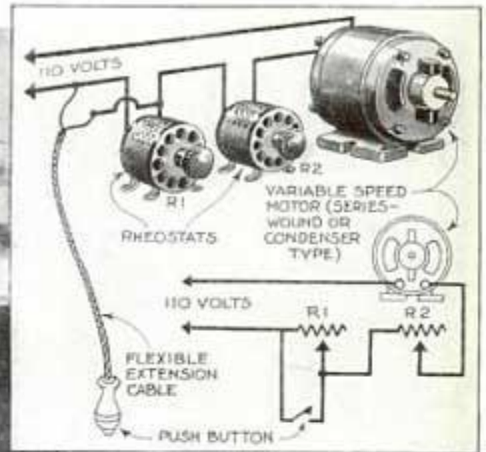
Don Marshall *tells* HOW TO CONTROL

Your Television MOTOR

JUDGING THE MOTOR SPEED

A flickering neon lamp and dots on the disk simplify the problem of adjusting the speed



Picture diagram showing how rheostats are arranged on the push-button synchronizer

By

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"SOMETHING'S got to be done about it, Don," I said dejectedly as I tried to synchronize the disk of my television receiver by the "thumb method" previously described (P.S.M., Nov. '31, p. 88). "I've worn out three pair of garden gloves so far, not to speak of wearing the edge off my nerves. Can't I rig up something that'll keep the motor running at just the right speed?"

Don Marshall, radio expert and television experimenter, smiled. "I didn't think," he said, "you'd be satisfied with that crude method of synchronization after the novelty wore off. Why don't you use a synchronous motor; then when you receive the signals of stations located on the power line that supplies your motor, you'll have nothing to worry about?"

"Well, to tell the truth," I admitted, "I've been trying to get along with the equipment on hand. I thought maybe there was some way of connecting up this motor of mine to obtain synchronism."

"On commercial sets," Don replied, "they use a synchronizing device called a 'phonic motor'."

"A phonic motor?" I asked. "What is that?"

"Physically it consists of a toothed wheel which revolves between the poles of an electromagnet. In reality," Don continued, "it's a small motor that is run by an amplified portion of the received television signal. Since the toothed rotor is fastened to the shaft of the main driving motor, it serves to keep it in perfect step with the motor at the transmitter. In other words it's a speed regulator that is operated by the frequency of the television signal and serves to keep the driving motor in perfect synchronism with the station being received."

"Isn't there some way we can obtain practically the same result without going to the bother of building an additional motor?" I queried hopefully.

"A method which will work but will not be as good as the phonic motor," Don explained as he made the wiring diagram sketched above, "is to use a variable resistance that can momentarily be reduced by the operation of a push-button switch. By using two rheostats as shown in this sketch and supplying the first with a pendant type of push button, the decrease in resistance can be varied by altering the setting of the first rheostat."

"How does cutting down the resistance effect synchronization?" I asked.

"In this system you are just replacing your thumb with an electrical means of obtaining the same result. In use, the pendant push button is held in the hand of the observer, and when he notes that the image is slipping off to one side or the other, he operates the push button sufficiently to speed up the motor and cause it to revolve in synchronism again. Of course, the same method can be applied to a single rheostat," Don continued, "but the system using two variable resistances has the advantage that the resistance cut out by the push button can be altered if necessary to obtain just the right balance."

"In other words," I said, when Don had finished his explanation, "the motor is set at the proper speed and then held at that speed by reducing the resistance to speed it up just the required amount. I'll have to buy another rheostat and try it out."

"Of course," Don suggested, "if you want to, you can make a variable resistance by suspending two large lead plates and one smaller one in a tank of water acidulated with sulphuric acid. The push button is connected between one of the outside larger plates and the middle smaller plate. To vary the total resistance and alter the speed of the motor, it is necessary only to increase or decrease the distance between the two outside larger plates. The removable resistance can be altered by varying the distance between the end plate and middle plate. When the push button is operated, the resistance is cut down since the distance between the two terminals of the circuit is reduced."

"What do you mean by acidulated water?" I asked.

"Acidulated water," Don proceeded to explain, "is water to which a small amount of acid has been added to increase its electrical conductivity. The quantity to be added can best be found by filling the tank you intend using with water and adding the sulphuric acid drop by drop until the conductivity of the solution reaches a point where moving the plates apart or nearer together materially affects the speed of the driving motor."

"Mentioning speed reminds me of something else I wanted to ask," I said. "Isn't there some arrangement I can use that will tell me when the motor is revolving at just the right speed of twelve hundred revolutions a minute? Between trying to synchronize the disk manually and recognize the proper speed visually, I've had so much to do when I try to operate this set that I haven't had time to enjoy the image."

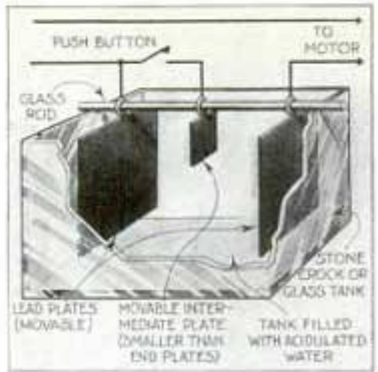
"Have you ever heard of a stroboscope?" Don asked.

"The name sounds familiar," I admitted. "It seems to me that it has something to do with moving machinery."

"Partly so. A stroboscope," Don began, trying his best to choose simple words and phrases, "is nothing but a flickering light that keeps time with the turns of a revolving object in such a way as to illuminate it at the same instant during each revolution. If a revolving wheel, let us say, is illuminated at the same time in every revolution, it will appear to be standing still, so a stroboscope is really an arrangement that allows us to make moving parts appear to be standing still."

"It all sounds very nice to me," I interrupted jokingly, "but what has the stroboscope got to do with television?"

"JUST this," Don replied. "By applying this to a scanning disk, we can tell when it is revolving twelve hundred revolutions a minute. If a neon glow lamp of the pilot light type, costing about seventy-five cents, is connected to the one-hundred-and-ten-volt, sixty-cycle alternating current supply, it will fluctuate from full-on to full-off one hundred and twenty times a second. The proper speed for the disk is twenty revolutions a second, just one sixth of the value for the fluctuations of the neon lamp; so if six dots are placed at equal divisions near the edge of the disk, they will appear to stand still when the disk is rotated at just the right speed and the spots are illuminated by the fluctuating neon lamp. You see, this gives us an ideal method for obtaining the proper speed. All we have to do is hold the small neon lamp close to the disk and increase the speed until the dots appear to stand still. The speed has to be right then, since only the proper speed will produce the effect."



A water resistance with movable plates can be used instead of the rheostats if desired

"Why can't I use the television neon lamp for this?" I suggested. "Then I could connect it up with a double-pole, double-throw switch in such a way as to allow me to switch into the one-hundred-and-ten-volt supply or the receiver."

"You can do that if you want to," Don agreed, "but I'd suggest using the cheaper type of pilot neon lamp; then if anything goes wrong you'll be out only half a dollar or seventy-five cents. You can screw the neon lamp into a hand socket."

"Let's see if I've got it right," I said. "First, I adjust rheostat number two until the dots appear to stand still under the illumination from the neon lamp connected into the one-hundred-and-ten-volt A. C. supply. Then I watch the image being formed and synchronize by operating the pendant push button held in my hand. If I need any further adjustment to obtain synchronism, I can obtain it by altering the resistance of rheostat one."

"That's right," Don said as he prepared to go. "Let me know how it works out."

Next month Mr. Waltz will continue this informative series of articles telling of an amateur's experiences in television.