



Fig. 1. The Emerson model 1158 remote-control unit shown here is capable of duplicating all of the TV set's front panel adjustments for picture and sound.

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In many cases these units are furnished with the set, but, they can be installed by any service technician.



Remote Control for TV

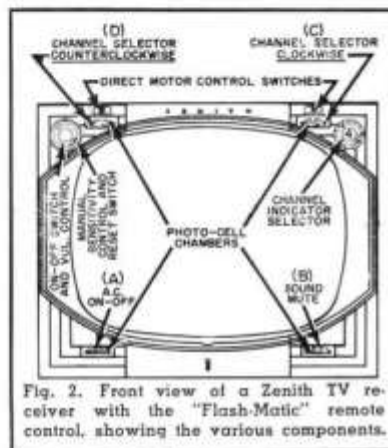


Fig. 2. Front view of a Zenith TV receiver with the "Flash-Matic" remote control, showing the various components.

NOW that TV receivers have become more standardized in circuitry and over-all design, some manufacturers are stressing special accessories for their sets as sales features. One of these is a remote-control attachment to permit the viewer to change channels and make other adjustments without leaving his seat. Quite a few receivers in the luxury class are delivered with remote control and this feature is optional on many medium-priced receivers. Adding remote control to older sets should prove an added income source for the alert service technician. Such installations are especially useful in homes where older persons or shut-ins find their major diversion in TV viewing.

Service-wise, the wired remote devices are subject to wire damage and mechanical failure of switches and relays. The photoelectric type of remote control invites defects in both the electronic and mechanical portions. This article presents a short survey of some of the most popular remote-control devices and gives troubleshooting and service data for most common defects.

Early remote-control TV systems used a separate r.f. tuner and i.f. system, feeding a video signal to the

receiver itself. This system required a coaxial cable, "B+" and heater wiring, and a fairly large remote tuning cabinet. None of the more recent systems are of this type. Instead, use is made of a small motor to turn the r.f. tuner shaft while the remote unit itself usually contains only potentiometers and switches. This means that the voltages required over the cable are either 117-volt a.c., 6-volt a.c., or simple audio or bias signals. As a result, most of the control units comprise little more than can be held in the palm of one's hand.

Perhaps the most elaborate system from the technician's point of view is the Zenith photoelectric tuning system. For the viewer it is the simplest. He merely shines the beam of a flashlight on one of four photocells to get the control actions he desires. This wireless system is described in more detail later and is quite spectacular in its operation, although fairly expensive.

Most of the other remote control systems use a wire between the set and the viewer. In some instances this is a simple two-wire line, while in others a more complex cable is used. One type of remote control system, the *Sentinel* unit, includes a remote speaker located

right in the control unit. This permits the viewer to look at his set from quite a distance and keep the volume low enough for comfortable listening.

Typical Remote Systems

The new Zenith "Flash-Matic" system is illustrated in Figs. 2 and 4. A total of four photocells is used. Each of these cells controls a relay through an amplifier tube. The upper two cells initiate counterclockwise or clockwise rotation of the tuner shaft by means of a small motor for channel selection. The lower-left cell turns the receiver on and off, while the lower-right photocell shorts out the sound. Since the photocell characteristics will vary with age and since ambient and incident light may further vary their operation, a manual sensitivity control is provided at the upper-left corner. There is also a reset and manual volume control and power switch.

Remote control of contrast or volume is not provided in this system. Fig. 4 shows the mechanical arrangement inside the cabinet. Note that there is a separate remote control chassis containing three tubes, relays, and additional sensitivity controls for the service technician's use. It is apparent from

this diagram that the sound is shut off at the speaker and not at the volume control. The turret tuner switching motor is geared down and stopped by means of detent and limit switches which disconnect it when a channel is tuned in.

Adjustment of the four internal sensitivity controls should be performed by the service technician after the set is installed. The room lighting should be arranged as it will be during normal receiver operation. Each control should be set individually to give good control action with the flashlight shining on the respective photocell from the farthest spot in the room. After each sensitivity control is set, the front panel sensitivity control is adjusted for best operation. The customer must be instructed not to touch the internal controls but to adjust only the front panel control if needed.

The "Automatic-Manual" switch located in the lower left-hand corner of Fig. 4 permits shutting off the remote-control chassis and converts the set to normal front-panel control operation. In the automatic position, the remote-control chassis will draw a small amount of power even if the receiver has been turned off.

A more complicated remote tuning unit is the Emerson model 1158 shown in Fig. 1. This unit makes use of three potentiometers and permits remote adjustment of volume, brightness, fine tuning, and channel switching. How this is done is shown in the circuit diagram of Fig. 5.

Note that there are two switches; one, S_1 , the a.c. power switch, and the other, S_2 , the motor actuating switch. The volume control is connected in parallel with the front panel volume control and uses shielded wire throughout. Brightness is varied by the usual d.c. voltage. The fine tuning control is accomplished by varying the "B+" voltage on the r.f. oscillator. This eliminates mechanical alignment problems at the fine tuning control on the tuner itself and accomplishes the control smoothly, electronically.

