

Notes

# Battery Feed with Coin Battery

Test your coin phones and make the coin relay work!

## Building a Combination Power Supply With Battery Feed and Coin Battery

Instruction Manual

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To test any old telephone you have two choices.  
Use your phone line and not get incoming calls  
Build some sort of simple tester

If you are going to test a coin telephone, you can use any tester for the talk circuit, but for the pre pay coin relay you need a power supply of about 100 Volts DC that is current or power limited. For Post Pay phones a line reversal switch is needed. Building a simple tester is not difficult and this is just a bit more complicated.

Battery Feed is a telephone company term that is used to describe a function of a common battery telephone line. Battery (also known at talk battery) is connected to the telephone line so that the telephone at the distant end has power (voltage and current) needed to make the circuit and the transmitter work. The common battery at the central office supplies the power to all the telephone lines and to the equipment to make things work. Central Office Battery is 48 Volts.

Coin Battery is typically between 100 and 120 Volt Direct Current. The must operate voltage of the Coin Relay is 60 Volts. Older or "well used" relays may require minimum voltages slightly higher. The power to operate the Coin Relay on this device is power limited and you must push a button and hold it in to operate the relay (with your other hand in your pocket to prevent a shock!).

This booklet should be read after "Battery Feed", the booklet that is more basic and explains battery feed. Voltages used in this project can be dangerous.

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2010 Colin T. Chambers  
BFwCoinMSW41

Built by \_\_\_\_\_

Date built \_\_\_\_\_

You should read the basic booklet on Battery Feed before starting this project

### Before You Build Your Tester

Identify your phone first and try to get a wiring diagram. Read my other publication, "Battery Feed" for basic information. Make sure you understand HIGH VOLTAGE and precautions that go along with it. Building this project is at YOUR OWN RISK. Do not build it if you do not understand how to protect yourself from shock and the effects of High Voltage (DEATH!).

This is a medium difficulty project. You should have built other electronics projects before attempting this one.

### The Coin Relay

The Coin Relay in a modern 3 Slot phone is a single coil with a resistance of about 1000 Ohms, in an older phone it is two coils with a combined resistance of about 1000 Ohms. If you have any other type of relay with a different resistance it may be a Post Pay Phone or a Single Slot Relay from a modern computerized phone. This tester is universal and will test Pre Pay or Post Pay Telephones. Single Slot pay phones with special coin relays may or may work.

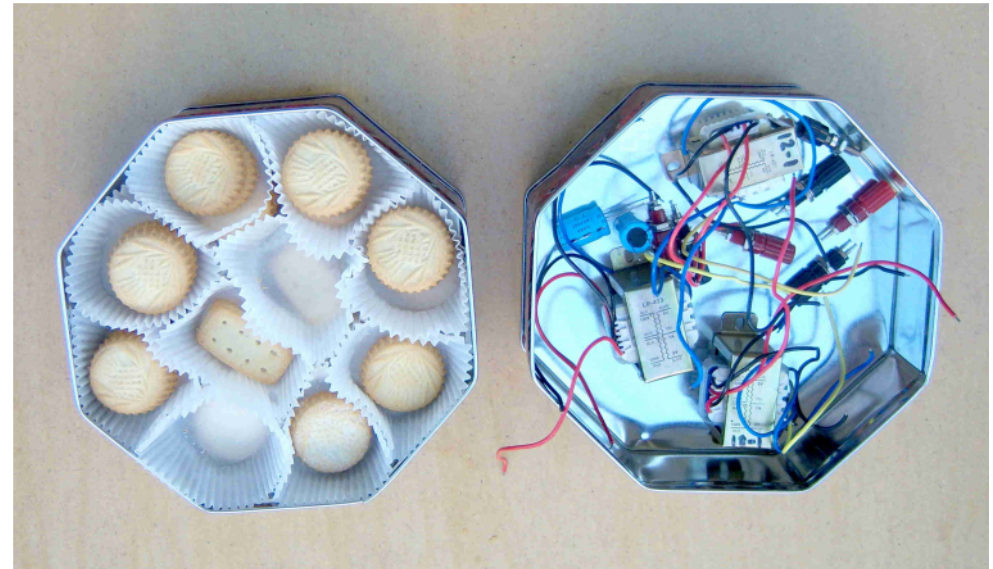
For Post Pay Phones there is a reversing switch on the Tip and Ring of the tester. Post Pay Phones work on the direction of the line current.

