

HOW TO DO WIRING REPAIRS EASILY FOR BEGINNERS

Step By Step Guide on How to Do Simple Electrical
Wiring Projects in And Around Your Home
(For Both US And U.K.)



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Introduction

Are your doorbells, bathroom fans, lamps, and extension cords, among others, constantly breaking down, burning up, or blowing up because of wiring problems?

Would you like to sort out this issue personally, once and for all, but you do not know how to?

Would you like a comprehensive guide with step-by-step guidelines on how to do different electrical wiring repairs without worries of blowing up your home or electrocuting yourself?

If you have answered yes, keep reading:

[An article written by HomeAdvisor and reviewed by Salvatore Cutrona, a licensed master electrician, reports that ^{\[1\]}](#) hiring help in the United States to repair a switch, for example, will cost around US\$465. In comparison, electrical panels will cost around US\$1,100.

In the United Kingdom, [Household Quotes, a body set up by Karl to “help homeowners and tenants avoid paying too much for jobs done in their homes, ^{\[2\]} has similar results.”](#) They report that since most United Kingdom homes have old electrical wiring, wiring may cost you more. However, [on average ^{\[3\]}](#), if you live in a one-bedroom flat, for example, you might part with around £ 3,900, meaning if you have a bigger home, you might spend more!

This is costly no matter which country you live in, right?

Well, you being here, reading this, shows you relate to this and would like to step up.

However, it is common to have questions such as;

- Why should I consider doing my own electrical wiring repairs?
- What basic tools do I need for common electrical wiring repair tools?
- What safety procedures should I consider before beginning any electrical wiring repair project?
- Are there signs that I need to do electrical wiring repairs?

If these are some of the questions you have, you are reading the right book because it will answer all of them and more in simple language!

Specifically, this book will cover;

- Common electrical problems
- Benefits of doing DIY electrical wiring projects – benefits of doing wiring repairs
- Basic electrical parts
- Common electrical and wiring tools
- General wiring rules you should always follow
- Simple electrical wiring projects
- Common hazards of home wiring
- Electrical wiring mistakes to avoid
- And much more!

Imagine how capable you will feel once you can accurately manage to notice electrical wiring problems before they cause more damage to your home and how you will feel when you sort out any electrical wiring complications, DIY-style. It will feel good, right?

Well, do not imagine only. This book is what you need.

Without much further ado, let us begin.

PS: I'd like your feedback. If you are happy with this book, please leave a review on Amazon.

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Chapter 1: Home Wiring 101: The Basics

It is common to blame the town's or state's power system for most, if not all, your home's wiring problems. However, the reality is that your wiring could be the main problem. No?

Well, before proving that your home might be the one with the faulty electrical system, let us understand how electricity travels throughout your home, shall we?

How Electricity Travels Throughout Your Home

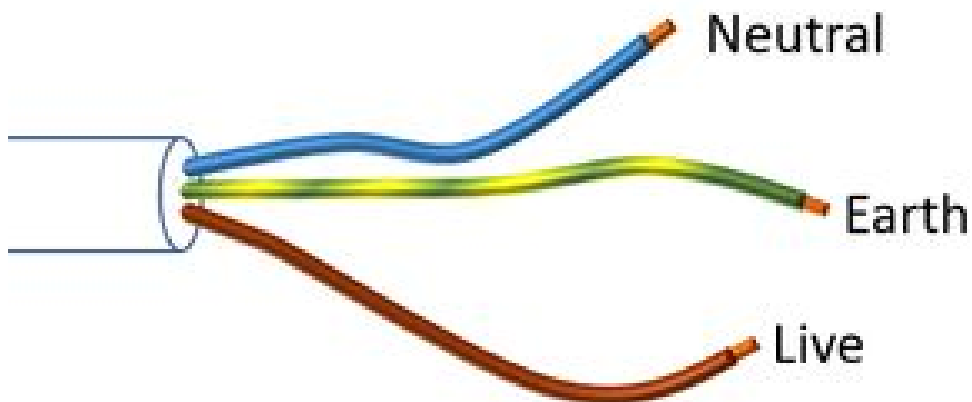
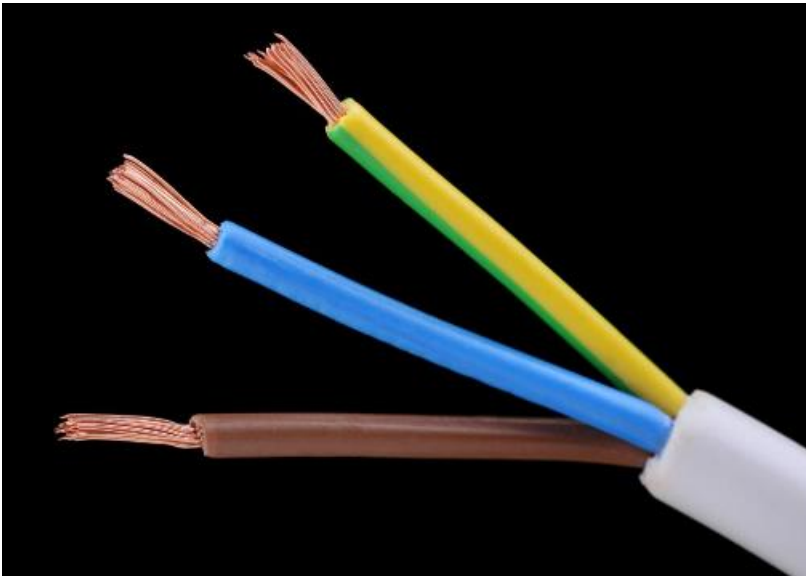
Let us start with the outside.

If you go down to your basement, you will notice that the home service wires connect to the nearby distribution transformer (this may be above or below the ground). Your home may have three main service wires; one neutral wire and two 'hot' wires that have power.

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Let us elaborate on these service wires further:

Different Types of Wires: Earth, Neutral, and Live Wires



The two hot wires consist of two wires; Earth and Live wires:

- **Earth wire:** Also known as the safety wire, the earth wire connects to the ground and provides an electrical connection to it. It is an important wire because it will protect you from electrocution. This means that instead of the current passing through you, it will go straight to the ground.

- **Live wire:** The live wire, also called the phase wire, is the wire that carries the electric current. The live wire carries electrical current to your devices. However, if something happens to the live wire, such as when it touches some metal part, it may lead to an over surge, which in turn may make the circuit breaker blow or may cause electrocution
- **Neutral wire:** The neutral wire completes the work of the live wire. You see, your live wire will carry electricity from the meter box and take it to the outlets. On the other hand, the neutral wire will complete the circuit as it takes the electricity from the outlets and takes it back to the meter box. It also sends current back to a circuit breaker (we will discuss more on the circuit breaker next).

Remember, electricity will move in a straight path through the live wire, then to the outlets, then back to and through the neutral wire, then back to the meter box.

Many confuse the neutral and the earth wires. Yes, these two wires have a connection. However, as we have seen, their functions are quite different. To recap and help you easily differentiate between the two, let me reiterate it once more;

Your neutral wire is part and parcel of the normal flow of current. But the earth wire is more of the system's safety feature that prevents issues such as electrocution in the event the live wire comes into contact with metal casings by directing the electricity from the live wire to the ground safely

Basically, it is through these three wires that your home gets electricity.



These wires then connect to a square metal box with a circular display, commonly known as the power meter box.

To understand your meter box better, let us look at its basic components;

Parts Of A Meter Box

Your meter may have a lot of components as different companies customize their models. However, the following are the basic components you expect to see in yours;

Meter



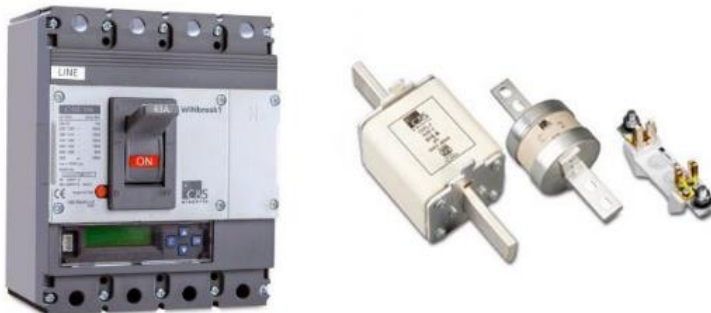
This device measures and records the amount of electricity you have used so far.

Main switch



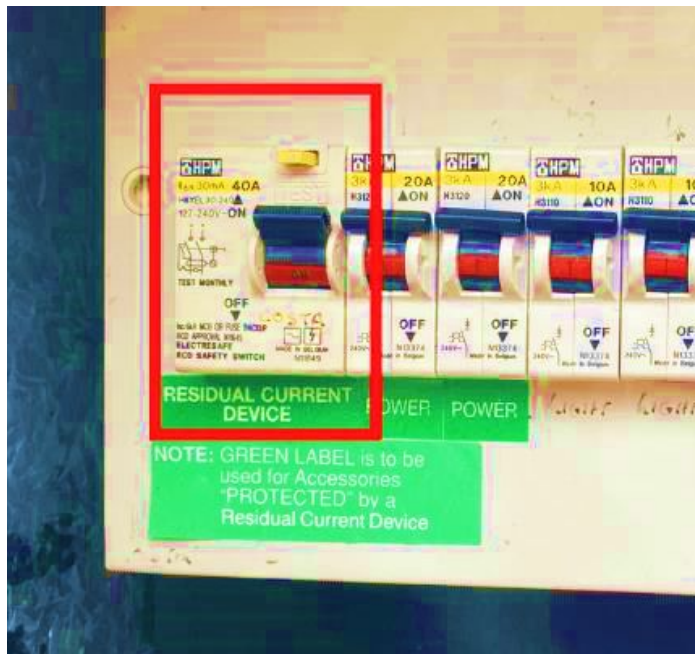
Also called the main breaker, the main switch disconnects power to the circuit breaker panel as a whole. Therefore, if you switch off the switch, you will have turned off power to the whole house. On the other hand, if you turn the main switch on, you will have turned on the power to the whole house.

Fuses and Circuit Breakers



Fuses and circuit breakers control how electricity flows to different house parts. For example, you can have a circuit breaker for the main living room, another for the bedrooms, and another for the kitchen. For some houses, all circuit breakers and fuses have an external main meter box.

Residual Current Device



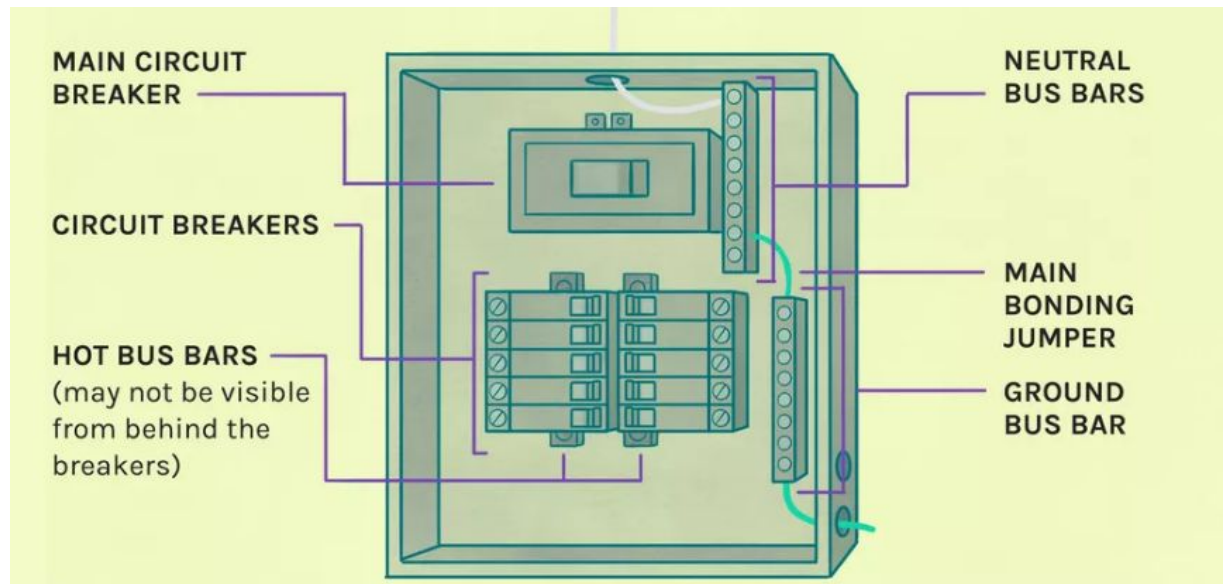
As you can see from this image, it looks similar to the circuit breaker, right? Well, the two may look alike, but they function differently. The circuit breaker will protect your whole wiring system in case of a power surge, while this RCD switch will protect you from electrocution.

Specifically, the RCD switch will help monitor how electricity flows through the system and detect imbalances in the live and neutral wires. So, when there are detected imbalances, the RCD will switch off, reducing your chances of electrocution.

In our image above, the RCD is in red:

Power from the meter box travels through the three wires discussed earlier and heads to the service panel. The service panels consist of several parts. Let us look at this next;

Components of the service panel



Inside the panel, you will find the following;

The main circuit breaker

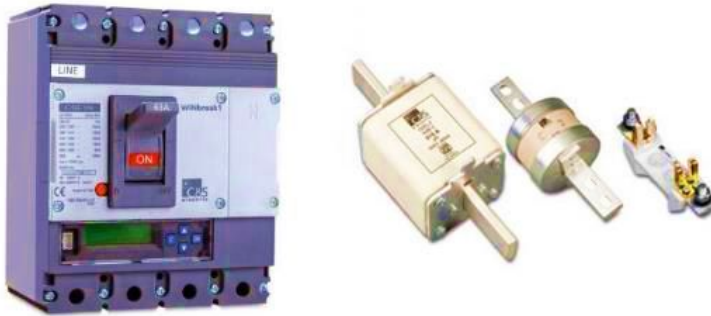
As mentioned, the main circuit breaker, often located at the top or bottom of the panel, controls all the other circuit breakers. In other words, the main circuit breaker controls all the other separate circuit breakers.



The Bus Bars

For the service panel to work, it requires electricity and a medium to travel through. This is where the busbars come in. They act as the medium through which electricity from the service panel gets into the service panel. The different busbars will house the three wires we discussed: the live, neutral, and earth wires.

From the breaker, the power goes through the wires to the circuit breakers or fuses.

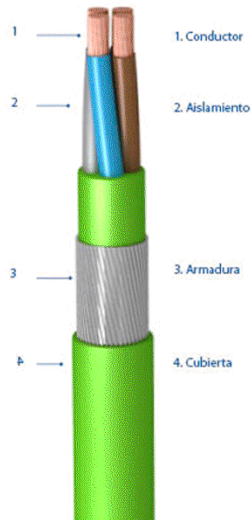


So, in the event of too much power, the breaker trips, which breaks the electrical connection. From the circuit breakers, electricity goes to the outlets throughout the home.

From what we have discussed thus far, we can agree that wiring is more than wires. It involves more components. These components may break down for one reason or another. It is at this juncture that I feel it is essential we go through these problems. But before this, let us discuss one thing we have not discussed – the electrical cable.

Let us look at the anatomy of an electronic cable next.

Anatomy of An Electrical Cable



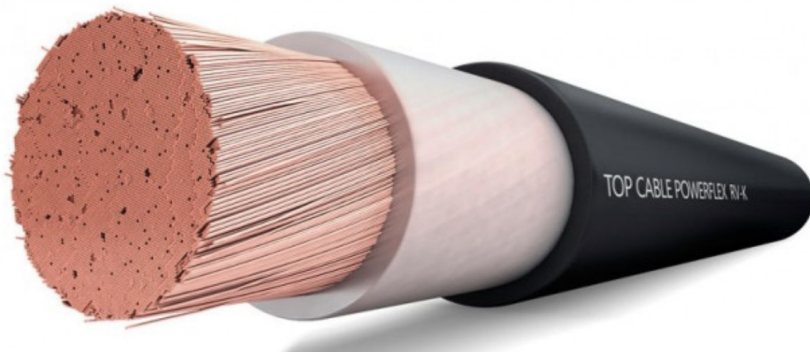
Basic Electrical Wiring Cable Components

Cable Conductor



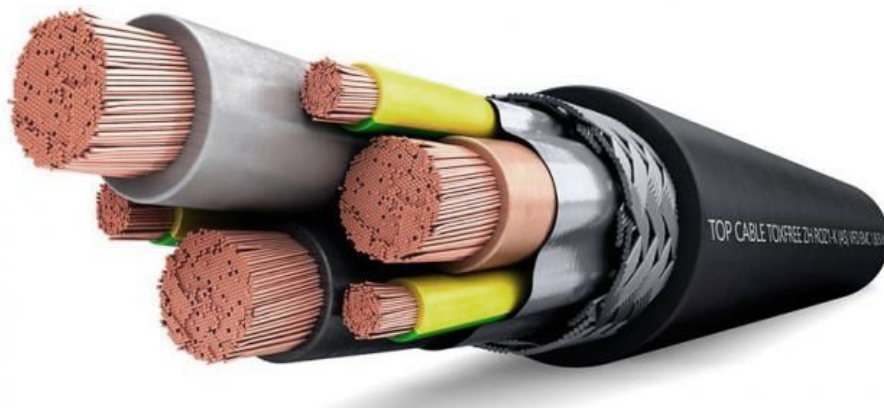
The cable conductor is the part of the cable that transmits electrical current. It is at the center of any wire and cables and made of aluminum, copper, and other high-strength alloys

The cable insulation



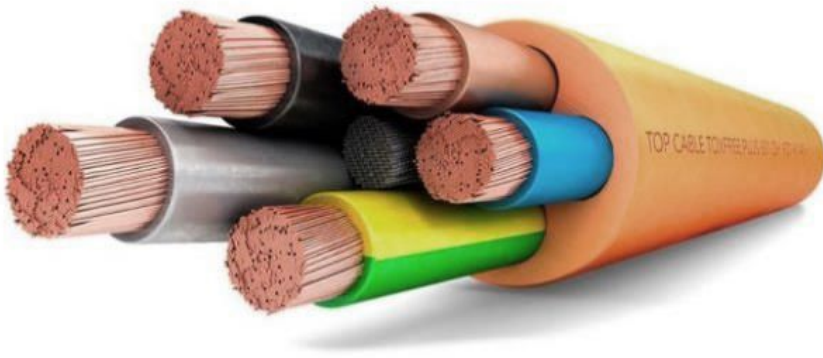
This is a non-conductive material within any electric cable. This insulator primarily prevents electrical leakage, which prevents that wire from coming into contact with nearby wires as this may cause issues such as getting shocked

Cable Metal Protection



Some cables have metal protections. These protections are also called shields or screens because they isolate the signals that go through the interior parts of the cable from any external interference.

The cable's outer sheath

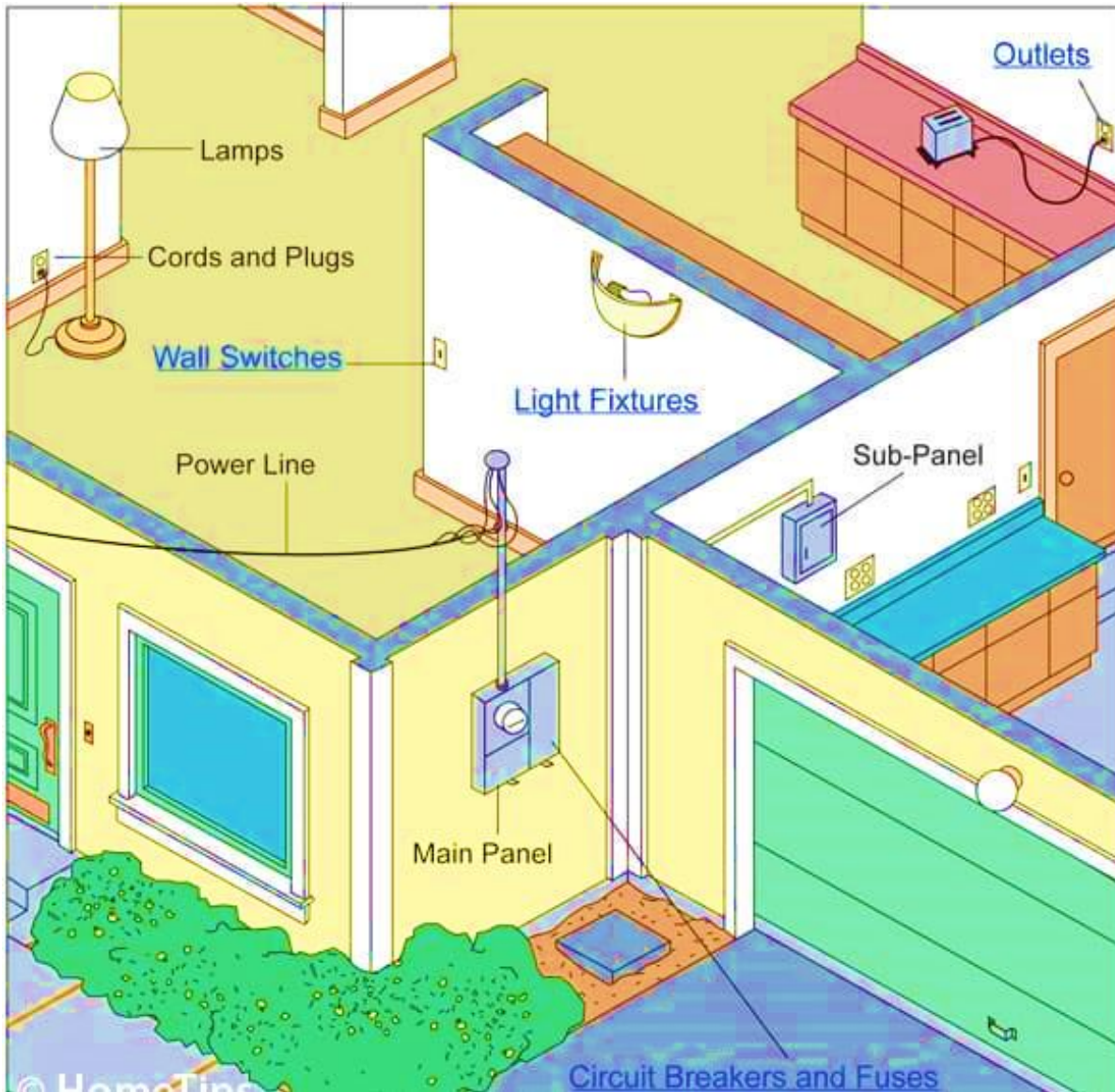


This is another layer of protection for your cable. The sheath is usually made of polymeric material; you will also notice that the sheath is somewhat like the cable's insulation material.

