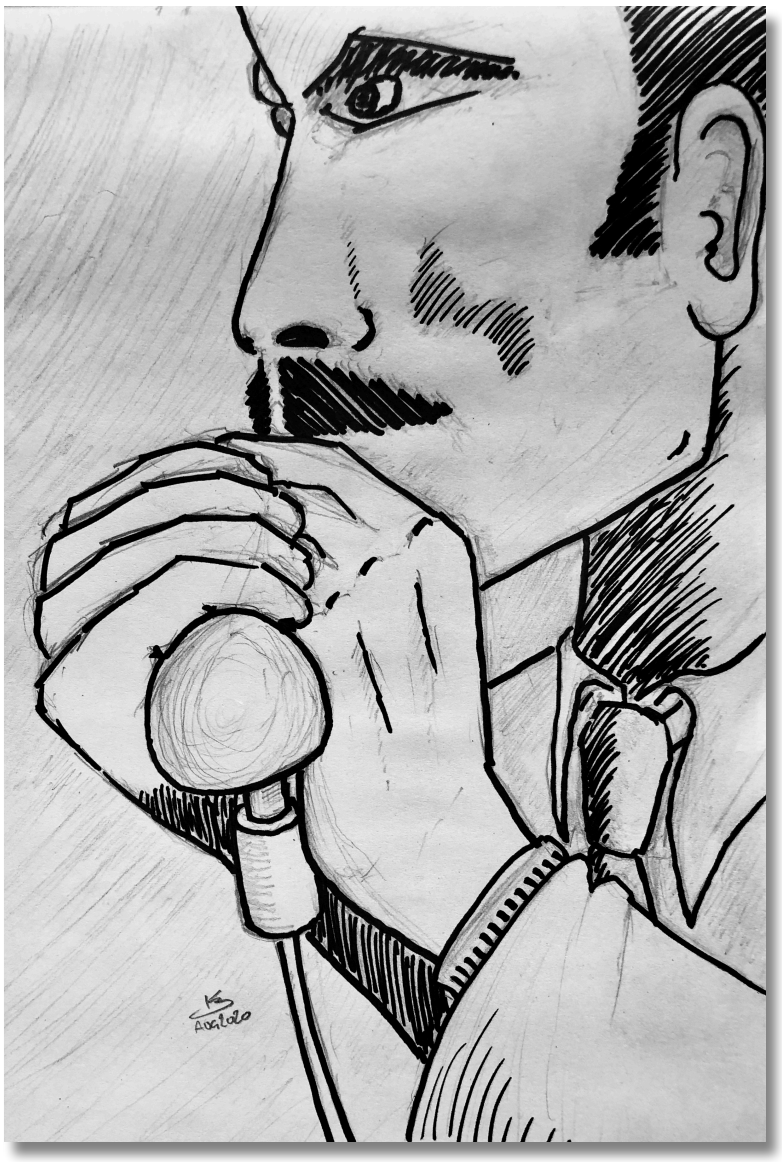
Harmonica Microphones



A Primer from
www.leedsharmonica.uk

Version 1.0.1
Last Revision: 2021-03-06

Contents

Acknowledgements and Resources

I'm indebted to James Waldron from simplemics.com for allowing me to use photographs of his excellent refurbished vintage microphones.

This document represents knowledge gathered over many years from my own experiences and from endless hours of scouring the internet, sorting the truths from the myths and the facts from the fanciful.

I cannot hope to list every resource but those below are invaluable and I strongly encourage you to explore them for yourself. You could spend the rest of your life researching this if you were so inclined.

