Summary

About This Digital Book Series

You are accessing a volume that belongs to a series of digital books. The content covered in this volume depends on the content of other volumes.

Do you want to have a complete learning experience? Study all the volumes.

This volume specifically is the

RReballing – Learn BGA Soldering – Practical Guide - Volume 13.

Are we going to study basic electronics in this volume? No.

And board electronics? No.

And tools such as digital and analog multimeters? No.

Are we going to study basic soldering and desoldering techniques? No way. Here we will study BGA soldering and desoldering techniques.

All this, and much more, has already been covered in other volumes.

Therefore, no, absolutely no volume is incomplete. It can be a volume of less than 20 pages.

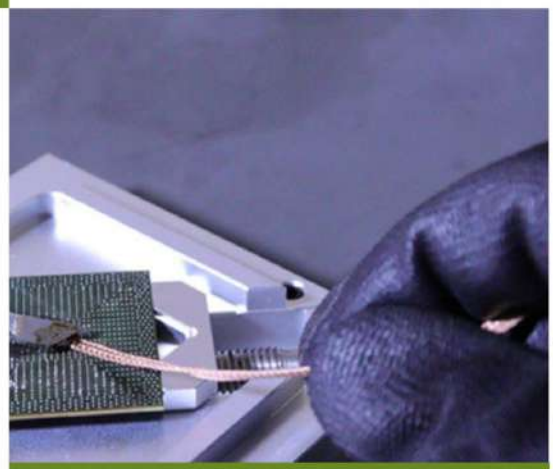
Each volume is complete in what it sets out to do. And together they form a “mega training”.

And if you want to have a truly complete learning experience, study the entire series of digital books.

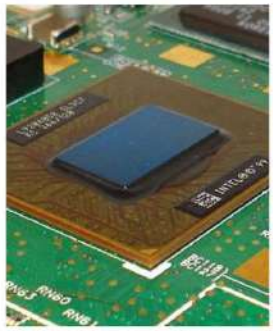
At the end of this book there is a catalogue containing some of the books belonging to this series.

Happy reading, happy studying!

CAPÍTULO 01



Introdução Técnica



What the Technician Should Know

We have finally reached a very advanced volume (in this great series of digital books). And I can tell you that it is, without a doubt, the most advanced.

It is more advanced in technical terms, in equipment used and in the possibility of putting into practice what is taught.

As much as my explanations make learning easier, don't be fooled. Put it into practice and you'll see that it really is an advanced technique that requires practice, practice, and practice. And after all that, you'll need one more thing: practice!

The objective here is to study soldering and desoldering techniques. Our objective is NOT to study the market and/or analyze whether or not it is worthwhile to study the proposed subject.

Reballing will always exist. There may be phases where certain notebook lines

They present serial errors where the solution is reballing, another phase where some video game model that is on the market presents serial defects, there are video cards, and so on.

And whoever masters the technique will always have the possibility of additional work.

This is the kind of book that, no matter how much you learn, there may be no way to simply read and put into practice right now. Unless you already have at least the basic equipment and enough electronic scrap to be able to start “playing around”. But I believe that most of those who are studying through this book will not have everything necessary to put into practice today (now).

Some of the equipment I present will cost you around R$5,000, R$11,000, R$25,000. Or more! But don't worry, you **NO** You don't need to make such high investments to get started. In this book I present “paths”, choices, and more accessible options (and fair for those who are just starting to learn).

To continue from this point it is essential that you have studied the previous books.

It is essential to already know what BGA is and several other topics related to electronics, computer boards, tools and much more.

If you “skipped” books and came here just to “see” what it’s like, stop now. Stop, go back and start studying properly. If you haven’t even studied the basics of BGA, how do you intend to study Reballing, Reflow and ME BGA?

And if you are the “smart” type who loves to say that you already know everything, then let’s move on to the “trial by fire”. I’m going to ask you a very basic question: What is VFBGA? Did you know the answer? Congratulations, keep going. Didn’t know the answer? Go back to book 01 to start studying properly.

Finally, only practice on scrap. Buy old boards to study, burnt boards, boards that would otherwise be discarded. On Mercado Livre (www.mercadolivre.com) you find signs

damaged being sold “as is” for restoration or removal of parts. Do a search formotherboard (for example) setting (in the search) a minimum and maximum price range. For example: from R$80.00 to R$100.00.

When you have a minimum skill, buy a used board that works.

Turn it on to make sure it works. It could be a video card or a motherboard, for example. But now it has to work, it can't be burned. And do a BGA Reballing procedure on it. After that, does the board still work? If so, congratulations, you're becoming a master in the subject. Did the board stop working? Then you still need to practice and study a lot.

Therefore, from this point on it is at your own risk (if any).stubborn and do it differently).

What is cold welding?

The first concept I will define is exactly this: cold soldering. Cold soldering is a technical term used to explain when a certain soldering point is not making contact, or is not making perfect contact, causing some intermittent error (sometimes it works, sometimes it doesn't). This can be caused, for example, by some mechanical or thermal shock.

In welding, cold welding occurs when there is no perfect fusion of the solder with the components to be welded.

So notice that I mentioned two types of cold welding:

1 - Caused by some shock mechanical or thermal: the solder was originally made perfectly (in theory). However, it can happen that the user of the equipment drops it on the floor, for example. Then we have a mechanical shock. Another example of mechanical shock occurs in connectors, such as

such as cell phone power connectors, for example: over time, the natural “plugging” and “unplugging” of the power connectors causes a bad contact to appear where the cell phone does not charge the battery or sometimes charges and sometimes does not charge. Or overheating of the equipment, which can cause a crack in this solder and then we will also have a bad contact. In addition to overheating,

the normal heating can also be a problem: let's use a GPU as an example. Over time, it heats up and cools down (when it is turned off), and this repeats itself over and over again. This ends up creating expansion and contraction in the material over time. This can also cause wear and tear and cracks in the solder;

2 - Caused during welding: in this case it is a service done with poor quality or lack of experience. It could be, for example, low temperature of the welding equipment. If the temperature is not sufficient the solder does not melt as it should, causing an imperfect union of the components being welded. In this example, the components

Soldiers may even work initially, but over time cracks, poor contacts, etc. may appear.

This type of problem is extremely common in computer, cell phone, video game, television, etc. repair shops. When I say extremely common, I am not exaggerating. It is very common indeed.

This type of problem caused by mechanical or thermal shocks is common. The customer drops the equipment and it doesn't work, or sometimes it works and sometimes it doesn't. Cold solder on cell phone power connectors, etc.

BGA: What can cause cold solder joints and symptoms

Now that you know what cold soldering is, let's make the "game" more enjoyable. Cold soldering can occur on BGA chips. On any equipment on earth/universe? Theoretically yes. For less

that the component cools down, there is still a question of the correct mechanical shock?

In the case of computers, especially notebooks and video cards, this problem is quite typical: overheating of the BGA chip (chipset, graphics chip, etc.) which causes solder wear, cracks and, ultimately, failures in the BGA chip. For example, there may be a contact failure in the graphics chip causing no signal to be displayed on the screen (whether it is a notebook or a PC). And don't forget what I said, normal heating is also a problem due to heating and cooling.

Overheating of the BGA chip is a serious problem and many devices may have this chronic defect. When the temperature is above normal, it can cause the problems I just mentioned and the device (notebook for example) does not turn on or only the LEDs turn on without showing any signal on the screen.

If overheating is one of the causes of problems with BGA chips, it is interesting

think of ways to minimize this problem. Observe if the equipment is heating up outside the standard.

Some notebooks, for example, start to heat up so much that you can feel it just by touching a certain point on the case. In many cases, cleaning it thoroughly, changing the thermal paste, checking the thermal pads, changing coolers and fans (if necessary), etc., will solve the problem.

These ways to minimize this problem are just preventative actions. In many cases the problem in the BGA chip is already present. And there are a number of symptoms, such as:

- **The device turns on and shows no signal on the screen:**this happens a lot with notebooks, video games and video cards. In the case of notebooks, it is common for the notebook to turn on the LEDs (or blink), emit beeps and not display anything on the screen. In the case of video games, the device keeps turning on the red LED and does not display anything on the screen. And it can even occur

these problems intermittently: sometimes the problem occurs, sometimes it does not.

- **Device turns on only the first time:**the notebook turns on and works normally. But when it is turned off, it does not turn on again when the power button is pressed;

- **Only connects with external monitor:**the notebook does not turn on its own screen, but it works with an external screen;

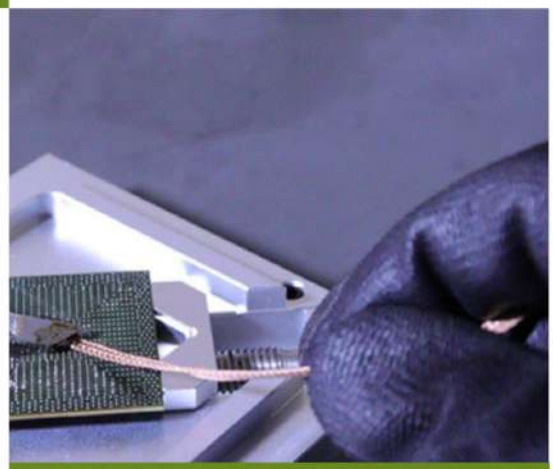
- **Multiple interface failures:**other interfaces may simply not work, such as webcam, keyboard and touchpad, USB ports, etc;

- **Distorted image:**the image on the screen may be distorted when the device is turned on or while processing some task;

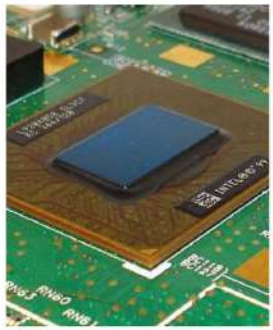
- **Battery charging problems:**does not charge battery, battery charge indicator does not light up, etc.

These are just some symptoms, they are not rules andmay be caused by other problems (not related to BGA). Therefore, study, practice and experience will help you to identify symptoms, causes and solutions more safely.

CAPÍTULO 02



O que é ME, Reflow e Reballing?



First steps

Now we are ready to understand what exactly ME, reflow and reballing are. They are different techniques and each one has a different objective.

The most basic technique is the**ME**, which are acronyms of **M**inimal**AND**squentation, which in good Portuguese means Minimum Heating. It consists of heating the BGA chip very briefly (a few seconds for example). The goal is that with the heat the spheres will have connection again and the equipment will eventually be able to work again. If it works again it will already be a diagnosis that the problem is really a failure in the BGA chip. Therefore, understand this: the ME technique is only for

diagnosis, and should never be used as a as definitive solution. Including you can adopt the ME technique always and before attempting a definitive solution.

Now let's go to the**reflow**, which is an intermediate technique. In reflow we will heat the BGA chip until the melting point of the solder (from

spheres). This allows the spheres to be re-attached (welded) and cracks and flaws can be corrected. This is not the ideal technique and it is not a procedure that can be considered definitive. The reason is very simple: there is no way to ensure the integrity of the spheres. If there is a crack, for example, it may remain there or reappear again as the user uses the device. This is a technique that makes sense to use in situations where there is no time to perform the reballing service, or the user/owner of the equipment does not want to invest in reballing. For example: it may be a piece of equipment that the user will discard and replace in a short time.

Finally, the**reballing**. This is the most advanced technique and is recommended for definitive services. Here, the BGA chip is desoldered, all the spheres are replaced and soldered again.

BGA Rework Station

They exist several brands and models of equipment. If you do a quick search for “BGA Rework Station” you will find many options with prices ranging from R$5,000 to R$25,000 more or less.

My goal is not to create a list of brands and/or say that brand “x” is better or worse than “y”, or that model “x” is better or worse than model “z”. The goal here is to provide general and relevant information that will truly help you become an increasingly qualified professional.

Infrared Station

This type of station does not use hot air for soldering and desoldering, but rather an infrared resistance system. They are generally cheaper compared to hot air stations, however,**no**They are recommended for companies and professionals who have a good volume of daily work.

This is because whenever you finish a job, you have to wait for the machine's resistors to cool down and only then can you install a new board to perform a new job. Therefore, be aware that if you are a company with a daily workload, there may be delays in services.

And this “daily volume” is very relative. In general, it may be necessary to wait around 15 minutes for the heating elements to cool down. I’m going to put this time at 20 minutes (it’s better to err on the side of too much than too little). So, is having to wait around 20 minutes between one service and another bad for you? If so, if it can disrupt your workflow, then this model is not for you.

