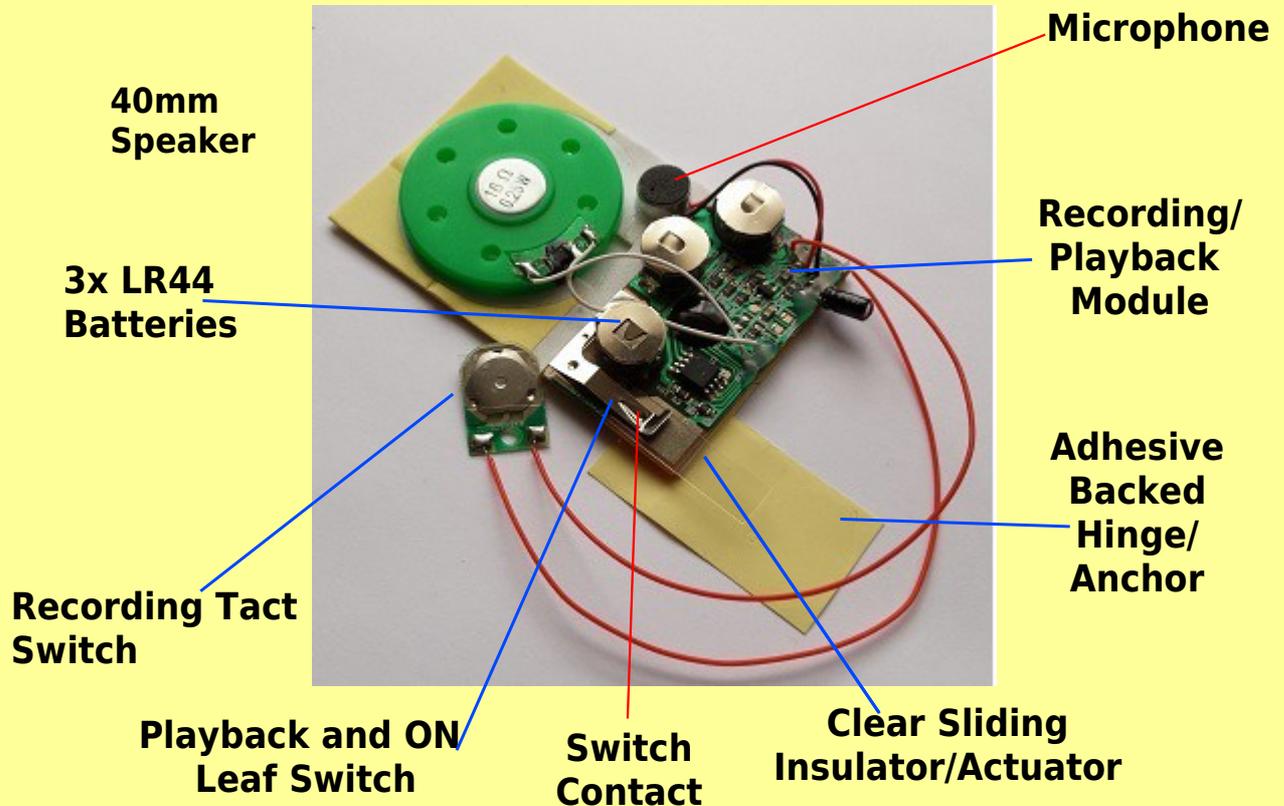


**NEW**

# KSSM-60S THE DIY SOUND RECORDER THAT SPEAKS FOR ITSELF



**Design your own seasonal and promotional greeting cards.  
Add your own sound effects to models and art installations.**

## Getting Started with the KSSM-60S

When you examine your device, you will notice that it is attached to a foam backing which is, in turn, on a yellow backing sheet. This is peeled back when the module is attached to a surface like a card or inside a box or model. The part in which we are immediately interested is a small clear strip (sliding actuator) under the Playback leaf-switch. This serves two purposes. In transit, it stops the batteries from discharging. In operation, this slider, when pulled back, allows the switch contact to close onto a conductive area on the card. The module is now ON and responds with a recorded test message. That tells us the module is working in playback mode.

With the module switch ON we can use the microphone to record our message or sound content.

To record content point the microphone towards the sound source, press the flat record button tact switch which will immediately sound a “beep” and start the module recording, erasing any previous content. Hold the switch ON for the duration of the record. 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, momentarily open and close the Playback Switch leaf by inserting and withdrawing the insulator, or by lifting the end of the switch leaf and closing it again. This returns the playback to the beginning of the recorded content and restarts the Play. 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 place a paper keeper under the playback switch contact to ensure zero power drain.

In the following pages we will show you some of the basics of greeting/promotional card assembly and suggest some model building ideas

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For more details, email us at [info@kitstop.com.au](mailto:info@kitstop.com.au)

## Using the KSSM 60S in Simple Card Applications.

Before getting into the detail of how to put the module and your card together it's worth taking some time to think through what sort of card you'd like to build.