Books

Blues Harmonica For Dummies, by Winslow Yerxa
(John Wiley & Sons. ISBN: 9781118252697)

Harmonica for Dummies, by Winslow Yerxa
(John Wiley & Sons. ISBN: 9780470337295)

Gig Savers: Harmonica Microphones, by David Barrett
(Mel Bay Publications, ISBN: 97807866681 51)

The Harp Handbook, by Steve Baker
(Wise Publications, ISBN: 9780711949195)

Online

https://greenbulletmics.net/
https://www.patmissin.com/index1.html
https://jt30.com/
http://www.bluesharmonica.com/

http://www.blowsmeaway.com/

http://badassharmonica.com/

https://www.modernbluesharmonica.com/blues_harp_forum.html

https://www.slidemeister.com/forums/index.php

https://harp-l.org/

https://www.simplemics.com/

Introduction

Amplifying your harmonica sounds simple enough. Surely you just blow into a microphone? Well, yes. But this is harmonica. And like most things related to this crazy instrument, a simple premise soon turns into a rabbit warren full of landmines.

This document focuses on one half of the puzzle - the microphone. The other half is the amplifier, and that's a whole other subject for another day.

NOTES:
This document speaks in very general terms, and even flirts with minor inaccuracy for the sake of simplicity. The assumption is we're more interested in playing than pedantry, so broad accuracy is deemed sufficient. That said, comments, corrections and feedback are welcome and can be directed to leedsharmonica@gmail.com.

It is assumed we're talking about playing live in front of an audience, either in a band, ensemble, duo or even solo. In a recording studio all kinds of other considerations come into play. We're not concerned with those here.

Finally, it should go without saying that you absolutely *cannot* use gear to make up for poor technique. No way, no how. Never. If you want to sound good, get a good teacher and put in the time, blood, sweat and tears. There is no other way. Clear? Good.

With that out of the way, let's dive in.

"Acoustic" and "Amplified" Harmonica

If you just pick up your harmonica and play, that's acoustic harmonica.

If you walk onto a stage, stand in front of a microphone and play, we call that acoustic too. That's not very intuitive but in this case you're not using the equipment to colour the sound of the harmonica, you're just making it louder. So the sound can still be called "acoustic".

"Acoustic" harmonica.

"Amplified" harmonica generally refers to a player wrapping their hands around a microphone that's plugged into an amplifier. This can have a significant and desirable effect on the sound. The player may also use effects such as delay or chorus to make further enhancements.

"Amplified" harmonica.

So it's called "acoustic" if it sounds just like your harp, only louder, and it's called "amplified" if you're "cupping" (more on this later) a mic to deliberately colour the sound.

You can think acoustic vs amplified harmonica as analogous to acoustic vs electric guitar. That's not a perfect analogy, but it gets you most of the way there.

Microphone Shells

The *shell* is the physical form of the microphone, the bit that you hold on to. For our purposes there are two basic varieties, *Stick* mics and *Bullet* mics.

Stick mics are usually cylindrical, so you can grab hold of them, or clip them onto a mic stand. Some have a ball grill on the end you sing/play into like this Shure SM58.

Shure SM58.

Some stick mics don't have a ball grill, like this Japanese Akai DM-13.

Akai DM-13.

Stick mics can either be put in a stand, if you're playing acoustically, or cupped in the hands, if you're playing amplified.

Bullet mics, on the other hand, are so-called because their shape broadly resembles a bullet. They have a grill at the front for singing/playing into and a rear that tapers slightly. Bullet mics are usually cupped in the players hands. They can be used on stands but it's not common.

1963 Shure Green Bullet Mic.
(Picture from www.simplemics.com)

Microphone Elements

When sound goes into a microphone, it gets converted into an electric signal. The signal then travels to an amplifier of some kind before re-emerging from a speaker as sound again.

The term *element* (or *capsule*) refers to the electronics that convert the sound into an electric signal. It is by far the most important part of the microphone, in terms of defining the sound it creates. The shape, dimensions and material of the shell have an effect, but are of secondary concern.

In this document we're going to concern ourselves with three broad categories of elements (although there are others). *Dynamic* elements, *crystal* elements and *controlled reluctance/controlled magnetic* (often abbreviated to CR, and CM) elements.

Most modern mics have some kind of dynamic element, while vintage bullet mics commonly have a crystal, or a CR/CM element.