The channel tuning motor itself is stopped automatically by a conventional detent limit switch relay arrangement. Once the remote cord is unplugged from the chassis, the receiver operates in the conventional manner through the front panel controls.

When adjusting the front-end tuning circuits of a remotely-controlled set it is necessary to check the local oscillator "B+" voltage and set it to the correct median value before adjusting the individual channel tuning slugs of the local oscillator.

A completely different channel switching arrangement is used in the remote-control system of the *Walsco* model PC-9 TV receiver. The palmized remote control shown in Fig. 3 contains a channel selector knob similar to those usually found on the front panel of a TV receiver. In this system, the cable must carry about 17 wires to the TV receiver, but once the channel

is selected, the tuner will automatically keep turning until the correct channel is reached, and then the tuner motor stops.

A circuit of the entire system is shown in Fig. 7 and indicates that the motor operates a commutator-type switch. It keeps turning the commutator and the tuner shaft until the relay receives power through the remote switch ground return. Then the 6-volt relay opens its contacts and the motor power is interrupted.

In addition to the tuner selector, there is a simple "on-off" and volume control combination switch. All audio leads are shielded. When the remote control is not used, a local volume control on the TV receiver is used in the conventional manner. It may be mentioned that the particular TV receiver used with this remote-control system employs printed circuitry throughout.

A more elaborate remote-control system is marketed by *Sentinel Radio Corporation*, both for some of their latest TV receivers and for installation in older sets. Shown in Fig. 6, this control unit is much larger than those previously described and contains a small speaker. In addition to the 12-channel selector switch there are fine-tuning, volume, and brightness controls. The latter contains the "on-off" power switch. There is another small switch to select the remote loudspeaker. One of the features of this unit is that it is designed to be installed by TV technicians in almost any receiver having a 12-position tuner.

Before describing its installation, consider the circuit as shown in Fig. 9. At the left is the remote unit itself, with all controls and the small personal loudspeaker. The fine tuning is accomplished by varying the oscillator plate voltage just as in the *Emerson* unit. A switch on the fine-tuning control potentiometer chooses either remote or on-the-set channel selection. The volume control affects the loudspeaker directly and acts either on the remote or local speaker. Brightness is controlled in the conventional manner with the remote control in parallel with the on-the-set one. A 12-position switch selects channels by letting the motor run until the desired position



Fig. 3. Channel-selector, "on-off" switch, and volume control are included in this remote-control unit for Walsco TV sets.

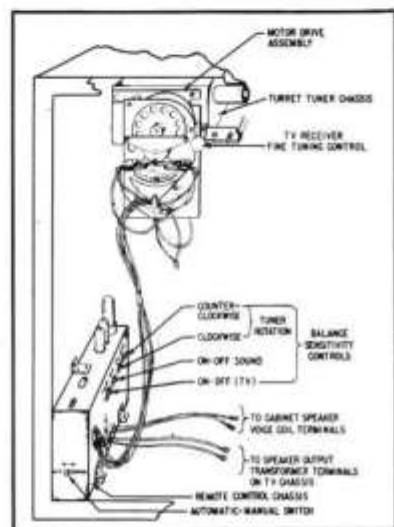


Fig. 4. The remote-control chassis and turret tuner motor drive for the Zenith "Flash-Matic" system are shown here.

is reached, when the motor circuit is opened.

A relay turns the receiver off and on. The primary winding of the 24-volt transformer is always connected across the line, but draws negligible power. Both the relay and the motor operate

Fig. 5. Schematic diagram of the Emerson model 1158 remote-control system. The unit on the right is the hand-held control; on the left, the part in the TV set.

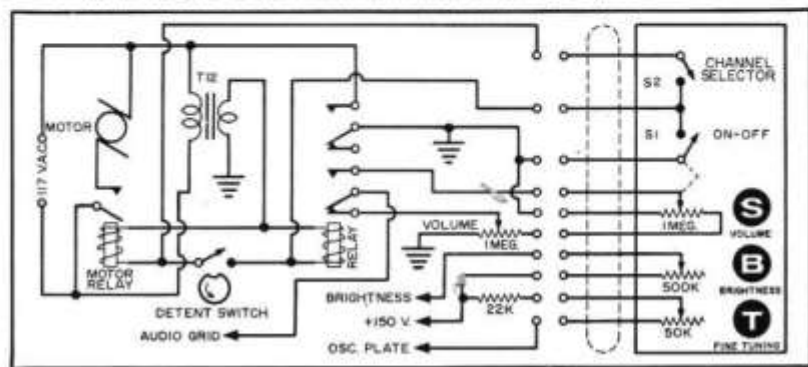




Fig. 6. The Sentinel remote-control unit. Besides including all necessary picture and sound adjustments, this unit also contains a small speaker for remote listening.