Hot air station

This type of station is ideal for companies and professionals who have a good volume of daily work. It uses an air conditioning system

hot that is “blasted” onto the component to be soldered or unsoldered.

These models do not require cooling between jobs, at least under normal circumstances. This saves you time. Just to give you an idea, with the infrared model you need to take a break of about 20 minutes (remember: I increased this time a little to avoid mistakes, but the time is around that) between jobs. If you repair 6 boards per day, you will lose 120 minutes. That is a lot of time.

Because it is a more robust type of station (at least in this sense), they tend to be more expensive. Therefore, if you are starting out and have few reballing jobs per day, consider choosing an infrared model.

Important features to be observed

Don't buy a station based solely on the price of the equipment. You can't just decide to buy the cheapest equipment you can find or the most expensive one.

If you buy as cheaply as possible, you run the serious risk of purchasing equipment that will not meet your needs or equipment that is (equipment that has a despicable construction) or is (used equipment that needs a lot of maintenance) very bad.

And if you buy the most expensive one you can find (if you have a lot of money “to spare”) you run the risk of making a huge mistake in sizing your business (throwing money in the trash?!), buying equipment that was not made for your professional profile and/or company. You could buy a machine that has top-of-the-line quality and performance, that can handle all-day work, that can handle

You can easily do 50 reballings per day, but in the end you don't even do 6 reballings per day. This is just an example, but do you understand correctly? Top-of-the-line equipment will cost a small fortune. It's a big investment. You need to have an exact idea of whether you'll be able to recover the money invested and, if so, you need to know how long it will take to recover that money (through reballing services).

To help you with these questions, below I have outlined some characteristics that you need to look out for.

Temperature control

In stations such as the Achi Ir6000 V4 BGA Rework Station, temperature control is done through buttons on the front of the equipment. And there will be a settings control for the base and one for the gun.

Other equipment has an LCD panel where you can make all the adjustments and

possible configurations. Example: Honton R690 V4 BGA Rework Station and Ly R690 V.3 4300w BGA Rework Station.

The more configuration options the equipment has, the better it will be for your work. I will use the Achi Ir6000 V4 BGA Rework Station as an example. With it, we can configure (set) a temperature for the base (200 ºC for example) and up to 10 different temperatures for the gun. In other words, we can already pre-configure up to 10 work profiles that can be easily chosen when you are going to perform a service. This saves you time and performance, since it will not be necessary to program the machine every time you are going to perform a service.

Efficiency

Efficiency is strongly linked to the machine's working capacity. I have already explained this in detail, you already know the difference between an air station and an infrared station. An air station will have

one profile of professional and one of infrared will have another professional profile. Stay tuned for that.

Markets served

Many attention the that. All manufacturer will inform, either on its website and/or in the equipment's technical specifications, which market its equipment serves. If your objective is to work with notebooks, for example, you cannot purchase a station that was built to serve the smartphone market.

Want a practical example? The Irework soldering/ rework station is specifically designed for the cell phone, smartphone and tablet market. It is smaller in size. A notebook or PC computer board would not even fit inside. Even if the technician tries to “find a way around it”, the quality of the service will be completely compromised.

Items included

Very important, as more items and The more tools included, the better the quality of the service performed by the technician. What can't be missing:

- Printed manual or;
- DVD for assembling, configuring and handling the equipment.

There are other items that are important and this varies from equipment to equipment. One of them, just to mention as an example, is the suction clamp (I will talk about it later). Some equipment will already have it, others you will have to buy separately.

Another item that specific BGA rework stations will have is the anti-warping support, which I also mention below.

PCI/PCB specifications

THE manufacturer also will provide these information. PCI stands for Printed Circuit Board and in English it is PCB - Printed Circuit Board.

A given station will have a limit on the maximum plate sizes and the maximum sizes of the usable heating area.

Obviously, if the station serves the markets of notebooks, desktops, tablets, televisions, receivers, games, decoders, DVRs, smartphones, cell phones, among others, this means that it was built to serve practically “all” the main markets.

Upper barrel, useful heating area and power

As I finished of explains node topic Specifications PCB/PCB, you manufacturers usually inform this specification. Look for

these information in "Specifications techniques". Example:

Upper cannon Useful heating area: 80mmX80mm Power: 450W 220V

Base, Usable Heating Area and Power

As I finished of explains node topic Specifications PCB/PCB, you manufacturers usually provide this specification. Look for this information under "Technical specifications". Example:

Base Area useful of heating: 200mmX200mm Power: 1800W 220V

Maximum temperature

Quite easy to deduce, this information refers to the maximum temperature that the station can work at. Many models work with a maximum temperature of 300/350 ºC, which is enough for BGA reballing services.

I'm sure you already know this, but I'll just reiterate: the settings to be made at the station are not at maximum, that is, you won't simply set the machine to heat at maximum. That's not how it works. It usually comes pre-configured from the factory and using the manual you can make any necessary adjustments.

Suction clamp

It is a tweezer used to “remove” the BGA chip once it has been desoldered. Through suction, it attaches itself to the upper part of the component and you can easily remove it.

It is an accessory/tool that not all station models will have. In some cases you may and/or will have to purchase it separately.

Anti-warping support

It is a base that will prevent the plate from warping. It holds and locks the plate. The plate fits better and is firmer. And usually there is some mechanism at the bottom to prevent the plate from bending. It can even be a simple system made up of screws that will rest on the bottom of the plate, providing support and firmness so that it will not bend downwards.

110 or 220v?

If this option is available, that is, if there is the possibility of choosing a station for 110V or 220V network, give preference to the station for 220V network. This is because these devices need more energy to work, especially if it is a medium-sized station or larger. In fact, some manufacturers make certain models only for 220V networks.

Obviously, your workshop must have the desired network: 110V or 220V. And if your workshop

If your AC does not have 220V, there is an option which is to use 110V to 220V transformers. In this case, it is essential to contact support or the store to size this transformer correctly.

Examples of BGA Rework Stations

Below I present three models of BGA rework stations. Each one has a very different price range. My goal is not to say that one station is better than another, as I firmly believe that each one has its exact and perfect audience.

I have included the sale prices I found during the research for each station. Therefore, there may be variations.

Achi Ir6000 V4 BGA Rework Station

Price range: around R$5,459 Heating:
infrared
Power: 2250 W
Maximum temperature: 350 °C

In the Free Market:
https://produto.mercadolivre.com.br/MLB-1714838892-estaco-retrabalho-bga-achiir6000-v4-rev-autorizada-nova-_JM#position=1&search_layout=stack&type=item&tracking_id=a23391fd-dee8-4799-b33ae06ce323d39c

https://lista.mercadolivre.com.br/esta%C3%A7%C3%A3o-retrabalho-bga-achiir6000-v4#D[A:Esta%C3%A7%C3%A3o%20Retrabalho%20Bga%20Achi%20Ir6000%20V4]

Figure 02.1: Achi BGA Rework Station Ir6000 V4

Honton R690 V4 BGA Rework Station

Price range: around R$11,900 Heating: air

Power: 4700 W
Maximum temperature: 300 °C

In the Free Market:
https://produto.mercadolivre.com.br/MLB-1914505501-estaco-retrabalho-bga-hontonr690-v4-rev-autorizada-nova-_JM#position=11&search_layout=stack&type=item&tracking_id=ac9b73cf-370f-4111-a97ff95720eca7fb

https://lista.mercadolivre.com.br/esta%C3%A7%C3%A3o-retrabalho-bga-hontonr690-v4#D[A:Esta%C3%A7%C3%A3o%20Retrabalho%20Bga%20Honton%20R690%20V4%20]

Figure 02.2: Honton BGA Rework Station R690 V4

Ly R690 V.3 4300w BGA Rework Station

Price range: around R$25,000 Heating: air

Power: 4700 W
Maximum temperature: 300 °C

In the Free Market:

https://produto.mercadolivre.com.br/MLB-1682913894-estaco-de-retrabalho-bga-lyr690-v3-4300w-

_JM#reco_item_pos=1&reco_backend=univbitems&reco_backend_ty
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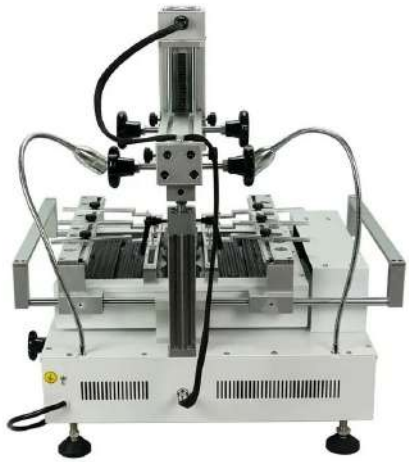
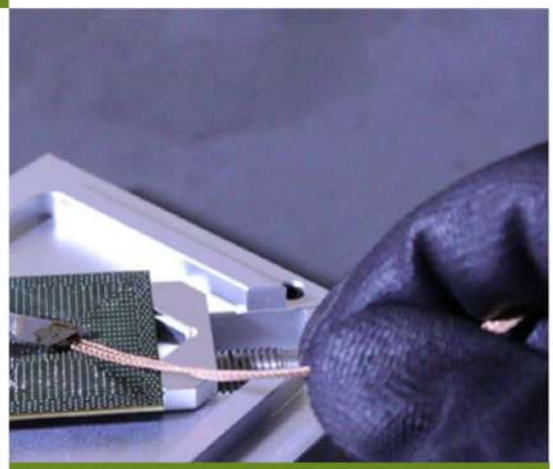
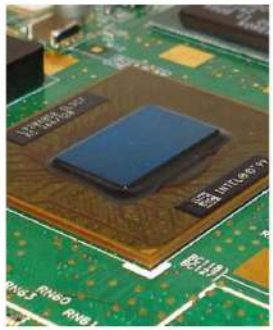


Figure 02.3:BGA Rework Station Ly R690 V.3 4300w

CAPÍTULO 03



Na prática: estação Retrabalho BGA



Step by step

Creating a step-by-step tutorial on how to reball with a BGA rework station is extremely complex. There are many issues involved. After all, which station should I use? Which brand, which model? Many stations will have an LED panel, others will not. The way to configure them varies from one to the other. If I specify a model, would I be forcing all readers to buy that model?

To avoid all this problem the solution I found was very simple:

1 - I made a generic tutorial on BGA rework station, which theoretically will work for any model and brand.I don't explain many processes in this topic. , therefore, what I present is just a general overview. I explain these details in the next topic;

2 - And I made a second tutorial (see next topic) where I do the reballing using a Yaxun 902+ soldering and rework station

110V. Then I explain several points that need to be observed, such as the use of stencil, solder balls, solder flux, etc. The Yaxun 902+ 110V soldering and rework station is a “general purpose” soldering and rework station, and is not specific for BGA. However, it is possible to study, train and even perform services (reballing) using it or another soldering and rework station (these “general purpose” ones) that you already have in your workshop (as long as it has the air gun).

So, let's go to item 1, that is, the generic tutorial on BGA rework station:

1 - The first point is to understand perfectly is: How your BGA rework station works. I have already explained that there are several models and brands and each one will have its own particularities. Read the manual carefully. If the manufacturer has provided a DVD (or link/YouTube channel) with explanatory videos, watch them all in detail. Understand how the heating, control and settings of the base and gun work;

2 - Security:follow standard procedures such as wearing anti-static gloves, carefully removing the component, etc.;

3 - Attention to the system anti warping: Your BGA rework station will have mechanisms to prevent the board from bending. Use it correctly (read the manual). This system can be removable or fixed to the station structure;

4 - Use the thermal tape:to protect components that are near and around the component that is to be extracted;

5 - Base temperature: The station usually comes pre-configured from the factory. But read the instructions provided with the machine carefully. You should always look for information on temperature values for each type of service. The base temperature is generally a fixed value. For example: we can set the value to 200 ºC. It will heat up to this temperature and will perform the entire procedure with it;

6 - Cannon temperature: Unlike the base temperature, the cannon usually works with a ramp system. There will be several ramps (stages) and each one will have a specific temperature. For example: the first ramp can be from 0 ºC to 100

º C, the second ramp is from 100 ºC to 150 ºC, the third ramp is from 150 ºC to 200 ºC, and so on. It remains stationary for some time on a ramp, after that time it moves to the next one, remains stationary for a certain time, moves to the next one and so on;

7 - Welding types and temperature:around the year 2006 onwardslead solder began to be avoided and was replaced bylead free solders . In other words, newer equipment tends to use lead-free solder. And this directly affects the melting temperature:

- **Leaded solders:**melts between 183 ºC and 188 ºC;

- **Lead-Free Solders:** melts between 217 ºC and 223 ºC;

7.1 -Therefore, the required temperature to melt the solders on old boards, which use lead solder, is smaller.

