# Knowing the tools of your trade

Phone Lines –

It takes only two wires to form a single analog telephone line. The wires are named "TIP" and "RING." The names come from the old days when operators used the old "Banana" plugs on their switchboards. One wire of the telephone line was connected to the tip of the plug, and the other was connected to the ring portion of the plug. The names stuck.
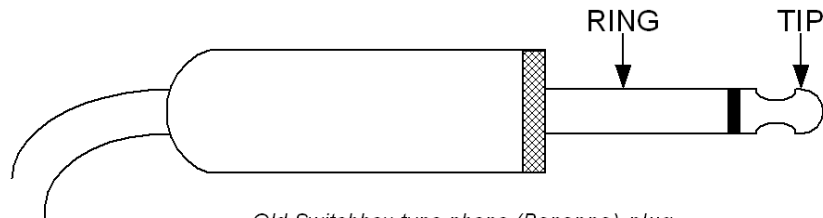

Old Switchbox type phono (Bananna) plug

MODULAR PLUGS

Telephone systems were standardized years ago using Modular "RJ" type plugs. The original specification, RJ11 had 2 conductors, which allowed for one phone line. RJ14 allows for two (*Line 1 & Line 2*). **We primarily use RJ14**.

Over the years this modular type plug became very popular for engineers, who expanded on it by adding more conductors. Today the modular type plug is used in a variety of consumer telephony and communications electronics products.

It's important that you understand what type of system you're dealing with before attempting to patch in our equipment. Our equipment works on analog telephone lines <u>**ONLY!**</u>
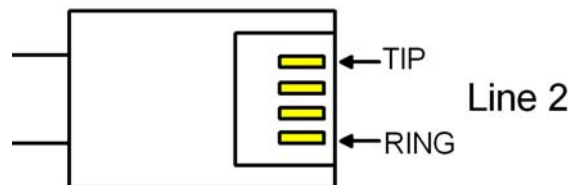
The picture below shows a standard male **RJ14** modular analog telephone plug with 4 conductors. A 2 conductor cable (RJ11) would have only 2 contacts.

Contact
Pads
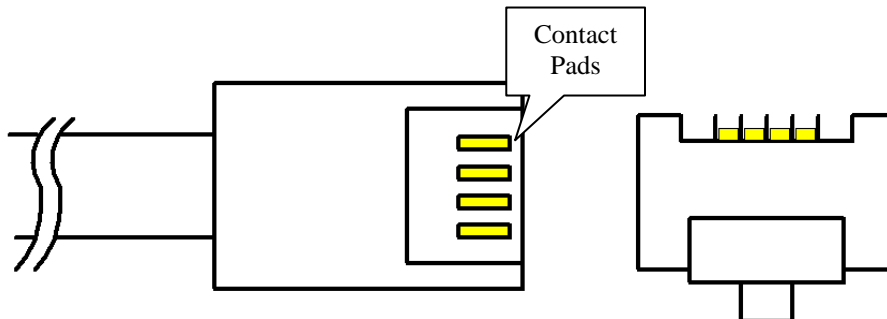
The two center conductors make up line #1. An RJ11 will have these only.

TIP
RING Line 1
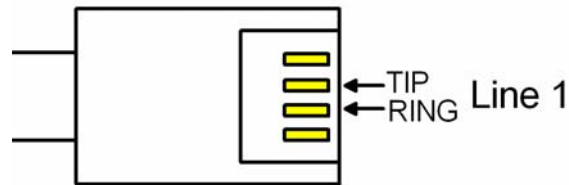
The two outer conductors make up the additional line #2.

TIP

Line 2

RING

Only 2 wires are actually necessary for a standard single line analog phone to work.

You can also tell how many conductors a female plug is by counting the metal pins inside. If there are more than 4 pins (conductors) then it is probably not a standard analog telephone line and will probably not work with our equipment.

1) **RJ11** – 2 Conductor analog telephone line. This is the most common standard phone cord, which is capable of carrying only one phone line.