Harmonica players will commonly find a shell they are comfortable with and have their favourite element installed in it. The opportunities for mixing and matching are endless. Many players enjoy trying many different combinations, and spend years searching for the magic recipe. However, this does require some specialist knowledge and some skill with a soldering iron. A simpler option is to buy refurbished vintage mics from one of several specialist builders listed later in this document.

The technical details of how the different types of element actually work are outside the scope of this document. Outlined below are what you need to know about each in practice.

Dynamic Elements

There are many different kinds of dynamic elements. Most of them are very durable and tough to damage with normal use.

Unfortunately, just knowing that a mic has a dynamic element doesn't give you much of a clue what it's going to sound like, beyond the likelihood it will produce a less distorted sound than a crystal or CR/CM element.

The most common dynamic microphone you are likely to encounter is the Shure SM58. Here the ball end has been unscrewed so you can see the element.

Shure SM58 with grill removed.

Crystal Elements

Way back sometime in the 1940s the Astatic company started producing bullet microphones with crystal elements. These are usually seen as "Holy Grail" elements, and some players will part with hundreds of pounds/ dollars for them.

The problem with crystal elements is they are extremely fragile, and even when babied they won't last forever. Many of the older ones are dead. Many, which are technically working, have an output so weak they are useless.

The chances of finding a good one in the wild (i.e. one that hasn't already been harvested by a mic fanatic) are practically zero. If you want to get hold of one, your best bet is to contact one of the few trusted harp mic builders listed later in this document.

Controlled Reluctance / Controlled Magnetic Elements

Partly to address the unreliability of crystals, Shure developed a new kind of element which they put into their bullet mics called controlled reluctance. Controlled Reluctance elements come in two different varieties. *Black label* and *white label*.

When they were first introduced, CR elements had a black fabric wrapping. These are viewed as the most desirable and therefore command the highest prices.

Left: Shure Black Label Controlled Reluctance Element.
Right: Shure White Label Controlled Reluctance Element.
(Pictures from www.simplemics.com)

After a few years - and some minor mechanical changes - the label changed to white. These still command a high price, but aren't quite as highly sought after as the black label versions.

At some point in the 1950s Shure made further minor mechanical changes to the controlled reluctance element and changed the name to controlled magnetic. They retained this moniker until ceasing production some decades later.

Shure White Label Controlled Magnetic Element.
(Picture from www.simplemics.com)

So Which Element is Best?

In practice, it doesn't really matter exactly what element a mic has inside it. People prize the crystal and black label CR mics mainly due to vintage cachet. It's true that they can, and do, often sound amazing. However, due to them being handmade, and with extremely wide quality assurance tolerances, no two sound exactly alike. It's perfectly possible - and even likely - you'll find a CM or dynamic element you prefer to a crystal or CR.

Unfortunately, unless you're lucky enough to have access to a collection of vintage mics, the only way of discovering what you like best is to buy and spend time with lots of different mics. To further complicate matters, the amp you're playing into makes a huge difference too. You may find you prefer one mic into amp A and another into amp B.

In addition, many harmonica players like to route their signal through a variety of effects pedals to further colour, boost or otherwise manipulate the sound. Once your signal has made its way through that mess of electronics all bets are off.

In 2020 you can can expect to pay anything between 150 - 500 GBP for a high quality vintage mic with a crystal, CR or CM element. And the chances are you'll have to import it from the US, incurring further expense.

The Proximity Effect

Most, if not all, microphones produce more bass frequencies the closer the sound source is to the mic. This is called *The Proximity Effect*. Singers and harmonica players can use this to their advantage to vary their tone dynamically as they perform.

Close and distant mic placement.

"Cupping" a Microphone

The proximity effect can be fully exploited by use of a technique called *cupping*. This refers to a player creating as airtight a seal as possible between their hands, harmonica, mic and face.