8 - Leave the station level: Make sure the station is as level as possible. If it is on a table/bench, make sure the table/bench is level. This makes it easier for the station itself to be level as well.

9 - Liquid soldering flux: Apply solder flux to the bottom of the component. If you do not have liquid solder flux, use the paste type for study and testing purposes only. The liquid penetrates the component's solder more quickly and easily;

9.1 - Use of syringe:you can use a syringe with a needle (pharmacy syringe) to inject the liquid solder flux right under the component. As you inject

the flow you can you see it overflow
on all sides of the component. This means that you have managed to get a good amount of flux on the underside of the component, between the solder joints/balls.

10 - Place the plate at the station:place the board firmly, levelly, with the anti-warping system and already with the thermal tape. The board cannot have one side slightly misaligned, or worse, be wobbly;

11 - Center the cannon: Pay close attention. Center the cannon in relation to the component. There are boards of all different sizes, right? A laptop board is much larger than a cell phone board. Therefore, when placing the board in the station, you can generally position it in such a way that it favors the alignment of the cannon. Once this is done, just center the cannon itself;

12 - Thermocouple:pay attention to this. Some stations will have a thermocouple to measure the temperature of the component. Please note this

question, its correct use according to the manual, etc;

13 - Gun Distance/Height: The manufacturer usually informs this in the printed, digital or video manual. But the height is around 1.5 cm. Therefore, bring the barrel closer to the component and leave it at approximately this height or the height informed by the manufacturer;

14 - Start the reballing process: what we call starting the profile. The profile can have some ramps, as I already explained.

14.1 - A good practice is to start the profile with a slower curve, where the **first ramp** the temperature will rise between 120ºC and 150ºC and will last for around one (1) minute;

14. 2 - The second ramp can go up to about 188/190 ºC and leave for about 30 seconds. Note that here we can remove leaded solders (melts between 183 ºC and 188 ºC);

14.3 - The third rampcan go up to some 200 ºC and leave for about 30 seconds. If the component uses leaded solder and the removal was not done on the previous ramp, we can certainly remove it now;

14.4 - The fourth rampcan go to 220/230 ºC and leave for 30 seconds. Here it is possible to remove components with lead-free solder (melts between 217 ºC and 223 ºC).

At no point am I stating that this ramp scheme that I presented is a rule and that it will work for any service. It is just for illustration.

During the process, do not lower the cannon in an attempt to speed up the process. You may harm the components that are around the BGA chip. You will only bring the gun closer if it is necessary to redo the process with it closer

next, in case of having the wrong height for example. The ideal is to test, study and learn the correct height.

Is it normal for solder flux to “boil”? Yes, it is perfectly normal. Is it normal for a little smoke to come out? Yes, it is possible. happen. That very discreet and timid “smoke” is normal, after all, there is solder heating up and entering a “liquid” state, there are other chemical components on the board, such as varnish, etc.

15 - Let the board and component cool down: When removing/taking out the BGA chip, it will be necessary to clean the board and the component and remove all the old solder. Before doing so, it is a good idea to let both cool down;

16 - Cleaning the BGA and the board: Secure the BGA to a BGA support and clean it thoroughly, removing all old solder. To do this, you will use a desoldering mesh, paste flux, a soldering iron with a knife tip and contact cleaner and/or isopropyl alcohol;

16.1: Apply solder flux to the component. Using a soldering iron with a knife tip, clean the excess solder. Do not use force, this is delicate work;

16.2: Now use the desoldering iron to remove the remaining solder and do a more detailed cleaning. Do not use force, it is a delicate job. It is all a question of skill and not strength;

16.3: To finish, use a flannel or paper towel to clean the entire component with contact cleaner and/or alcohol isopropyl;

16.4:repeat the process on the board.

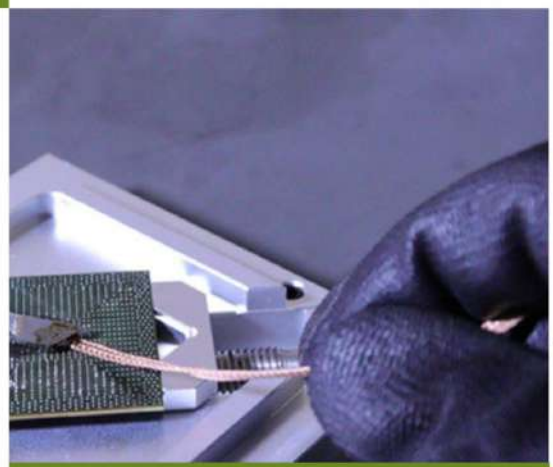
17 - Once everything is clean: We use the stencil and a BGA support to place the spheres. In the next topic I will explain this in more detail, as the process is exactly the same.

18 – Place the sign at the station again:the plate must return to the station, observing everything I explained at the beginning when we placed the plate at the station for the first time;

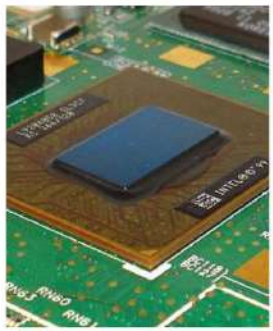
19 - The new spheres will already be in the component: Obviously I am summarizing this step, because in the next topic this is better explained. We must now position the chip on the board, observing the correct position of pin 1;

20 - And we do the whole process again:what we call starting the profile. The profile can have some ramps, as I have already explained. This will be used for the welding process.

CAPÍTULO 04



Na prática: Retrabalho BGA com a estação de solda e retrabalho



Tutorial - BGA Rework with Yaxun 902+ 110V

Now, I will present more details about the BGA reballing process. Now I used the Yaxun 902+ 110V, which is a soldering and rework station that I named as a “general purpose station”. You can use another station, you can use one that you may already have in your workshop (as long as it has air soldering and desoldering).

Please note that we have already had a long tutorial on the use of a BGA rework station. This is a more expensive type of equipment and many of those reading this book do not have it. In this tutorial (using a BGA rework station) some details were omitted on purpose, as I worked on and detailed them in the following pages.

This form you it achieves absorb knowledge and can practice now, using your rework and soldering station. Even if you don't have one, you can acquire one for a relatively low price. A Yaxun

902+ 110V (which I used in this tutorial), for example, costs around R$500.00. A much more affordable price, right? It's an excellent way to start practicing.

In the following topics I have tried to simplify the process as much as possible, because the goal here is learning. My goal is to give you a way to start your journey. But, as much as I have tried to simplify, it will be necessary acquire/buy some tools. I will present them in detail later.

Tools and other supplies

I have listed here the tools and other supplies that we will need to put this reballing tutorial into practice:

- **Soldering and rework station:** in this case I used the Yaxun 902+ 110V, but you can use a similar model, as long as it has a soldering iron and air;

- **Knife tip:**to be used in the soldering iron. I already introduced it in chapter 17;
- **Syringe with needle:**very useful for applying liquid solder flux right under the component. It can be a 3mL syringe;

- **Liquid and paste soldering flux:** both will be used. And one**simple brush**to spread;

- **Resin Remover:**It is a liquid that removes the resin/glue that is used in some components, such as chipset, among others.

- **Desoldering mesh:**Also known as desoldering tape. A sheet of 1.5m x 2.5mm tape is sufficient for this exercise below;

- **Clean contacts:**it could be contact cleaning spray or a small bottle of isopropyl alcohol;

- **Brush:**brush or brush
  antistatic for cleaning electronic components;

- **Tweezers used in electronics:**to assist in removing the component;

- **BGA Support:**It is a support where we will attach the component for cleaning, and the component and the stencil for placing the spheres. There are several models. There is the simple universal support that is sold for a very affordable price (something around R$30.00) and other better built models such as the Honton Ht 90x90 BGA Support that will cost something around R$200.00;

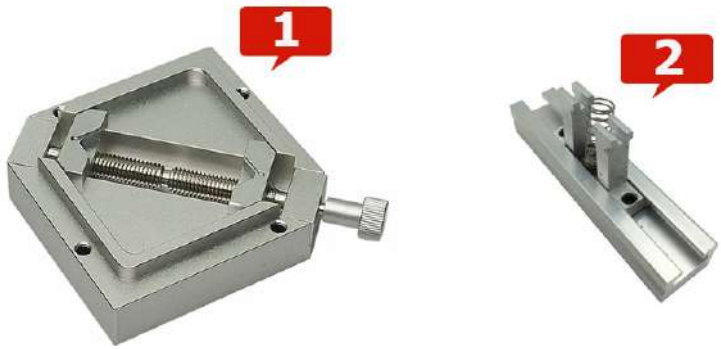


Figure 04.1: Honton Ht 90x90 BGA support (1) and simple universal support (2)

- **Direct Heat Stencil:**It is a type of template that allows us to place all the spheres on the component correctly, aligned and perfectly. Direct heat means that it can withstand heat, which I consider to be better. There are models that cannot withstand heat. Each component will have its own stencil. For example: there are stencils for DDR chips, stencils for Xbox CPUs, iPhones, etc. And there is a set of universal stencils. There are chips that are very difficult to get stencils for. For example: it is much more difficult to get stencils for Android cell phones. Technical personnel generally use the universal stencils for the iPhone in the Android line. Obviously, all of this requires experience. It would be possible to write a book just about stencils and solder spheres. My advice is to initially acquire a set of universal stencils;

Figure 04.2:universal stencil set

- **Solder balls:**These are the spheres used in the BGA chip. There is no universal sphere. Each chip uses a specific sphere depending on its size. The sizes are in mm. In a workshop, it is ideal to have a set of spheres. Example: 0.30mm, 0.35mm, 0.40mm, 0.45mm, 0.50mm, 0.60mm and 0.76mm. But be careful: spheres have an expiration date, be aware of this. When you find the stencil you are going to use, it will have a description of which sphere to use (mm).

Figure 04.3:solder ball set

- **Thermal Tape:**It is an aluminum tape that is used in reballing and reflow work. We use it to insulate components that we want to protect from heat;

Figure 04.4:aluminum thermal tape

- **Magnifying glass with articulated support:** The higher the magnification options, the better. A 2.5x or 3x magnifying glass would be the minimum recommended. Working with BGA involves analyzing tiny solder balls and dots. Without the aid of a magnifying glass, this work can become almost impossible;

Figure 04.5:magnifying glass

Master Tips

Before we jump right into our step-by-step tutorial, I'm going to add some important technical information. My goal is for you to absorb as much knowledge as possible. Let's go:

1 - Pay attention to the temperature of the rework station:you will work with temperatures between 230/250 °C up to a maximum of 300 °C. And this will require your experience, as you get your hands dirty you will be able to make the best temperature calibration. If the temperature gets too high it can warp the stencil, damage the chip, and desolder nearby components (this can even happen, but there is a way to learn how to control it).

2 - Air vessel: The air flow is calibrated according to practical experience. It almost seems like an “excuse” for not giving more details. But unfortunately you have to understand that this is how it is. Only practice will make you a good professional. There are a large number of rework stations, brands and models. It is impossible to say that a certain air flow setting will be ideal in all scenarios. What you need to know is that the air flow has to be small, you cannot blow too hard otherwise you will remove the component from the

You can even remove the components next to it. Try setting the flow rate to values between 4 and 6 and keep testing until you find the one that works best. You can use a nozzle with a higher flow rate or don't use any nozzle at all, just remove it. If it's a very small component, you can choose a nozzle that has a large flow rate, but it can't be too much. Everything is a test.

3 - Distance of the nozzle from the plate: You also need to learn how to calibrate the distance between the nozzle and the board. Calculate about two fingers' width. If you leave it too far away, the component won't come out; if you leave it too close, it could burn the chip.

4 - Pay attention to the temperature of the soldering iron: The soldering iron is used to clean the contacts on the component and the board. These contacts are called pads or solder islands. You have to find the ideal temperature of your soldering iron to do this cleaning without the tip of the soldering iron sticking to the pad in such a way that it can even

pull them out. Test scrap metal with iron at a temperature of around 380 °C.

5 - Thermometer: If possible, monitor the temperature with a thermometer. Don't rely solely on the rework and soldering station. There are many tools for this, such as multimeters with thermometers, digital thermometers with thermocouple sensors, etc.

6 - Be careful with nearby components: Be very careful when desoldering or soldering a component. If there is a component nearby and solder flux drips underneath it, cold solder may occur on that component.

