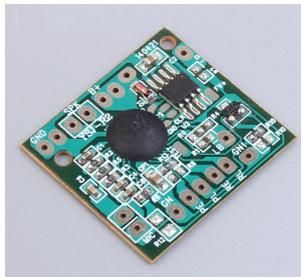
Garden Surprises – Lift a rock and it protests and wants to be put down.

Audio Alarms – Used in conjunction with Water, Temperature, Flow and Overload detectors as Play Back Triggers

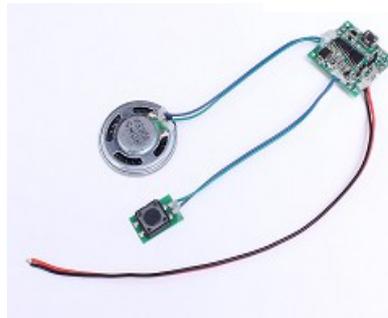
Coming Soon - 5 New products in our range of sound recording and playback devices



KSSM-5, A 5 Channel USB MP3 WAV Player that can address up to 32GBytes of Storage (USB Memory not supplied) 2W on-board amplifier



KSSM-120S A 120 second Recorder/Player PCB. Supplied with 4Tact Switches, 40 mm 8 Ohm 0.5W Speaker, Microphone and a switched 3xAAA Battery Case



KSSM-300S 5 minute USB Player PCB -Loads straight from your PC – No special Software. Simple one button control. Will play multiple tracks in the order they are recorded.



KSSM-9 9 Channel Micro SD Card MP3 WAV Player. Addresses up to 16GB of Storage (Memory not supplied) 3W On-board Amplifier



The Amazing KSSM-32
A 32 Channel Micro SD Card MP3 WAV Player that can access up to 16GB of programme content. (memory not supplied)

Got a Sound Idea? We would like to hear from you!!

KitStop
electronics – the fun starts here

KitStop Retail Systems

Perrin, Wright and Associates ABN 86 481 210 936
PO Box 5422 Clayton Victoria 3168
PH: 0432 502 755
www.kitstop.com.au email info@kitstop.com.au