A player using a tight cup will allow only a very small amount of air to escape between their fingers and the shell of the mic, thus ensuring all

available air is forced directly into the element. This produces a pleasingly distorted and bassy sound which is effectively used by blues players.

When we use the phrase “tight cup”, we’re referring to the air-tightness of the seal you’re creating, not how hard you’re squeezing. Force and tension have no place anywhere in harmonica playing. A skilled player will create an air-tight seal with minimal pressure, and their tone will be better as a result.

In addition to making sure air doesn’t escape through your fingers, it’s important you don’t forget air leaking back out of the holes at the front of the harmonica. This can be avoided by pressing the face of the harmonica against your cheek as you play.

In common with most harmonica techniques, cupping sounds straightforward but is deceptively difficult to master. Players spend hundreds of hours honing this skill as they attempt to wrench the most powerful and soulful sounds possible from their rig.

Players view of a cupped bullet mic.

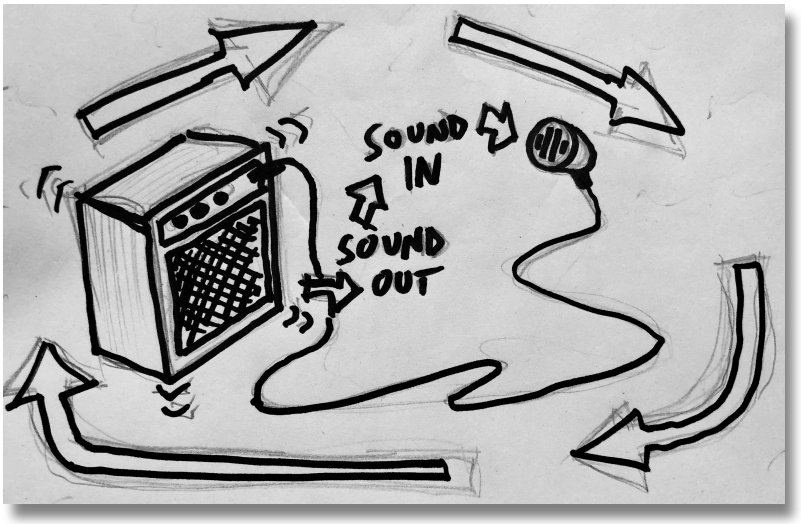
You can cup any kind of microphone, but you’ll find some more comfortable than others. For example, many players find it awkward to

cup stick mics without a ball-grill, like the Shure SM57. Especially for long periods of time.

Feedback

Feedback is that ear-piercing, screeching noise which sometimes occurs on stage. It usually sends the band into a frenzy of panicked knob twisting and blame apportioning while they try to identify the source.

Feedback occurs when sound that went into a microphone comes out of a speaker then goes back into the mic, then back out of the speaker and into the mic again, creating a loop. The signal loops and loops like crazy, and causes the unpleasant frequency which drives both band and audience nuts.



The feedback loop.

Unfortunately, amplified harmonica players are especially prone to causing feedback. Usually because we're using high gain vintage microphones and standing too close to our amplifiers (which are already turned up way too far) on cramped stages.

Happily, there are strategies you can employ to minimise the risk of feedback, and/or kill it if it does occur.

- Turn the volume (or gain, if your amp has a gain control) down a little. Sure, it's might take a bit of crunch out of your tone, but you can't play at all with howling feedback everywhere.
- Turn your microphone off, or turn the volume down when you're not using it. Failing that, hold it against your chest so sound from your amp can't get back into it.
- Change the position of your amp, or your position in relation to it, in such a way that the sound coming out of it doesn't get back into your mic.
- Point your amplifier away from hard surfaces that reflect sound.
- Have very little, if any, harmonica signal in the stage monitors.
- If your signal is going through a mixer, it may be possible to use it's controls to notch out the problem frequency.

Feedback is an absolute scourge, and it often pops up when you least expect it. The best you can do is be aware of the conditions that cause it and avoid them.

Volume Controls

Volume controls are used to adjust how much signal the mic sends to the amplifier or PA.