7 - Slipping component: When soldering the component again, if it starts to slip, that is, you put it in the exact place and when the air hits it it starts to move and move out of place, it could be excess air flow.

solder. When you do the soldering again, use a little solder flux.

Reballing Step by Step - Part I

Now that we have all the necessary initial instructions, let's go step by step:

1 -The first step is to check if the BGA chip has resin/ glue on its four corners. It can be red, black, transparent or another color. This resin helps to fix it. Some chips have it, others don't. To do this, use resin remover. You can even use a syringe to apply the liquid to each point where there is resin (just don't use the same syringe that you use the liquid solder flux with). Wait 5 minutes and apply more remover. Wait 10 minutes. After that, use tweezers to remove the resin. The tweezers should be used very carefully. If in doubt, use a toothpick (since it is made of wood, it is still risky).

to start pulling the resin and finish with tweezers.

Figure 04.6:resin remover

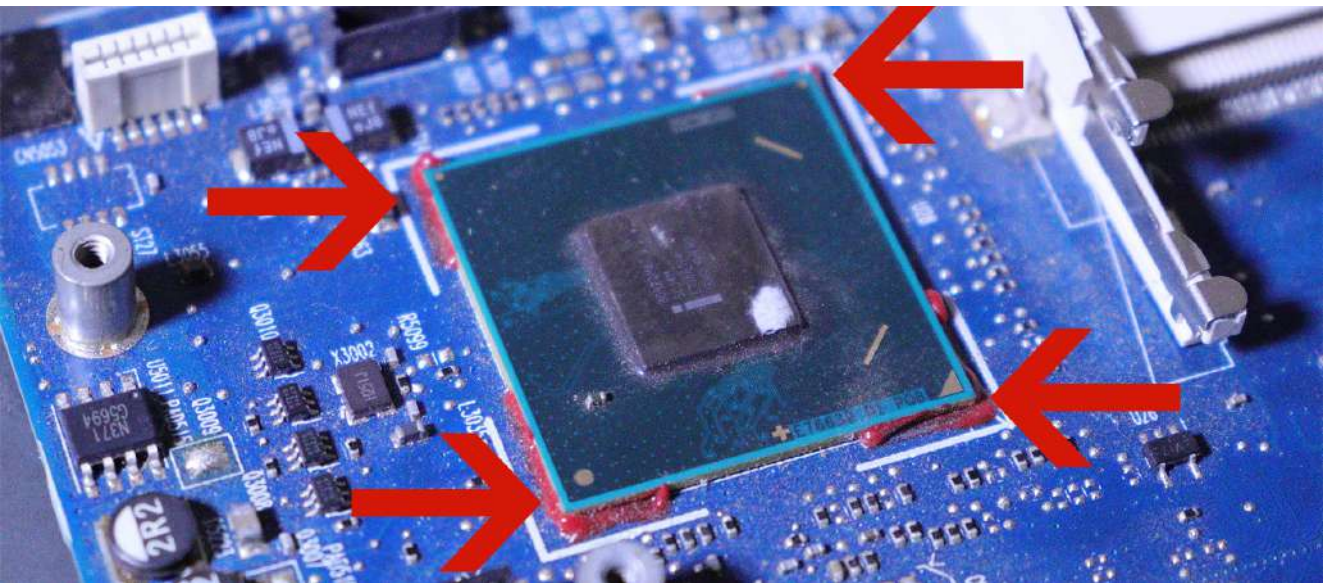


Figure 04.7:BGA chip with resin on the corners

2 -Once done, clean it very well. Use paper towels and isopropyl alcohol. Do not leave the area damp;

3 -Now preheat the board. Use the air from your rework station. Start with 120 ºC. You can use the largest nozzle you have.

The goal is to spread the air across the entire plate. The flow rate can be 7 or 8, or the highest that is available at the station. Spread the air across the entire plate, including both sides of the plate. Do this for about 5 minutes and then increase the temperature to 180 °C and repeat the process for another 5 minutes.

3.1: The goal is to minimize the amount of moisture that naturally exists on the board. Although this method has not been proven to be effective (an oven would be ideal), it is advisable to do so. Ovens and preheating are used in an attempt to prevent bubbles in the component. Bubbles are caused when the temperature of the component is increased significantly. There is moisture trapped inside it and this will cause the component to expand, forming the bubble.

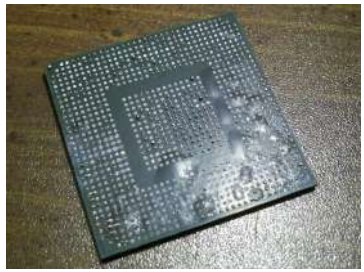


Figure 04.8:the bubbles are these “swellings” that arise. Observe.

3.2: The bubble can also be caused by the high temperature that the technician exposes the BGA chip to, often a temperature beyond what is permitted;

3.3: Preheating is also useful to help prevent warping of the board.

4 -Now we will use the aluminum thermal tape to insulate all the components that are around the BGA chip that we are going to desolder. The more insulated, the better;

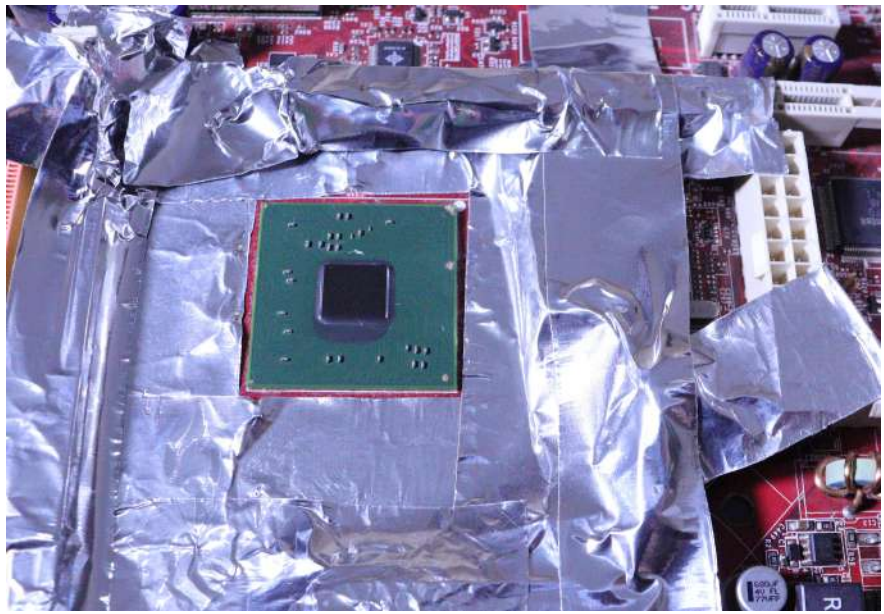


Figure 04.9: Properly insulated BGA chip

I can to use paper aluminum of “kitchen”? That aluminum foil used in cooking can also be used. However, be very careful! Cooking aluminum foil has a correct side to be used. There are two sides, the shiny side and the not so shiny side. The shiny side is used facing

the food, precisely to reflect and retain as much heat as possible. This way, the food cooks more efficiently. Therefore, to use it on the hob, the shiny side must face outwards (opposite the hob), because our objective is exactly the opposite of the food: it is to reflect the heat away from the elements protected on the hob.

5 -Position the board on the countertop so that it is level. Do not leave other boards or anything else underneath it;

6 -Use the syringe with the needle to inject liquid solder flux under the BGA chip. You will inject it from one side and you will see the flux overflowing on the other sides. When it overflows, it means that the amount is sufficient. Be careful not to scratch the component or the board with the tip of the needle;

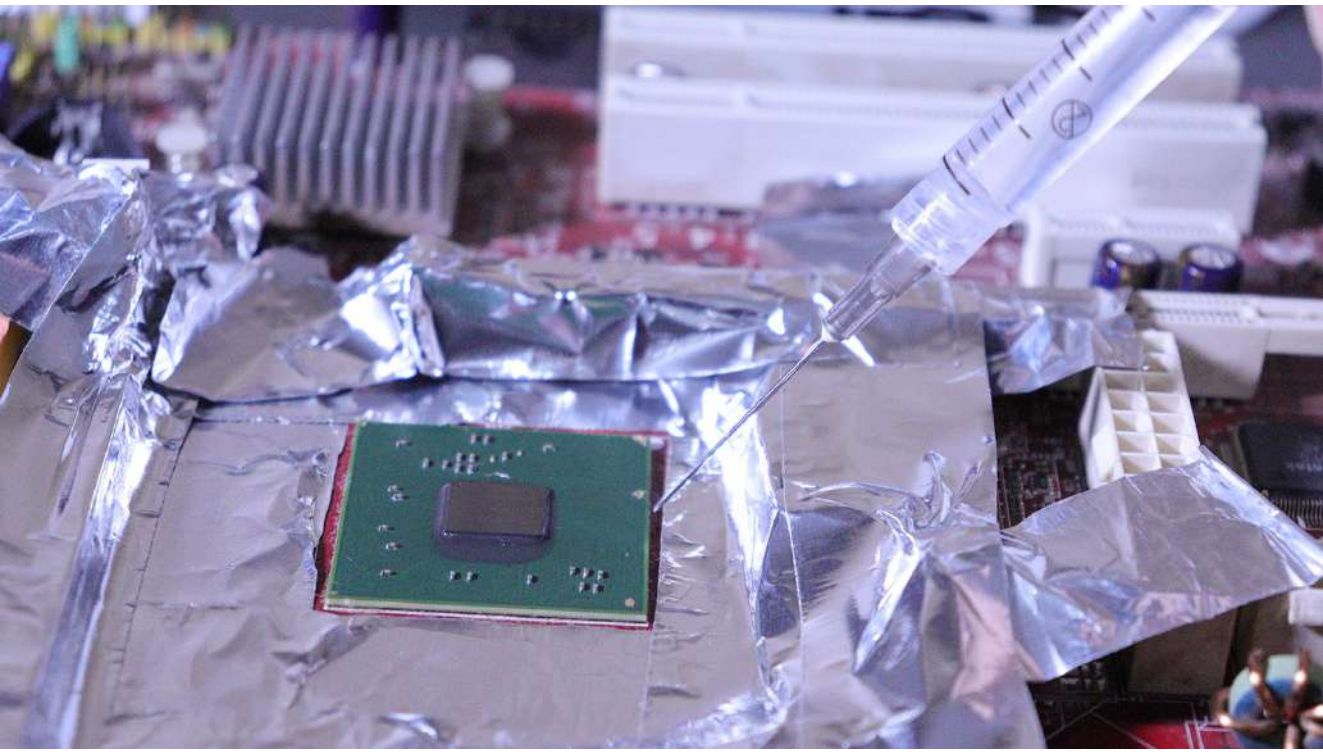


Figure 04.10:putting liquid soldering flux

7 -To start extracting the BGA chip, set the temperature and air flow as I previously taught in “Master Tips”. If in doubt and if it is your

First test on scrap metal, start at 230 ºC. If it doesn't extract or you notice a lot of difficulty, do a new test at 250 ºC and then a new test at 300 ºC. The air flow can be between 4 and 7 (and you can, and should, test each flow to detect which one your station will work best at) and do not use any nozzle if it is a large chip (like a chipset). If it is a small chip, such as tablet and cell phone chips) test with the larger nozzles (test, on scrap metal, with two or three nozzles). Make circular movements. On the chip, on the edges, in the middle and all over the chip, keeping a height of approximately two fingers;

7.1: You will work calmly, without rushing. Especially if it is a chip that has never been extracted, and you are just starting your studies, you will have some initial difficulty. This is normal and expected.

Figure 04.11:make circular movements

7.2: Use tweezers to touch the chip to check if the solder has melted and if it is loose. Do this every 30 seconds to 1 minute or more. There is no rule, the more you practice the better you will become.