This cable will run all through your home. You might be advised to take the best high-quality cable in the market, and in as much as it is the best step to take, there are other components of your home wiring systems you should know of.

Some of these we have discussed already;

- Power meter
- Main breaker
- Circuit breakers
- Busbars
- Electricity outlets such as switches and sockets, among others



As we have seen, your home's wiring system is extensive. Wrong wiring can damage the components we have discussed so far, and it is key that we look at what wiring problems your home can have. However, we should first look at different problems that this system can experience.

Let us look at this next.

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Chapter 2: Common Household Electrical Problems

Below are some of the most common electrical problems and issues:

Circuit Breaker Problems

A circuit breaker interrupts your electricity's flow when any surge is detected, making it your home's 'first line of defense' as it protects your home against short circuiting or overloads.

Your circuit breaker may experience the following problems;

- **Miswiring** – This may often result from wiring problems within the electrical system. This may make your breaker turn on when it should not
- **Electrical loading** (an electrical load is a device that consumes electrical energy in the form of current and then has it transformed into forms such as light or heat, among others); complications here may be because of a broken fuse or a tripped breaker.
- **A power surge or spike** – This is mostly caused by;
 - Elements such as lightning
 - Passing static electricity (static electricity happens when the negative and positive charges attract each other). Until these charges are released, they will continue building up. With this in mind, static energy may destroy all your electrical appliances.
 - Overuse of extension cords and devices that surpass your circuit's amperage capacity. With this in mind, let us discuss circuit amperage capacity a bit more deeply.

Circuit Amperage Capacity

As already mentioned, a circuit breaker automatically switches off once there is a power surge or an overload. This works well to prevent circuit damage or damage to your appliances.

That circuit breakers come in different capacities is an uncommon fact. You see:

We can have small circuit breakers tasked with protecting a few household appliances and big circuit breakers that protect more household appliances, towns, and cities. So, if your house has the wrong circuit breaker capacity, you will experience more circuit breaker problems which, if undealt with, can lead to more electrical problems.

Electrical Meter Problems

As mentioned earlier, an electrical meter calculates the amount of electricity you have used so far. When it does not work as it should, it can cause many problems. These problems include;

Being charged excessively

When you notice that your electrical bill has spiked without any increase from what utility companies charge, it should signal that something is causing the meter to consume excessive power.

The first thought should be that you have a malfunctioning appliance, like a kettle heater. The other problem could be that your electrical conditioner is drawing more power than it should. It is critical to check these problems immediately. We will do this in subsequent chapters

Losing power unnecessarily

Yes, elements might cause your circuit breakers to switch off. However, there'll be times when your circuit breaker works as it should, but still, you realize that your home has no power. This may be because of your electrical meter. It could be damaged, which makes it lose from how it is connected to your panel. In subsequent chapters, we shall focus on how to do preliminary checks on the electric meter.

Meter Box Problems

The most common meter box problems are;

- **Poor outdoor positioning** – All meter boxes must be positioned above a damp place on your property. This should be at least 300mm above a finished ground level. In addition, more electric professionals will recommend that the meter box be placed as close to the main electrical panel as possible.



- **Elements such as frost, high winds, and heavy rains** – For example, if you see water dripping out of the electrical box, you

should take several steps to remedy the situation because water and electricity combined can be lethal. It is therefore essential to properly seal the top of the box or cover where the service entry cable pass.



- Vandalism
- Wear and tear to the meter box door



For example, your meter box can have broken hinges or latches caused by either wear or tear. It is therefore essential to keep monitoring the box and replace any damaged parts.

In subsequent chapters, we will discuss how to repair the meter box safely.

These are the main components of your house's electric system. Noticing them will not be straightforward. However, we can so far agree that doing repairs is essential, right?

Indeed.

What are the benefits of going through all the hustle and bustle of DIY regular electrical repairs in and around the home?

Let us look at this next.

Chapter 3: Benefits of Practicing Regular Electrical Maintenance for Your Home

The most standout benefits of regular electrical maintenance are:

Regular Electrical Maintenance Will Protect Your Life and The Lives of Those Around You

The truth is that electrical failure is one of the leading causes of household fire accidents in America. Do you find that surprising? Well, you should be because the U.S. Fire Administration affirms it! [Their report says that home electrical problems cause around 67,000 fires, over 400 deaths, and over US\\$800 million in property losses](#) ^[4].

Specifically, as reported by the [National Fire Protection Association, wiring and electric equipment malfunction account for at least two-thirds which translates to around 68 percent of all home fires](#) ^[5].

With these statistics in mind, regular electrical repairs in and around your home will help prevent you from being among the statistics we have discussed above.

Regular electricity repairs in and around your home will help reduce costs

As mentioned in the introduction, the cost of hiring professional help whenever you have wiring and electrical-related problems in your home is high. Doing it yourself helps you save these costs. Furthermore, regularly maintaining your electrical system will reduce utility bills.

As we saw in the previous chapter, you might face meter problems such as getting an increased bill. Therefore, it is essential to continue doing regular electrical maintenance.

Regular electricity maintenance will boost the overall performance of your appliances

Imagine having a movie night with your loved ones only to experience regular blackouts or power surges. For example, your appliances may not work in the event of a power surge or a regular blackout due to issues with your meter or the circuit breaker. In such a case, you might have to postpone the movie night or short-circuit your appliances. With this in mind, regular electrical maintenance will boost reliability and ensure you always get optimal performance whenever you need it the most.

As we have seen, these benefits are essential to all of us, and it is your responsibility to ensure that your home is safe while also ensuring that you receive the power you deserve.

So, before we get into repairs, there are a few signs you can watch out for that will help signal that a repair is urgently required. Let us discuss this next.

Chapter 4: Signs That Your Home Needs An Electrical Repair Urgently

You can use the following signs to determine when your home is overdue for an electrical checkout or maintenance:

Dimming or flickering lights

The most common cause of dimming or flickering lights is poor connection. A poor connection may be due to loose or corroded wires. If not repaired, this may lead to overheating, sparking, or worse, fire.

Not-so-common burning out of light bulbs

Poor electrical wiring may lead to bulb blowouts. Well:

Bulb blowouts may be because of overuse, but if your bulbs blow more than what anyone would consider normal, it may be because of a loose socket or circuit connection. In addition, it may be because of overheating of insulation wires. We will look at how to repair these in subsequent chapters

Dead outlets

Bad electrical wiring may lead to dead outlets. As we will see later, this may result from a poor connection or a tripped breaker caused by excessive heat that might have built up in the outlets or the melted wires.

Warm switches and outlets

Poor wiring may make your switches and outlets warm, which should be a safety concern. Unless it is a dimming switch, this book will show you how to repair any warm outlet or switch.

Electrical shocks

Do you get shocked every time you turn an appliance on and off? This may be a sign that your appliance has some electrical problem or that wiring issues need prompt addressing.

Sparking

Sparking is caused by electricity from the live wire running from the outlet into the appliances. If you see big sparks, especially when plugging in a device, repair the wiring because fraying often leads to sparks.

Another reason for sparks is that there might be some water exposure or wear and tear on your connections. In subsequent chapters, we will learn how to deal with old, frayed wires from the house's system or the appliance cords.

The Presence of Too Many Extension Cords

Your wiring system is mainly buried within your walls because it should remain as undisturbed as possible. So, when you see naked, disturbed, or altered wires all over the place, then it is a sign that you need to do some immediate repairs.

As we will later see, it is best to use extension cords sparingly and for short periods to reduce kinking of cords, making it impossible for them to get pinched (pinching of wires may lead to regular tripping of your circuit breakers, broken down outlets, and more severely, fires)

Funny Smells

It is common for new appliances to produce some sort of smell for a while, but if you notice the smell worsening, this may be a sign that you need to do some repairs. This is because there might be issues with the fuse box or the breaker panel.

With these signs clear as day, you are now ready to begin doing your repairs. However, there are a few tools that you should get.

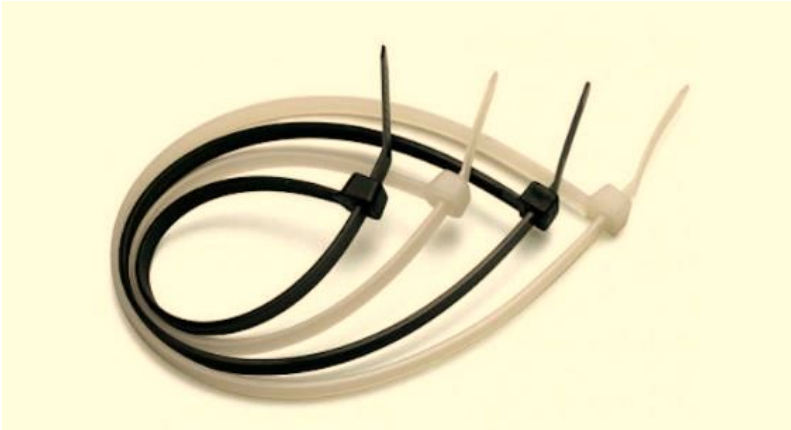
Let us discuss this next.

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Chapter 5: Must Have Electrical Repair Tools

The primary tools you will need for DIY electrical repairs include:

Cable Ties



You will need these ties to bind your electrical cables; you will use them to keep the electrical wires together neat and organized.

To pick the best size, measure the wires you need to bundle, then select a size that perfectly does so. Also, consider where the bundles of wires are. If you will use a lot of heat, use a metal cable tie. On the other hand, use a cold-resistant cable tie if your wires are in a cold environment. Last but not least, if your wires are close to oils or other fluids, get an oil-resistant cable tie

Electrical Tape



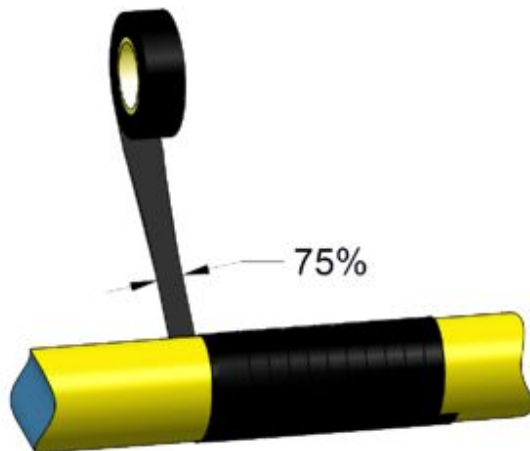
This tape is made from either vinyl, fiberglass cloth, or plastic, and it is made from adhesive material that can handle pressure. In addition, this tape will perfectly insulate your wires while at the same time preventing electrical current from going to the nearby wires. This means you will not get electrocuted when you touch the wires.

Before you purchase electrical tape for your repairs, consider the following;

- If you will do the repairs in a dry environment, purchase tape made from vinyl because of its perfect insulation capabilities, durability, and strength.
- If you will do repairs in a wet place, purchase vinyl electrical tape and add a seal on top. In other words, for wet wiring projects, use rubber tape and then cover it using vinyl electrical tape.
- When taping your wires, do a two-half lap or wrap it one and a half times, depending on the thickness of the wire's insulation.



- As you do the wrapping, remember to stretch the tape. Stretching the electrical tape will give you more insulation protection. With this in mind, always wrap the electrical tape between 75 percent – this should be almost heading to its breaking point. Once complete, the last wrap should be without no tension at all because this will prevent instances of flagging.



- For outlets and boxes, use wire nuts instead of electrical tapes. If you do not have wire nuts, use tape but have it as a temporary solution. I urge you not to use electrical tape because current may travel through the copper wire, which can produce heat. Such heat will cause the tape to degrade over time.

Wire Nuts



You will need wire nuts to make tight connections. The best part is that wire nuts are reversible; therefore, you can unscrew them anytime, making replacing anything possible.

As mentioned when talking about electrical tapes, wire nuts are strong, which will only insulate the top of the wire and hold the wires together firmly.

Screwdrivers



You will need different types of screwdrivers for fastening and loosening different parts. I recommend you get ergonomic ratchet screwdrivers. It has all the screwdrivers you need – all you have to do is to change the screw.

Using a screwdriver is somewhat straightforward. However, despite this being true, I urge that you get a screwdriver with LED lighting. This will help you work in dark spaces. Get two batteries for the lighter. This will let you have a spare.

Pliers



You will use this tool for several things, such as twisting, bending, straightening, or cutting. Purchase pliers with insulated handles as this is the best when working with live wires.

Electrical Drills



As you do your repairs, you might need to install new lighting fixtures or disassemble installed hardware before you can access wires or other

electrical components. To do these things as they should be done, remember to purchase some electric drills

Level



This tool will help you find the right placement points and install the right fixtures. Your level will help affirm that everything is right where it should be.

Cable Lugs



You will require this tool when connecting different cables. Cable lugs are essential in most or all electrical projects because they allow sufficient distribution of current without getting any hindrances between the cables.

Wire Strippers



Wire strippers will come in handy when you need to make custom connections. They help expose the copper neatly and professionally — making it better than using your teeth, don't you agree?

Coax Connector



This type of connector will simply do as part of its name suggests – to connect cables to devices. They have a strong shielding that ensures the cable is kept firm.

Flashlights



You might have a screwdriver that has an LED light attached to it. However, this is not enough. You need to have a separate flashlight to help illuminate dark spaces.

Splicing Connector



If you will work with multiple pieces of wire, allow the splicing connector to let you make quick, professional connections. You will not require to do any stripping. All you should do is insert both wires into this tool, squeeze down with the pliers then close the cap.

Conduit Bender



This tool will help you bend or curve your piping. This will help you find the routes easily while ensuring neat and professionally done piping.

Reaming Bit



You might have an electrical project that may need installation or replacement of conduits. This is where the reaming bit will come in handy. This tool is normally attached to a drill and works to widen the opening of a pipe, thus allowing you to connect piping easily.

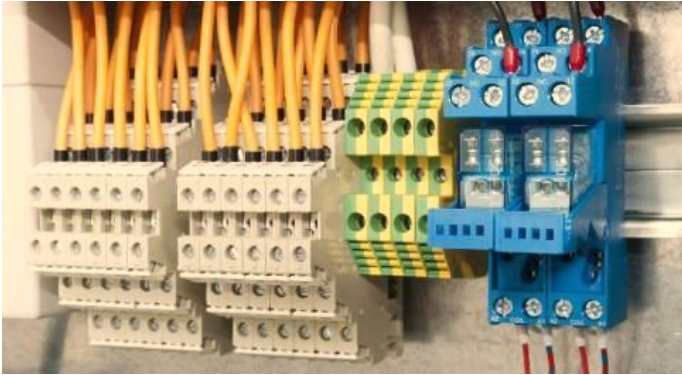
Voltage Tester



This is an essential tool you will need. As the name suggests, this tool is used for testing outlets for power. You see, you cannot do electrical repairs

when current is flowing through. This tool will help affirm that no current is running through.

Terminal Block



This tool will come in handy when you need to group multiple wires together. In most cases, terminal blocks are used to connect the wires to the ground or connect switches and outlets to the mains.

Fishing Rods



You will require fishing rods to do wiring below your carpets, through walls, or above your ceilings. This tool is made from fiberglass, and on one end, they have hooks that make maneuvering easier.

Insulated Gloves



As we all know, the chances of getting electrocuted when doing your repairs are high. One of the best ways to take precautions is to wear insulated gloves. These gloves have an added layer of protection that will protect you from electric shock, allowing you to work from start to finish as safely as possible.

Safety Glasses



As with all DIY projects, it is essential to protect your eyes. No one can assure your eyes of protection, especially when doing things such as cutting wires or when operating power tools. Thus, it is important to wear glasses when doing your repairs.

Circuit Analyzers



If you need to get all information about a circuit, then purchase this tool. Circuit analyzers will measure the circuit's voltage, reversals, and much more within a few seconds, making it easier to affirm that what you are doing is done professionally.

Standard Tape Measure



You will need this tape to set heights for your outlets and switches, mark surfaces where cutouts will be, and affirm that fixture boxes are strategically placed and centered.

Hammers



You will use hammers to do things such as pulling out nails, for example, before you can change wires or switches. Use hard-faced hammers to strike hard objects that have cylindrical-shaped heads. On the other hand, use soft-faced hammers to rewind processes (for example, after changing a wire or a switch, you need to hammer it back but do so using a hammer that will not damage the already-hit surface).

Cable Pullers



There may be a time when you may need to pull individual wires from the conduit. Instead of doing this using the fingers, use a cable puller.

Soldering Tools



After making a connection, it is important to make it firm, even when you intend to use electrical tape. To do this, I recommend doing some soldering.

Ground Fault Circuit Interrupt



A Ground Fault Circuit Interrupter is a safety tool that switches off electricity when it detects leakage or ground faults. I urge you to use GFCIs for all outdoor circuits and bathrooms that use a single circuit.

Electrical wires



Finally, we cannot do any repair work without using an electrical wire. Electrical wires are important because they help conduct electricity. Your home's wires are probably insulated. To affirm they are so, check on the coating – it should be non-conductive plastic. As for ground wires, most professionals will use solid copper that is either uninsulated or insulated with some green sheathing.

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There are six main types of electrical wires. Let us discuss them;

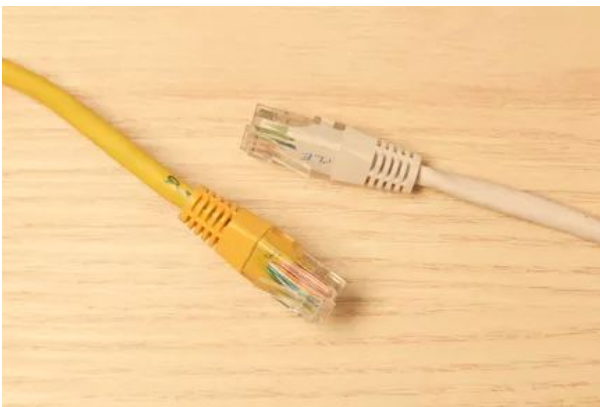
Types of electrical wires

Coaxial Cables



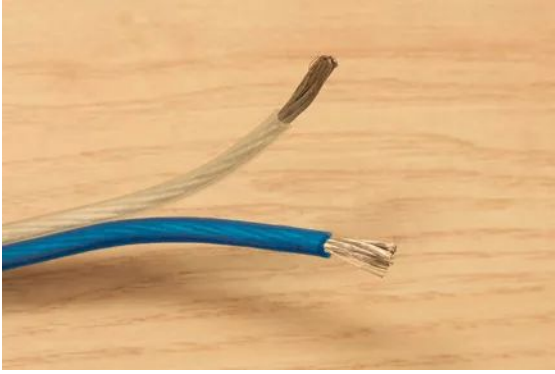
This is best for data wiring. You should use this wire to do HDMI connections and other connections that accommodate data.

Data and Phone Wire



This wire is perfect for internet and landline connections. They are perfect for this type of work because they are low-voltage.