Some mics have volume controls built-in during manufacture, but they can also be added as a modification after-market. Alternately, volume controls can be added "in-line", meaning added to the signal chain between the mic and the amplifier. These are usually small devices that connect to the mic itself, but can also take the form of effect pedals.

Unfortunately not all volume controls are created equal. The best kind will give you a nice smooth roll-off of volume and have minimal effect on the tone. Cheaper ones will be jumpy and inconsistent, or may be a bad electronic match with the element, which can have a detrimental effect on the tone produced.

Volume controls also provide some defence against feedback. If you're feeding back a slight roll-off of volume may be enough to tame or eliminate it. Also, if there's feedback on stage and your volume is at zero you can be sure your mic is not causing it. That means you can start yelling at the guitar player.

Another often overlooked benefit of a volume control is that you can effectively use it as an on/off switch. You can turn the volume to zero to eliminate unwanted sounds when you're not playing.

Acoustic Harmonica Microphones

For the most part, if you're playing acoustic harmonica, you just use a regular vocal microphone. In live situations these are overwhelmingly stick mics with dynamic elements. The most common is the Shure SM58 pictured above.

The SM58 has been an industry standard for decades. Used by everyone from the sweetest of indie-pop singers to the most guttural death-metal screamers. They sound good, are amazingly durable (the oft repeated quip is that you can hammer nails in with them) and until recent years you'd be hard pushed to find a stage without one.

You'll also commonly find the Shure SM57, which shares the same dynamic element as the SM58, but has slightly different tonal characteristics, due to the different grill.

Shure SM57.

In recent years other brands of mic have started encroaching on traditional SM58 territory. Various models by Sennheiser are gaining serious popularity among vocalists, and as such are starting to appear on more and more stages. You'll also run into mics from a variety of brands which are basically cheaper SM58 clones. Usually these are perfectly serviceable and you may not even notice the difference.

Left: Sennheiser e845. A popular vocal microphone.
Right: Pyle-Pro PDMIC58 . An extremely inexpensive Shure SM58 clone.

There is an interesting microphone from Audix called the Fireball. It's available with or without a volume control. It's a very clean sounding mic, and it's unique feature is that it has little or no proximity effect. This means you can cup it and play as if it were a bullet mic, but retain an acoustic sound.

Audix Fireball Microphone.

WARNING

Never walk onto an unknown stage, grab a vocal mic from its stand and cup it in your hands.

Vocal mics are set up at the mixer for vocals. That means for a singer probably no nearer than three or four inches from the grill. If you cup that mic and blow your harmonica into it you will overload the element and enter a hellish world of ear-piercing frequencies and extreme feedback. Your audience will hate you, and you will *never* be invited back on stage.

Disregard this warning at your peril.

The take-away point is this: In the heat of a live show, you're going to be hard pressed to tell the difference between different mic brands and model. If you're buying a mic for yourself, you can't go wrong with a Shure '58 or '57. If you turn up to a jam or are sitting in with a band just play whatever's there and don't sweat it. Your audience want to hear you play. They couldn't care less what mic you are playing through.

Amplified Harmonica Microphones

Most players interested in blues eventually want to chase that gritty, distorted, gnarly tone heard on records by Little and Big Walter, James Cotton, George Smith etc.

The odd thing is, until relatively recently there were no microphones manufactured specifically with amplified harmonica in mind. Even now, many of those which are have off-the-shelf elements that may or may not

(most likely not) be what you want. We'll look at some common vintage mics and some of the better modern mics here.

Vintage Harmonica Microphones

Remember that when you're buying a vintage microphone the chances are you'll be buying refurbished. The mic will very likely not have its original element installed. That's not a bad thing, just be sure to buy from a trusted source such as one of those listed below. They will be able to describe the tonal characteristics of the mic, it's output level etc. Most players end up buying several mics. It can become a compulsion if you're not careful.