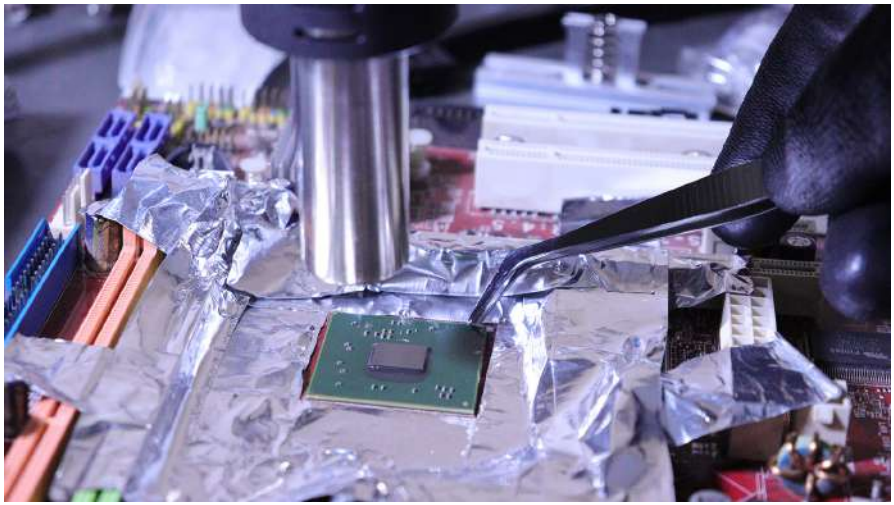


Figure 04.12:checking if the chip is loose. Give it a little push to the side.

7.3: If you notice that the chip is completely loose, remove it very carefully. It should come out easily and the solder should be completely melted. The chip should NOT stick to the sides when you remove it. If this happens, it could break the pads (contacts where the spheres are located), the tracks that are connected to the pads and you would lose the entire board.

Figure 04.13:chip extracted

Problems that may arise in part I

Some problems may occur in this first stage (part), especially if it is your first contact with reballing. That is why it is very important that the learning is done on scrap. I will list here the most common problems:

1 - The chip's solder does not melt: It's been 8, 10 minutes and nothing. This is normal, you're still practicing. Many things can cause this problem. It could be a solder flux of questionable quality, the air temperature is not sufficient or the air flow is too low. The solder flux is the last possibility that you can try to change. Initially, increase the temperature and the air flow. You can test the air flow using the maximum of your station. And you can test the temperature with a maximum of 350 ºC. Another test you can do is to decrease the height of the nozzle in relation to the chip and make slower circular movements. Everything is a test and a lot of practice;

1.2: The melting point of the spheres (Leaded solders: melts between 183 ºC and 188 º C; Lead-Free Solders - Lead-Free: melts between 217 ºC and 223 ºC;) is in the spheres themselves. There is the entire body of the chip, the entire encapsulation that the heat needs to pass through to reach the spheres. You are not throwing direct heat on the spheres. That is why the process of

learning, something that is easily solved with practice;

2 - When extracting the chip, some spheres were still soldered: This is extremely typical when a student first extracts, where some spheres remain stuck to the pads and then break tracks (and pads). Don't worry. This is normal to happen while you are studying and practicing. It simply happens because the spheres have not yet completely melted.

3 - Bubble formation: As I already explained, the cause could be humidity or excess temperature.

Reballing Step by Step - Part II

At this point the BGA chip has been removed. Let it cool naturally. The same should be done with the board. In this part II we will clean the chip and the board.

Let's start by cleaning the chip:

1 - We will use BGA support:I have already presented two models previously. In this tutorial we use the Honton Ht 90x90 BGA Support. It makes the BGA chip firmer and we can work more safely. Place the chip as shown in the following images;

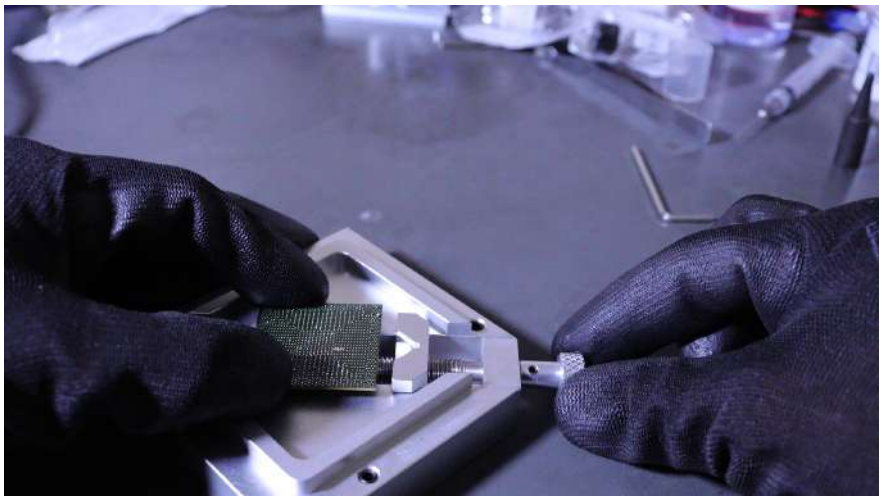


Figure 04.14:positioning the chip in the holder BGA Honton Ht 90x90

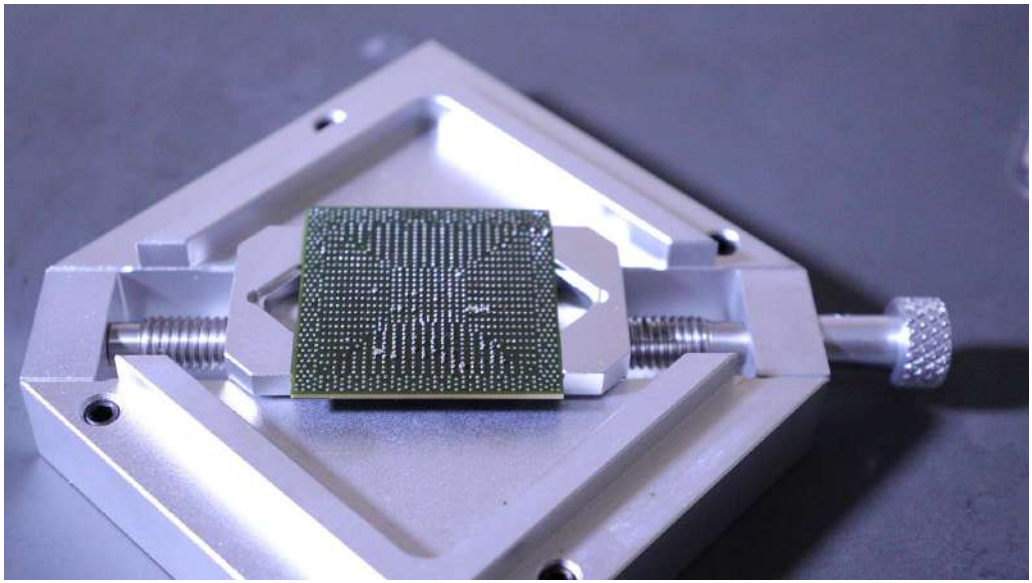


Figure 04.15:chip on Honton Ht BGA Holder 90x90

2 - Solder Flux: Apply a thick solder flux to the entire area where the pads and spheres are located. Use a brush to help spread a thin layer of flux;

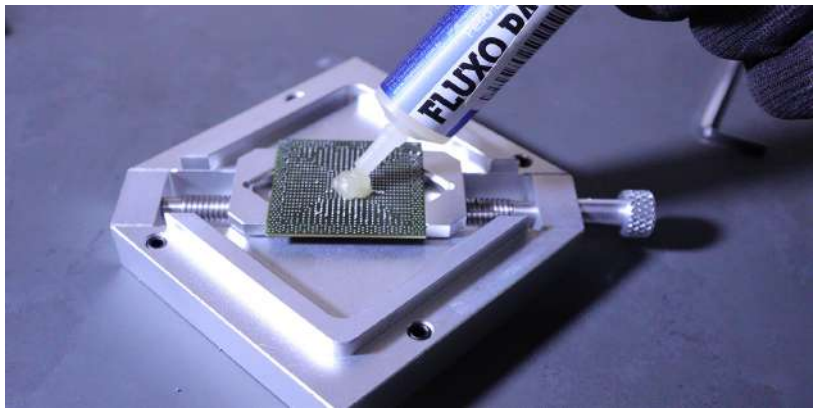


Figure 04.16:use of pasty soldering flux

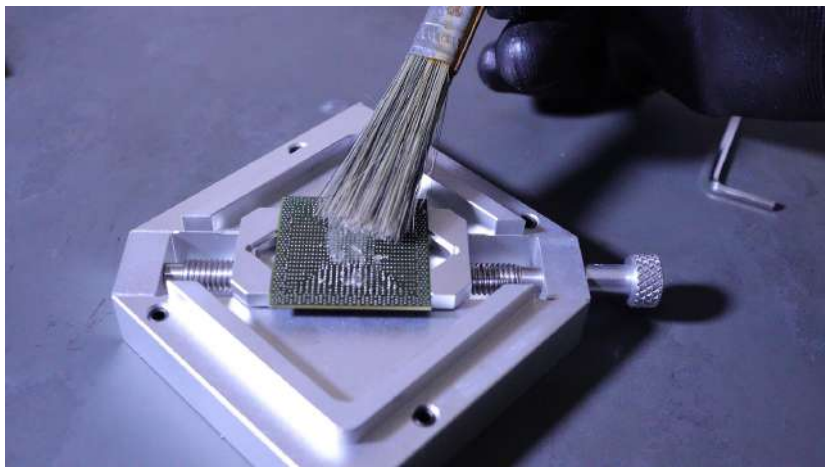


Figure 04.17:spreading the solder flux

3 - Soldering iron temperature:place the knife tip on the soldering iron. And the temperature should be 380 ºC. Wait for it to reach this temperature to go to the next step;

4 - Put solder on the tip:put some solder on the tip (tin). This will help remove the solder that is on the chip;

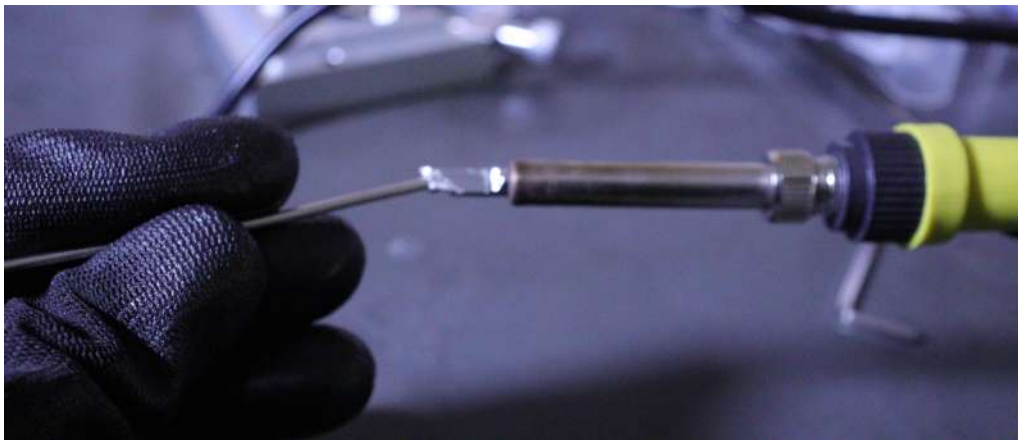


Figure 04.18:put solder on the tip

5 - Removing the solder from the chip:now we are going to remove the solder that is on the chip. Here we go

remove the excess, as we will still use the desoldering iron to complete the service. You will pass the tip very lightly over the chip. Do NOT scrape it. It is normal for solder to be very stuck, do not worry and do not try to scrape it off in order to remove it;

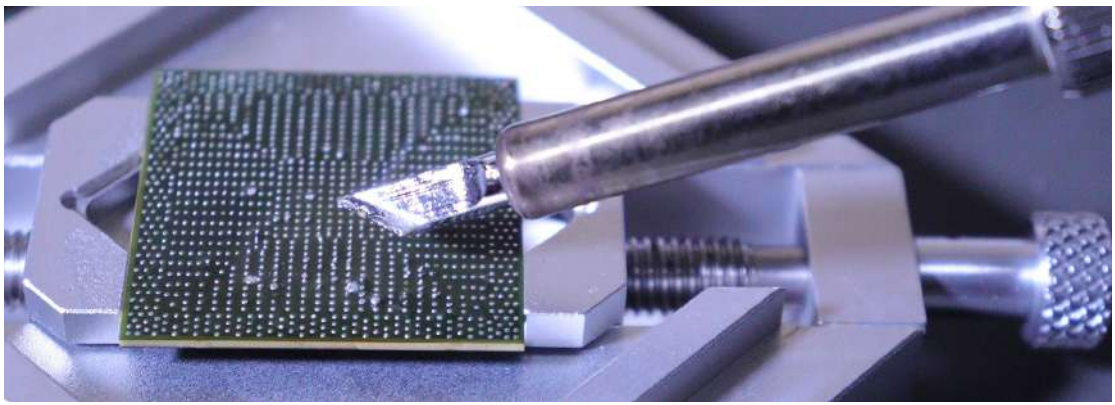


Figure 04.19:removing excess solder with a soldering iron and knife tip

6 - Use of desoldering mesh: At this point we have already removed the excess solder. To finish removing the solder we use the desoldering mesh. When using the mesh, do not press it too hard against the chip. It is

Yes, pressure is applied to ensure that the solder sticks to the mesh. But not excessively.