Standard Low Voltage Electrical Wires



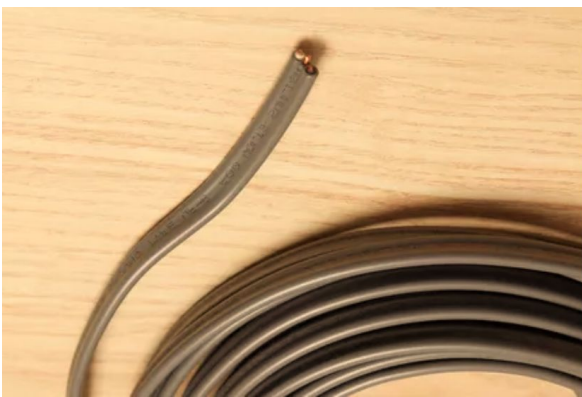
This type of wire is essential for connecting or installing circuits with 50 volts or less.

THHN/THWN Electrical Wire



This electrical wire is perfect for normal connections from circuits to outlets.

U.F. Cable



This type of electrical cable is perfect for underground connections. I prefer using this type of wire for all outdoor fixtures.

N.M. Cable



You should use this type of electrical cable when doing interior use. In addition, remember to use this cable when doing repairs in dry space only.

With your tools ready, we can now get ready to begin doing your repairs. But before we get to the different repair projects, let us go through a few wiring ground rules:

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Chapter 6: Wiring Ground Rules to Consider

This chapter outlines the most important wiring ground rules you should remember:

Understand GFCI

Remember to take some unique precautions if you intend to do any electrical repairs to your bathroom circuits. For example, any outlets within six feet **MUST** be protected by a circuit known as the Ground Fault Circuit Interrupt.



A Ground Fault Circuit Interrupter is a safety tool that switches off electricity when it detects leakage or ground faults. As mentioned earlier, use GFCIs for all outdoor circuits and bathrooms that use a single circuit.

Be Cautious When Dealing with Overhead Power Lines



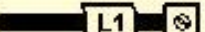
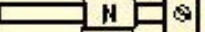
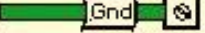
Before you begin any repairs outside and inside the house, remember that these lines are NOT insulated. You might see some animals, such as birds resting comfortably on these lines and think that these lines are safe, but the truth is that they are only alive because they have not completed the circuit. They would die if they touched the ground while being on these lines!

Kindly approach ALL overhead lines carefully. Contact a licensed electrician or a utility worker if you cannot handle such complex issues.

Know Your Limits

Although we will tackle different DIY electrical repairs in this book, it is essential to know your limits to what you can and cannot do. As a beginner, I urge you to work on electrical repairs outside your house's walls. As you develop your electrical repair skills, you can do more advanced projects.

Mind The Colors

Electrical Cable Colour Codes		
Old Colours	International	USA & Canada
 L1	 L1	 L1
 L2	 L2	 L2
 L3	 L3	 L3
 L	 L	 L
 N	 N	 N
 Gnd	 Gnd	 Gnd

You might not be the person who did the original wiring in your house, so do not be surprised if you find different types of colors. To make things easier, always have a non-contact voltage tester with you. This tool will help you verify that the line you are working on is dead before working on it.

Do Not Ignore Low Voltage

Many will tell you that you can deal with low-voltage systems easier than working on the electrical breaker box. The truth is that no matter the system, take the same basic precautions.

Remember that it is not the voltage that is harmful. The most important thing to consider is current because there are times that low voltage wiring will electrocute you more than when dealing with a safe current.

Do Not Ignore Vampires

After making your repairs, be keen on devices that drain power, such as phone charges, computers, coffee makers, electric toothbrushes, etc. These devices will continue sucking in more energy even when turned off.

Energy vampires will cost you a lot! “How much is a lot?”

Well:

A [National Resource Defense Council report notes that Americans spend around US\\$19 billion annually on vampire energy costs alone](#) ^[6]!

To deal with energy vampires, follow the tips below;

- Get energy star certified appliances

When replacing components in your house, get endorsed brands and ones that are a part of [Energy Star](#) ^[7]. These appliances are known to be electric efficient, and they meet performance and quality standards

- Use Power Strips

Unplugging appliances when they are not in use is easier said than done. So, plug-in electric strips to ensure you always cut back on electricity.



Why electric strips?

Well, instead of going through the hustle of unplugging each device, you can cut off the power to appliances that are not in use at the press of one button.

Do Not Install Three-Slot Outlets If There Is No Ground Wire



Before replacing any outlet, find out if it has a ground wire behind it. This is because you might ignore the two-slot outlet and replace it with a three-slot outlet. Before you begin working on such slots, use your tester to see if it is grounded or not.

To check if a socket is grounded, follow the steps below;

- First, take a multimeter and turn it to the highest A.C. voltage range.
- Next, take the multimeter's probes. One probe should go into the hot slot and the other into the neutral slot. Take down the measurement.
- Next, pull the black probe out and insert it into the outlet hole. Note the measurement.

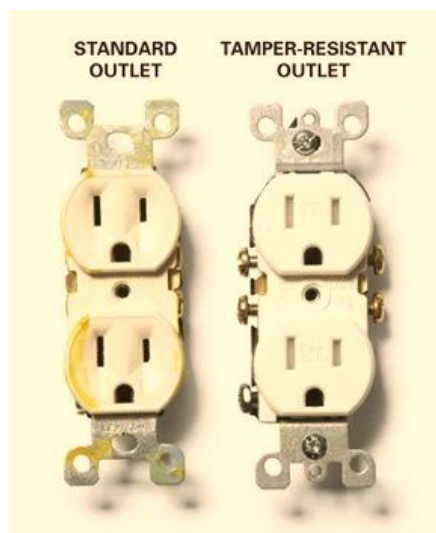
If the measurements are the same, it means the socket is grounded.

After testing a three-slot socket, if, for example, you realize that it is ungrounded, I urge you not to use the three-slot; rather, replace it with a two-slot socket.

Circuit Breakers Should Not Be Held or Taped Down

Always remember that circuit breakers are tasked with breaking the current in case of any complications; therefore, if you realize that the breaker has popped, do not hold it down with tape because this may lead to bigger problems. In subsequent chapters, we will discuss how to repair popping circuit breakers.

Go For Tamper-Resistant Outlets



This book seeks to help you learn how to make safe repairs. Safe repairs start with installing the right tools. I urge you to use tamper-resistant outlets. Why these types of outlets?

It is because they will stop your child from inserting things such as paper clips into the outlets. The best thing is that you can use these types of sockets everywhere.

With the ground tools ready and with wiring ground rules in mind, it is time to work on different repairs. Let us look at this next

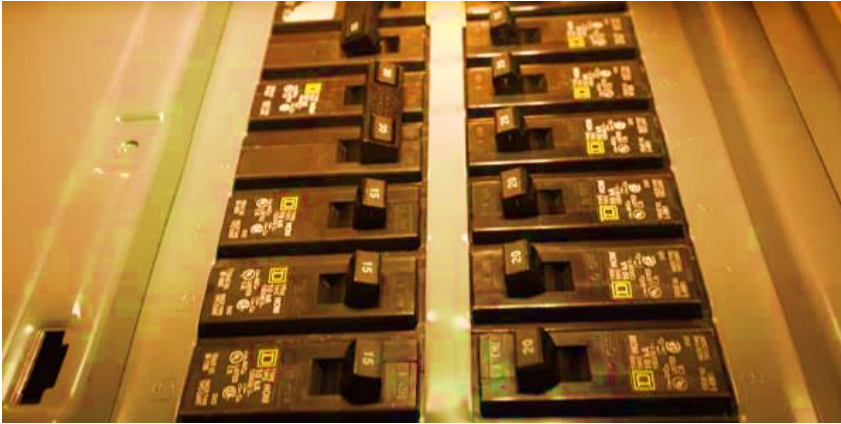
Chapter 7: Basic Electrical Repair Projects

This chapter will have varied home repair projects you can DIY around your residence or home.

Let's dive right in, shall we?

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Electrical Repair Project 1: Repairing A Tripping Circuit Breaker



Materials Required

- Flat Head Screw Driver
- Replacement Circuit breaker
- Electrical tape, I used a painter's tape
- Flashlight
- Voltage Detection Pen
- Multimeter

Procedure

Kindly note that I will replace a 15amp circuit breaker for this project.



Be keen about the numbers on the breaker. If yours has 20 written on it, get a 20amp replacement circuit breaker. Basically, repair what is right in the circuit breaker.

Another thing to do is, when you get your replacement, check at the bottom of it. There, you will see something that looks like a type of grease.



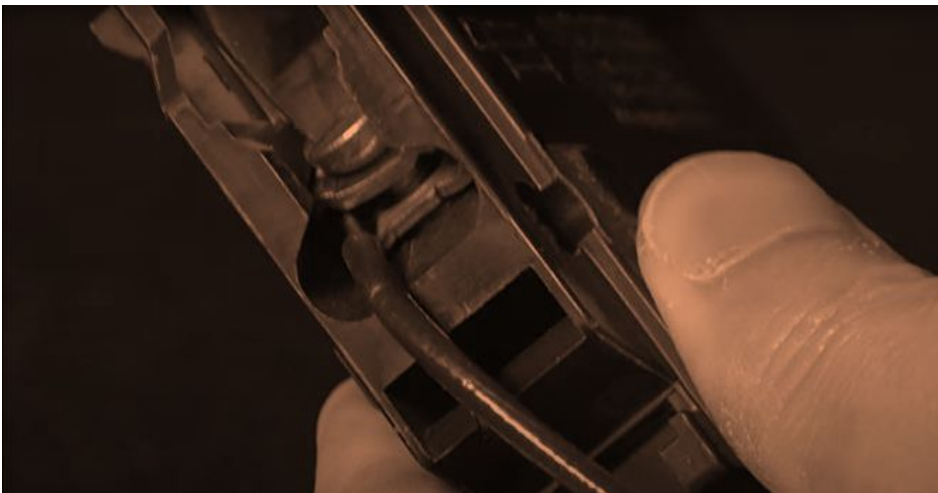
Many will wipe this out. However, please note that this grease is important because it will help it go right into the panel without too much hustle, so I suggest leaving it as it is.

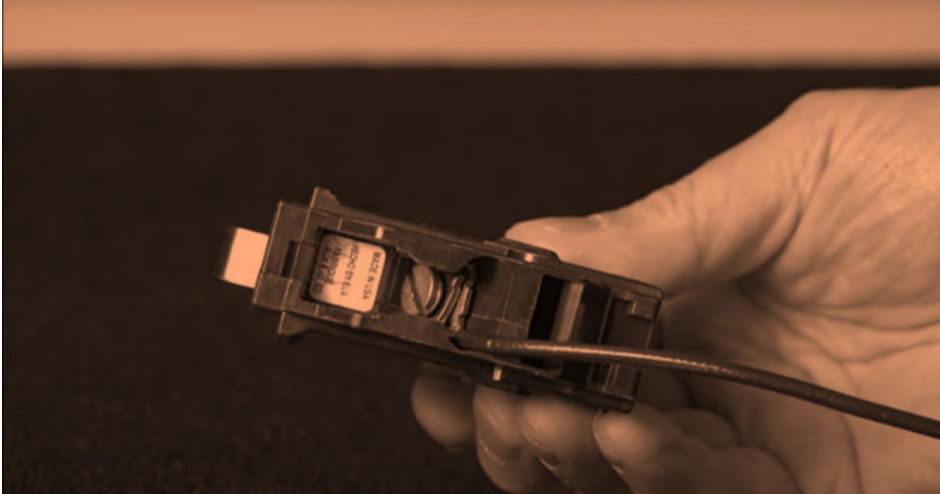
Another important thing to note is the round part:



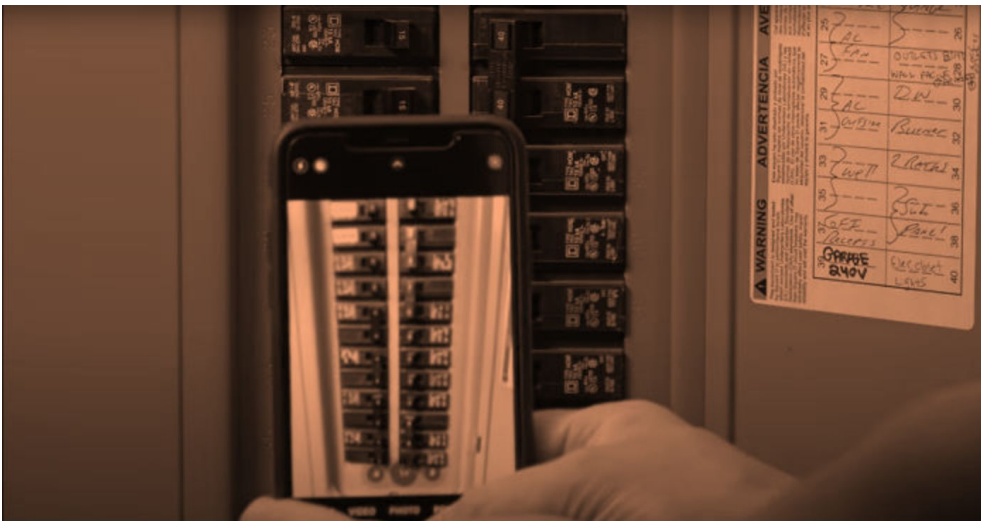
That round part is where the wire will attach to the circuit breaker. You will put your electrical wire underneath the screw, right between the plates —as shown in the image below.

To put in the wire, all you will need to do is to take your screwdriver and untighten the screw. Next, slide in the wire.





First, take your phone and take a picture of the breaker:

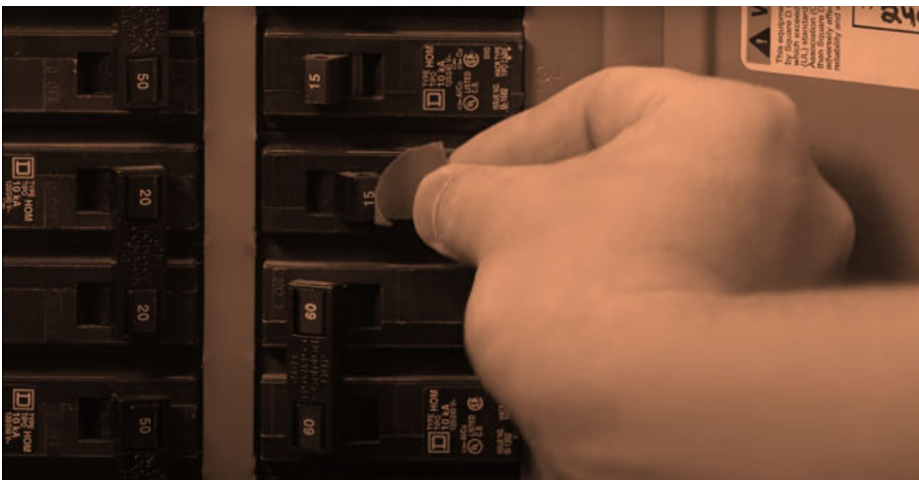


This will help you re-affirm the setup once done and also help you know what type of breaker to purchase.

Next, turn off the circuit breaker that needs replacing.



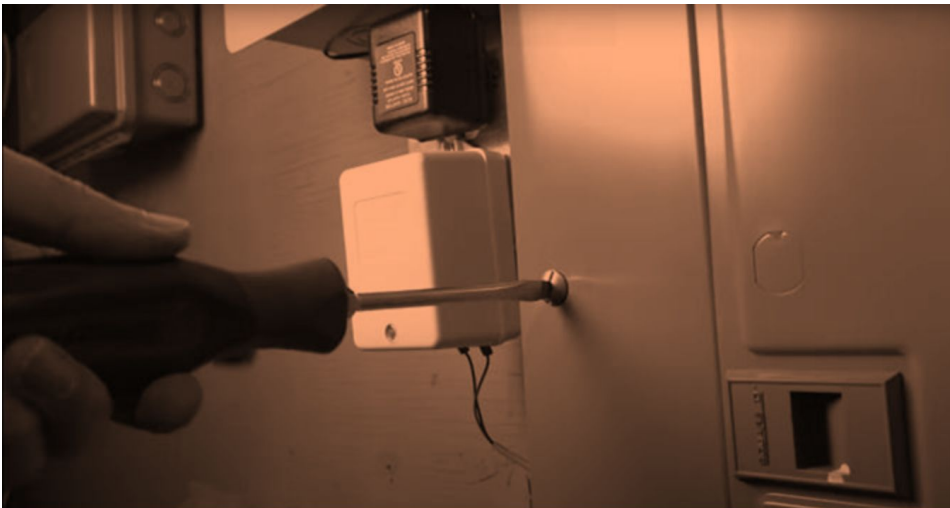
Next, take your electrical painter's tape and mark it. Doing this helps because you can lose sight of the specific circuit breaker you are working on.



Next, switch off the main circuit breaker.

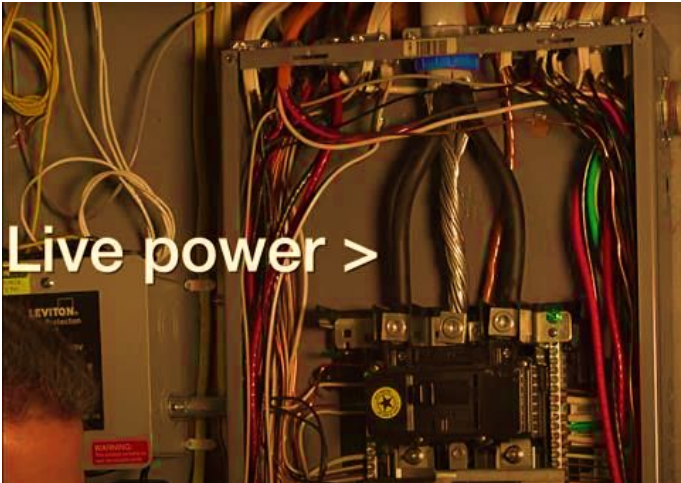


Next, take the flathead screwdriver and take off all the screws.



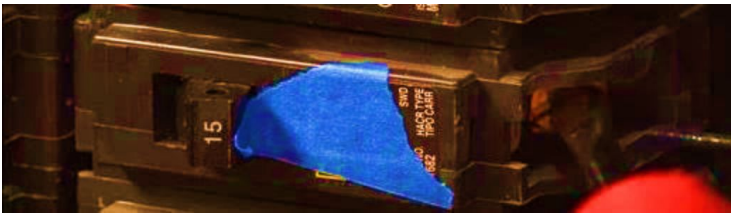
As you take the cover off, keep holding on to it.

Despite turning off the main circuit breaker, remember there is still power from the street's supply line. That is why you will notice that the wires are live when testing them with a tester.



Verify that the power is off using a multimeter or a voltage detection pen. Most pens light up if they detect current, and multimeters will produce some noise.

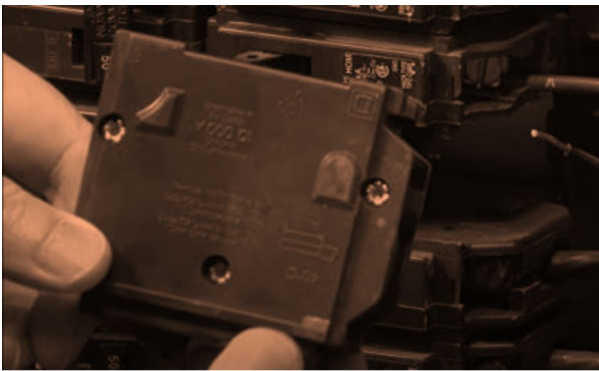
With your security assured, use your flathead screwdriver to unscrew the screw at the end of the breaker —as shown in the image below



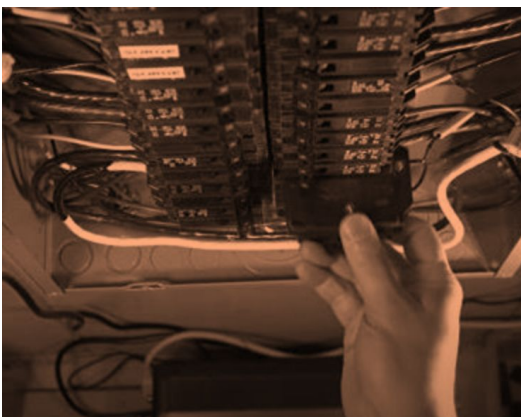
Next, once the screw is loose, pull out the wire feeding the circuit breaker.

Do not be surprised if you find out that the circuit breakers are not held with any screw. If this is the case with yours, just grab its edge and force the breaker outwards.





Next, take the new circuit breaker and fix it in.



For the circuit breaker to go in the opening without too much hustle, insert it at an angle. Once it is in, all you have to do is push the opposite end of the breaker.



Next, put back the covers

Next, restore your power by turning the main switch on, then turn the new replacement on



And you are done!