Here are some of the more common shells you are likely to encounter. All of the pictures below have been kindly supplied by James Waldron at www.simplemics.com. Note that James has refitted all of these mics with a Switchcraft screw-on connector. This is usually the preferred connection. You can read more about it in the "Cables and Connections" section below.

This is a classic Shure Green Bullet in great condition. These came with various model names and in various different colours and finishes over the years. You can see the metal riveted label with the model and manufacturer information. The hole is where the original stand would have connected. Note also the retro-fitted screw-on connector.

Shure "Green Bullet" 520D.

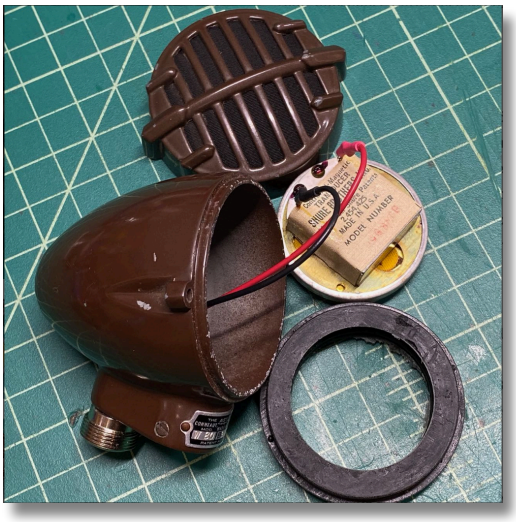
This is the classic Astatic JT-30. This one is from the 1960's and has the sticker label which replaced the rivet tag.

Astatic JT-30 with sticker label from the 1960s.

This Astatic is older. It's a W-30 model but it's the same shape as the JT-30. The original brown paint covers both the body and the grill on this one. It's in great condition considering it was manufactured in the 1940s. Note the rivet label which appeared on earlier models.

Astatic W-30. This is the same shape as the JT-35.

Here's the same mic opened up. You can see it's been fitted with a controlled magnetic element. The rubber ring is a gasket which holds the element in place inside, and isolates it from handling noise.



Astatic W-30 opened up.

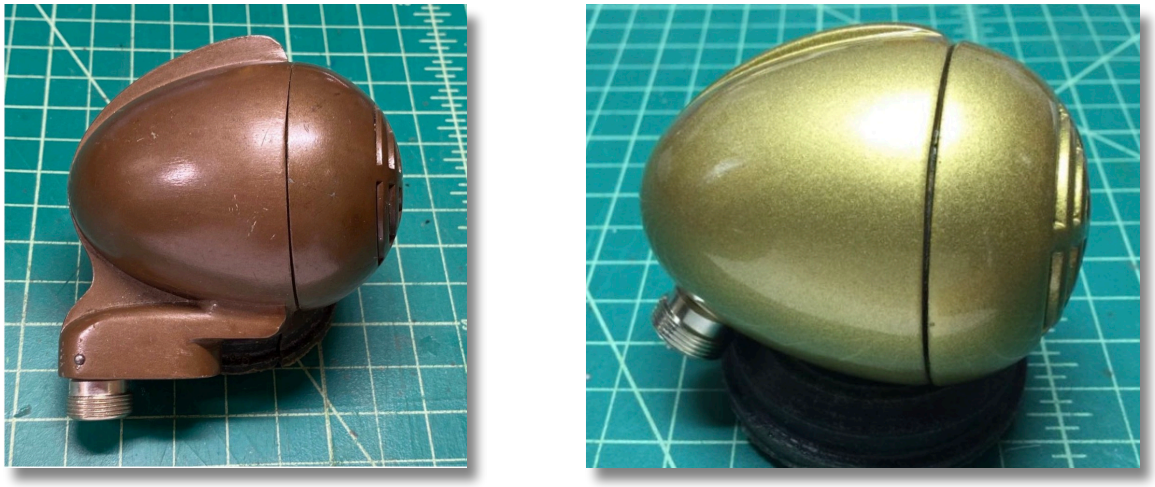
This is an interesting Astatic model commonly called a "biscuit" due to its shape. It is much flatter than a typical bullet mic. Some players find them more comfortable to hold. This one has also had a volume control fitted during refurbishment, along with the screw-on connector.