The coin relay on the standard "telephone company" single slot pay phone may also be tested, but some (3<sup>rd</sup> party ones) work only on 48 VDC and some at 12 VDC.

### Getting Started

Read this book, then read it again. Order the parts and then build it. I used a cookie tin with a few vent holes. You can use a plastic case. There is only minimal heat. I added binding posts to use DC power, 48 Volts, for other purposes, only about 300 MA (0.3 Amp) or so otherwise the voltage drops.

## Construction Details & Cookies



On the left is the Before picture on the right is the After picture. It will be necessary to empty the can of cookies before starting construction.

Cookie tins come in all sizes, order your transformers first before you select your cookie tin. Some tins are short and will not be able to contain all the parts. Relays and transformers should be at least an inch apart or more.

It may be necessary to buy several cookie tins before you get the right parts fit.

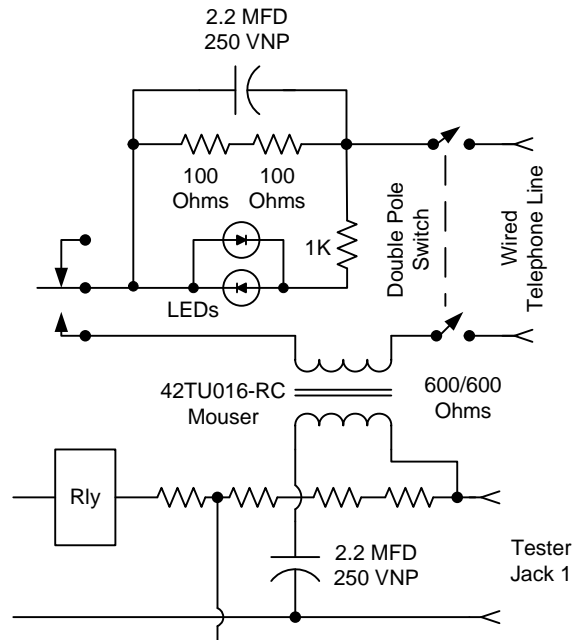
On the lid mount the jacks, the switches and binding posts. Contact cement the relays to the bottom of the tin for maximum sound effect. Painting the cookie tin is optional.

The cookie tin I used had 2 layers of cookies, as transformers may not fit if there is only one layer of cookies.

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## Dial Tone Connectivity



This can be added, by operating the switch, dial tone will be available to the telephone you are testing. If it has a rotary dial the relay will “repeat” the dial pulses to the telephone line, if it has a tone dial the audio will couple to the phone line, as well as the voice. The transformer is a 1:1 miniature transformer from Mouser for under \$3.

The advantage of this circuit is that you can test your phone any time on a regular telephone line. This does not transfer ringing voltage from the wired telephone line to the telephone you are testing. It just saves you unplugging your telephone from the tester and plugging it into the wired telephone line and going back and forth.

The LEDs indicate that the wired telephone line is being connected to the telephone under test. If they are too dim, replace the 1K resistor with 470 Ohms.

## What this Power Supply Does

This power supply provides two independent battery feed circuits that have an audio path between them. This simulates a dialed telephone connection. Loss is inserted between the connections so it should sound like a telephone connection in terms of volume.