Unlike plain cards, a "Talking /Music" Card needs somewhere to hide the electronics and the speaker. In order to do this we must allow for some extra card material. In the illustration Fig 1 below we have an A4 and a half sized card (or a 3 x A5 sized card), where panel A is folded over Panel B to hide the electronics. Alternatively, we could use an A4 card folded and an A5 card to cover the electronics

The illustration below shows the positioning of the KSSM 60S Sound Module relative to a two-fold card.

The panel A, is folded over Panel B and edge glued to the central panel (B) to hide the module, but leaving sufficient gap for the actuator to work.

Of course, it is just as valid to make it so that panel C is folded onto B with the AB fold being the hinge point.

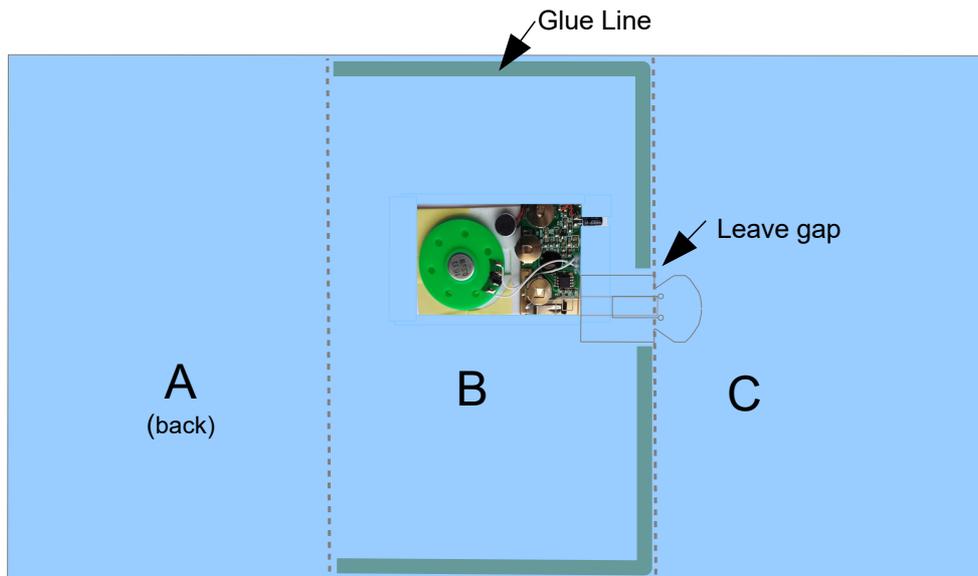


Fig 1

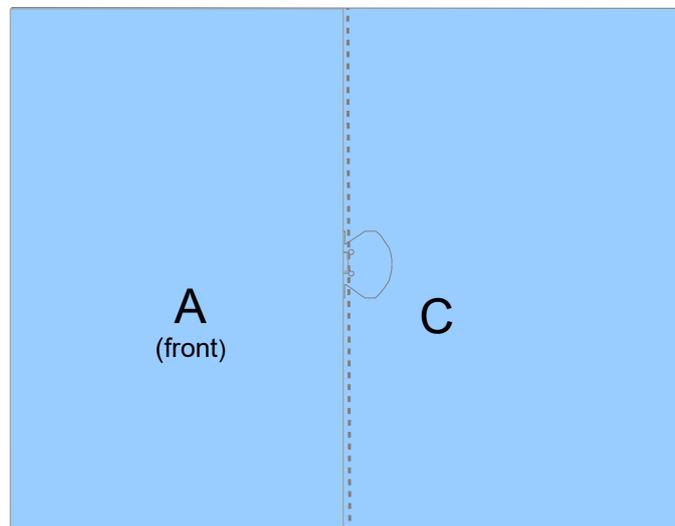


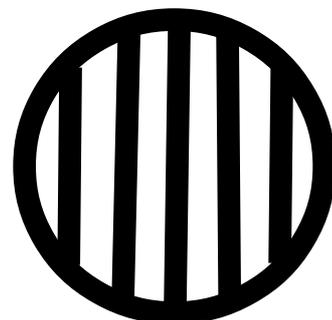
Fig 2

The above is only intended as a guide. Your card design is limited only by your imagination. Some makers will opt for two part cards. Others will decide not to use the slide switch and, instead, will re-purpose the Record switch as a Play Button sandwiched between the sheets of cardboard. We'll show how this is done later on.

Model Makers looking for louder outputs may opt to incorporate a grille pattern as per the drawing at right on the inside of Panel B where the speaker mounted.

The pattern of the grille is not really critical. If a drawing on the outside of Panel B had 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 3cm<sup>2</sup> it will go a long way towards harnessing the available power from the speaker.



## Putting The Module into Your Greeting or Promotional Card

Turning the KSSM – 60S electronics ON and OFF when the cards or gift boxes are open or closed uses a slide leaf switch.

### Slide Switch Assembly

This assembly converts the action of opening and closing of the card into switching action by way of a hinged actuator.

The assembly consists of three main components

1. The on-board leaf switch assembly which is kept in the open condition (normally OFF) by:-
2. The sliding insulator (the actuator) which is held in place by:-
3. The insulator hinge and anchor which links the sliding insulator to the greeting card.

This is on the yellow backing sheet.

The pictures below illustrate the components which have been included with your sound module.