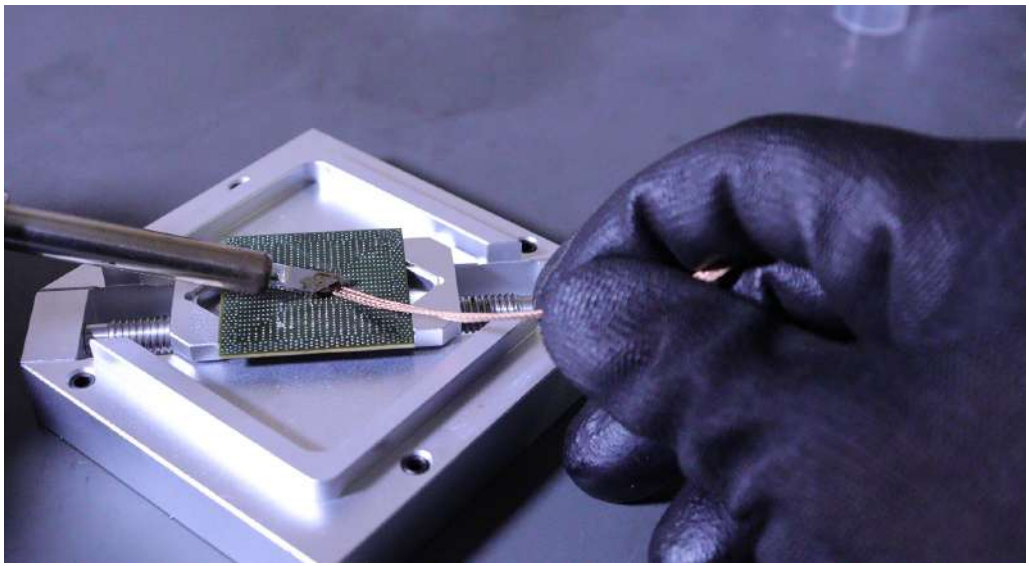


Figure 04.20:use of desoldering mesh

7 - Clean chip:the expected result is that all the spheres, melted spheres and other traces of old solder have been removed. All pads should be perfect. Let the BGA chip cool naturally. After that, clean it with isopropyl alcohol. Take a good look at whether

all pads are perfect and look for any pads that may be connected to each other by solder. Use the magnifying glass to make a thorough analysis;

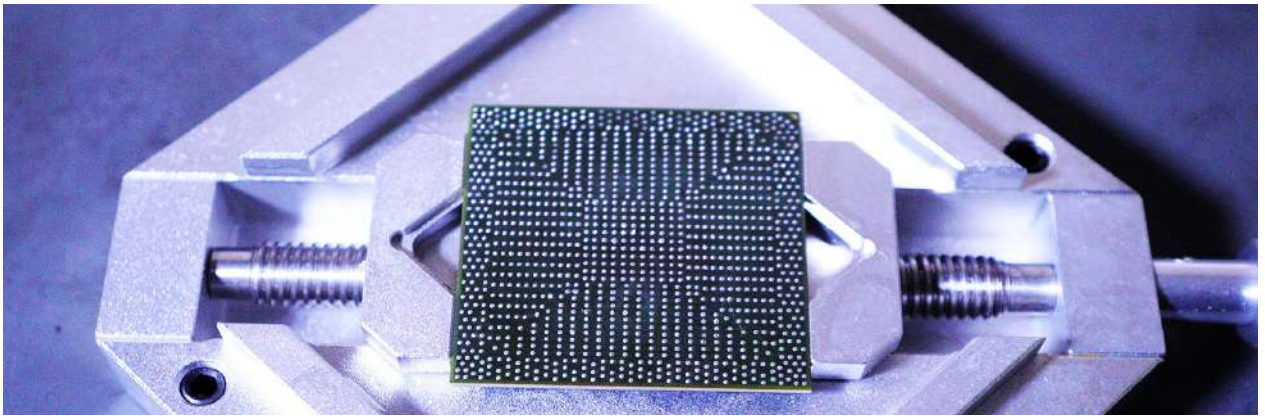


Figure 04.21:clean BGA chip

8 - Motherboard preparation:and the same process must be done on the motherboard. It is exactly the same process, there is no need to explain the step by step again. My suggestion is to remove all the aluminum thermal tape, as it will get in the way of cleaning.

Problems that may arise in part II

- **Difficulty removing old solder:**it is purely a matter of practice;
- **Unable to use the desoldering iron**: it is purely a matter of practice;

- **Connected Pads:**leave solder points (pads) connected with solder. A microscopic fraction of solder is enough to connect two pads;

- **Broken Pad:**it may have been an error in desoldering the BGA chip or in cleaning the chip;
- **Pad Destruction:**Here it goes beyond a few broken Pads, where there are many broken Pads, destroyed tracks and total loss of the board.

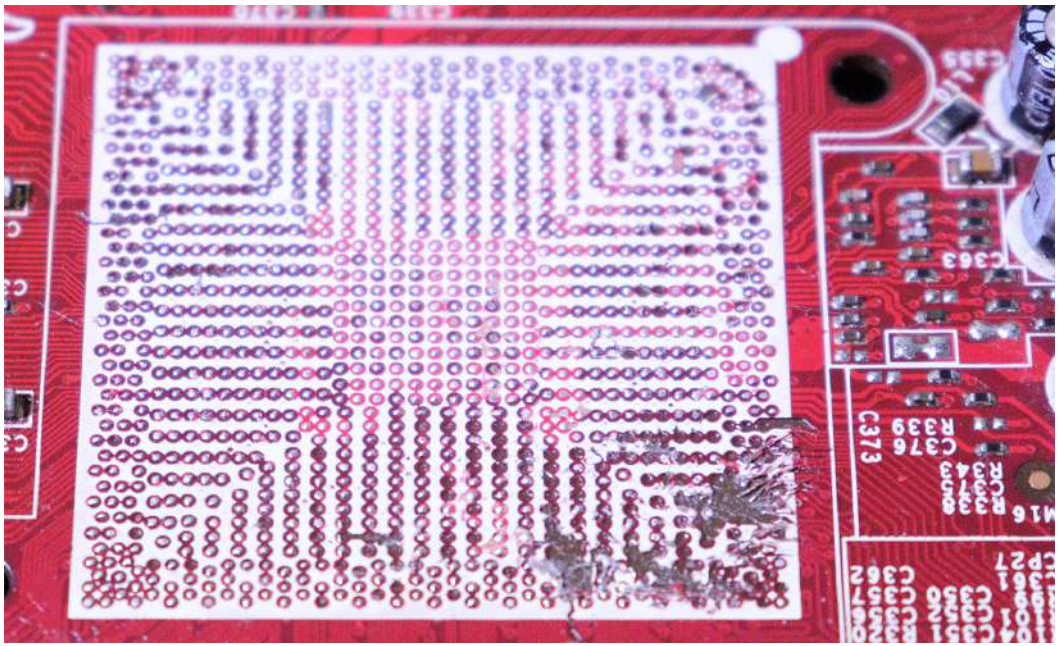


Figure 04.22: Here is an example that occurred in the classroom. The student did not have the patience to remove the chip at the right time, forced the removal and ended up breaking pads and tracks. When it was time to clean it, the destruction increased.

Have patience to learn, persistence to improve and willpower to seek

do better and better.

Reballing Step by Step - Part III

And now let's move on to the penultimate part. First, take a look at as many details as you can. I divided this process into four parts precisely to provide as much detail as possible. I presented a detailed step-by-step process, with lots of tips, advice and I presented many possible mistakes that can be made. **In this part III we will work on placing the spheres on the BGA chip:**

1 - Understand the stencils:A big difficulty that all beginners have is dealing with and/or understanding “stencils”. Basically, each BGA chip will have a specific stencil. I said, “basically”. This is because some chips simply will not have any compatible stencil (this would be the opposite scenario). I will give you some examples: if you are going to reball a BGA chip,DDR3 ,Xbox 360 processor ,Ps4 Ddr2-3 ,Ps4 processor , Nvidia Gf104325a1 Gf 104 325 A1 Gf-104-325- a1 ,Gtx 750 Ti 1050 among hundreds of other examples, is there a specific stencil?**Yes.**Simple

like this. And there is a huge line of stencils universal and/or aset that you can purchase to meet some demand that you have in your workshop. For example: you can purchase a stencil set that will meet iPhone and iPad up to 4 A Xs , or even a set of Stencils universal for Android, Motorola, Samsung, LG and Xiaomi .

Figure 04.23: Ddr3 Xbox Stencil

Figure 04.24: Ps4 CPU Stencil Cxd90025g

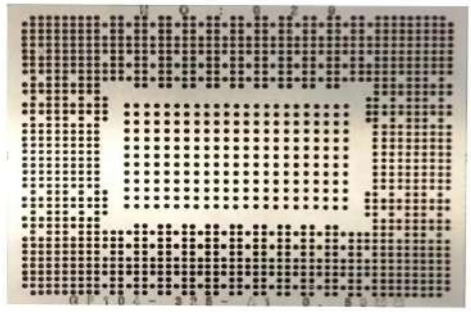


Figure 04.25: Nvidia Gf104325a1 Gf Stencil 104 325 A1 Gf-104-325-a1

Figure 04.26:TV, PC and Notebook Stencils Kit

2 - Understand that each chip has a layout for the positioning of the Pads: Do you know what layout is? Layout is an English word, often used in the Portuguese form "leiaute", which means plan, arrangement, scheme, design, project. And if we analyze

the way the spheres are positioned, making a broad analysis of several chips, we notice that there are several plans, arrangements, schemes, designs, projects. In some, we noticehorizontal lines (or verticals), in others they arediagonals . There may be the exclusion of one or a group of pads, in many cases entire sections. In some cases there may be lineshorizontal and vertical , as if they were trying to create true works of art. This is all because there really is an almost artistic diversity in the positioning of the Pads. Not every chip will have the Pads in a single direction, forming horizontal or vertical lines (these are, without a doubt, “easier” to find a stencil for, including universal ones). There are chips for which you will find a compatible stencil more easily, while others not so much. And there are chips that will not even have a compatible stencil, leaving it up to the experienced technician to make adaptations.

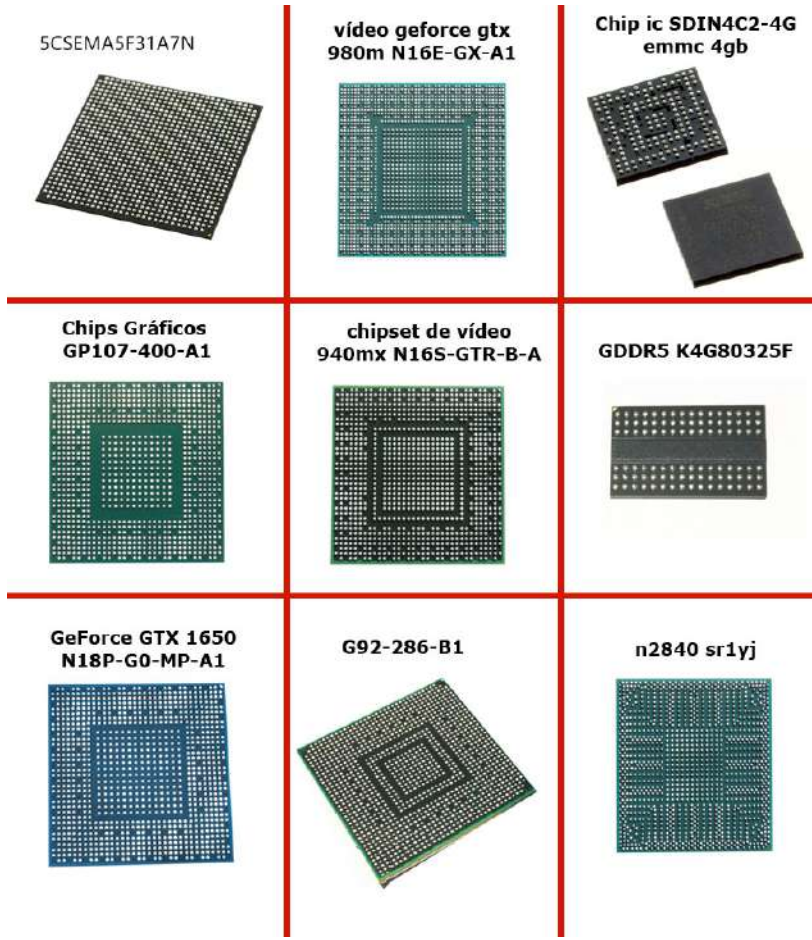


Figure 04.27:various BGA chips. Note Here are several examples of pad layouts.