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Electrical Repair Project 2: How to Fix a Broken Electric Meter Box Door



Materials Required

- A meter cupboard cover
- Saw
- Screws
- Drill
- Level

Procedure

First, measure your meter box door and get one that matches it



My cover went right over the old unit



If you find any pipe barriers (you should expect this as the meter box must have supply pipes bringing in electricity), cut some holes through the new meter box cover.



Next, drill holes in the wall. This will help screw in the cover to the wall



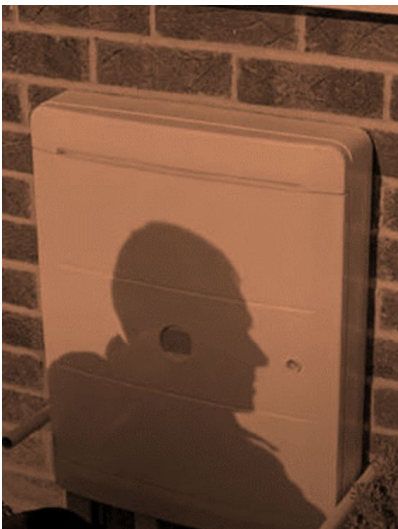
Affirm that the cover is level



Finally, fix in the meter box door



And you are done



If you have a meter that's damaged beyond repair, you can safely and easily install a new one. This project is also for those who want to move the meter box to a place that cannot be affected by harsh elements.

What you need is to follow the steps below;

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Electrical Repair Project 3: Meter Base Installation



Materials Required

- Meter base
- Expansion coupling
- SEU cable
- Duct seal
- Non-oxidizing properties
- A 2-inch clamp
- Lag screws
- Conduit
- Brackets
- Flat screwdriver
- Piece of wood
- Pliers

- Ladder

Procedure

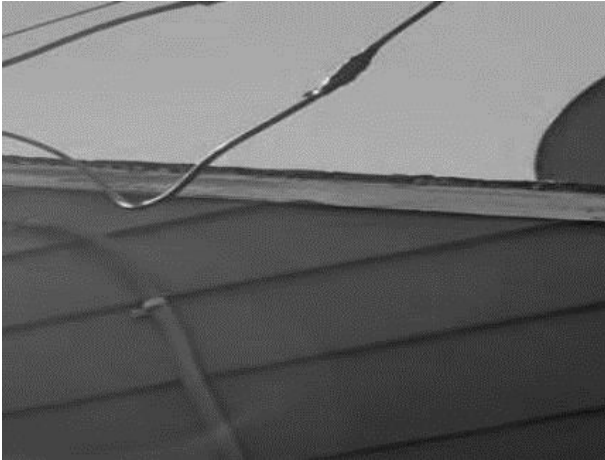
I kindly suggest that you follow the steps below as they are. If you go through the steps and realize you cannot do it, kindly do not do it at all because we will be dealing with live service supply wires

First, we are going to cut the power to the house. To do this, follow the steps below;

First, wear your gloves, get your electrical tape and a ladder, then climb up to the service lines, as shown below. If your service lines are far from reach, do not do this project at all because while cutting the wires, you **SHOULD NOT TOUCH ANYTHING** except the said wire



Next, remove the electrical tape, wrap it around the area you want to cut, then **WHILE ENSURING YOU DO NOT TOUCH ANYTHING SUCH AS THE ROOF** (this will prevent any grounding), cut through the tape. After cutting the cable, cover it up with more electrical tape, then let it go. Do the same to the other service line.



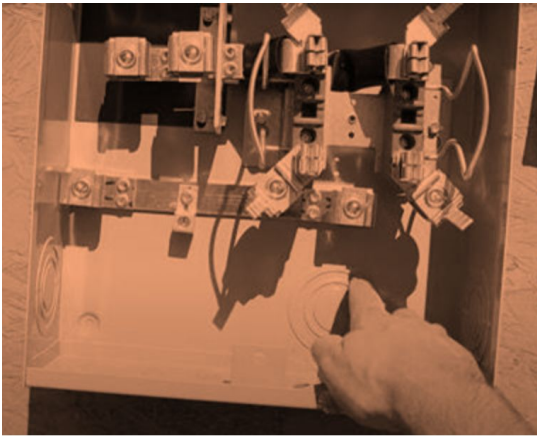
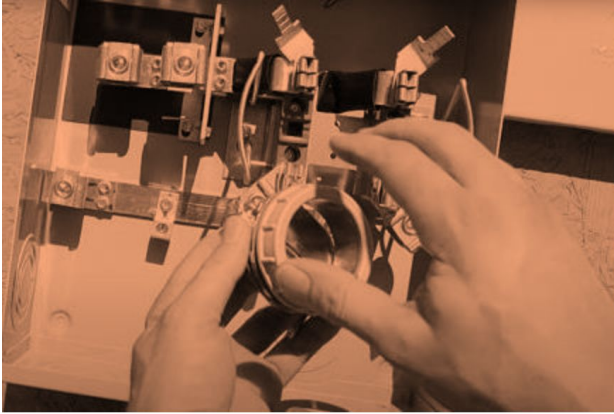
Next, after cutting the two hot wires, cut the neutral wire. My neutral cable was white

Next, open the new meter base



With your open meter base, you need to do several things:

First, pop out the area pointed below. That space will be used to install a clamp



To do the popping correctly, first, flip the box and measure the tool that will be placed through the hole once it is made





Because we will knock out that section, lay some piece of wood below the meter base then take a straight screwdriver and a hammer, then hammer through the meter base

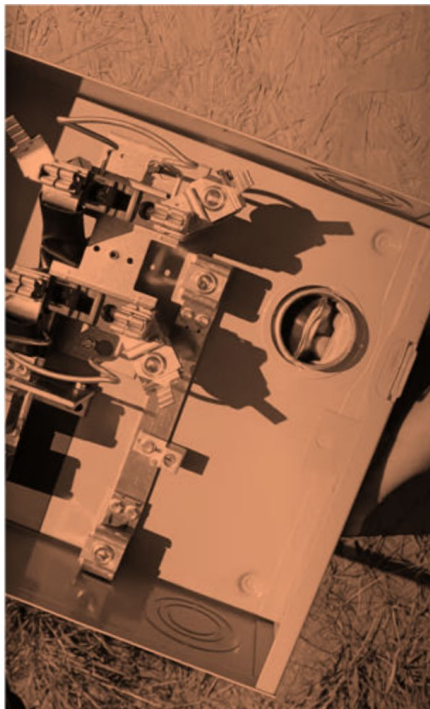




Next, take a pair of pliers, then take the loose piece out, as shown in the image below



Next, slide the clamp into the hole



Next, knock out each corner that has an indentation

Next, set up the meter box but first, ensure that it is level. To do this, use a torpedo level



Since you had taken out the indentation, take out the pencil and mark the holes



Next, drill through



We will use this hole to run the cable



Since power is going to come from the bottom part of the meter base



Start from the conduit and ensure the coupling to the meter box is done well. The gluing should be done well. If it is not done right, add more glue to the joints





Next, set up the box.



Next, tighten the screws on the clamp

Next, slide the base over the conduit



Next, take your quarter-inch lag galvanized bolts that have a duct seal on the end, as shown below install them in each corner of the meter box



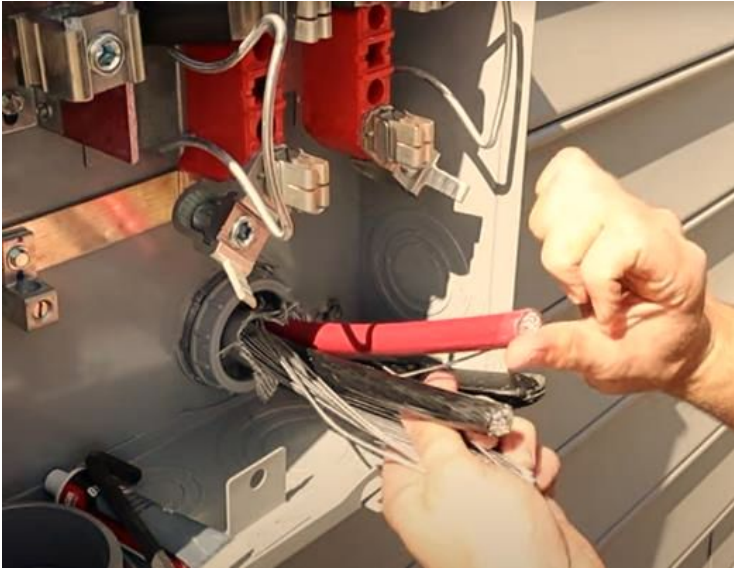
Next, take the three-inch metal ring and then tighten it around the threaded fitting



Next, hook your wires into the terminals. To do this, take your utility knife



Next, separate the red and the black

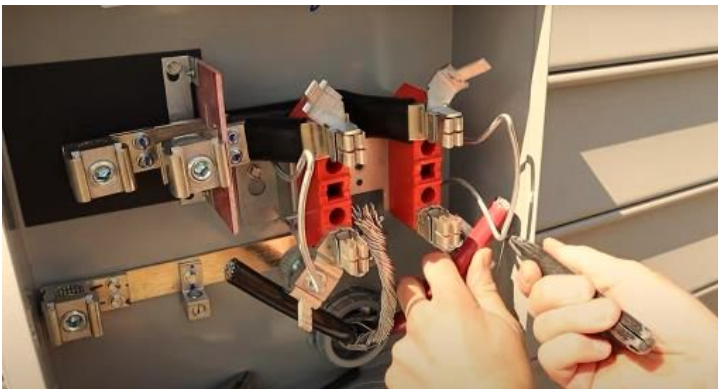


Next, take the aluminum wires below and twist them together, then push them upwards and the middle of the breakers



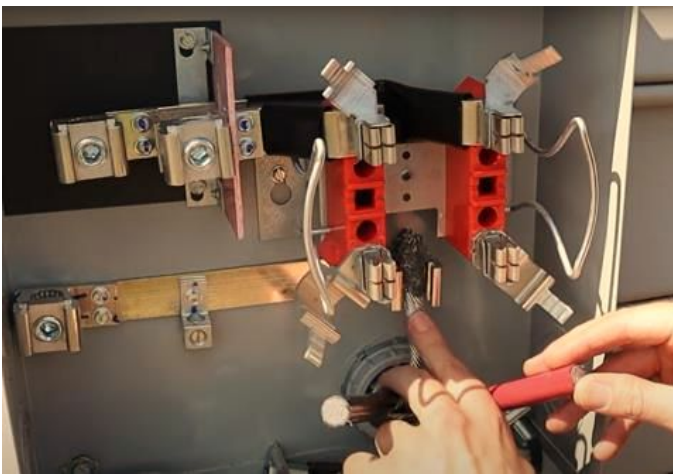
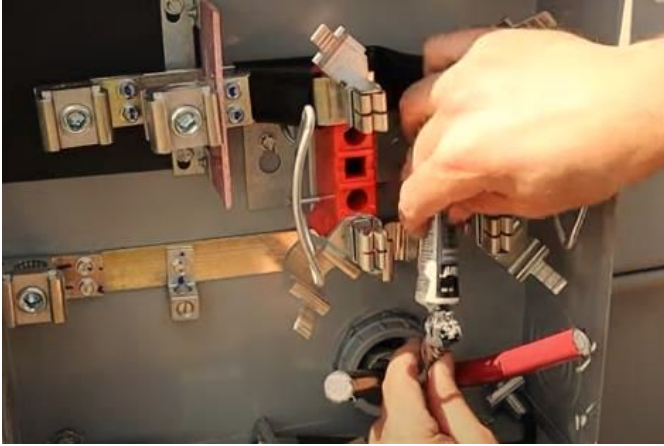


Next, mark and fix in the cables

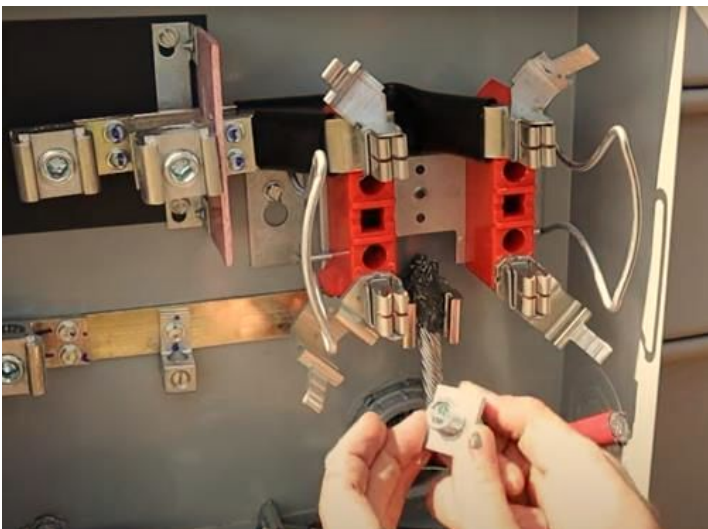


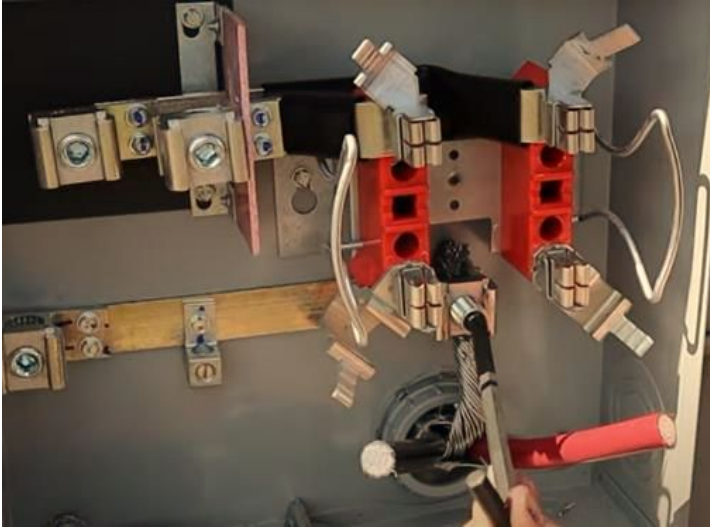
Next, take a Sawzall and trim the cables.

Next, loosen up all the lugs and drop them out

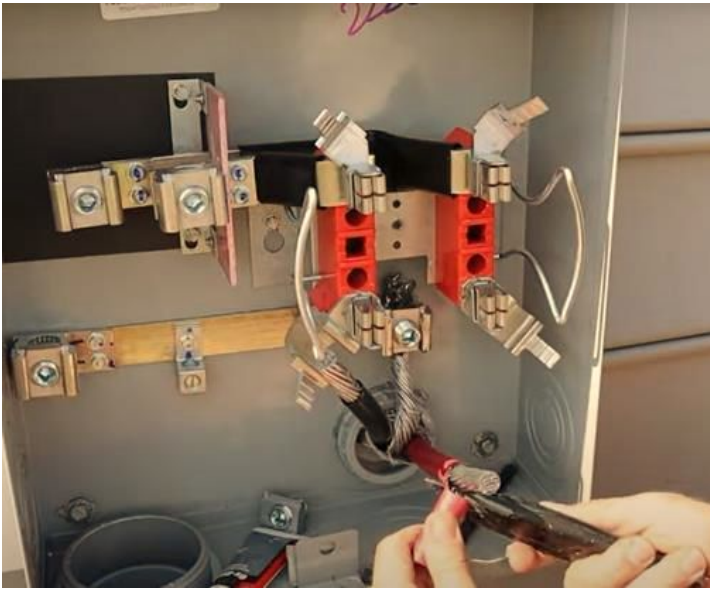


Next, take a lug and install it with the aluminum wires. Tighten it with an Allen wrench





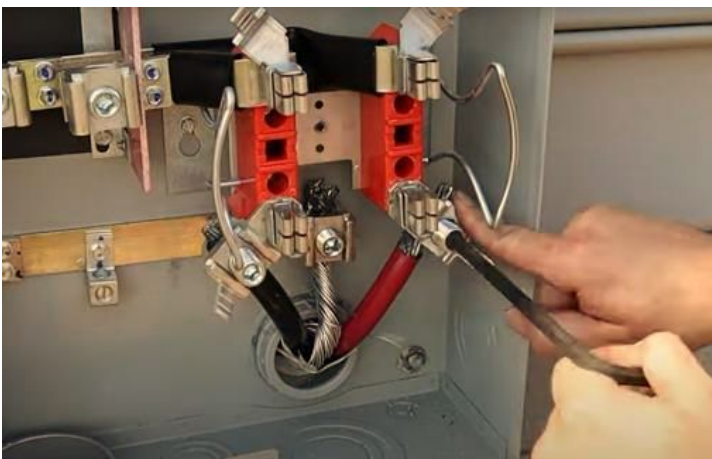
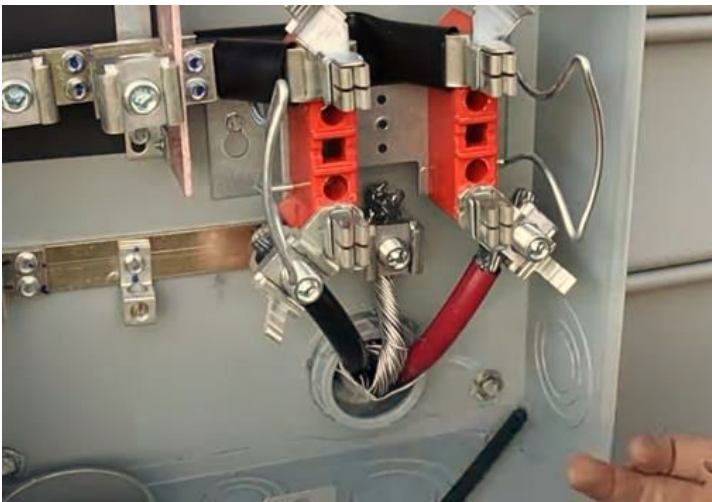
Next, strip the insulation off from the black and red wires, then fix it in



Before you fix the red and black wires in, add some ox guard



Next, add some lugs and fix the wires back to the base



If your conduit is unanchored, anchor them because it is a requirement by some states. Many states will require that you put at least two brackets



And you are done.



Now that you have repaired your meter box, let us redo the wiring in the next project.

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Electrical Repair Project 4: Meter Base Wiring Re-installation



Materials Required

- Main Circuit breaker
- Panel box
- Bonding screws
- Lug covers
- An assortment of breakers
- Screwdriver
- Punch
- Hammer

Procedure

NOTE: For this project, I will show you how to wire your meter box and complete a setup of the meter box and the panel. So, if you need to replace your panel, this project is for you too.

In addition to this, ensure that no power is connected. Check out the previous project to learn how to disconnect power from the service line.

Let us get to it.

If you want to shift your panel, measure out the space



Please note that this breaker will face elbow up.

To begin, pop out the holes in the panel





Next, screw in the panel to the wall. As for the height requirements, ensure that the panel is less than six feet or as per your state's requirements

At this juncture, double-check to ensure the panel is level.

Next, fix in the cable from the meter box to the panel





Next, take your drill and tighten the clamps below the panel

Next, take a utility knife and strip your cable's casing. Ensure you strip it as close to your clamp as possible. Once you strip the casing, you will find some wrappings – remove them

Next, you will see some aluminum wires. Separate those wires from the black and red cables you will see, then twist them together. Twist them till it becomes the 'third' wire

Next, work on the two main wires – the blue and the black wire. They do not have to follow a specific pattern. Mark and cut the wires (use a Sawzall) and fix them in the lugs



Before you fix in the cables into the lugs, apply some oxidizing agent to the tips



Next, affirm that the clamp is tight enough. If it is not tight enough, tighten it further with the drill.

Next, fix in the individual wires that will go into the circuit breakers



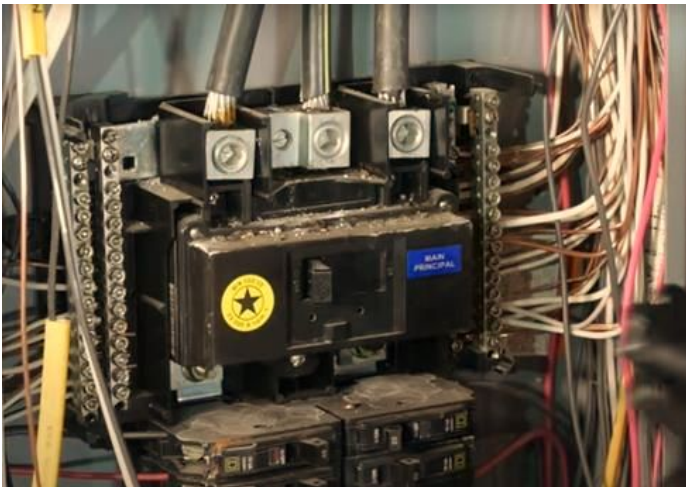
Before you fix in the individual cables through the panel, ensure that they are stripped.