### Assembly Steps

**1** Lift Hinge up from the Yellow Backing Sheet

**2** Hold the Hinge up and Slide the Actuator under Hinge to the "Shoulder Line"

**3** Press the tacky underside of the Hinge down onto Actuator

**4** Remove yellow backing sheet and apply the clear hinge and actuator assembly to card with the "shoulders" aligned with the fold line. The hinge may be difficult to see, however holding it at an angle to the light improves visibility.

**5** With the sound module's backing paper still in place, and the card in the open condition, position the sound card so that the "L" of the switch leaf is through the square hole in the actuator. Now push the sound card so that the heel of the switch is just touching the right hand edge of the hole.

**6** Still holding the module in place with a finger, lift the right hand of the greeting card to about 90° as if to close the card. The switch should open. Open the card about 5-10° and whatever is recorded on the module should play.

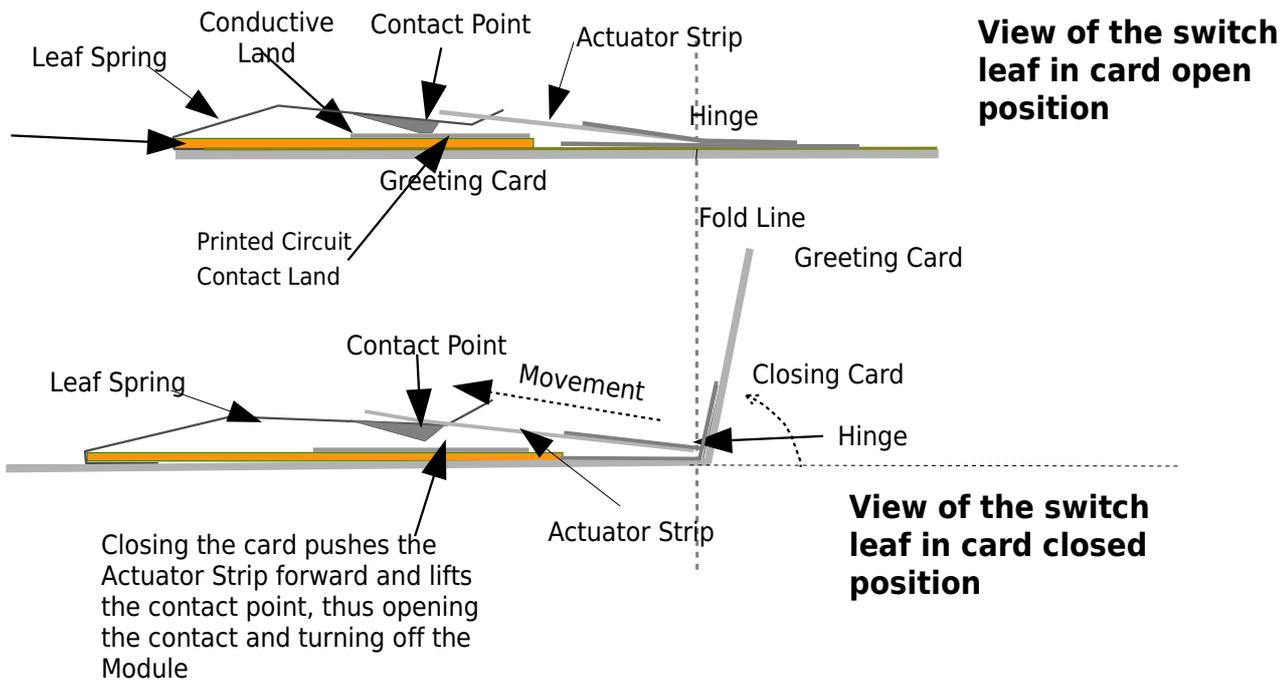
**7** With your finger still in place, open and close the card a couple of times to ensure that the switch is working and then trace a pencil positioning line around the module. Carefully unhook the leaf spring from the actuator. Remove the backing paper from the module and stick it down carefully inside positioning line. Re-assemble the leaf spring and actuator and test the operation of the card.

**Replacing Batteries.** Replace spent batteries immediately to avoid corrosive chemical leakages. Replacement batteries MUST BE LR44 AG13, L1154, LR1154 or 157 Alkaline 1.5V type. For longer life Silver Oxide type SR44, SR44SW, 303, 357 may be used To remove spent batteries, lift the small tab (see arrow) on one side of each battery holder and push the battery out from the opposite side with a toothpick or other non-conductive probe.