3 - Size of the spheres: Each chip will use spheres of a specific size, given in mm (diameter). The most basic way to find out is by looking at the stencil itself. In fact, I would venture to say that this is the most commonly used standard form, as it is simple and functional. Have you found a stencil that is specific to the chip, or one that is universal and fits the chip perfectly? The description of the sphere size will be on it. There are some databases on the web that will give you various information about each chip, including sphere sizes. If you want to check, here is an example:

https://www.topline.tv/bga.html?gclid=CIGmxbzfqpgCFQSenAodGgNHnA

Figure 04.28:diameter of the sphere. In this example is 0.50mm.

4 - Use of pasty soldering flux: Use a thin layer of soldering flux paste. Do not use too much. You can spread it with a brush and use a technique well known in technical circles: using a business card, you remove the excess and make the flux layer uniform and in the minimum amount necessary.

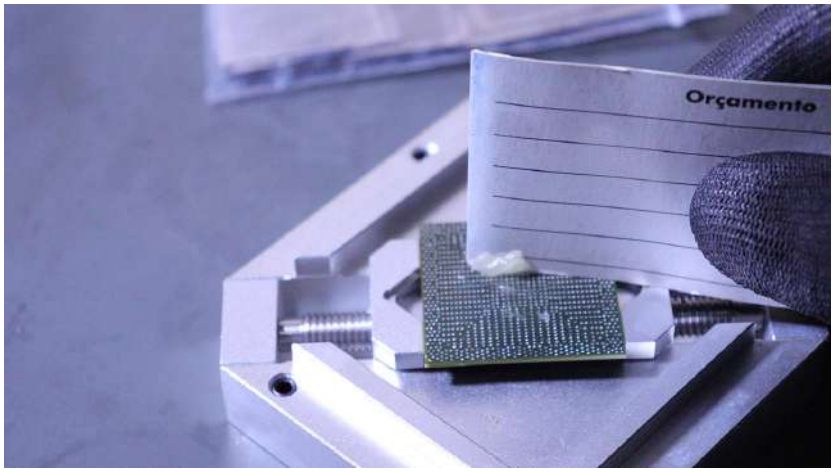


Figure 04.29:removing excess flow solder.

5 - Correct position of the stencil on the chip: When positioning the stencil on the chip, note that the holes must “match” the pads perfectly. At this point, the BGA chip must be in the BGA support. There are many models of supports and stencils. Some support has a base that holds the stencil. Some support locks the chip and stencil together (as long as the stencil is the same size as the chip). Some technicians

improvise, holding the stencil with magnets, holding it with tweezers, etc.

5.1: The chip has pin 1 (I'll explain this in detail later). It can be indicated by an arrow, a dot, or even by the absence of pins. Check if the same occurs with the stencil. If it has an indication for pin 1, use it as a reference (make pin 1 on the stencil coincide with pin 1 on the chip).

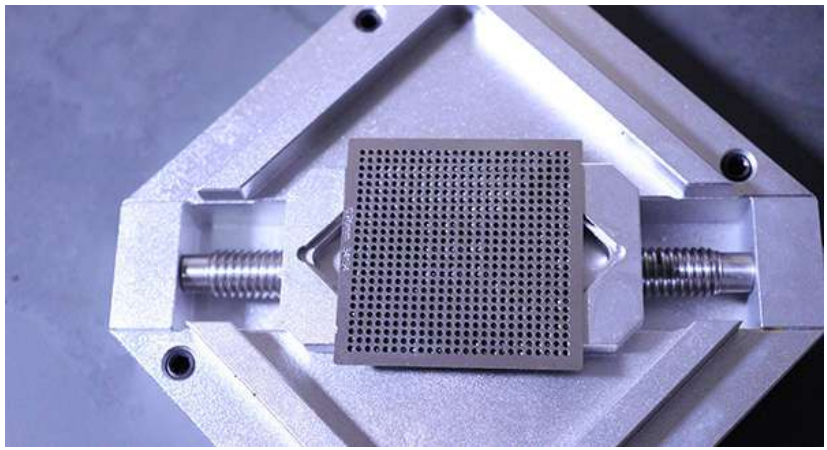


Figure 04.30:positioning the stencil

6 - Place spheres: The placement of the spheres is an “unusual” point. Each technician develops his/her own technique. In general, a good amount of spheres is taken (for example: a teaspoon) and poured onto the stencil. Using a spatula, the spheres are spread out so that each hole has a sphere. Some technicians do this over a basin so that the excess spheres fall into the basin. In fact, there are some BGA supports that are built in such a way that the technician can pour the excess into a container.

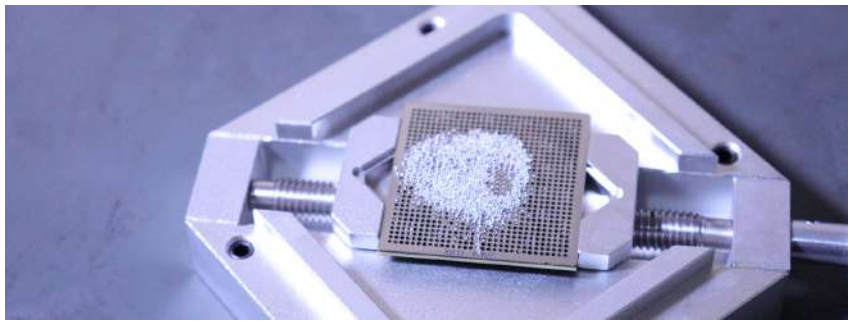


Figure 04.31:placing the spheres

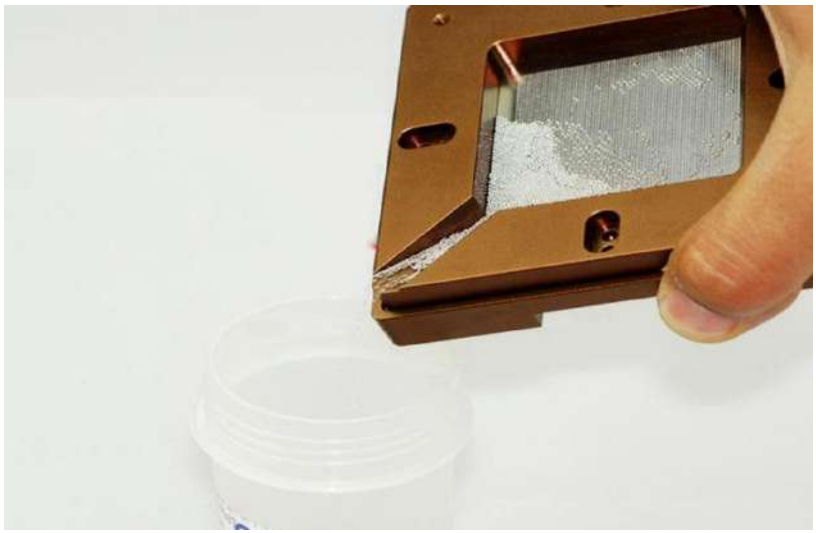


Figure 04.32:surplus spheres

7 - Welding the spheres: Now all that's left is to solder. To start soldering, set the temperature and air flow as I previously taught in "Master Tips". If in doubt and this is your first test on scrap, start with 230 ºC. The air flow can be between 4 and 7 (and you can, and should, test each flow to detect which one your station will work best at) and do not use any nozzle if it is a large chip (like

(a chipset). If it is a small chip, such as tablet or cell phone chips) test with the larger nozzles (test with two or three nozzles on scrap). Let the air blow over all the spheres until they glow. When you see the glow, it means the solder has melted. Make sure to do this on all the spheres. Use a magnifying glass if necessary.

7.1: As for temperature regulation, you can increase it if you feel that it is difficult or taking too long to melt the solder. Since the air is hitting the spheres directly, it is usually quite easy. However, you need to test it with your station as I have already explained “thousands” of times. Each station will have a setting.

7.2: The air flow must be enough to melt the solder, but it cannot blow the spheres away. This is more than just testing, it is common sense. Practice.

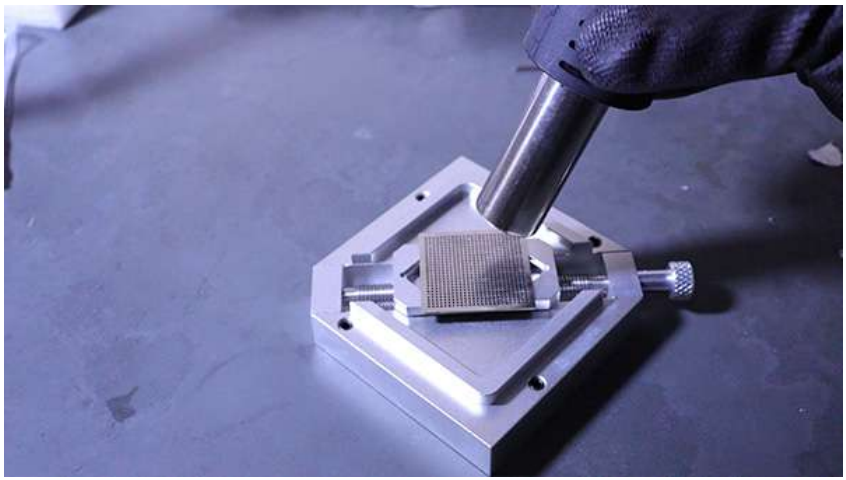


Figure 04.33:welding process

8 - Remove the stencil: Once the soldering process is complete, let the chip cool for about 15 minutes. Once done, remove the chip from the base. You will remove the stencil and it is normal for it to be a little stuck to the chip. Remove it little by little, releasing it on each side of the chip slowly until it comes loose;

9 - Cleaning the chip: Wash the chip with isopropyl alcohol or contact cleaner spray and brush it with the anti-static cleaning brush.

If some of the balls come loose, there is no problem. Ideally, the balls that are not welded properly should be removed. A poorly welded ball can cause poor contact.

10 - Placing missing spheres: Let the chip dry for about 15 minutes and then place it back on the base. Apply a thick solder flux, but this time you will use a brush and not the card to remove the excess (since there are already soldered spheres, you will not be able to use the card).**Now pay attention:**Use a magnifying glass and an object with a very small tip. This could be the syringe needle itself, and do the following:

10.1: First, check carefully whether all the spheres on the chip are perfectly soldered. There cannot be any spheres soldered outside the pad. If there is a sphere soldered outside the pad, you will need to remove it. To do this, use your soldering station with a very fine nozzle, very low air flow and heat only these spheres and at most those that are close to them. When it melts, remove it.

carefully. Use the magnifying glass and a very small object, such as the syringe needle.

10.2: Now manually place all the missing spheres.

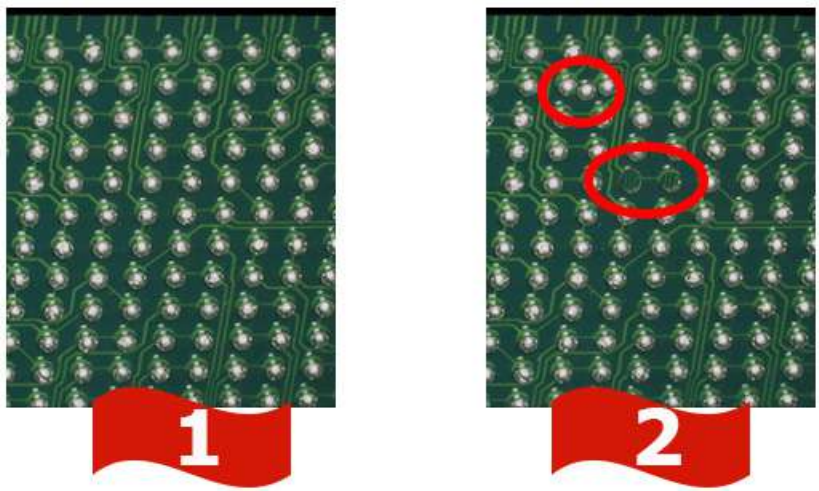


Figure 04.34:image 1 is perfect. Image 2 has two errors: missing spheres and a sphere out of place.