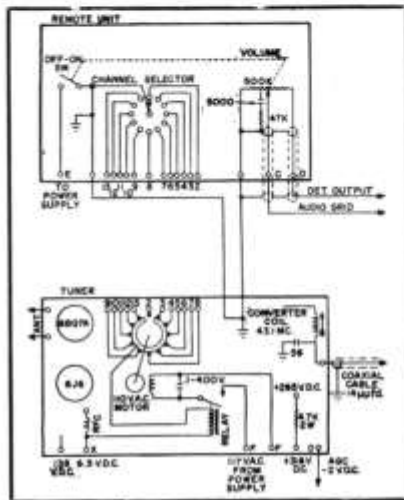
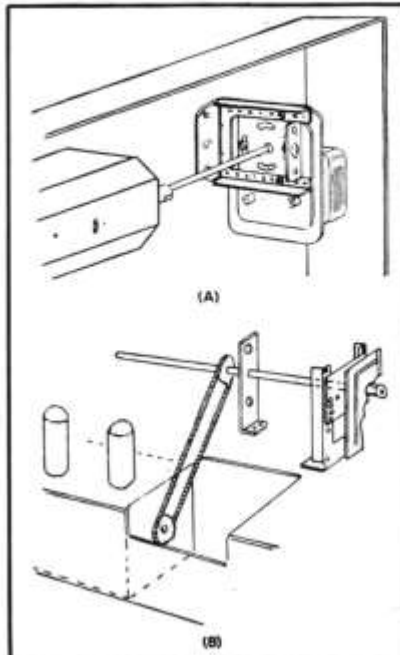


Fig. 7. Schematic diagram of both the remote unit (sometimes called the remote head) and the TV receiver portion of the Walco remote-control feature.

Fig. 8. Mechanical coupling systems used by the Sentinel remote-control for driving a turret-type TV tuner.



on 24 volts and are simply and ruggedly constructed. A brief analysis of the circuit of the remote switch and the station-seeking switch on the motor shaft will show that with the former set to channel 2, for instance, the motor will keep turning until the latter switch reaches channel 2.

Each remote-control kit is supplied with detailed installation instructions and it is interesting to note just how the mechanical arrangements are made. In Fig. 8A, the case is shown where the motor is mounted in line with the tuner shaft. A coupler is supplied which connects the rear of the tuner shaft to the motor drive shaft or an extension thereof. Different couplers and a long shaft are supplied permitting almost any mechanical arrangement. For sets where there is insufficient room behind the tuner, a special sprocket and chain can be used as in Fig. 8B, and the motor and drive shaft can be mounted either above, below, or at the side of the tuner. It is necessary to note the channel position of the tuner shaft and to set the coupler or sprocket to get the corresponding channel indication at the remote unit.

The Sentinel remote-control unit is furnished complete with cable, motor, and all hardware and even includes a drill for the tuner shaft locking pin. Two different couplers, shafts, bearing brackets, and sprockets are supplied, allowing the service technician to mount and arrange the motor assembly in any convenient way.

Servicing

Defects in most remote-control systems are easily separated from the conventional troubles due to the TV receiver itself, because in every instance it is possible to operate the set without the remote features. Once the trouble has been definitely located in the remote-control system it is also relatively simple to determine in which circuit it is. If the tuner switching does not perform properly, the volume control obviously need not be checked. There is, however, one important point which is the same in practically every system. This is the common ground

return lead. Be sure to check its path through with an ohmmeter, especially if the remote control does not work properly on any control.

In general, it is possible to divide all defects in remote control devices into the following categories:

- Broken wire or bad insulation.
- Contact troubles.
- Poor lubrication (sticky shafts, detents, or relays).
- Burned-out motors, relays, or solenoids.

Broken mechanical parts (gears stripped, shaft worn, etc.).

In the case of the Zenith "Flash-Matic" system, there are no control wires from the user to the set, and this eliminates the first category, but there could be defective control amplifiers, photocells, and other parts. Troubleshooting this system is not confined to a mechanical check and continuity measurements, and the manufacturer's data must be followed carefully. Special consideration must be given to the photocells and their sensitivity adjustment.

Broken wires and contact troubles are usually found by inspection and ohmmeter checks. Lubrication troubles may result in excessive wear of bearings or even broken gears, etc. Only replacement with the proper part will remedy this type of defect. At this point it might be mentioned that ordinary lubricating oil may not be satisfactory due to the accumulation of dirt and dust plus the heat generated in the set. Silicone grease is probably the best, but a high grade automobile grease is usually satisfactory for shaft bearings, cams, and other moving parts. Burn-outs in motors, relays, or solenoids are often caused by excessive voltage or current and this may, in turn, be caused by some other defect. Be sure whenever a burn-out of this type is encountered, to check the various voltages both during warm-up and after a few minutes operation.

Other defects such as worn-out potentiometers, defective switches, etc., are so similar to those ordinarily found in radio and TV sets that they should not cause the experienced TV technician any trouble.

Fig. 9. Schematic diagram of the Sentinel remote-control system for all TV sets.