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



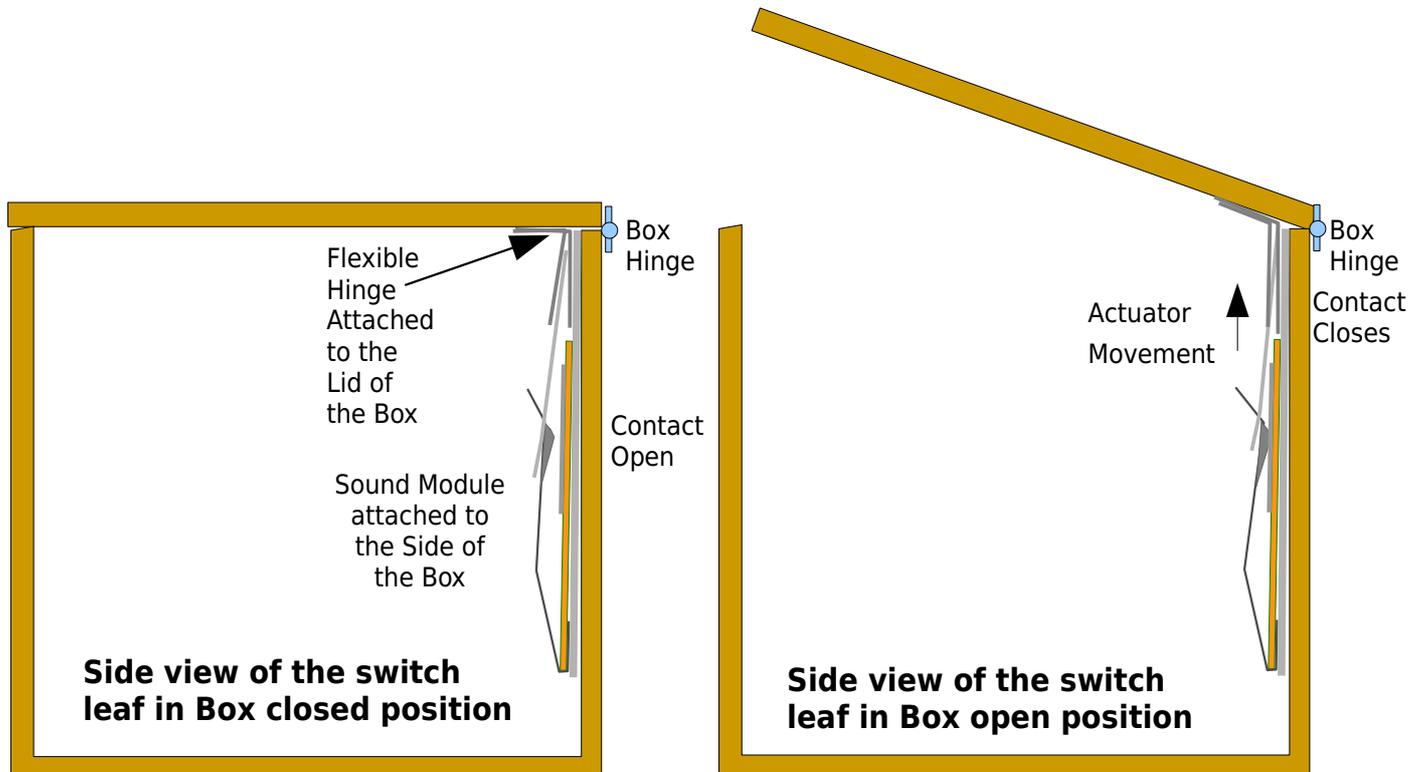
## This is how the Switch Operation looks from the side.



It can be seen from the above that by bending the card at the dotted line, the actuator strip is pushed forward. The trailing edge of the actuator hole pushes the switch leaf up and its contact away from the printed circuit underneath, thus opening the circuit. Flattening the card out again closes the switch.

### Gift Box Application Using the Slide Switch

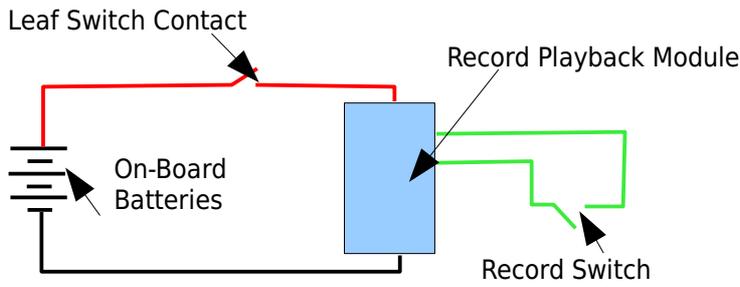
We have seen that the slide switch will operate over a relatively small angle of movement. In the following exercise we will see how the same mechanism can be adapted to a gift box to deliver a message or music passage to the recipient.



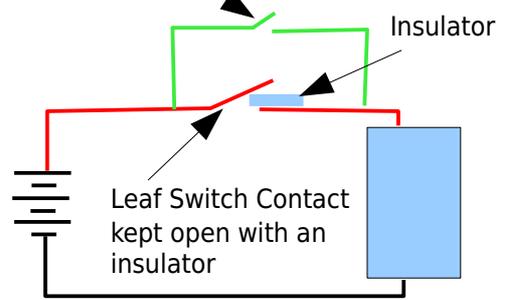
### Using Alternative or Additional Switches for Playback

The slide switch mechanism has one simple function and that is to connect the power of the on-board batteries card to the recording/playback module. Therefore, just about any switch can be wired in to act as a playback switch. This gives the model maker additional flexibility where it is required to mount the Voice Recording Module remotely from the location of the switch. Let's now look at how to turn the module on by using a micro switch.

