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The Heathkit Hybrid Phone Patch

. . . a review

FROM a fundamental viewpoint a phone patch unit has a formidable set of conditions to satisfy. It must match the nominal 600-ohm balanced landline to the unbalanced high impedance input of the transmitter, and it must match the very low impedance speaker line (3 to 8-ohms usually) to the same line. It must do this using one line for both transmitting and receiving *without switching*. And finally, is must maintain isolation between the speaker and microphone so that a feedback loop is not formed. In view of these considerations, a good phone patch is a pretty neat trick.

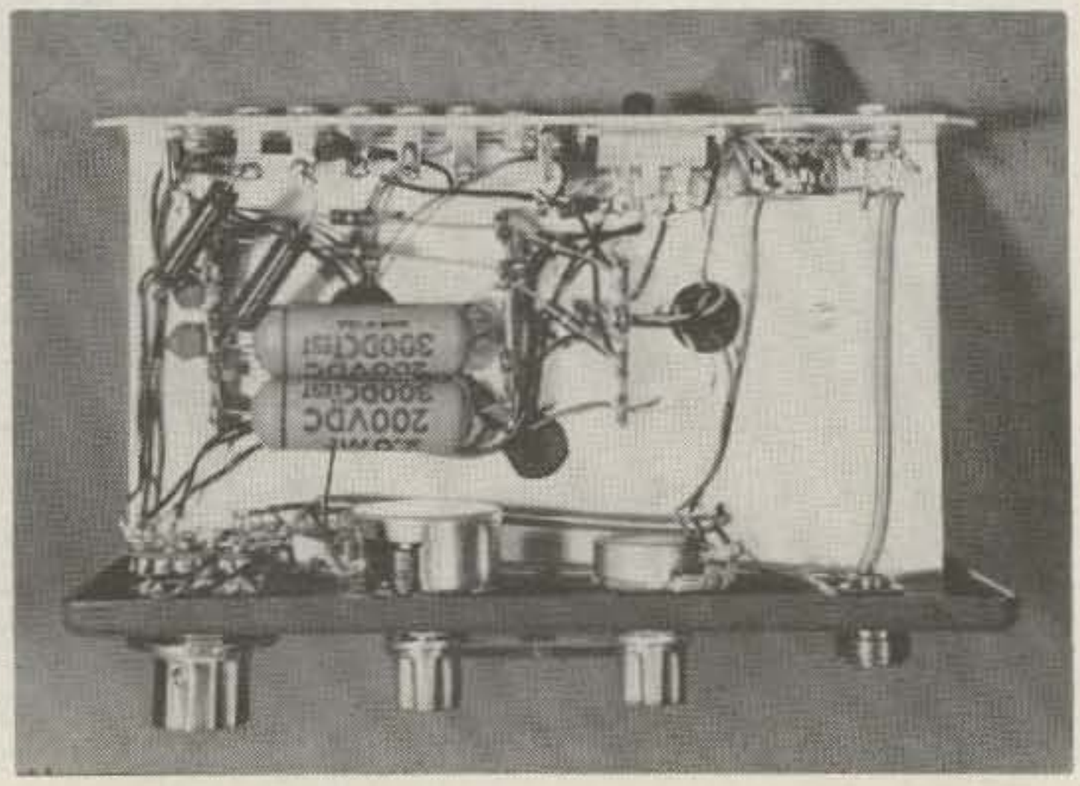
Fortunately, a traditional technique of the telephone industry is perfectly suitable to the problem. This is the hybrid matching method used in most phone patch designs. In essence, transformers are utilized with their windings wired into a bridge circuit in such a fashion that signals coming in on the phone line will appear at one set of transformer windings (connected to the transmitter input.) Signals coming into another set of windings from the receiver will appear across the land line terminals while cancelling out in the winding connected to the transmitter. And, since transformers are used as the coupling devices, impedance transformations can be accomplished at the same time.

There have been many phone patch circuits described in the literature around adaptations of transformers which were available in surplus or which were made for other purposes. Most of these have been compromises in that the transformers didn't always exactly fit the requirements. Many of the circuits did not provide for matching to land line which were somewhere between balanced and unbalanced electrically (as many phone lines are), and they did not provide for a method of monitoring and adjusting the level of the signals to and from the line.

