

# Plain Talk

## and Technical Tips

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## MATV and CATV Provisions in RCA Color TV

### VHF Tuner With Increased Shielding and Direct 75-ohm Shielded Input

To help insure optimum, interference-free reception from master antenna (MATV) and community antenna television (CATV) systems, RCA in model year 1973 began introducing color TV receivers

equipped with VHF tuners which provide increased shielding and/or provisions for VHF input via a 75-ohm shielded cable connected directly to the input of the VHF tuner.

### The CableGuard VHF tuner

The solid-state VHF tuner with increased shielding, called CableGuard, was first introduced in

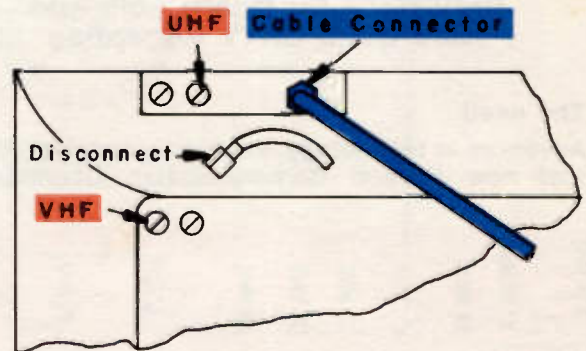
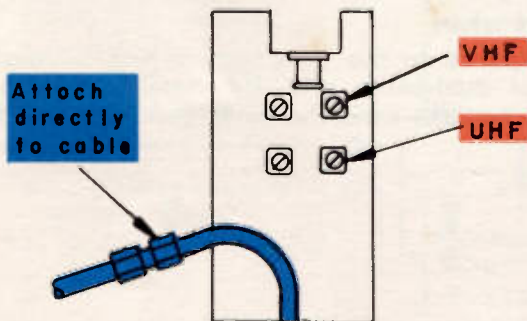
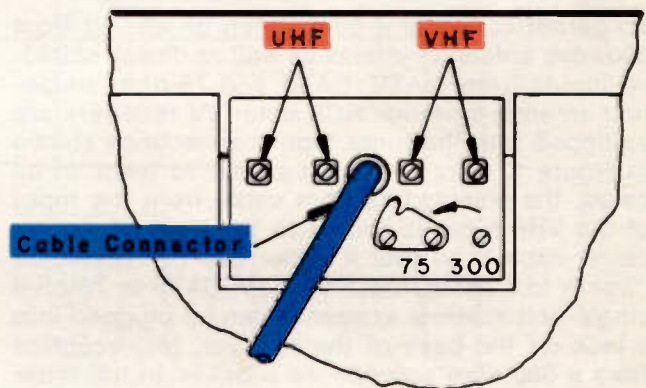
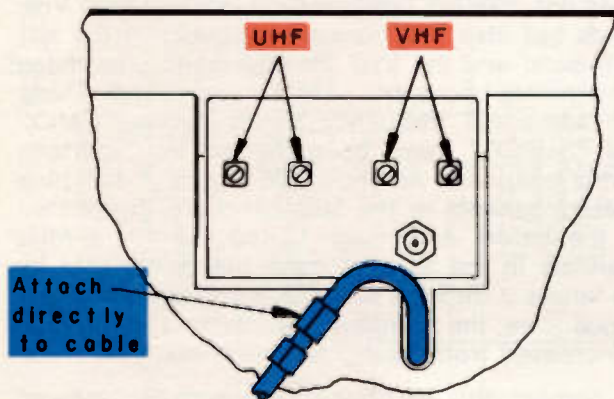


Figure 1—Examples of the cable and antenna connections on RCA Color TV receivers equipped with a direct 75-ohm shielded input to the VHF tuner. Each is shown with MATV or CATV cable connected directly to VHF tuner via the 75-ohm shielded cable.

1973-model 21- and 25-inch (diagonal) color TV receivers equipped with XL-100 (all-solid-state) chassis, and is used now in most color TV receivers equipped with XL-100 chassis. The increased shielding provided by the CableGuard VHF tuner system is obtained by enclosing all tuner signal-processing circuits within the solid metal frame of the tuner and by routing incoming signals directly to the input of the tuner through a shielded cable. The additional shielding provided by this design minimizes the probability of spurious and other unwanted signals entering the signal-processing circuits of the receiver and causing interference in the picture or sound.