This is where the Leaf Switch and the Recording Switch are in the circuit as supplied

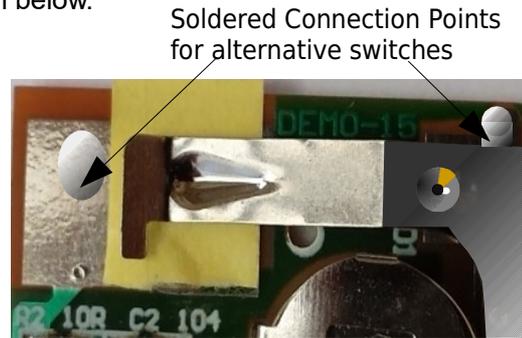
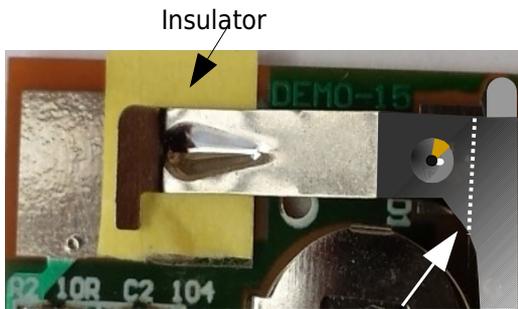


Re-use the record switch as a playback switch



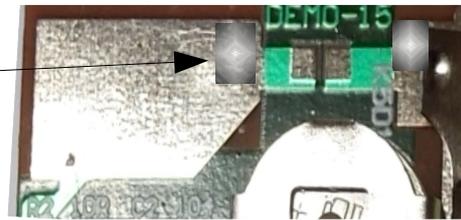
After recording the content, the Recording Tact Switch may be removed and re-used as a playback switch instead of the Leaf Switch. **Ensure that the power is disabled before removing the Record Switch.** If this is not practical cut only one connecting wire at a time. Cutting both at once will risk erasing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

Before installing alternative switches we need to either disable or remove the leaf switch. Disabling the leaf switch may be achieved by inserting a permanent insulating barrier between the switch leaf contact and the conductive land. Soldering connections may be made to the points shown below.



If it is not planned to use the leaf switch again it may be removed completely by cutting the leaf at the dotted line using tin snips.

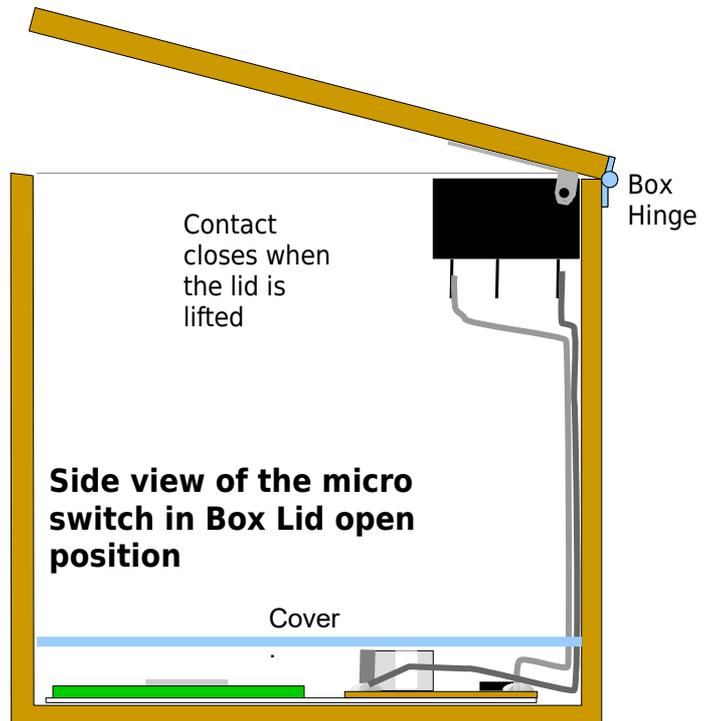
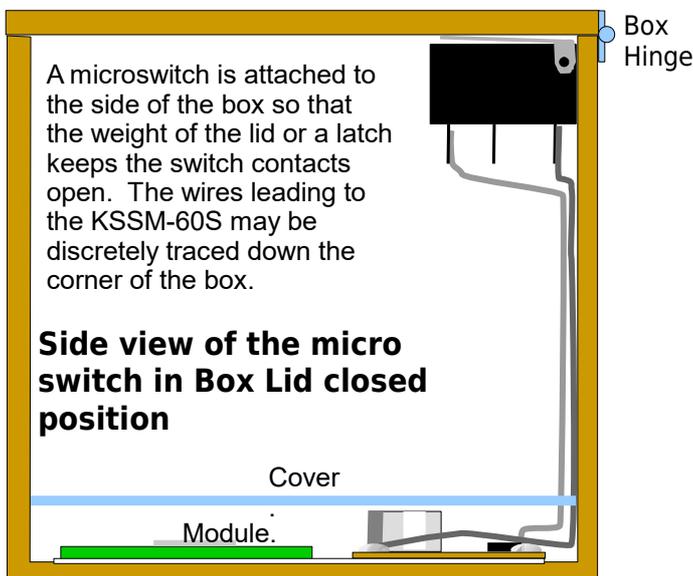
The soldered connection points will then look like this:



**CAUTION: This step is irreversible.** If there is any doubt Model Makers should consider using our KSSM-60S MM. This module set is offered without the leaf switch and the solder connections are ready for attachment to the switches of choice.