2) **RJ14** – 4 Conductor analog telephone line. Same as RJ11, however it contains 4 conductors, which allow for an additional phone line.

3) **RJ25** – 6 Conductor phone line – Used primarily in Digital computerized telephone systems. Rarely used for 3 line analog telephone systems. We cannot use our equipment with a digital phone system. RJ25 is rarely seen anymore in analog telephone systems. However it's become very popular with computerized digital telephone systems. A female RJ25 connector should be considered a Digital phone outlet.

4) **RJ45 (aka CAT 5)** – 8 Conductor digital Ethernet line. It will have a total of 8 conductors in the modular plug. These 8 conductor plugs are found in both digital telephone systems and Ethernet computer networks. We cannot use them at all.

RJ11, RJ14 and RJ25 sockets are all compatible with one another. If you find a 3-line RJ25 socket, you can plug in an RJ11 plug and access line one. An RJ14 will access both line one and line two.

WIRES:

Today, telephones commonly use a flat 2 or 4 conductor wire made specifically for use with modular type phone plugs.


Standard 4 conductor modular phone wire

This type of wire is best for making short hook-up connections between devices. It is not very practical to go beyond 25 feet with this type of wire. Whenever possible, it is best to use this type of wire for setting up inside the MOC. We have the tools and parts necessary to put new RJ14 modular ends on this type of wire if needed.

When we need to connect to a land line telephone source, we'll probably use 8/4 Conductor Hook-Up wire. This is the type of wire that is used to wire-up the telephones in your house and businesses. It consists of a polymer jacket surrounding four to eight 22 Ga. solid copper core wires. This wire is extremely versatile and can be used for just about anything. We can put modular ends on this type of cable using an RJ14 tool.

When using this hook-up wire, color code is not important, as long as TIP and RING are connected the same at both RJ14 ends. We'll only need and use one phone line, therefore we only need to connect two wires. They will be connected to the two inner contacts of the RJ14 modular plug.
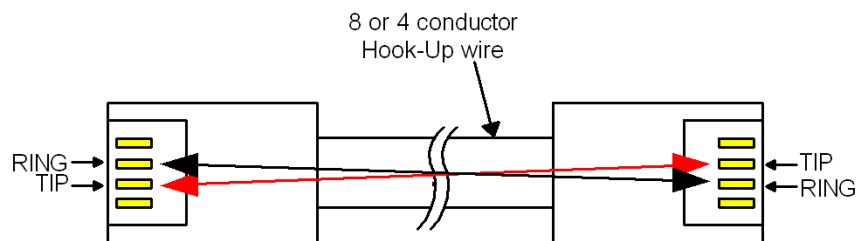
Only two of the wires needs to be connected.
Any color combination is fine, as long as RING = RING and TIP = TIP

If a modular connection inside a building is not possible, it will be necessary to connect to a junction box on the outside of a business or residence. Telephone wiring has become universal and once inside the box, it should be obvious which two wires to connect. I'd draw an example, but due to the vast quantity of different junction box styles out there, I won't. Try to remember that LINE #1 (which most houses and businesses have) should be color coded RED (*TIP*) and

GREEN (*RING*). Line #2 is usually BLACK & YELLOW. If you're not sure of the polarity (Tip vs. Ring) just hook it up. ***It will work either way***.

To find the junction box, look up at the nearest telephone pole and locate the main phone wire. It will come down a side of the building to a small box, mounted to the side of the building. For a residence, the wire should be 4 conductors, 8 for most businesses. Some phone boxes require a special HEX tool to open. In an emergency, use your imagination to open the box.

Note:

When making telephone connections, it is <u>VERY</u> important to be sure that a good connection is made. Telephone systems convert line current into sound. A bad connection interferes with current flow in the line and the phone turns that interference into sound. This is what causes static in the line. Solid connections are imperative in telephone lines!! A poor connection will result in a noisy connection.

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