### Direct 75-ohm shielded VHF input

The 75-ohm shielded direct connection to the VHF tuner, which is inherent in the design of the CableGuard tuner system, also is used in most other RCA color TV receivers. It eliminates the need for an impedance-matching device between the 75-ohm MATV or CATV cable and the input to the VHF tuner, and helps insure that maximum signal will be transferred to the tuner input from the MATV or CATV cable, with a minimum amount of ghost-producing signal reflected back into the source.

To permit convenient connection of lead-in from 300-ohm antenna systems as well as direct, shielded inputs from MATV, CATV and 75-ohm single-unit antenna systems, RCA color TV receivers are equipped with the tuner input connections shown in Figure 1, or connections similar to them. In all cases, the shielded 75-ohm cable from the input of the VHF tuner is routed to the back of the receiver cabinet so that it either can be connected directly to a cable from an MATV, CATV or 75-ohm single-unit antenna system or can be plugged into a jack on the back of the receiver, for reception from a 300-ohm antenna via a balun. In the latter case, the lead-in from the 300-ohm antenna system is connected to the conventional screw-type VHF connections near the cable jack.

## Provisions for Dual-Cable and Wide-Band CATV Reception

### The need

Advances in technology, marketing considerations and new Federal Communication Commission

rules have prompted Community Antenna Television (CATV) system operators to increase the amount of programming and informational services made available to subscribers. This, in turn, has required the development of CATV systems capable of distributing more than the twelve standard VHF TV channels.

Various methods of increasing the number of CATV channels have been considered. Of these, the following two have evolved as the most practical:

**Dual cable**—This type of CATV system uses two 12-channel distribution systems in parallel, thereby doubling the number of channels available to the subscriber. Although the total equipment, installation and maintenance costs of this type of CATV system can be as much as twice that of a single-cable system, it does *not* require internal modification of the subscriber's receiver, nor does it require that the subscriber be furnished a frequency conversion unit. It *does* require, however, a device whereby the subscriber can switch the input of the receiver from one cable to the other.

**Wide-band, single-cable**—This type of cable system increases the number of available channels by using not only the two standard low and high VHF bands but also the frequencies between the aircraft band and the VHF TV high band plus those immediately above the VHF TV high band. These two additional frequency bands, labeled "MID" and "SUPER," have been divided into fourteen 6-MHz channels. As shown in Figure 2, the nine 6-MHz channels in the MID band are designated by the letters A through I, and the five 6-MHz channels in the SUPER band are designated by the letters J through N. By using these additional frequencies, the number of available TV channels is increased from twelve to twenty-six.

To convert the MID-band (A-I) and Super-band (J-N) channels to standard TV frequencies which can be processed by a TV receiver, the subscriber must have either an external frequency-conversion unit or a TV receiver with such a unit built in.

### The receiver

In response to the development and increasing use of dual-cable and wide-band, single-cable CATV systems—and the cable-switching and fre-

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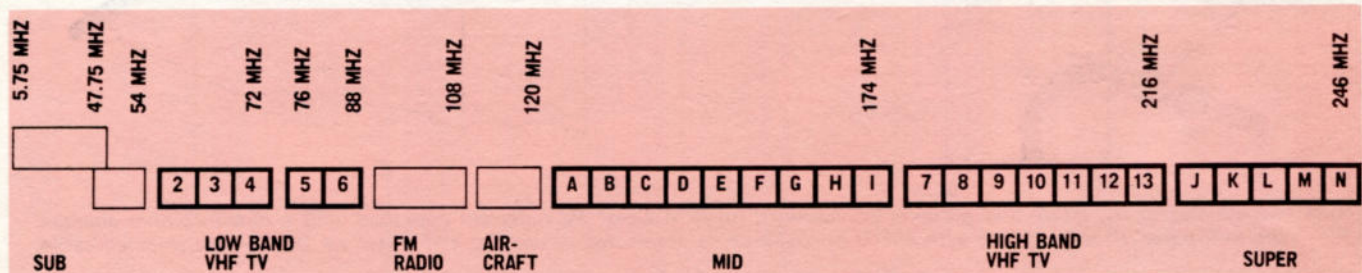


Figure 2—Channel allocations for wide-band, single-cable CATV systems.