Troubles with many such home-brew phone patches have generally taken the form of: high hum level making intelligibility poor and VOX operation difficult if not impossible; overdriven phone lines causing cross-talk in the telephone company's equipment; and generally poor audio quality as a result of the use of transformers not specifically designed for the purpose. The fundamental problems of adequate isolation between input and output and of prevention of rf energy from feeding into the telephone system have also been inadequately solved by some of the earlier designs.

Fortunately, the Heath Company with its usual competent engineering has solved all of these problems in the Heathkit Model HD-19 Phone Patch. Due to the size of their market, they could have good quality transformers made up to suit the application. Provision is made for balancing the bridge of the phone patch to imperfectly balanced land lines; and a VU meter is provided for monitoring the line at all times to assure that it is not overdriven. (The meter of the VU circuit also serves as a very sensitive and effective indicator for making the line match.)

Two potentiometers on the front panel allow adjustment of transmitted and received signals to comfortable levels while another potentiometer on the rear apron adjusts the balance of the patch to that of the line. Two switches complete the external controls available. A slide switch on the back apron places the VU meter across the line for monitoring purposes or the meter at full sensitivity across



the microphone output of the patch for balancing purposes.

The front panel switch places the patch in or out of the circuit as desired. It provides for switching the microphone straight through to the transmitter and the receiver straight through to its speaker when the patch is off. In the "on" position of this switch, the speaker and microphone are both disconnected and local input and output of the station are through the telephone handset only. This switching arrangement allows the patch unit to remain connected at all times without affecting normal operation of the station.

A terminal strip, coaxial phono-type output connector, and a coaxial microphone connector complete the connectors supplied. Shielded cable and mating connectors are provided for making up the line from the patch to the transmitter microphone input.

Underneath the chassis are the components of the line filter which prevents rf from being fed into the telephone lines, and the two 2-mfd. capacitors which are paralleled to form the dc blocking, audio-pass filter between the patch and land line.

Construction time for the kit is about two hours at the most for a careful worker, and there is nothing tight or tricky about it.

All of the external connections are spelled out in good detail in the manual. However, there is one thing which must be watched here, and which is not mentioned in the manual. Many modern communications receivers have one side of the output transformer secondary grounded to the chassis of the receiver. This polarity must be observed in connection of the receiver to the patch, or it will be found that the speaker is "on" under all circumstances and cannot be switched by the patch. Since the dc resistance of the output transformer is quite low, it is not possible with the usual types of ohmmeters to determine which of the terminals is grounded in the receiver. You must either find this from the schematic in your receiver's manual, or as a last resort you will have to open your receiver and see which terminal is grounded. (Of course, you can try the connection one way and if it doesn't work, reverse the lead connections at the patch. But this is a most unscientific way to proceed!)

Connection of the patch to the land line can be made with almost any kind of insulated wire—zip cord, twisted pair, etc. Since this is a low impedance balanced line, there *should* be no rf pickup. However, if you want to be sure, and especially if the line must run in close proximity to your transmitter, you can use two conductor shielded line (not coaxial) such as is sold for running shielded extension speaker leads. Ground the shield of this line to the patch and leave the other end floating.

There are only two criticisms which the writer has after a few months use of this patch. These are:

It might be better if the null adjustment potentiometer and the meter switch had been placed on the front panel. Admittedly, these need not be used often; but when it is necessary, it is a nuisance to have to pull the patch unit out to gain access to them. And, in those stations where each piece of gear is built into its own pigeon hole in a console, this could be a great annoyance.

The other criticism is a very petty one indeed, but one which could be easily corrected. The metal knobs are very neat in appearance and should be quite serviceable, but the index mark on the two small ones consists of a very small indented triangle filled with red paint on the narrow skirt of the knobs. This is quite difficult to see from the usual operating position distance. A dab of red paint on the side of the knobs has solved the problem for the writer, even though it doesn't look very professional.

In summary, the Heathkit Phone Patch is a very satisfactory piece of gear, and one which we can hope will attract many operators into providing themselves with patching facilities. This activity is one of the most rewarding in amateur radio, and one which certainly is good public relations for our hobby. The gratitude of some of the people who can hear the voices of their loved ones from overseas is heartwarming, and this is often their first personal contact with amateur radio. 73