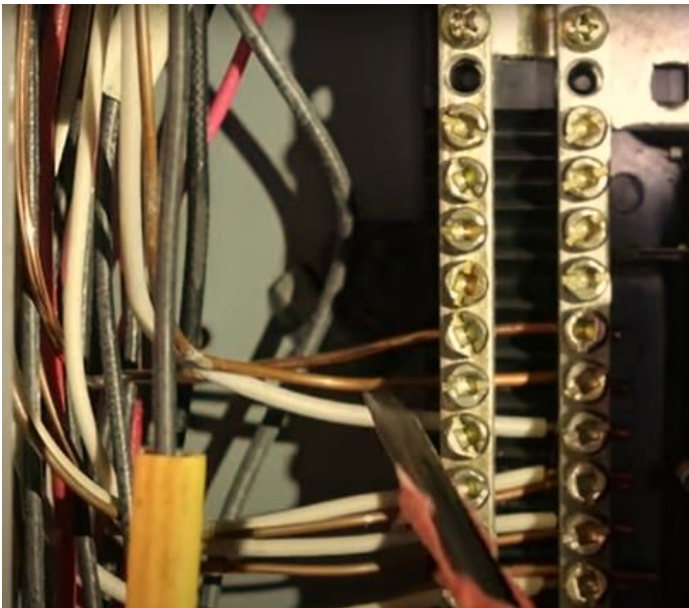
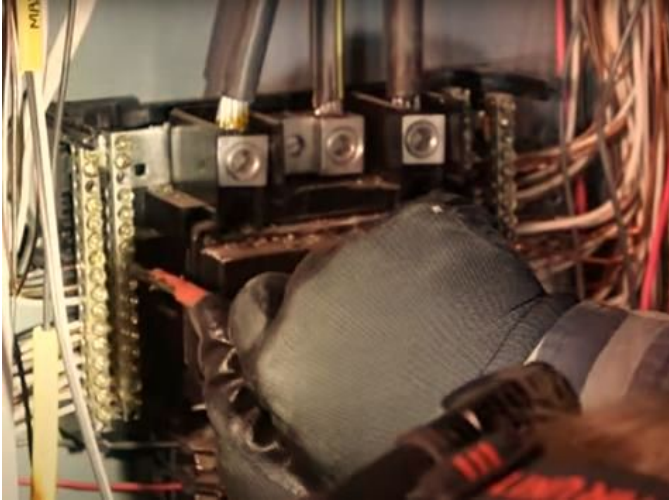
At this juncture, do you remember how we fixed a tripped circuit breaker? Well, this is what you will do with all your circuit breakers

If that process was not as clear as you would want, let me show you how to do it once more

After stripping the wires, you will remain with the live and grounding wires. What you need to do is to start working on it one at a time.

So, if you start with the grounding wire, you will add them to the bus bar that houses all other neutrals. My neutral wires are on the right, as seen in the image below. This means that we will fix in the grounding wire to the opposite busbar





Another important thing to note is to fix in the neutral first, then the grounding wire underneath it – all in the same screw

Once =done with the circuit breakers and the outside panel covering, its time to turn your power back on

Take your ladder and go up to the service lines. Ensure to carry an H-tap connector.

Start by attaching the neutral wire, then go to the live wires



Remember not to touch anything, like the roof, when dealing with the hot wires. Slightly strip off the live wire, take a connector, put in the piece from the house first, then put in the piece from the service line next.

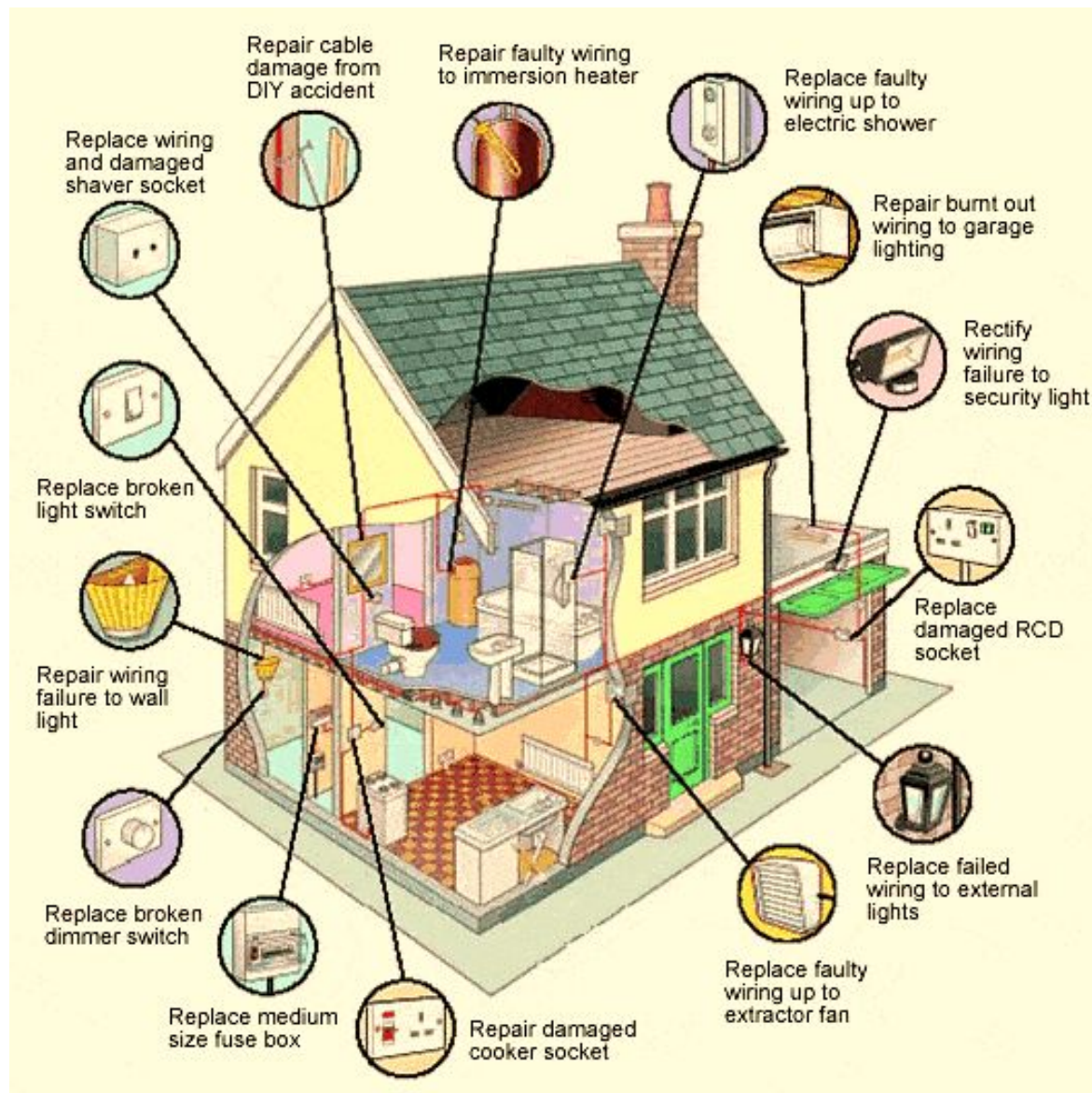
While ensuring you touch nothing, cramp the wires together just as we did with the neutral wire.

Repeat this process with the other hot wire, and that's it for this project!

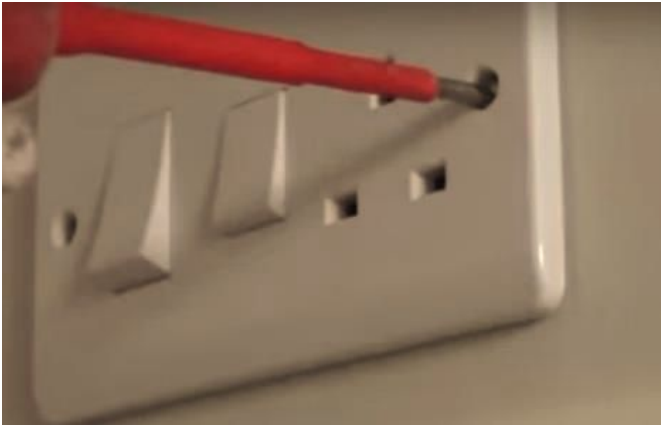
Now that we have an idea of how to repair the main parts of your house: the panel and meter box, let us go inside your home and work on the following parts as seen in the image below;

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Other Common Electrical Repair Projects



Electrical Repair Project 5: Replacing a Socket



Materials Required

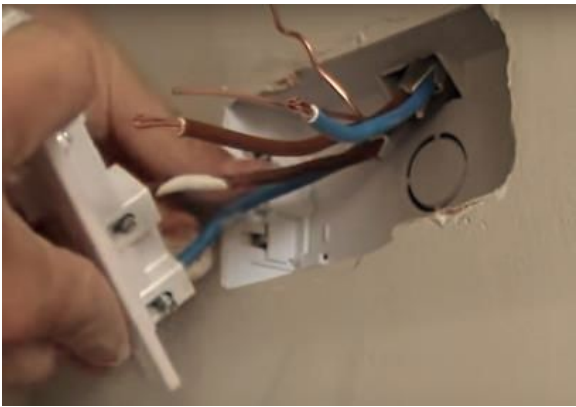
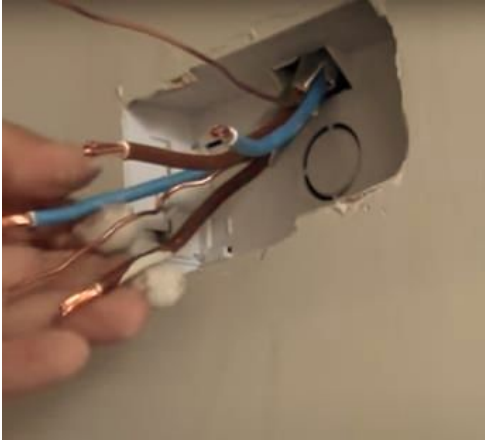
- Tester
- Flat screwdriver
- New replacement socket

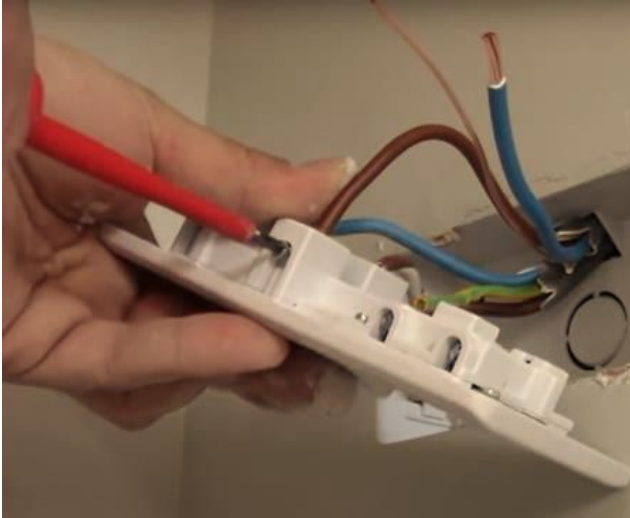
Procedure

First, go to the circuit board and switch off the kitchen's circuit switch or the main switch. To affirm that no current is running through, use a tester

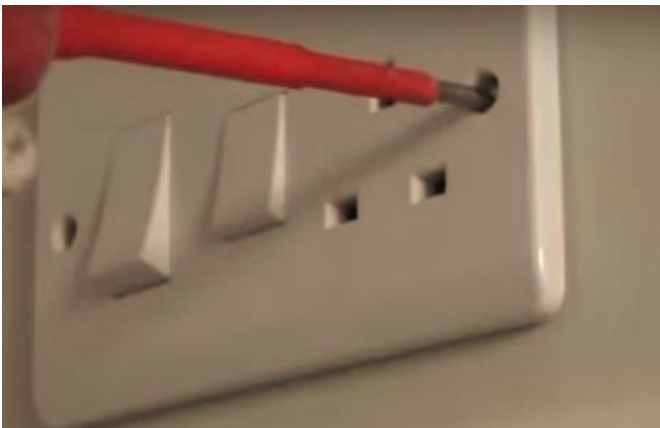
For my switch, you can see that the wiring is as follows;

- The brown wire will go to the L terminal
- The blue wire will be our neutral
- The yellow or Green wire will be our earth or grounding





After wiring in the new switch, screw it back to the wall, then switch your breaker on



We have just discussed a normal kitchen socket that follows the same step as other outlets.

The steps we will discuss next will show you how to install a USB Plug Socket

Electrical Repair Project 6: Replacing a Normal Socket with a USB Plug Socket



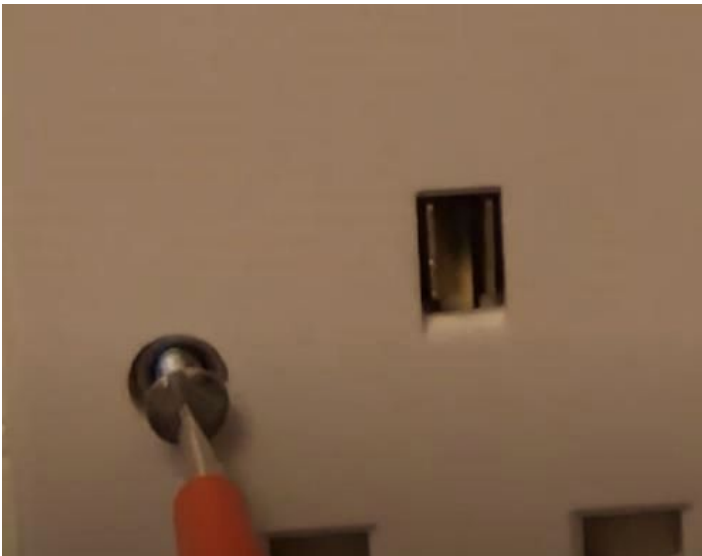
Materials Required

- Electrical screwdriver

Procedure

First, turn off the power from the main switch or the service panel

Next, take your electrical screwdriver and unscrew the socket



Next, gently pull the socket from the wall. If you notice that your cables are in red and black colors, use the following chart to color the modern brown and blue cables

	OLD	NEW
Live	Red	Brown
Neutral	Black	Blue
Earth	Bare (green/yellow sheath)	Bare (green/yellow sheath)

Next, undo the socket's terminal screws. If your wiring is like mine, you will notice that there are two earth wires

Next, it is time to fix in your new USB socket



Loosen the terminals of the new USB socket. Most USB sockets are color-coded; you will not have trouble correctly screwing in the wires. Start by screwing the live wires in, then the neutrals, then finally the grounding wires

Finally, push the socket back to the wall and screw it tight



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Electrical Repair Project 7: Installing a Fused Connection Unit



This is an electric outlet that has a fuse in it. It is mostly used to connect permanently installed appliances such as dishwashers and fridges.

If you are installing a new one in a different place, kindly note that you need to notify your local Building Control Officer before you begin

Materials Required

- FCU socket
- Screwdriver
- 1 mil cable
- Stripping tool
- Pliers

Procedure

First, fix in the metal back. This socket comes with its screws, so all you have to do is screw them to your wall



Kindly note that this fuse has two earth terminals

Next, turn the fuse and remove the blank that was there





Next, feed the cable through the spacing in the FCU and then tighten the cord



Next, ensure that the length is plenty, then strip the said wires.

Next, put the brown wire in the load terminal, then tighten it up

Next, take the blue wire and put it in the load terminal, then tighten it up

Do the same for the yellow wire

Below is what you should have



Next, screw the plate onto the back box



From the extended cable, you can decide to attach it to any appliance, such as the dishwasher

Electrical Repair Project 8: Repairing A Bad Ceiling Fan Installation



For this project, there was a high chance of the wires coming into contact, which could cause fires. This might be different from your fan, but the setup will be the same for almost every ceiling fan, so it's worth keeping it in mind

Materials Required

- Stud buddy magnet
- Saw
- Ruler
- Pencil
- Level
- Tape measure
- Wire nuts
- Ceiling fan support

Procedure

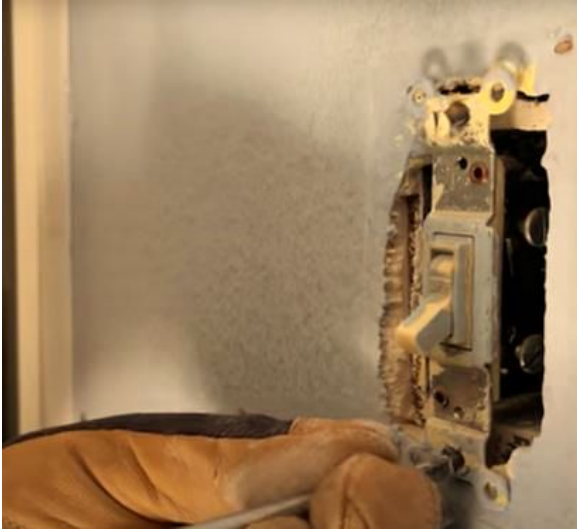
First, turn off the power

Next, cut off the drywall since it needs to be redone, making a clean patch. Since it is a ceiling, mind the joists. Use a stud buddy magnet to help you locate the nail trail. Once you get the nail trail for the joists, mark right at the edge





Next, unscrew the old switch



Next, take the new switch box and mark out the space it will take on your wall



Next, cut out that box



If you see any crimps on the wires, cut right below them



If cutting seems impossible, you can just snip the edges of the crimps. Once done taking care of the crimps, untwist the wires



Mark the wires to ensure you are not confused about which wires are hot or live. In my case, they were the three black wires



Next, take a flat screwdriver and pry the old switch box out





Next, run the new cable into the switch box opening from the attic. To be able to easily feed in the new cable, follow the old switch cable from the attic



Next, go back downstairs to the switch box, take your new switch box and feed in the wires



Next, push it back into the hole and screw it in place

Next, complete your box's wiring

Keep it in mind to make a mechanical clamp to replace the holes at the back end of the plastic. This will make it a lot easier to pull your wires

Next, hold your neutral and live wires and move them out of the way; this will leave you with the grounding wires in the middle



Next, twist the middle grounding wires and add a grounding wire nut. The twisted wires will help ground the two switches. In other words, the twisted

wires may bond the two switches

After twisting your wires, cut them short. Remember that you will be cutting all the short wires only



Next, after adding the wire nut, fold it back



Next, twist the short neutrals together, then add a wire nut. Next, fold it back

Next, twist the short live wires together, then add a wire nut. Next, fold it back



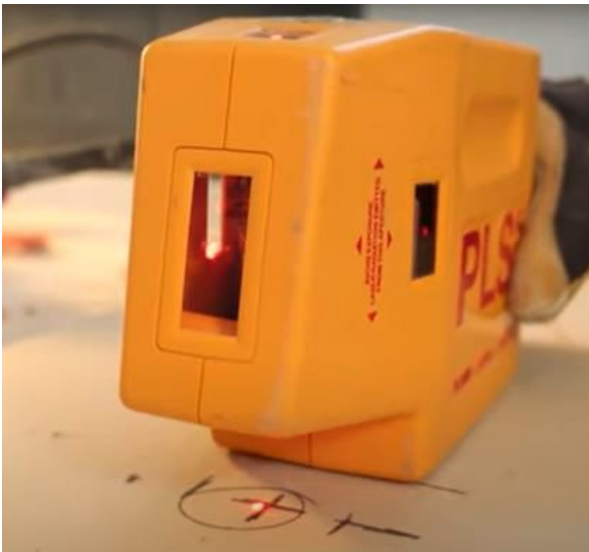
Next, take the black and the red wires and twist them; this will go to the fan. The two black wires left will help us make a temporary light to help with lighting the space



Next, measure and cut a piece of gypsum and fix it to the ceiling



Next, find the center of the room and make a hole. To find the center, take a chalk line and make an X on the ceiling. The X will mark the spot. In my case, I did this on the floor, and then with my center in place, I used a dot projector/laser to project it to the ceiling





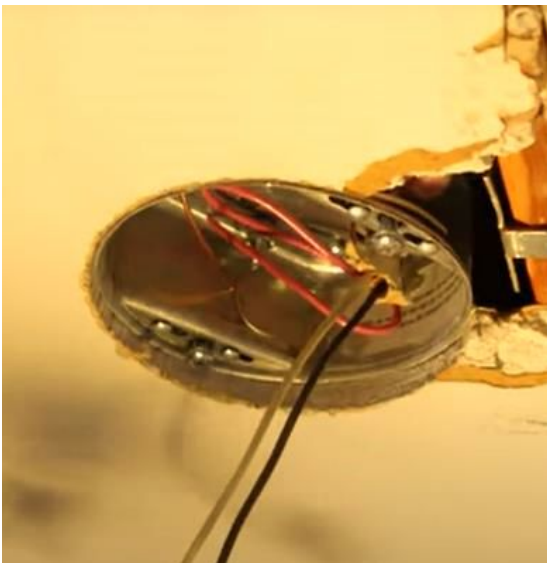
Next, take your drill and make a hole at that point



Next, go to the attic and install the fan support. Before installing the support, kindly strengthen the joists first



Finally, put a hole through the connector and run the cable through it





All that is left is to re-install the fan!