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.

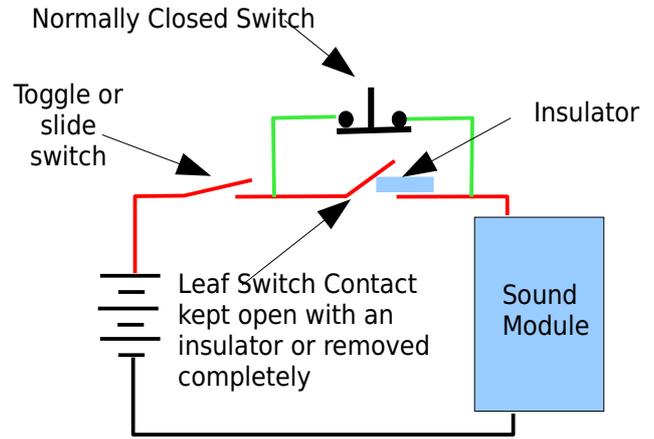


## One Touch Playing

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.

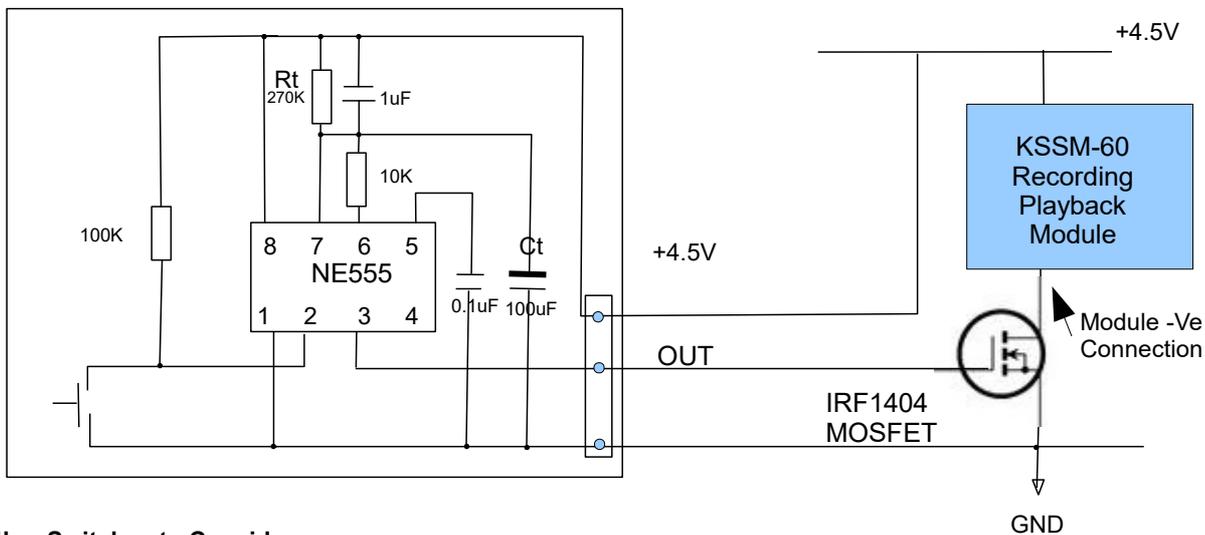
When pressed, the switch opens which stops whatever is playing and then when it closes again it starts the playing again from the beginning. The module plays out until the passage is completed and then goes into a low current (a few microamps) standby mode.

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 from a Normally Open Momentary Contact

The KSSM-60S requires power for the whole time of the stored message. The following circuit is for a low power timer that takes a momentary contact closure and stretches the signal to full 30seconds 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

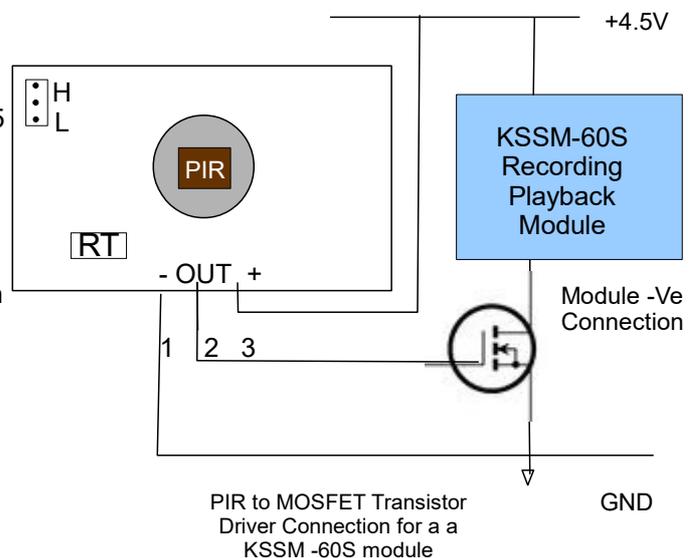
The drawing to the right is a simplified connection diagram. Here, the TTL output drives the gate of a low voltage MOSFET such as an IRF1404.