Astatic “Biscuit” mic.

This is a Turner 253 mic which has been refinished in sharp looking black and white. Turner made versions of this shell for a few different companies so you’ll see them with different logos on the grill. This has also had a volume control fitted to the rear.

Turner 253 bullet mic.

The Turner BX microphone (affectionately nicknamed the “Buck Rodgers” mic) has a very cool art-deco design. The mic on the right has had the top fin and the base removed to make it easier to hold and cup. It’s also been refinished in gold.



Turner BX. The "Buck Rodgers" mic.
Left: Original finish, base and fin.
Right: Refinished with base and fin removed.

Another cool design. This is an Electro-Voice EV603 on it's original stand which has a built-in on/off switch. The body has a narrower diameter than most bullet mics which some players like.

Electro-Voice EV-630 on original stand.

This is an Astatic 200 model with its original stalk intact. Sometimes the stalk is removed to make the mic lighter and less cumbersome.

Astatic 200 with original stalk.

There are many more weird and wonderful mics out there, but these are probably the most common varieties you'll come across.

Modern Harmonica Microphones

Below are a few of the modern mics built especially for harmonica players.

Shure still produce a version of the Green Bullet mic. These days it's called the Shure 520 DX. It has a volume control, a captive cable (which means you don't need to worry about buying a separate one, and remembering to bring it with you) and a dynamic element. It's a decent mic, but it's not in the same league as a good vintage CR/CM element equipped mic.

Shure 520 DX.

The Superlux D112-C is an excellent Green Bullet clone which many players feel has a slightly more desirable sound than the current Shure model. As it's also less than half the price it's a very easy mic to recommend to folk dipping their toes into the world of amplified harp playing. Again it has a captive cable, a volume control and a dynamic element. It also has the advantage of finger grips shaped into the metal at the top of the mic, making it very comfortable to hold.

Superlux D112-C.

The Bulletini, from Blows Me Away Productions has made a huge splash in the harmonica world in recent years. The Bulletini has two major attributes going for it.

The first that it's very small and lightweight. This addresses a common complaint from players who find traditional bullet mics too large, cumbersome and difficult to cup. The second is that it's equipped with "The Heumann Element", an off-the-shelf dynamic element that has undergone expert electrical and mechanical adjustments to tailor it to the needs of harp players. This thing is extremely bass heavy and easy to push into pleasing distortion.

It's available with or without a built in volume control.

Blows Me Away Bulletini.
(Photo from blowsmeaway.com)

In 2020 Hohner released a new microphone called the Harp Blaster HB52, and it's already developed a devoted following. It was developed in collaboration with many world renowned harp players including Steve Baker and David Barrett, among others. The shell is based on the classic

bullet shape but is much smaller (though not as small as the Bulletini). It's well made, feels good in the hand and features a volume control too.

Hohner Harp Blaster HB52.

There are more mics available but quality is variable. Presented here are models which can be recommended with confidence.

Also, don't forget the venerable Shure SM57/SM58 and 545SD models also make for great harp mics.

Cables and Connections

To round out this discussion, let's take a look at how we connect our mics to an amp or PA system.

Impedance

Broadly, mics and amp/PA inputs come in two varieties of *impedance* (abbreviated to "z" or Ω). Low, and high (lo and hi). There's a fair bit of science to this, but very simply, if your mic is hi-z it should be plugged into

a hi-z input, if it's lo-z it should be plugged into a lo-z input. If you mismatch impedances your mic will likely still work - and it won't be damaged - but it will sound much weaker.

Older vintage mics with crystal or CR/CM elements will be hi-z. Modern vocal mics tend to be lo-z.

If you want to plug a lo-z mic into a hi-z input (or vice versa) you can use an impedance converter. These are inexpensive and effective.