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If re-installing a fan will be challenging, let us discuss this next. However, the next project will cover the replacement of a ceiling from start to finish.

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Electrical Repair Project 9: Ceiling Fan



In this project, we will be replacing an old ceiling fan with a new one

Materials Required

- Head screwdriver

Procedure

First, turn off the power

Next, take your screwdriver and unscrew all the screws at the base of the fan. Start with the holes in the fixed holes, then go to the holes in the slotted

holes. This will give you enough space to drop the fan from the ceiling without necessarily dropping it.



After gently dropping the fan, you will notice that there are wires that need detaching from the fan



If the ceiling was wired professionally, you should see some caps that join the wires. The next step will be to untwist the caps



Next, loosen the screws underneath and into the wire box and take the base off. Since many modern ceilings come with their wire box, we do not need the old one



Next, install the new mounting bracket



Next, install the new fan motor. If you do not have an extra hand to assist you, hang the fan as shown below



The black color will connect to the hot wire, which should be black. Simply put, you will be connecting like colors



After connecting the wires with the nuts, cover them further with electrical tape



Next, take the canopy and mount it to the mounting bracket

Next, connect the lights. You might see a bunch of colors but ignore them. Just attach the color connectors to the fan connectors – blue to blue and white to white and follow the same sequence



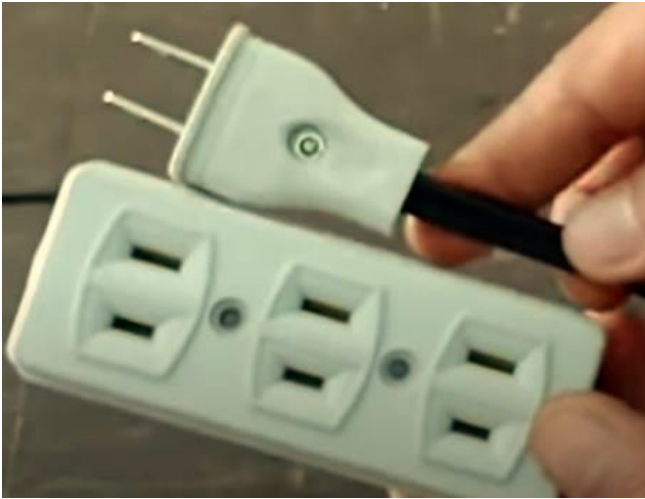
Finally, work on the lights and the fan blades



All these projects seem easier to do now, right? Even with this in mind, it is essential to keep a few things in mind as you continue brushing up on your electrical repair skills. Let us discuss this next.

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Electrical Repair Project 10: Repairing Extension Cords



If you are sick and tired of replacing extension cords, this project is for you.

Materials Required

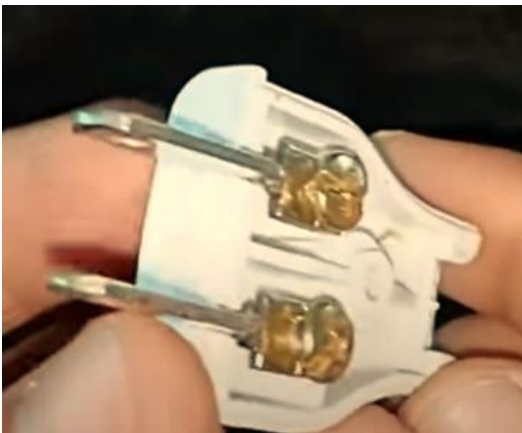
- Pliers
- Philip screwdrivers
- Flat cord
- Male plug
- Convenience outlet

Procedure

First, skin the flat cord conductor. Then, twist each other cables.



Next, take the plug, unscrew it then fix in the conductor wire





Next, close up the plug



Next, install the two conductor cables in the extension





To make it firmer, make a knot before screwing it down



Next, close up the extension



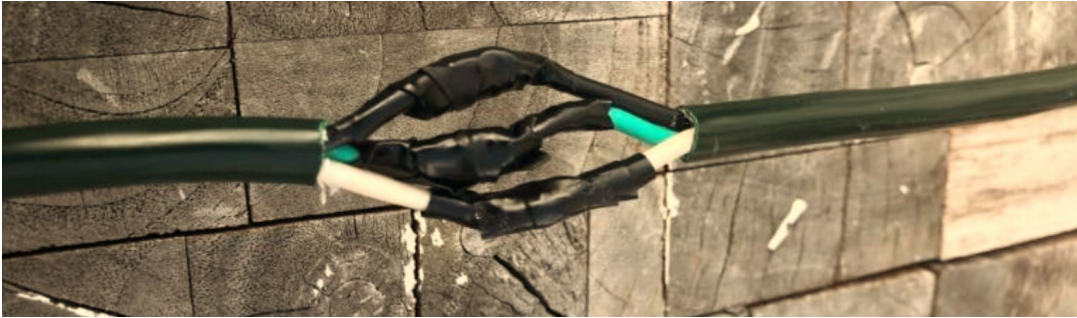
Finally, test it, and you are done!



If your extension cord gets cut, do not throw it away. Follow the steps in the next project to repair it

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Electrical Repair Project 11: Reconnecting a Cut Extension Cord



Materials Required

- Pliers
- Electrical tape
- Butt connectors
- Pliers with crimpers

Procedure

First, take your pliers and snip the top to reveal its wires. Do the same to the other side of the cable

Next, strip the individual wires

Next, take your butt connectors and fix the wires in them.

Next, take some wire cutters that have crimpers and crimp the wire down



Next, take the other wire of the same color, push it inside the butt connector, and then crimp it. Do the same to all the other wires



Next, take an electrical tape and wrap the wires



And you are done. Go ahead and test your extension cable

Electrical Repair Project 12: Repairing Landscape Lights that Do Not Turn On



Materials Required

- Tester
- Screwdriver

Procedure

First, check the A.C. I checked mine and immediately noted that it was a low voltage A.C.





Next, press the reset button and wait to see if, after the reboot, the lights will turn on

If it does not work, try to identify if power is reaching the A.C. To do this, open the system, turn on the power and carefully test to affirm if power is getting into the system

For me, I realized that power was not getting through, so I decided to replace it

Next, unhook the old system. Most A.C. outdoor systems are easily put as they are hooked to the wall, which means removing it will be easy



Next, wire the new A.C. up



Next, hook the new A.C. to the wall, switch the power on and add your desired settings



At this juncture, check your bulbs. You might have just solved the problem!

If all the bulbs are not on even after changing the A.C., take them out and try them in the house before replacing them. Also, before taking the bulb out, wiggle it first. The problem might just be a loose connection

Electrical Repair Project 13: Repairing a Faulty Water Heater Switch



Materials Required

- Blade
- Screwdriver
- Drill
- New switch

Procedure

First, turn off the circuit breakers if they are labeled but if not, switch off the main switch.

Take your blade and cut around the switch perimeter. This will help prevent the paint from falling off in excess as you pull off the socket.

Next, take a screwdriver and gently pop the socket out.

Next, take the same screwdriver and unscrew the socket.

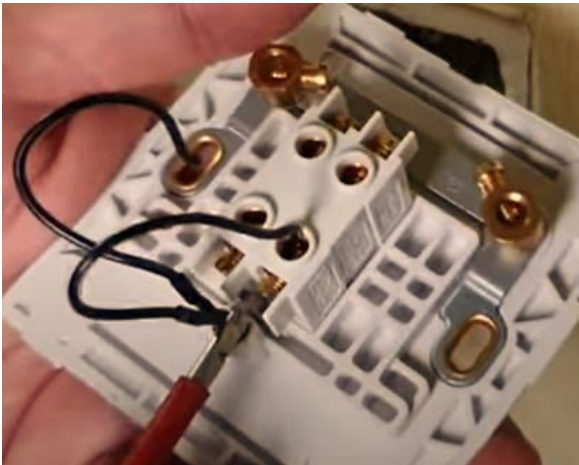


Next, unscrew the wiring done to the switch. But before you do this, mark out the wire —the incoming and outgoing wires.





Screw in the new switch



Screwing in will be easy because the switch should be marked. This will let you know where to put each individual wires



Screw the new socket back in the wall



And you are done



Electrical Repair Project 14: Repairing a Smoke Detector



Materials Required

- Flat screwdriver

Procedure

First, take the smoke detector apart.

NOTE: I am working with an ionizing detector for this specific project. It is radioactive, so if you are using the same one, do not take apart anything near where there is radioactive material

The radioactive material is between the two charged metal plates, and the radioactivity ionizes

Next, pop the plastic clips open



For mine, when I opened the clips, I somewhat guessed why it was not working. The little piezo buzzer might be the source of the problem



If you look below, I am holding a part – this is the detector's chamber; this houses the radioactive material. Be keen not to meddle with it



Next, take your flat screw driver and use it to detach the board from the plastic section holding the detector. You will notice that the board is being held by some plastic, so all you will have to do is push them aside



Next, brush off the board with home dry, then re-assemble the detector together. As for the little piezo buzzer, ensure to return it to its rightful position



And you are done!



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Electrical Repair Project 15: Replacing a Motion Sensor on Outdoor Light



Materials Required

- Ladder
- Tester
- Pliers
- Wire connectors

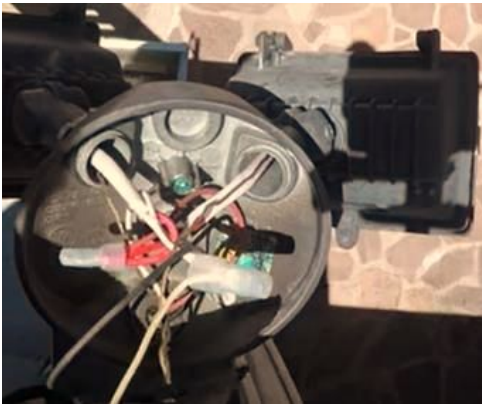
Procedure

First, assess the situation. I noticed that there was a serious gap in this sensor which made it susceptible to water trickling in the system



Next, switch off the power

Next, take the whole thing apart



Next, remove the nut collector that holds the red wires. Keep these wires twisted

Next, replace the nut collector after confirming that the red wires are done correctly

Next, work on the white wires and do the same



Remember not to twist the wires from the sensor

Next, remove the sensor and replace it



Re-wire the sensor back

Next, set the new sensor to dusk till dawn, and that's it for this project!

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Electrical Repair Project 16: Replacing Garage Door Torsion Cables



Materials Required

- New torsion cables. I used 7-inch cables
- Ladder
- Ratchet
- Winding door
- Flat screwdriver
- Drill
- Jamb bracket

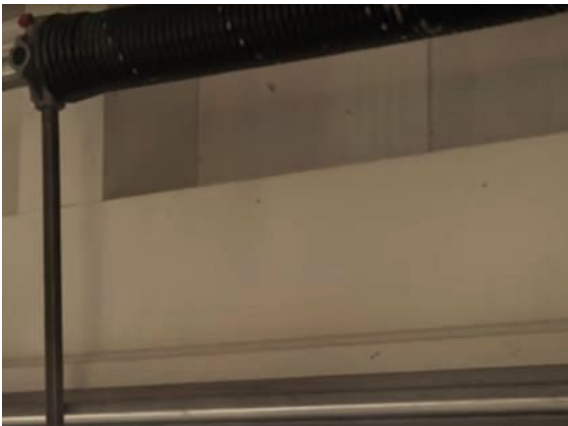
Procedure

First, take the ladder down at the old torsion springs

Next, using your winding door, lift it up and prop the spring with a winding bar



Propping will take all the pressure down to the spring, making it easy for you to loosen the drums right at the end and take the cables off



Next, loosen the keys on the drums and take the cables off. Do the same thing on the other side





Next, loosen the jam bracket. You may need a flat screwdriver to help you get the old cable off and put the new one in



To take the screws off, you will need a flat screwdriver or a drill

Next, take the flathead screwdriver and pop the table of the bottom bracket, and replace it with another one



Next, put the jamb bracket back into place. Do this to both sides



Next, screw the photo back into the wall. Do this to both sides

Kindly note that screwing the track too tied up against the inventory at the bottom bracket because the track will be rubbed, which may end up cutting into the bottom bracket.

In addition, the rubbing and cutting off of the bottom bracket will make the cable peel, making the door get stuck in the down position. I, therefore, suggest that you leave about a quarter-inch gap.

Once you work on the bottom parts, run the cables up and work on reattaching the cable to the grooves



Next, tighten the keys



Do you remember we propped the lining? Well, go back to it right at the center and remove the prop



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Electrical Repair Project 17: How to Repair the Central Heating System



Materials Required

- Digital Multimeter
- Set of jumper wires
- Capacitator discharge tool

Procedure

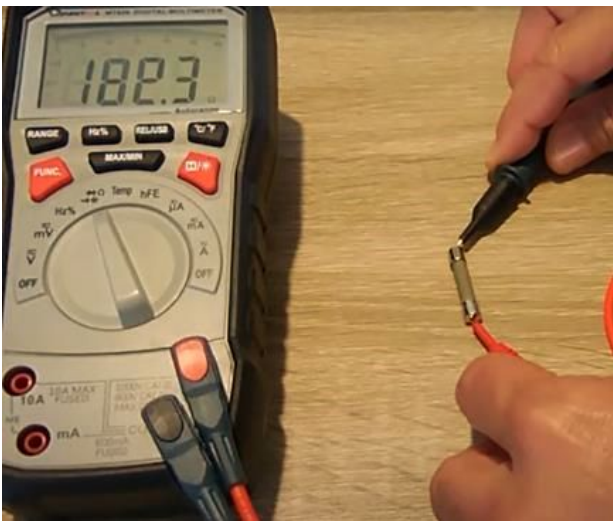
If you turn on the heat and nothing happens, such as the fan coming on, check your circuit breaker and ensure that it has not tripped

If the circuit breaker is okay, check the heating system's fuse



Affirm that the fuses have not blown

To do this, take your multimeter and have the probes touch

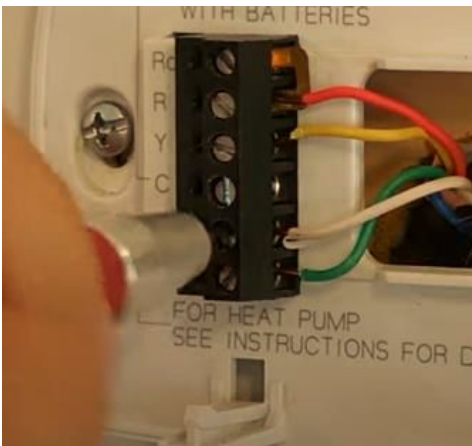


If the multimeter does not produce sound, the fuse is blown, so you will need to replace it.

If the circuit breaker and the fuse are okay, the next thing to do is to unscrew the thermostat from the wall



Next, disconnect each one of the wires from the block



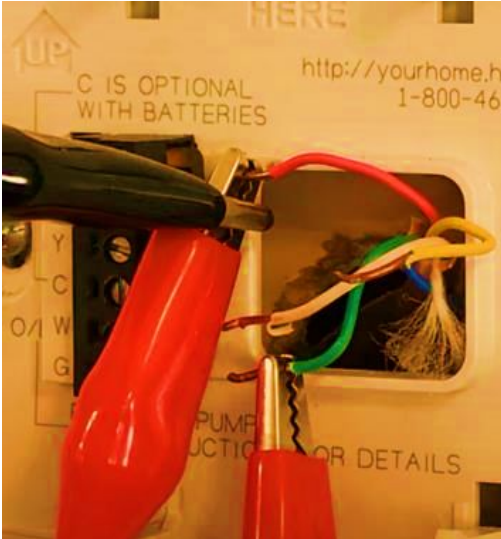
Next, take a jumper wire, connect it to the red wire and the green wire



Immediately after doing this, you should hear the fan come on. If it does not, then the problem will be low voltage in the transformer inside the air

handler

If nothing changes, add another jumping wire to the red wire and the other to the white wire



Doing this should turn on the heat and the fan. If they come on, then it means the problem is with the thermostat

If nothing changes after doing the bypass, go to the air handler and repeat what we have done above.

At the handler, ensure that the wire from the air handler to the disconnect is there

If the wires look okay at face value, take your multimeter and place it on the A.C. voltage, and measure between the two screws. Kindly note that a normal working A.C. should read around 240 and 250 volts



Once you check the top part, do the same at the bottom



If there is no power, you will have to troubleshoot it. This will help allow power to get sent to it, and everything will work

If it still does not work after troubleshooting it, test the low voltage transformer. To do this, take the fuse and test it as we did the other parts. If the fuse is blown, have it replaced. If it does not work, then it means you have to replace the low voltage transformer

The low voltage transformer is right at the back, as shown in the picture below;





Next, check the contactor. Test it and if the readings are not between 200 and 250 volts, have it replaced



Do this to the rest of the part, and I am certain you will be able to find which part is faulty.

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Electrical Repair Project 18: How to Add an Outlet to a Finished Wall



Materials Required

- Utility knife
- Hammer
- Zenith trim puller
- Magnet stud finder
- Oscillating tool
- Cat's paw
- Wago 221 three-pin lever nut

Procedure

Grab a utility knife and score the caulk line between the trim and the wall surface



Next, take a hammer and a zenith trim puller and finish working on the wall. This will help protect the wall from damage



Next, take a nail snip and snip the nails off instead of hammering them out



Next, remove the face plate of your outlet

Next, measure the distance from the outlet to the trim

Next, cut off some drywall using an oscillating tool



Next, use a magnet stud finder and find the best position on the wall to screw in the nails



Next, remove any fasteners nails using a cat's paw



Next, take a vacuum cleaner and deal with the dust

Next, depending on where you want the new outlet to be, measure and mark where the box will go



Next, cut that part out with an oscillating tool. Be keen not to overcut that section



Next, go back to the other existing outlet and remove it to expose the wires



Next, remove the outlet from the knockout from the bottom of the box



Next, drill through the studs using a diablo extension attached to the spade drill bit



Next, run a cable from the new outlet, through the holes you have just made and to the existing outlet

Remember to add a connector to the old outlet and run the cable through it.



The trick to do is to pre-attach the connector to the cable and then close it with the washer



Next, strip the wires



Next, put the wires into a Wago 221 three-pin lever nut. The hot, neutral, and grounding wires will go into one pin



The last grounding wire and white wire will be attached to the initial socket



Next, attach the socket to the wall



Next, work on the new socket

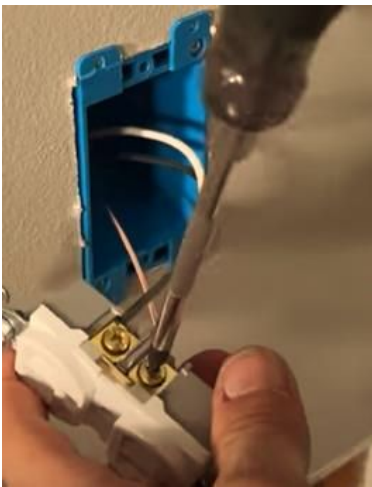
Start by screwing it to the wall



Next, strip and trim the wire



Next, screw the wires onto the new socket



Next, screw the socket to the drywall. Make sure it is as straight as possible using a level



Finish that off with a cover



Finally, button everything up by screwing the trim to the studs

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Electrical Repair Project 19: Fixing a Broken Electrical PVC Pipe



Materials Required

- Saw
- Slow setting PVC cement
- PVC cleaner
- Dremel with grinder

Procedure

First, turn off the power from the service panel or the meter box

Next, take a hacksaw and cut the PVC. What you should do is cut from where the crack starts to where it ends



Make sure that the pipes are clean from dirt, then take sandpaper and burr the ends of the pipes

Next, use a coupling to join the two new sections of pipe we will add. The trick is to pull it till it gets to the end. To ensure that the sections remain well done, use slow-setting PVC cement and a PVC cleaner.



After you push the coupling in, hold for a minute or so until it sets

Next, take the other coupling and do the same. However, before you set this one, take a Dremel with a grinding stone and grind the inner part of the coupling



Next, wait for the recent connection to settle then add the last coupling



First, you will slightly lift the PVC pipe, slide the coupling in as you twist, then twist it backward

And you are done



Now you are ready to run your wires through the pipes!