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



PIR to MOSFET Transistor Driver Connection for a a KSSM -60S module

## 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.

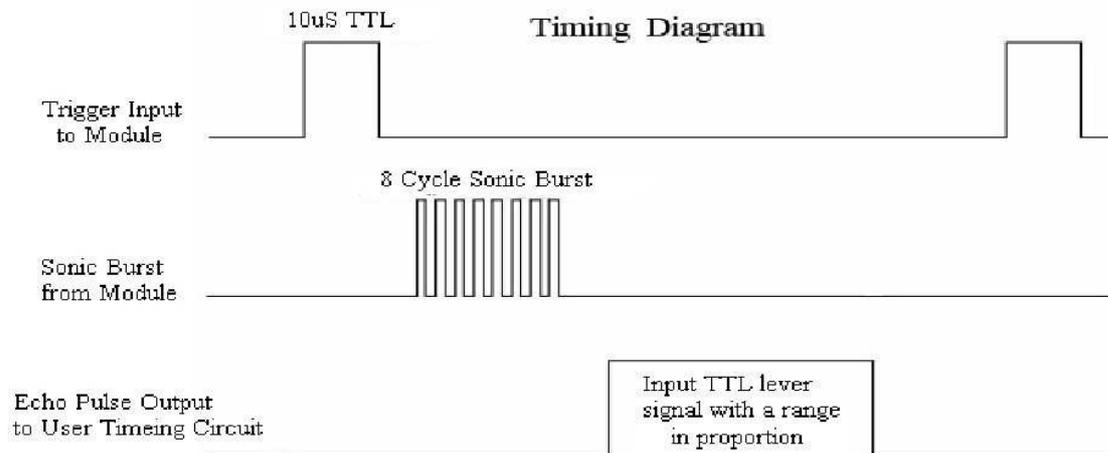


The interface to the KSR504 features 4 connections. +5V power, Send Control, Received Signal Out and Ground.

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

For more details about the operation of the KSR 504 please contact us through [info@kitstop.com.au](mailto:info@kitstop.com.au)



## Adding an External Audio Amplifier to a KSSM60S

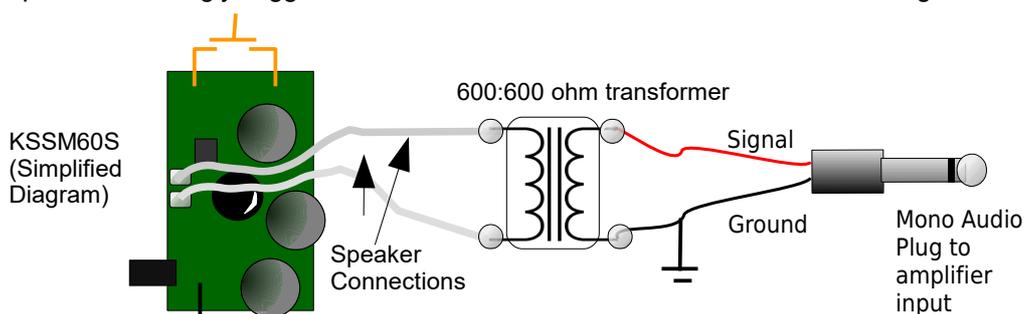
The KSSM 60S has a power output up to 500mW, with a speaker load of 8 Ohms. However, it can be adapted to higher powered audio amplifiers to provide more demanding sounds suitable for public space announcements and alarms.

The first thing to note about the output of the KSSM60S 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.



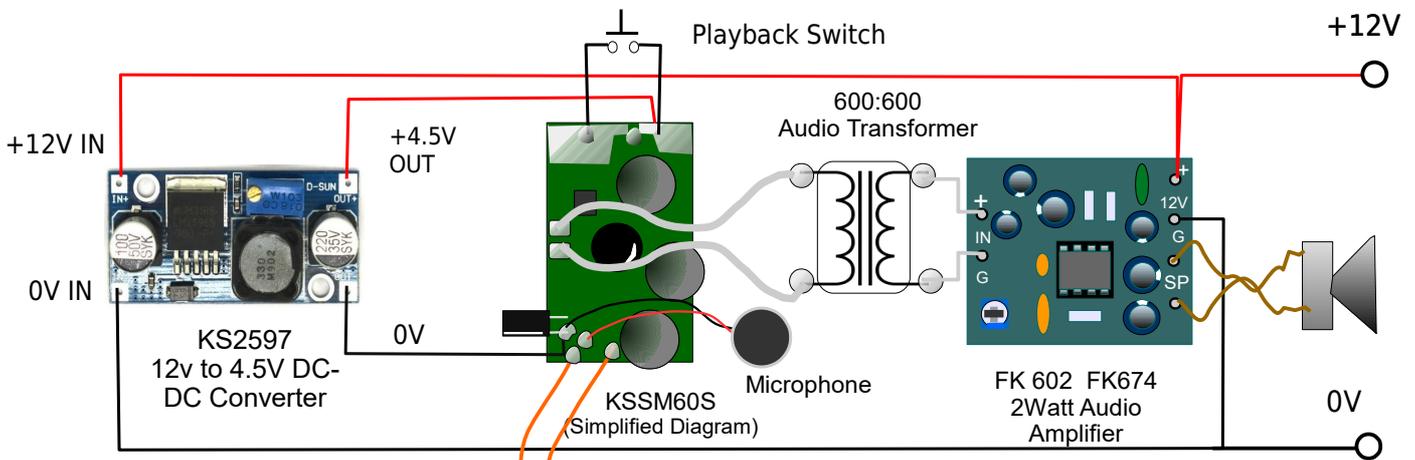
## Adding an External Audio Amplifier to a KSSM60S (continued)