The line current is higher compared to most testers. This will allow you to make sure the nickel lock up relay operates on pre pay phone or the post pay relay operates properly. A reversing switch on the test line lets you test post pay coin telephones. The higher line current will allow you to use a line powered speaker phone on Line 2 to make it easy to test and repair an old telephone.

A source of high voltage, that is limited in power, is provided to operate the pre pay coin relay. This is manually controlled by a push button switch.

Ringing is not provided, this is best tested when you plug the phone you want to test into a standard telephone line and call it.

Several options that you can include are discussed.

Parts are easily obtained from mail order electronics suppliers and the cost to build this tester is about \$50. This is an intermediate to advanced project. You should have some electronics kit building experience before starting this project. Once built you will have the deluxe tester you always wanted and it will last you for many years. Once you use it you will ask yourself why you did not build one before, it would have so much easier to test and repair all those old phones.

The voltage used for the pre pay coin relay is dangerous and you should understand the safety precautions with high voltage. Keeping one hand in your pocket, not standing in water and all those other safety precautions with high voltage should be followed. High Voltage can KILL.

Make sure you understand everything in this booklet before starting the project.

## Pre Pay and Post Pay

Pre Pay phones use a dual coil or single coil relay, the total resistance of the coil(s) is about 1000 ohms and it is designed to work on 60 to 130 Volts DC. When you deposit a coin a contact on the relay closes and one side of the relay is connected to earth ground. This arrangement required (note the use of that word) that the metal case of the coin phone be connected, with a heavy wire, to earth ground for two reasons. 1) safety and 2) proper operation of the coin relay. The coin relay is polarity sensitive and the polarity of the voltage determine if the coin will collect or return.

History of the pre pay coin relay and contacts: (simplified)

- 1) There was only one contact, the line was ground start, so you only got dial tone after you made the deposit. At the end of the call the high voltage was sent to the coin relay for collect or return.
- 2) Due to fraud, putting a wire in the hole in the transmitter cap and grounding it, a second set of contacts were added, these shorted the dial to prevent dialing without a coin deposit. The change was also made from dual coils to single coil relays.
- 3) Dial tone first came along with the ability to dial operator and emergency numbers without a coin deposit. Coin relays now had the second set of contacts that were not used.

Post Pay coin phones have a multi winding two step relay with a contact that shorts the transmitter to prevent talking when the called party answers. Battery on the telephone line is reversed when the call is answered, dropping the coin allows the contacts to operate to the "second step" and the transmitter is not shorted.

Some post pay coin phones had unity gain amplifiers to prevent yelling into the receiver to communicate with the called party.

This type of coin relay is somewhat difficult to adjust if it gets out of adjustment.

For more information look at the Pay Phone History Book by Phoneco.

## Using Your Tester

### Preliminary Testing

Plug a standard telephone into Jack 2, this could be a 500 or 2500 or a modern phone with a built in speakerphone, which makes it easy for testing/listening when you are doing testing by yourself.

Plug a good phone into Jack 1. You should be able to talk/listen and dial between the two telephones. Try a rotary dial phone and listen to the dial pulses by hearing the relay click.

Operate S2 and see if reversing the polarity of the line makes a difference. This will let you know if a tone dial phone has a polarity guard.

To test the coin voltage, connect a 4 or 7 Watt 120 Volt night light to the coin relay terminals, press and momentarily hold down the push button, S3, then release it. The light should come on briefly and rapidly dim out as the capacitor discharges. The neon lamp will do the same.

Using a meter check the line voltage at the phone jack. Test the short circuit current at the phone jack by setting your milliamp meter to 50 Ma or higher. Measure the voltage at the Coin Relay binding posts, set your meter to 200 VDC. Voltages and current will vary slightly depending on your power line voltage.

Remember that on a post pay phone, you must first have normal polarity on the line, go off hook and make the call, reverse the polarity, deposit the coin, then hang up the phone and restore line polarity to normal. These steps are necessary to operate and restore the coin relay.