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Electrical Repair Project 20: Plug Will Not Stay in Outlet



Materials Required

- Outlet tester
- Screwdriver
- New socket
- Pliers

Procedure

First, cut the power

Next, plug in an outlet tester to affirm that no current is passing through



Next, remove the socket



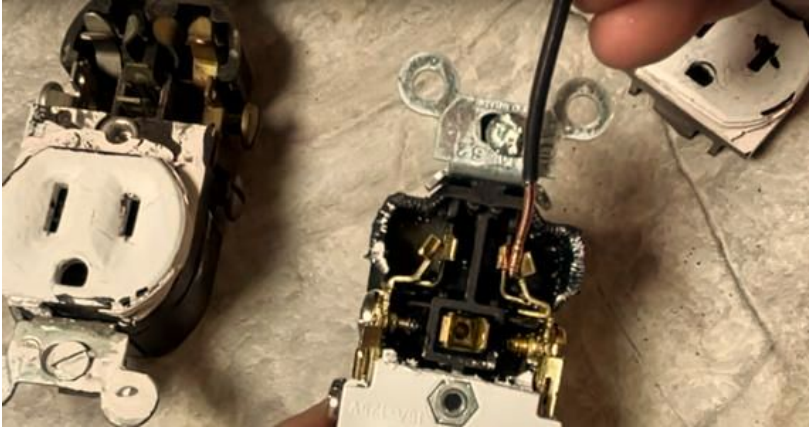
Next, open up the specific outlet that does not grip and assess the problem



Next, take a cable or a small gauged flat screwdriver and try to pass it through the clearances



Now take another plug and measure the clearance until you get one that is tight enough



To affirm its tightness, try it with a plug too



Since this plug is loose, the best thing is to swap it with a new one. I suggest purchasing a tampered socket

Finally, screw in the new socket





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Electrical Repair Project 21: Overheated Plug and Damaged Socket Outlet



Materials Required

- Circuit tester
- New socket
- A pair of pliers

Procedure

First, take a circuit tester and check if the current is on. But even before doing this, switch the lights off from the circuit breaker or the main switch

Next, remove the socket's face plate



Unscrew the two screws that hold the socket

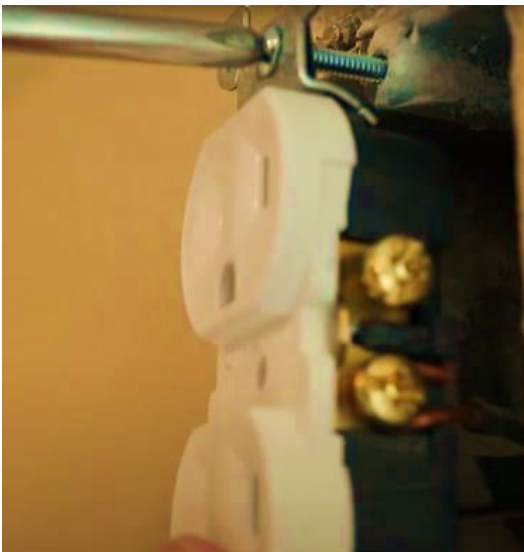


Next, remove the socket and replace it

If attaching the screw to the new screw becomes challenging, tighten it with a pair of pliers



Next, tuck the wires gently into the wall box and screw in the socket



Finally, screw in the face plate

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Electrical Repair Project 22: Adding Extra Pot Lights



This project is ideal for you if you want to add a couple of pot lights in the dining or kitchen area.

Materials Required

- Drill
- Drill bit – Milwaukee hole saw bit
- Cable
- Dandy wire cutters
- Cable connectors

Procedure

First, measure the diameter of the back of your pot light and keep that in mind

Next, get a drill and fix it with a Milwaukee hole saw bit

Next, drill according to the measurements you took in step one. Do not drill too fast



Next, go to the attic, and from one of the light joints, connect the new cable and run it through the new hole

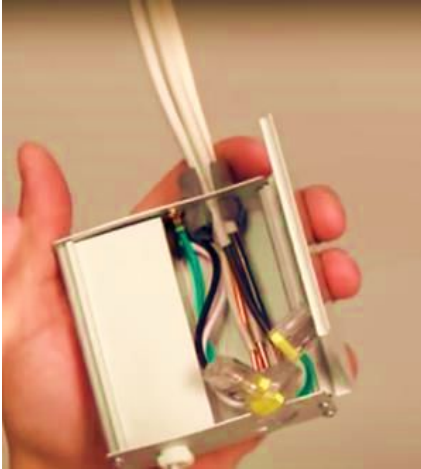
Next, strip some good length from the wires



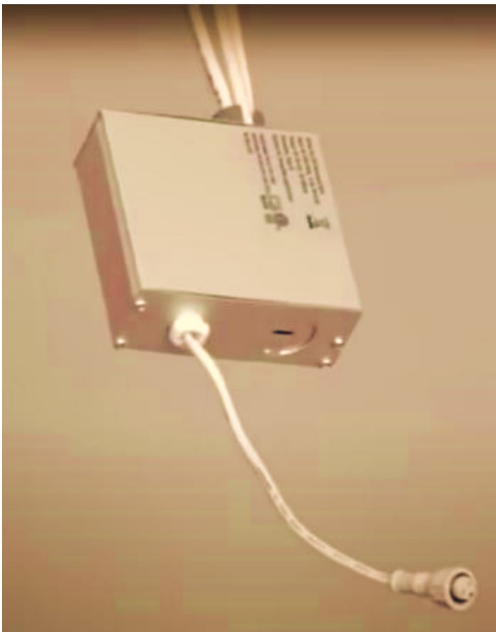
Next, fix in the connector to the pot lightbox. Be keen not to let the connector go in too deep because it will leave the wires exposed



Next, take the wires through the connector. Pull the blacks, whites, and grounds aside. Next, fix the wires to the connectors. The connectors will have color-coding; thus, affixing the wires will not be a challenge



Gently tuck the wires and their connectors inside the box and close it up



Fix in the pot light



Finally, put the box inside the ceiling and fix in the light



Electrical Repair Project 23: Changing an Electric Shower



Materials Required

- New and modern Triton electric shower
- Electric tester
- Screwdriver
- Spanner
- Silicone
- Pencil
- Drill

Procedure

First, turn the electricity off



Next, turn off the main switch or switch off the bathroom's current from the circuit breaker

Next, take your electrical tester and affirm that no current is passing through

Next, turn off the water supply from the main water supply. You should find your main water supply underneath your kitchen sink in most cases

Next, go back to your old electric shower system and look for screws found on the outside of the system. If you do not find any screws, try popping the system off. Remember, electric shower systems vary

Next, take your electric tester and make sure that no current runs through the system

Next, find the pipe that brings the water to the shower system and unscrew it with a spanner



If there are any screws, unscrew them too

You might see some water coming out. Well, do not worry because this water is what was left in the pipes after you switched off the water supply



Next, take your new system and begin working on it



Since you will re-screw your system through the same holes, ensure to add some silicone

On the other end, if you realize that the holes are in different positions, place the new system on top of the wall, then mark where the new holes will be, then take a drill and make your screw holes



Next, screw the system to the wall



Next, tighten the water supply pipe to the system

Once the supply is connected, turn back the water and test for leaks

Next, reattach the wires according to the manufacturer's instructions or if the color codes are alike, attach them according to the colors of the wires. New electric shower systems have unique connectors with clear markings, making wiring easier

Next, put the electric shower cover back on



Finally, add on the hose, and that's it for this project

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Electrical Repair Project 24: Reconnecting a Generator to the House



Materials Required

- Generator interlock
- A 220 or 240V circuit breaker
- Waterproof outdoor plug
- 240V extension cord
- Generator
- Screwdriver
- Conduit connector
- New main switch
- Nut connector

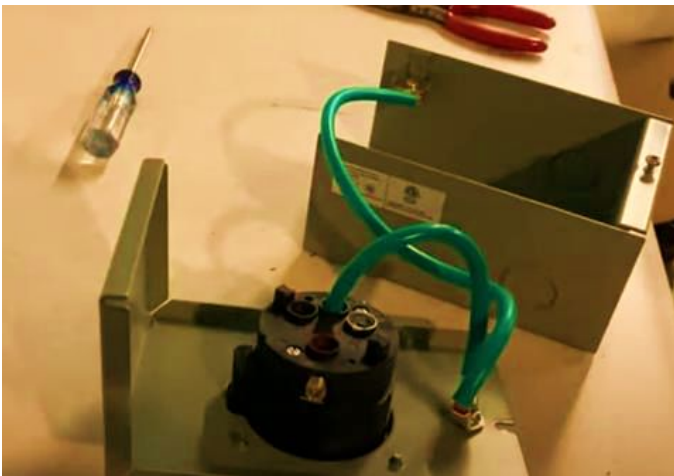
Procedure

Switch off the main switch

Next, put in a new circuit breaker for the generator. If you have forgotten how to add a new circuit breaker, kindly go back to project 4. This project has all the steps we need

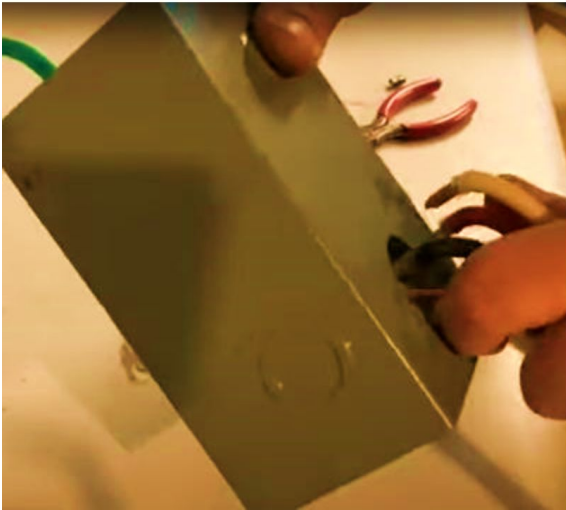
For the outdoor plug, I suggest putting it outdoors for safety purposes. If you have a shed, I suggest you put it there

When wiring the generator's outlet, start by opening the outlet box



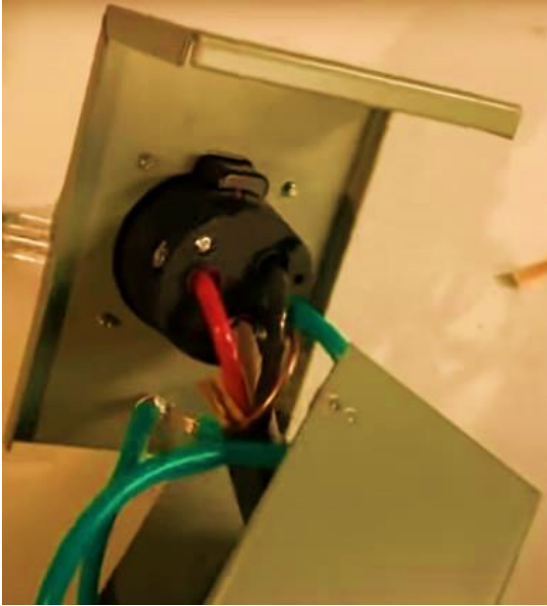
Take the cable that will run from the generator and peel its edge. Since this cable is really thick, stripping it before taking it inside the box is best. “Why,” you may wonder. Well, it is because bending it will be more challenging or nearly impossible

Next, thread in the stripped wires through a conduit connector. This connector will go into a hole in the outlet box where the wires will get fed in



Next, screw in the wires to the outlet





Next, close up the box.

Next, attach the outlet to the wall.

So far, the wires we have are running from the circuit breaker down to the outlet, right? Well, the last thing to do is to connect the generator wire to the outlet, then turn on the circuit breaker

If your installation had a problem, I hope you have identified the problem from the step-by-step installation process we have gone through. After

making this installation, it is essential to show you or remind you how to switch from electric power to generator power and vice versa.

First, it is essential to note that you should not connect your generator power simultaneously to the line power.

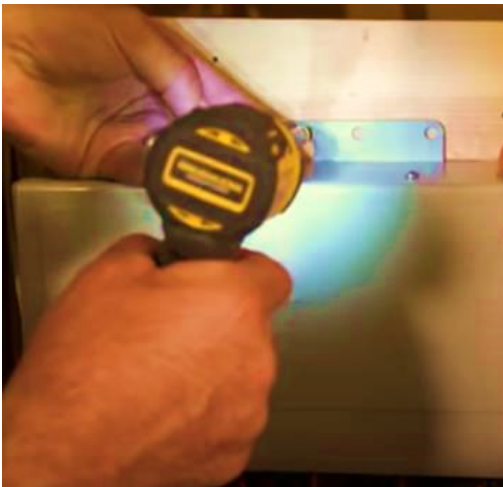
Also, keep in mind that if the power feed has no current and the generator is on, powering your home, it means your home will be sending power to the power line, which is dangerous, especially if a serviceman is working on the power line.

To avoid this fatal mistake, get a transfer switch that will cut the power flow from the incoming line and switch over to power from the generator feed. This switch will also give you the choice of which circuits will get power.

So, how is this switch installed?

Well, follow the steps below;

First, buy a manual switch and mount it next to the electrical panel.



Next, choose the circuits you would like to run with the generator

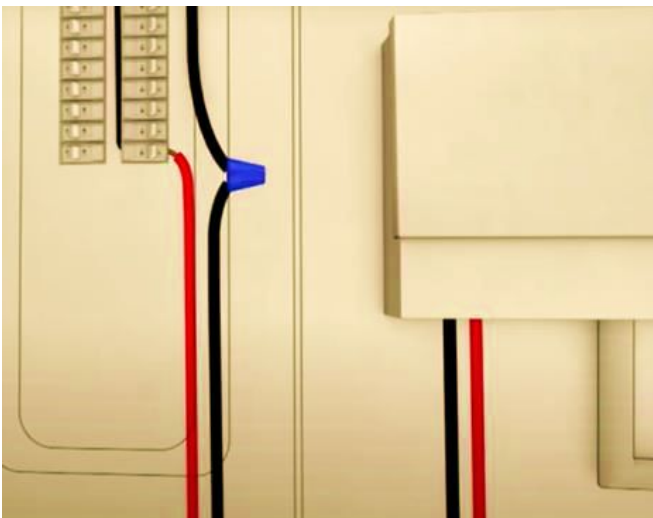
This manual switch has one ground and one neutral. So tie that into the main electrical panel



You will now have a mixture of reds and blacks. These wires will be your hot wires for the number of circuits you want the generator to power.

Remove the wire on the main circuit breaker that sends power upstairs to the lights and appliances and replace it with a new red wire from the transfer switch.

Finally, take a connector and join the splice



Electrical Repair Project 25: How to Fish Electrical Wire Inside Walls



Materials Required

- Endoscope for checking inside the walls
- Folding stick ruler
- Tape measure
- Masking tape
- Drywall screws
- Drill bit set
- DeWalt brushless drill and impact driver set
- Spade bit
- Retractable utility knife

- Hole saw
- Keyhole saw
- Electrical fish shape
- Stud finder

Procedure

Let us say you have an electrical box but want to add another light or socket in the same room, and you do not want to have the wires lying all over or without going to the attic, crawl space, or basement. Let's also assume you are wondering if there is another method.

Well, this is for you.

All you have to do is follow the steps below;

First, try to find the studs, then mark them. To help you find the studs, use the franklin stud finder. After finding each stud, mark with masking tape.



Next, run an electrical cable all through from a j box to another gang j box which I have already made a hole in. to do this, use a three-quarter inch spade bit.



Do not screw on top of the j box because it will make the wire follow a sharp 90 degree, and we do not want to mess up the cable's neatness



Next, move 8 inches above the j box and mark with a masking tape



At one masked joint, measure where your outlet will be and cut a small section out. Through this space, run your endoscope.

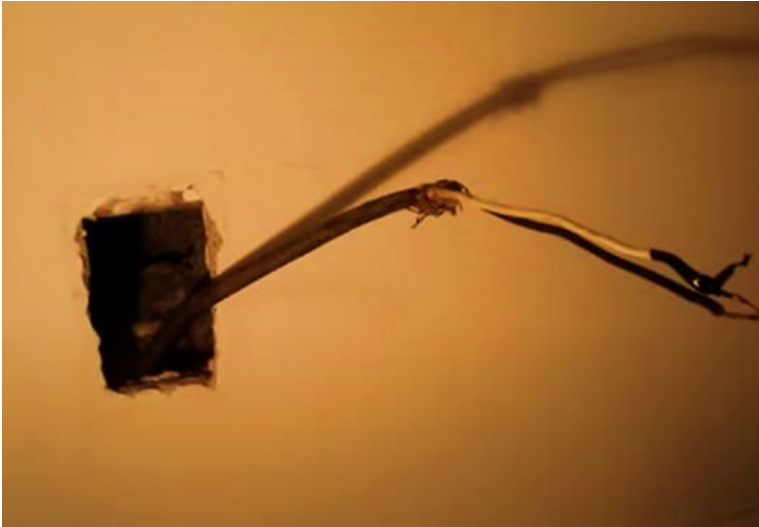


Once you affirm that the path is clear, cut the box, take a drill, and drive in through the hidden joists.

Finally, feel free to run the cables as you wish.

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Electrical Repair Project 26: Replacing Old Wiring with Romex – Outside Wall



Materials Required

- New cable
- GFCI outlet
- Chisel
- Screwdriver
- Endoscope
- Multimeter

Procedure

In this project, we shall focus on how to remove a two-conductor cable that goes from an outlet on the first floor to one on the second floor.

First, switch the power off from the main switch or the circuit breaker panel. If you have other people in the house, add a sign to let people know you are working. This will ensure that no one accidentally turns on the power.

To affirm that no current is flowing through the wires, use a voltage tester.

Next, remove the socket

Next, remove the outlet box



From the above image, it is essential to note that I have already added a new cable from my basement. So, since the new cable is fed into the outlet, we will go upstairs and work on the old cable.



The system in this tutorial has a straight wiring panel. This will make removing the cable possible. Also, note that I do not know how this cabling is done and how it has been fastened

As you can see from the image below, there are several wires. To know which one you have to remove, run an endoscope through the opening.

Another way to know which wire to remove is to use a multimeter. All you need to do is read its ohms – the ohms of the black and the white wires. So since, in our case, we have two separate cables, you will attach the multimeter in one cable and do the same for the other



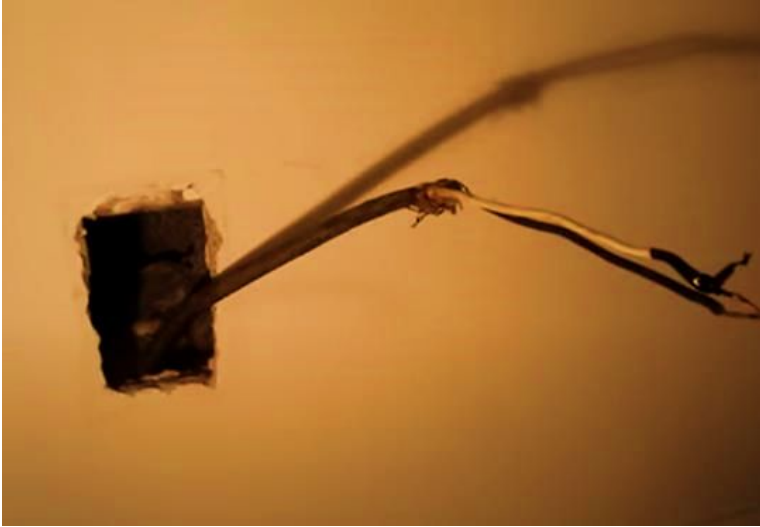
To read the wires correctly, add a connector at the end



Go back downstairs and get your readings. A 2ohms reading signifies that it is the cable we want to remove.

Next, attach a pull string at the end and pull





If it gets stuck, go to the other end and tug at it, then go back up and try to pull once more

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Electrical Repair Project 27: Updating or Replacing a Lamp Post and Light



Materials Required

- New lamp post
- New lamp light
- Pliers
- Electric tester

- Concrete mix
- Sledgehammer
- Standard pulse hole digger

Procedure

First, switch off the power to all outdoor lights. If this is not possible, switch off the lights from the main switch. Do not forget to put up a sign that lets people know you will be working on the electricity.

Next, uninstall the light. The light I am working on in this project is a simple one – it only has three screws, so uninstalling it will be easier.

Removing the wiring will help us access what is underneath the cap.

Next, get your voltage tester and use it to double-check if there is any current flowing through and within the Romex.

Since we are updating the light and the post, you do not really have to mind uninstalling the light from the joints. Just take a pair of pliers and cut it off.

Next, dig around the area around the post. Most posts are not deep; once you feel the post bending, shake it to and fro or right to the left, then ‘unplug’ it. Be keen not to cut the cable.

I was thinking of re-using the lamp post. I only need to use some rust-oleum primer and then paint black on top. This will help attain a unique, modern, richer look. But after looking at the bottom part of the post, I realized it was too beat, meaning it would need replacing.



I got a 3-inch diameter standard 80-inch-high lamp with a cross member. In addition, I went for a new photo relay

Next, go back to the post's hole and clear the hole. Be very careful not to damage the Romex cable. For digging, simply use a standard pulse hole digger.