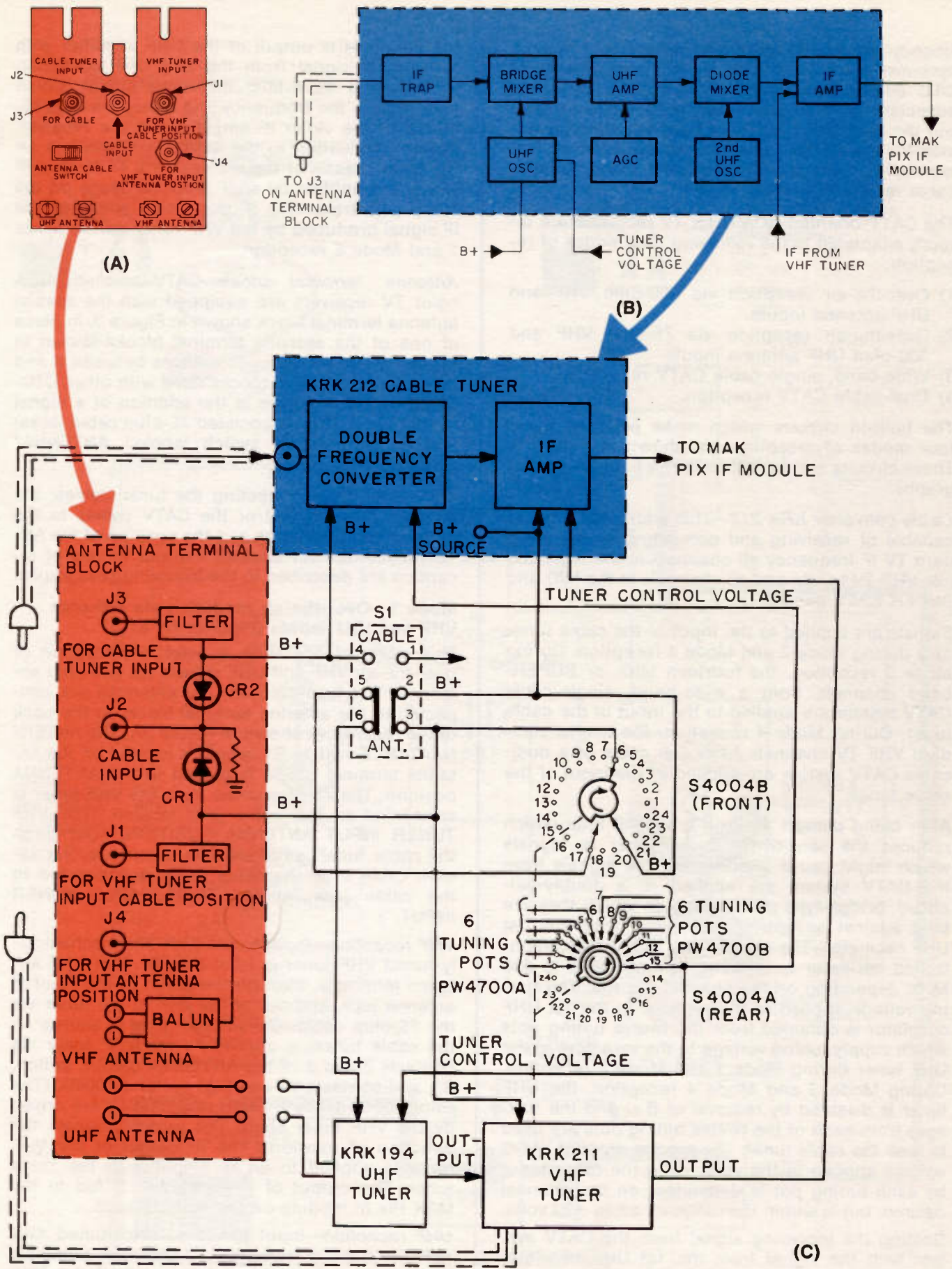


Figure 3—The built-in circuits and antenna terminal block shown here make CATV-oriented RCA color TV receivers directly adaptable to dual-cable and wide-band, single-cable CATV reception, without the need for an external cable-switching device or a frequency-conversion unit. (A) Line drawing of special antenna terminal block diagramed in (C). (B) Diagram of KRK 212 cable tuner. (C) Functional diagram of antenna terminal block and tuning system.

quency-conversion requirements inherent in such systems—RCA has introduced this year a series of CTC 68-equipped color TV receivers designed especially for reception from these systems, without the need for an external cable-switching device for dual-cable reception or an external frequency conversion unit for wide-band, single-cable reception.

The CATV-oriented RCA color TV receivers are directly adaptable to the following four modes of reception:

- 1) Over-the-air reception via 300-ohm VHF and UHF antenna inputs
- 2) Over-the-air reception via 75-ohm VHF and 300-ohm UHF antenna inputs
- 3) Wide-band, single-cable CATV reception
- 4) Dual-cable CATV reception.