11 - Final welding: Finally, repeat the welding process very carefully. Use the magnifying glass, be careful not to remove any spheres from their place and make sure that all the spheres will fuse together.

12 - Cleaning and final check: Once this is done, let the chip cool naturally for at least 15 minutes and do a final cleaning. Finally, use the magnifying glass for a detailed and final inspection. Here you cannot miss any mistakes. If you find any problems (spheres that have stuck together, for example), you will have to correct the problem and only then proceed.

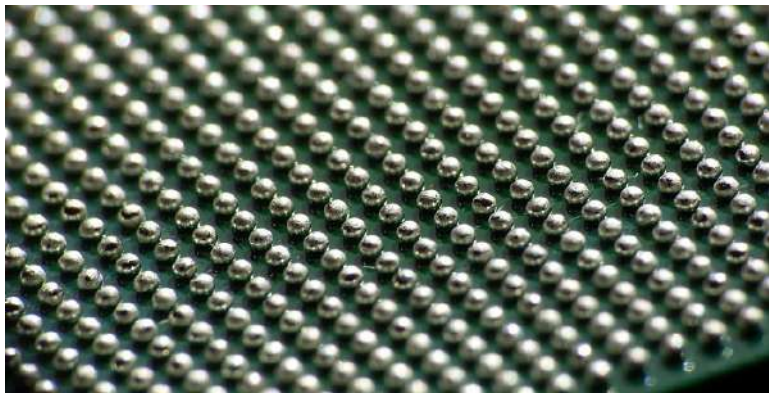


Figure 04.35:check thoroughly again.

Problems that may arise in part III

- **Loose spheres:**as I have already explained;
- **Spheres welded together:** as I have already detailed and also presented the solutions;

- **Many spheres merge, forming large groups of solder:**If this happens, the work is lost. You will have to clean up and redo everything again. There may have been a lot of mistakes in this

situation, but two main ones are: loose stencil (it was not firm) and use of spheres of a smaller diameter than should be used in the stencil. It can also be the use of a warped stencil. It can happen during the placement of the spheres, some of them slipped under the stencil. When heated, they melt;

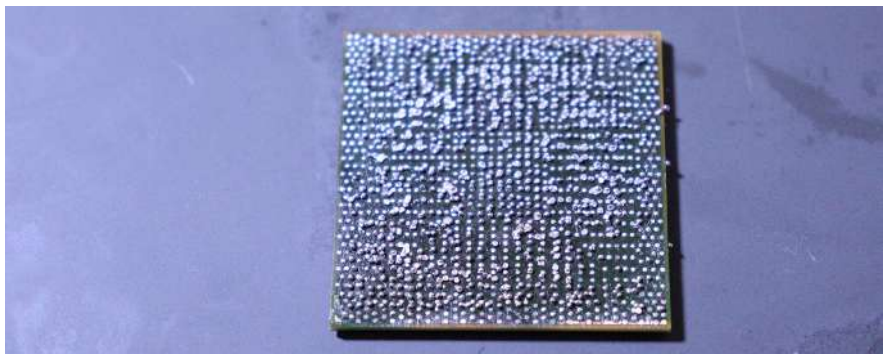


Figure 04.36:spheres merged together

- **Burning and/or warping the stencil:**check the temperature, is it too high? Is the distance of the station nozzle too close to the stencil?

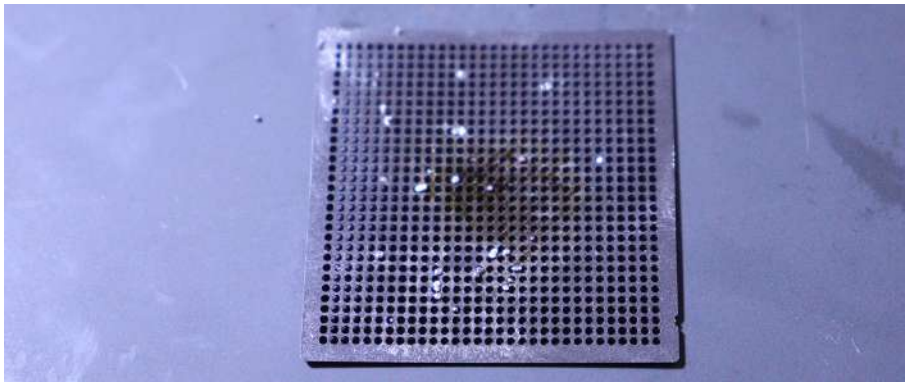


Figure 04.37:burnt and warped stencil.

Reballing Step by Step - Part IV

We are finally in the final stretch. We have managed to bring you many details and explanations. It is impossible not to be able to practice with everything that has already been presented. Now, let's solder the chip to the board and finish the tutorial:

1 -Preheat the board. Use the air from your rework station. Start with 120
º C. You can use the largest nozzle you have, as the goal is to spread the air throughout the entire

plate. The flow rate can be 7 or 8, or the highest that is available at the station. Spread the air over the entire plate, including both sides of the plate. Do this for about 5 minutes and then increase the temperature to 180 °C and repeat the process for another 5 minutes.

2 -Now we will use the aluminum thermal tape to insulate all the components that are around the BGA chip that we are going to desolder. The more insulated, the better;

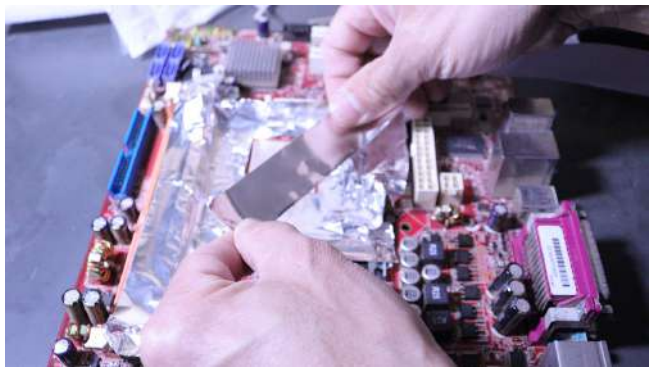


Figure 04.38:isolate components

3 -Use a paste-like soldering flux. Apply a thin layer. Spread it with a brush.

4 -Position the BGA chip correctly. What is the position of the chip? This is one of the most common questions asked by students. There is only one correct position. Observe pin 1 on the board and on the chip. It may be an arrow, a small dot, a bold mark, etc. There will always be a mark indicating pin 1. But pay attention to the following:

4.1: If there is a corner with an arrow and another with a dot, pin 1 is usually the corner with the arrow.

4.2: In addition to observing the indication of pin 1, observe if there are no pads in the corner indicated as pin 1. If so, this is normal and it is perfect, you have found pin 1.

4.3: On the board, there is usually a rectangle or a square painted white (usually). The chip must be positioned inside it, perfectly aligned.

5 -Finally, let's solder the component. This soldering is usually a little easier than the initial desoldering, since the solder has been replaced. The original solder usually requires more heat to melt. The soldering process is the same as the process we did in desoldering (to remove the chip). You already have a procedure to follow. The spheres will fuse and the chip will lower automatically. It is not necessary (and cannot) to push/force the chip down.

6 -When finished, let the plate cool for about 15 minutes. Then proceed with the final cleaning.

Never if forget: practice, practice and practice.

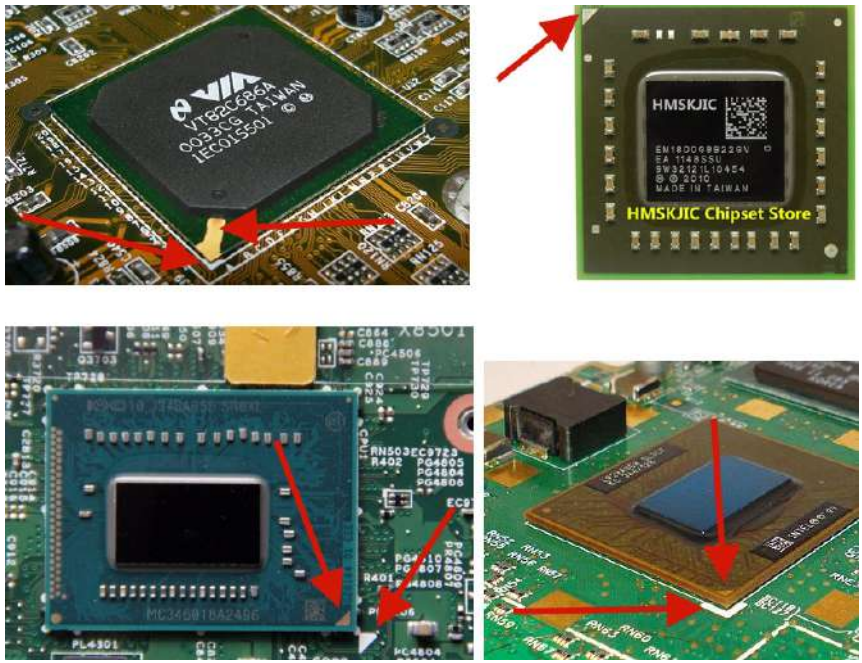


Figure 04.39:various examples of pin 1

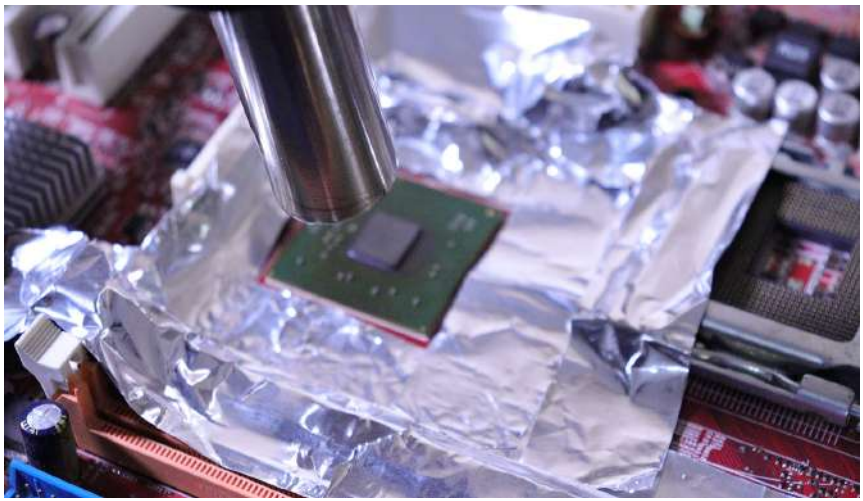


Figure 04.40:welding

Problems that may arise in part IV

- **Chip not soldering:**You have to check if enough temperature was used. In addition to the issue of the distance from the nozzle. I have already explained all of this exhaustively;
- **Crooked chip:**in relation to the rectangular (or square) marking on the plate. It may have been positioned incorrectly, or the station's own air

took it out of place. You have to do it all over again.

- **Crooked chip 2:**one corner higher than the other. This is an error in the heating of the chip. One part heated up more than the other and melted more than the other. You have to do it all over again.
- Other problems: Several other problems may arise, such as bubbles, the chip burning completely, etc.

How to Start Working with Reflow and Reballing?

Here's the question whose answer is worth a lot of money. How do you get started? How do you overcome the fear of simply damaging a client's equipment?

In fact, practically every beginner has this doubt. A beginner technician who has never done this type of service for a client feels insecure when faced with equipment whose solution is reflow or reballing.

Let's imagine that the equipment displays errors intermittently. What if the technician tries to reball it and the problem becomes permanent? Just look at the confusion and headache that will result.

Here is my opinion on how you should follow this path, on what your journey should be like:

1 -Initially train with scrap. This is the first contact. Learn and go to step 2;

2 -Buy used boards that work. Perform Reflow and Reballing. The board must continue to work. Once you feel confident in this step, step 3 will be available to you;

3 -Perform reflow and reballing on customer equipment that is already severely compromised. For example: a notebook that no longer shows any sign of life on the screen or a video game that won't turn on. A video card that no longer works. In other words, these are NOT intermittent errors. They ARE.

permanent errors. And in this case, you have the security of telling the customer that the equipment is already very critical (it is already “dead”), it does not work and that you can try the reballing technique to recover the equipment. If it works, the equipment will be able to work and if it does not work, it will remain the same as it is. Do you see? It is a VERY safe scenario for you to practice and make money with it;

4 -Take advantage of phase 3 to grow in the market, buy better equipment, create a safer cash flow (I'm talking about money);

5 -Finally, start working with any equipment/device, including those that present intermittent errors. After all, if you got here it is because you already have experience, equipment and cash to cover any warranty emergencies given to customers.