With the hole, aim for around 23 inches. Going below this will negatively impact the height of the lamp post

Next, add concrete mix



Use a sledgehammer to tamper down the concrete mix

Next, get in your Romex cable through the Romex post before you fix the post in the hole. Do not forget to do this because we will be dealing with concrete.



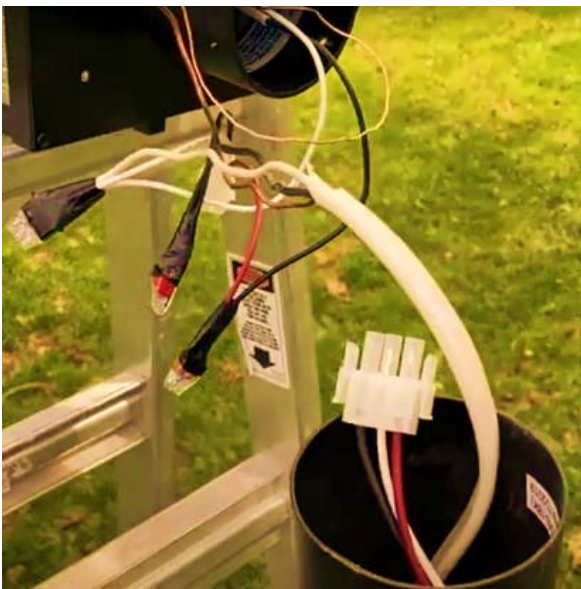
Next, put a little more concrete into the hole around the pole

Next, add water to the hole. Add water in two stages. So, it is about two quarts of water.

Next, use a carpenter's level to affirm that the post is straight.

Next, do some prep work on the light as the concrete cures. Most lights come with a connector, making them easy to set up. For connecting the

wires, use the common wire nut connectors, or you can use the new type of connectors that requires you to affix the wires.



And you are done



Electrical Repair Project 28: Replacing a Rose Fitting Light



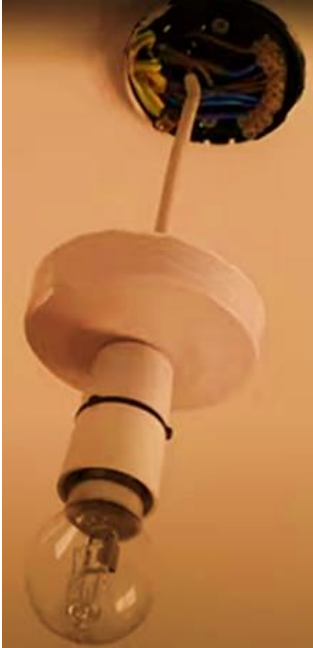
Materials Required

- Drill
- Screwdriver
- New rose light
- Terminal block
- Electrical insulation tape

Procedure

First, switch off the current from the switch box or the main switch. If you are working in a house with other people at the time, place a sign on top of the meter box, letting other parties know that you are doing an electrical repair.

Next, remove the old cover of the ceiling rails



Before touching the wire, use a volt pen or a voltage detector to affirm that no current is passing through.

Rose lighting has wires coming in one from the consumer unit; in mine, one is going to the next room, and another is going to the switch.



Next, take all this wiring out.

If you are unsure of what wire should go where, take a photo. You will use this as a guide when wiring the new rose light.



Next, use a drill to take the plate off.



Next, take the three brown wires and terminate them into a terminal block. Then, insulate that terminal block with an electrical tape.



Next, take the neutral wires, put them into a terminal block, and leave them there for a while. We will come back to them in a few.

Next, take your earth wires and bunch them together into a terminal block.

By now, I am sure you are wondering where all these wires will be, right? Well, we will use the cavity in the ceiling. We will make that cavity bigger, then we will push them inside there.

Next, take a plasterboard fixing and screw it.





Next, cut some pieces of earth wire, strip them, and attach them to the terminal that houses other earth wires.



Next, do the same for the single live wire.



Next, do the same for the neutral wires.



If you do not have enough space in the light fin to fit all the old wiring, use my earlier suggestion- make a larger cavity. Before you push those wires in, insulate the terminal blocks with an electrical insulating tape.

Next, wire the light.



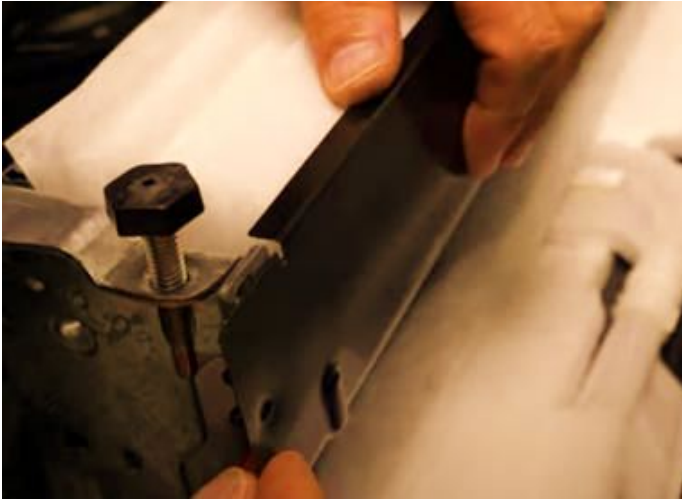
Next, push all the wiring into the fin. All you have to do is push and twist. Finally, screw it tight.

Go to the circuit breaker and switch on the lights, and that is it for this project!



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Electrical Repair Project 29: Connecting A Dishwasher Power Cord



For this project, the dishwasher cord might have been damaged beyond repair. I will illustrate how to install a new one.

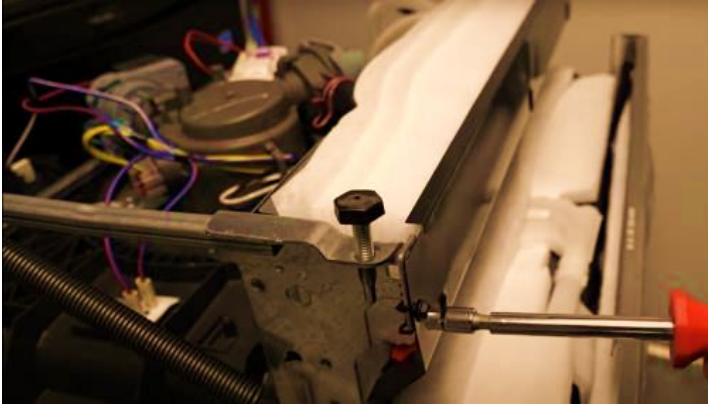
Materials Required

- New power cord
- Screw taps
- Nut driver

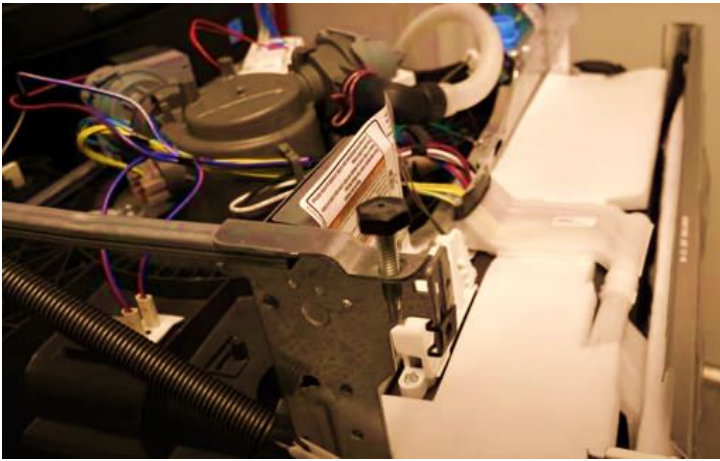
Procedure

First, switch off the current from the switch box or the main switch. If you are working in a house with other people at the time, place a sign on top of the meter box, letting other parties know that you are doing an electrical repair.

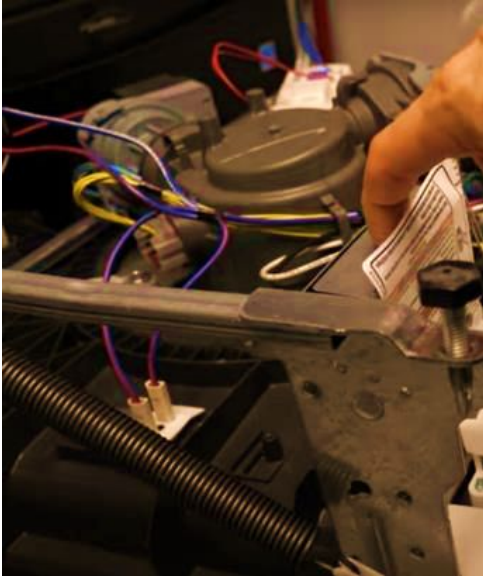
Next, get a nut driver and remove the little hex head screws from the kick panel. Kindly note that there should be one on each side. Unscrewing them will make the junction box more accessible.



Next, take the insulation batting off and set it aside.



Next, locate the junction box. It is where my finger has pointed in the image below:



If your machine is tamper-free, you will find a sticker concealing it.

Next, you will notice that a single little hex head nut holds down the junction box.



You can remove the junction box with either a Torx or a hex head, or a nut driver

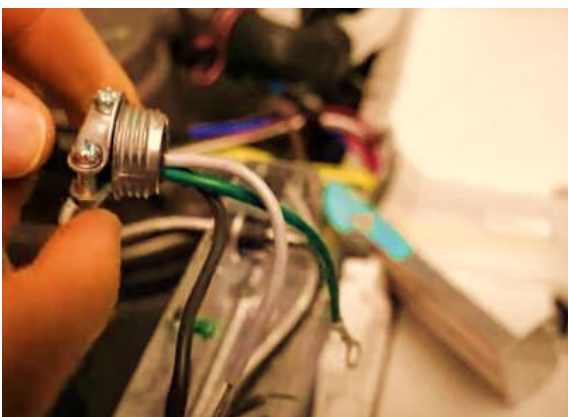
After removing the junction box, you will see two wires –you will open up the paper housing the cord and work on fixing the cord to the machine.

Next, take your strain relief and hook it up to the junction box

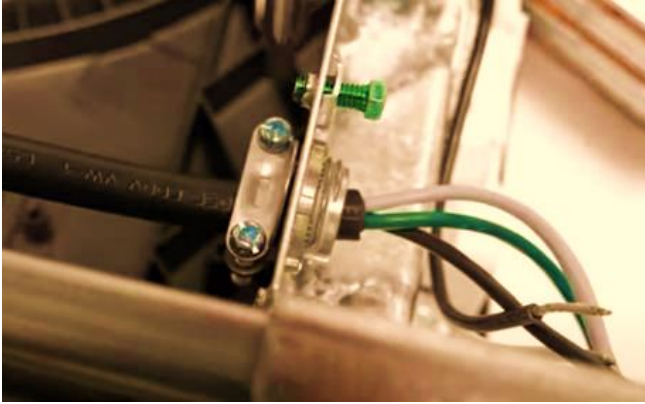


To do this, take the power cord and run it through the strain relief. But before you work on the strain relief, ensure the washer is unscrewed and connected on the inside.

To fit the cord, unscrew the screws till you see a little gap.



Once the cable is through the hole, ensure you tighten the screws evenly.



Next, take the grounding wire, unscrew the little hex head nut near the hole and attach it. Make sure that it is tightly screwed in.

Next, attach the other wires: white to white and black to black.

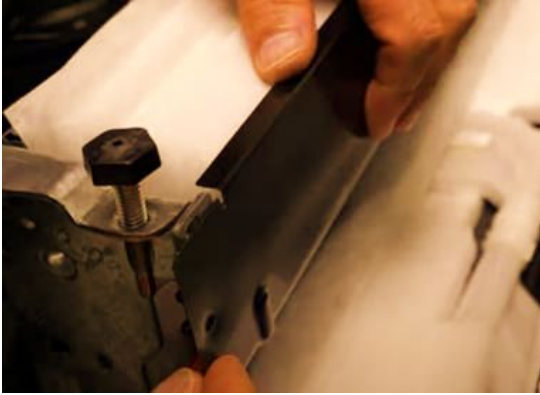
After twisting each pair of colors together, take a cap and twist it clockwise. Do the same to the black-to-black twist.

Next, take the wires and set them back in the junction box. As you do this, ensure there is clearance to make the connection without messing up the wires.



Next, screw the junction box back in.

Next, re-install the kick panel



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Electrical Repair Project 30: Installing a Low Profile Under Cabinet LED Lighting



For our last project, let us upgrade the kitchen. You might have had under-cabinet lighting done, but you do not like it now for one reason or another. Or, perhaps they got too damaged and now need redoing. Well, this project will show you how to install a better type of under-cabinet lighting.

Materials Required

- 24-inch and 48-inch LED lights
- Electrical insulator tape
- Nut connectors
- Drill
- Plywood pieces

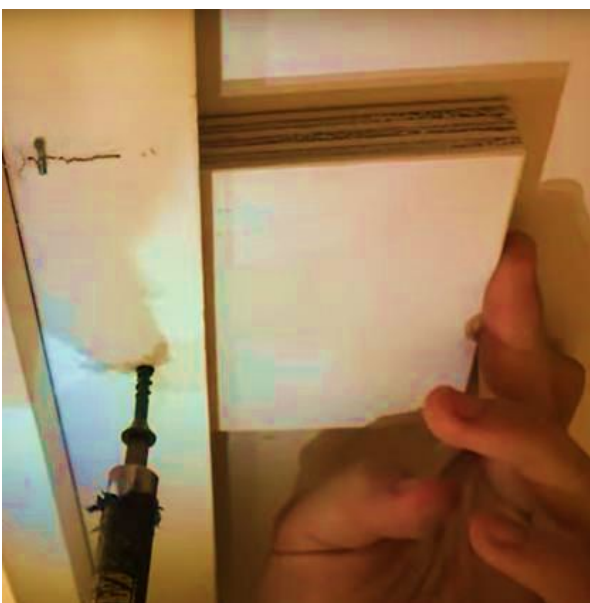
Procedure

First, switch off the current from the switch box or the main switch. If you are working in a house with other people at the time, place a sign on top of the meter box, letting other parties know that you are doing an electrical repair.

Next, go to the attic and join the new cables that will go from the LED lights to the old lines. Remember to use nut connectors and to insulate them.

Next, secure the LED lights beneath the cabinets. To do this, especially if the beneath part of the cabinet has some small pieces of wood passing across, add square pieces of plywood.

You will screw these pieces of plywood to the cabinets, then screw in the LED light holder on top.



Next, let us learn how to install a light dimmer to give our LED that modern look.

For this part, you will need the following materials:

Required Materials

- A dimmer
- Screwdriver
- Voltage tester

Procedure

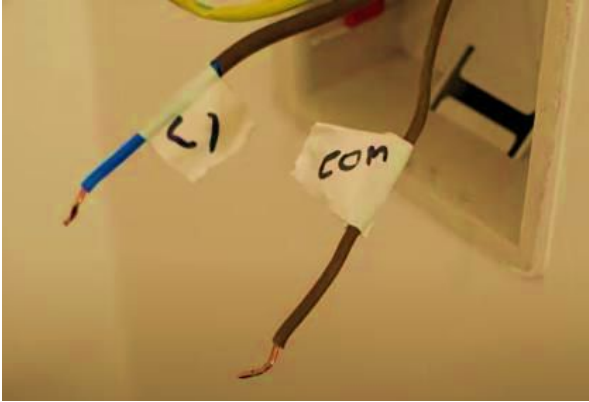
First, switch off the current from the switch box or the main switch. If you are working in a house with other people at the time, place a sign on top of the meter box, letting other parties know that you are doing an electrical repair.

Next, take an insulated screwdriver and remove the old switch.



Next, pull the light switch away from the wall and before doing anything else, use a voltage tester to affirm that no current is passing through.

Next, remove the wires.



Before screwing in the dimmer switch, kindly mind its wattage. For example, what I am using in this project is perfect for LEDs ratings from 5 to 150 watts.

With this in mind, let us continue.

You will see three terminals when you look at the back of your dimmer switch. This is where you will attach your wires. All you have to do is unscrew the screws, match the wires, then screw them back tightly.



Finally, screw the socket back to the wall, and that's it for this project!



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Chapter 8: Common Electrical Wiring Hazards

To avoid electrical hazards, take note of the following key elements:

Extension Cords

You see:

[Over 3,000 home fires originate from extension cords.](#) ^[8] Thus, being good at doing repairs is not enough because there might be instances where it may be too costly.

The first hazard you should always mind is following important extension cord safety rules.

These rules are:

Always purchase the right extension cords

Consider the following whenever you go out to buy any extension cord;

- Buy extensions from brands known to sell approved products.
- If you intend to use any extension cord outside the house, mark them accordingly.
- It is best to use three-prong plug cords
- For large appliances, get thick, round, low-gauge extension cords; for small electronics and appliances, get flat cords.

Always use the right extension cord size

Extension cords come in different sizes, colors, and, most importantly, gauges. So whenever you are out purchasing an extension cord, mind its gauge. The trick is to get the cord with the smallest number because the smaller the number, the larger the wire and the more current it can handle

sagely. Besides the gauge, note that extension cords with short cords are the best because they will handle more current.

Always check on the state of your electrical cord

For extension cords not to cause extensive wiring damage, you need to carefully check their entire length and ensure it has no cracks or punctures in the insulation. If you notice any puncture or insulation, go to project ten and try and repair it. If it does not work after that, replace them.

Always follow the extension cord safety rules for usage

Always follow the following basic ground rules for extension cord usage;

- Never remove your extension cord's grounding pin —even if you want to make it fit into a two-prong outlet (a socket with two prongs or openings).
- Do not use a single cord to power up multiple appliances, especially if the cord's gauge is wrong.
- Do not tape your extension cords to any surface with nails or staples.
- Do not use extension cords that feel hot to the touch.

Curious Children

Always follow strict safety rules when doing your wiring; this is the best way to protect inquisitive children from electrical dangers. Children will sometimes pull appliances from their cords or place objects into outlets.

To protect them, consider the following;

- Safely tuck all extensions and other cords. By saying 'tuck,' I do not mean covering them to a point they cannot 'breathe.' This is because many wires irradiate heat, which increases the chances of fires erupting.

- Tamper all your outlets

Lightbulbs

Mishandling electric bulbs may cause serious electrical hazards such as electric shocks. To ensure your lightbulbs do not become a danger to your home, consider the following:

- Always turn off the power before replacing any lightbulb.
- To prevent overheating, purchase lightbulbs that have the right wattage.
- Never replace any lightbulb with wet hands.
- Always keep your lightbulbs away from flammable materials such as upholstery, plastics, or drapes.

Finally, in addition to the hazards, there are a few mistakes you should avoid. Let us discuss this next;

Chapter 9: Common Wiring Mistakes to Avoid

Do your best to avoid the following electrical wiring mistakes at all times:

Never leave any wire unprotected

As we have seen from our projects, wiring involves a lot of cutting. Thus, you must never leave wires unprotected. This is why I always use wire nuts and electrical tapes.

Never install too many outlets on a wire

Overloading will always trigger the circuits, lowering the voltage. As you know, a low voltage may lead to a utility blowout or may make the items malfunction. In other words, not overloading your wires will help prevent issues such as tripping circuits.

Cutting the wires too short

Short wires will make it challenging to make any connections, which may increase the risk of electrocution. Refer to your area's code to affirm which length to work with for all projects.

Always use ungrounded electrical sockets

Pre-1960 homes had outlets with only two slots; therefore, they don't have any grounding. As discussed in the projects, it is not right to place a three-slot receptacle in two-slot receptacles; thus, if your home is wired using the old guidelines, update it to the modern wiring system.

Using the wrong wire

As discussed in the initial chapters of this book, there are different types of wires. Therefore, use the right wire for the right job. Using the right wires for the right jobs will help prevent instances of circuit breaker issues or, even worse, electrical fires.

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Conclusion

As discussed in this book, electrical repairs are risky, but if done well, they can save you a lot of money!

As you work on the different parts of your home, always stay safe, and if a project is too difficult or challenging for you, get help.

Good luck!

PS: I'd like your feedback. If you are happy with this book, please leave a review on Amazon.

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[1] <https://www.homeadvisor.com/cost/electrical/>

[2] <https://householdquotes.co.uk/about/>

[3] <https://householdquotes.co.uk/how-much-does-rewiring-cost/>

[4]

https://www.nationalcityca.gov/home/showpublisheddocument/375/636090627169130000#:~:text=D,uring%20a%20typical%20year%2C%20home,many%20fires%20as%20electrical%20appliances_.

[5] <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Electrical/Electrical>

[6] <http://insideenergy.org/2015/05/08/ie-questions-how-much-do-energy-vampires-cost-us/>

[7] <https://www.energystar.gov/>

[8] <https://www.esfi.org/reaching-to-safety-use-extension-cords-properly>