Visit my web site for basic telephone information and for cards that can be printed to use in the display holder on your pay phone.

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## Circuit Design

Transformers T1 and T2 have the 18 Volt windings placed in series for 36 Volts, when converted to DC this provides about 48 to 52 Volts DC, somewhat dependent on your power line voltage. This is filtered with C1 to provide the Talk Battery.

The Relay (650 or 700 Ohms) and the 4 each 100 ohm resistors provide the "battery feed" of about 40 Milliamps (.04 Amp) to simulate a telephone line. The LED across the resistors will glow when a telephone is off hook or a connection is made and will blink with a rotary dial. The relay will also click when you use a rotary dial.

The two lines are identical in their operation. The 330 Ohm resistor and the 2.2 MFD capacitor provide the talk path between the two lines. The connection path for this is arranged so that there is a little loss to simulate an end to end connection like an actual telephone call. You can use a 1K resistor for average line loss in place of the 330 Ohm.

Transformer T3 has the 12 volt winding connected across the 9 volt winding of T2. This provides about 90 Volts AC which is converted to about 125 Volts DC. Only one primary winding is used.

S2 is a DPDT switch to reverse the line polarity, this is for testing Post Pay Phones or determining if a polarity guard is present in Touch Tone Dials. S3 is used to test the coin relay by charging a capacitor to 125 VDC and discharging it into the coin relay.

48 Volts DC is available at two terminals, if you exceed 0.3 A or 300 Ma the voltage may drop. There is only a primary fuse so watch your load. You can use up to 1 Amp, but the voltage may fall to 40 Volts.

Clicking of the relays when dialing or going off hook is normal. This also gives an audible indication of the line status, after a while you will not need to watch the line LEDs.

Use of cheap phone with built in line powered speaker is strongly suggested for Line 2, it is a lot easier to test phones on Line 1 this way.

## Parts List

BR – 200 PRV 4 Amp  
C1 – 2200 MFD 63 VDC – Power Supply Filter, or 3300 MFD  
C2- 2.2 MFD 250 VDC NP – Voice Coupling  
LEDs – Any LED – High Brightness suggested, any color  
R1 A/D – R2 A/D - 100 Ohms each – Line Resistor  
R3 – 2.2 K – LED Resistor  
R4 – 6.8 K – LED Resistor                      ALL Resistors ½ Watt  
R5 – 2.2 K – LED Resistor  
R6 – 330 Ohms – Voice Coupling  
R7 – 100 Ohms – Surge Resistor, limits inrush current  
R8 – 220K – Safety Discharge  
R9 A/B – Current Limiter  
R10 – 100 K – Current Limiter for Neon Lamp or integrated assembly  
NE – Neon Lamp or integrated assembly  
F1 – Fuse 1 AMP and fuse holder  
SW1 – On Off Switch  
SW 2 – DPDT Switch – Reverse Line  
SW 3 – SPDT Switch – Coin Relay Power, charge and discharge  
T1 – T2 – 18 VAC CT 1 AMP – MPJA  
T3 – 12 VAC CT 1 AMP – MPJA  
Relays – 24 VDC 4PDT – See Battery Feed Book for description  
Misc – Cookie Tin Case, line cord, etc

## Notes

Make a few holes in the cookie tin for air circulation, there is not a lot of heat so only a few holes. Attach the ground wire to the case along with the ground terminal, remove any paint on the case for a good connection. Be sure to wire the green (ground) of the 3 wire line cord to the metal case (remove paint of the case at this location)

Mount the relays with contact cement to the cookie tin. This will provide an audible click and make it easy to detect an off-hook condition.

Relays are contact cemented to the case. Use contact cement on the LEDs to secure them.

## Parts Sources

allelectronics.com  
jameco.com  
mouser.com  
mpja.com

# Battery Feed – Coin Phones – Higher Line Current - - - Coin Relay Power Schematic Diagram

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