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 Recorder to a DIY Amplifier

Recording Tact Switch



### IMPORTANT

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

## Improving the Recording Quality.

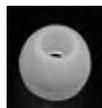
The KSSM 60S takes in its audio content through its on-board electret microphone. The user simply puts the microphone in front of the sound source whilst recording. This is OK for most applications, however, there are times when ambient noise or even shaky hands can effect the recording quality.

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.



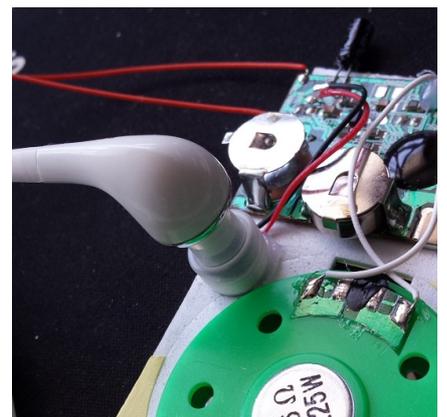
By turning the "mushroom" shape inside out, we create something that looks like this



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 may sound a little sharp if pushed to its limits by the modules on-board 1watt 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](mailto: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.

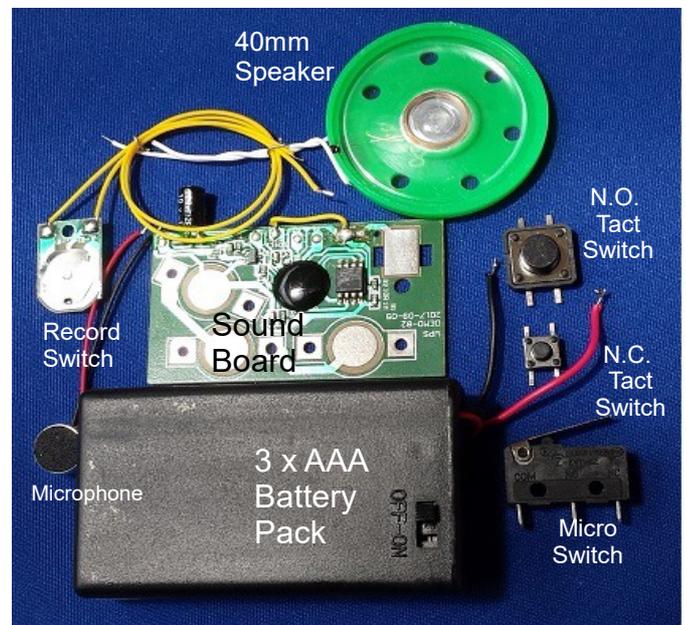
Makers are encouraged to experiment with different configurations including additional speakers. Either 2x 8Ohms in Series or 2x16Ohms in parallel.



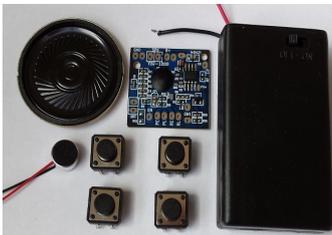
## You may have noticed a few mentions of our KSSM – 60S MM for Model Makers

Here it is, pictured at right, a variation of the KSSM-60S with the various key components of the KSSM - 60S separated out for easier access to the control functions and to allow more flexible installation options.

This configuration is complete with additional N.O. and N.C tact switches plus a micro-switch and switched 3xAAA battery holder (batteries not supplied),

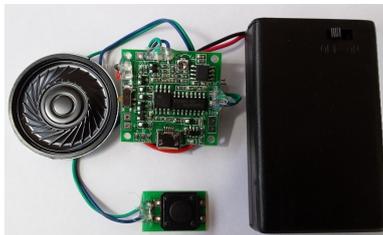


## 5 New products in our range of sound recording and playback devices

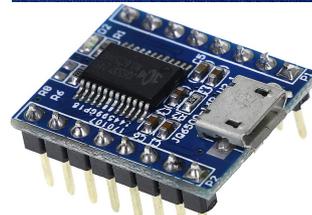


### KSSM-120S MM

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



**KSSM-300S** 5 minute USB Player PCB -Loads MP3 Files straight from your PC – No special Software. Simple one button control. Will play multiple tracks in the order they are recorded.



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



**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)

**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** – Use Water, Temperature, Flow Overload detectors as Play Back Triggers

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

**KitStop Retail Systems**

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