Impedance converters.

Quarter Inch TS Cables

These are guitar cables with a "tip and sleeve" (TS) connection on each end. Sometimes called "phone" connectors or simply audio jacks. These have been around since the 1870s, believe it or not, and are still the standard input on guitars and amplifiers to this day.

If you're plugging into an amplifier, you'll need a TS connector on at least one end of your cable. This connection is usually used for hi-z signals. It's not recommended that you run lengths longer than around 6 meters (20 foot), as they are susceptible to interference and signal degradation.

Guitar cable with quarter inch TS connectors. One straight, one angled.

XLR Cables

XLR cables are used for most modern vocal microphones. They have three pins, with male connector on one end and a female connector on the other (the female end plugs into the mic).

The advantage of XLR cables over standard guitar cables is they use a bit of nifty electronic manipulation to very effectively shield the signal, meaning you can run them for much longer distances without interference or weakening the signal.

An XLR equipped mic can be plugged directly into an XLR input on the mixer. Some acoustic amps have an XLR input for vocal mics too.

XLR cables usually carry lo-z signals but you may come across a cable with an XLR connection on one end and a TS jack on the other. The new Hohner Harp Blaster is a hi-z mic that requires this kind of cable.

XLR cable showing male and female connections.

Screw-On Connectors

This is the typical connection used on hi-z vintage bullet mics. The cable literally screws onto the connector on the mic, creating a very secure connection. It's old technology, but very effective. The other end of the cable usually has a standard TS jack.

The downside is that screw-on cables are not common. If you're handy with a soldering iron you can make your own. Alternatively, excellent ones are available from vintage mic restorers (see below).

If you can't get hold of a cable, it's common to use a screw-on to quarter inch adapter. These are made by Switchcraft and are inexpensive. This allows you to use a standard guitar cable, which is very convenient.

The downside is it's easy to stand on your mic cable and yank the cord out mid solo.

Screw-on to quarter inch TS adaptor.

Buying Vintage Mics

Modern mics are easy to come by, both new and second hand. Any music instrument store will carry the Sure SM57 and SM58, along with a variety of other vocal mics (they may even let you try them if you're lucky.) Be careful though, counterfeits are rife! Ensure you buy from somewhere or someone reputable.

If you're after a vintage mic, on the other hand, your options are much more limited. Unless you want to make a hobby out of searching for and restoring vintage mics the only sensible option is to buy from a specialist.

The three sellers listed here are among (if not *the*) best in the business. They are reputable, contactable and will go out of their way to make sure you are satisfied.

Dennis Gruenling
https://badassharmonica.com/

Dennis is a fanatical collector and restorer of vintage harmonica mics. He's also one of the worlds best blues harp players, so he knows his onions. Leeds Harmonica HQ is home to two vintage JT-30s that came via Dennis.

Greg Heumann

http://blowsmeaway.com/

The Willy Wonka of harmonica mics. What Greg doesn't know about amplified harmonica isn't worth knowing. He hand makes beautiful wooden shells and has produced his own signature element too. He keeps a stock of vintage shells and elements and will put something together to your specifications.

Simple Mics (James Waldron)

https://simplemics.com/

James is, in his own words "serious about fun". Restoring and rebuilding mics from vintage parts to a high quality at reasonable prices. If he doesn't have what you want in stock he'll most likely be able to build it for you. James was kind enough to allow me to use many of his photographs in this document.

Final Words

You were warned that amplifying the harmonica is a deceptively complex thing to do!

If all you want to do is make your harmonica louder you're lucky, that's by far the simplest to achieve. If you're searching for that gritty, distorted Chicago Blues tone, welcome to a fascinating - if often frustrating - world of vintage mic hunting. Like everything in music, it's a journey, and you never know quite where you're going to end up.

Good luck!

Kevin Bishop
9th August 2020

Revision History

Version 1.0:	2020-08-10
Version 1.0.1	2021-03-06 (minor typo and grammar correction)

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