The built-in circuits which make possible these four modes of reception are shown in Figure 3. These circuits are described in the following paragraphs.

**Cable converter KRK 212**—This additional tuner is capable of receiving and converting to the standard TV IF frequency all channels in the high and low VHF TV bands *and* all channels in the MID and SUPER CATV bands.

Signals are applied to the input of the cable tuner only during Mode 3 and Mode 4 reception. During Mode 3 reception, the fourteen MID- or SUPER-band channels from a wide-band, single-cable CATV system are applied to the input of the cable tuner. During Mode 4 reception, the twelve standard VHF TV channels from one cable of a dual-cable CATV system are applied to the input of the cable tuner.

After being passed through a special filter which reduces the sensitivity of the tuner to signals which might cause interference, the signals from the CATV system are applied to a doubly-balanced, bridge-type mixer stage, in which they are beat against an appropriate signal from the 1st UHF oscillator. The signal from this varactor-controlled oscillator is variable from 640 MHz to 830 MHz, depending on the channel desired. The tuning voltage applied to the varactor in the 1st UHF oscillator is obtained from the twelve tuning pots which supply tuning voltage to the varactors in the UHF tuner during Mode 1 and Mode 2 reception. During Mode 3 and Mode 4 reception, the UHF tuner is disabled by removal of B+, and the voltages from each of the twelve tuning pots are used to tune the cable tuner. The precise amount of DC voltage applied to the varactor in the cable tuner by each tuning pot is dependent on the channel desired, but is within the range of +5 to +20 volts.

Beating the incoming signal from the CATV system with the signal from the 1st UHF oscillator produces a 587.75-MHz difference signal, which then is amplified by the UHF amplifier stage and applied to a diode mixer. This second mixer beats

the 587.75-MHz output of the UHF amplifier with a 542-MHz signal from the 2nd UHF oscillator, producing a 45.75-MHz difference signal, which conforms to the frequency and bandpass requirements of the video IF amplifiers of the receiver. Before application to the MAK Pix IF module on the main chassis of the receiver, the 47.75-MHz IF signal is amplified by an IF amplifier stage on the cable converter. This IF stage also amplifies the IF signal produced by the VHF tuner during Mode 1 and Mode 2 reception.

**Antenna terminal block**—CATV-oriented RCA color TV receivers are equipped with the special antenna terminal block shown in Figure 3, in place of one of the antenna terminal blocks shown in Figure 1. The principal differences between it and the antenna terminal blocks used with other CTC-68 equipped receivers is the addition of a signal splitter (with three associated 75-ohm cable jacks) and a two-position switch labeled ANTENNA/CABLE.

The method of connecting the tuner cables, the antenna lead-ins and/or the CATV cables to the antenna terminal block and the position of the ANTENNA/CABLE for each of the four modes of reception are described in the following paragraphs.

#### **Mode 1—Over-the-air reception via 300-ohm VHF and UHF inputs (Figures 4A & C)**

This mode of operation is used for reception of over-the-air VHF and UHF signals via 300-ohm antennas. The lead-ins from the antennas are connected to the antenna terminal block on the back of the receiver as shown in Figure 3A. The ANTENNA/CABLE switch, S1, which is located on the antenna terminal block, is placed in the ANTENNA position. The 75-ohm cable from the VHF tuner is connected to the cable jack labeled "For VHF TUNER INPUT ANTENNA POSITION." (Although the cable tuner is not used in this mode, the 75-ohm cable from the cable tuner is connected to the cable jack labeled "FOR CABLE TUNER INPUT.")

**VHF reception**—Input to the KRK 211 mechanically-tuned VHF tuner is from the 300-ohm VHF antenna terminals, through the balun to the 75-ohm antenna jack, and out of the jack to the tuner via the 75-ohm cable. B+ voltage, from a source on the cable tuner, is applied to the VHF tuner via contacts 2 and 3 of the ANTENNA/CABLE switch, S1, and contacts 21 and 6 of switch S4004B. (The rotors of switches S4004B and S4004A are driven by the VHF tuner shaft. The arrows indicate the direction of rotation.) The IF output of the VHF tuner is applied to an IF amplifier in the cable tuner. The output of this amplifier is fed to the MAK Pix IF module on the main chassis.

**UHF reception**—Input to the varactor-tuned KRK 194 UHF tuner is from the 300-ohm UHF terminals on the antenna terminal block. When the VHF CHANNEL SELECTOR is rotated to the "U" position, B+, from a source on the cable tuner, is ap-

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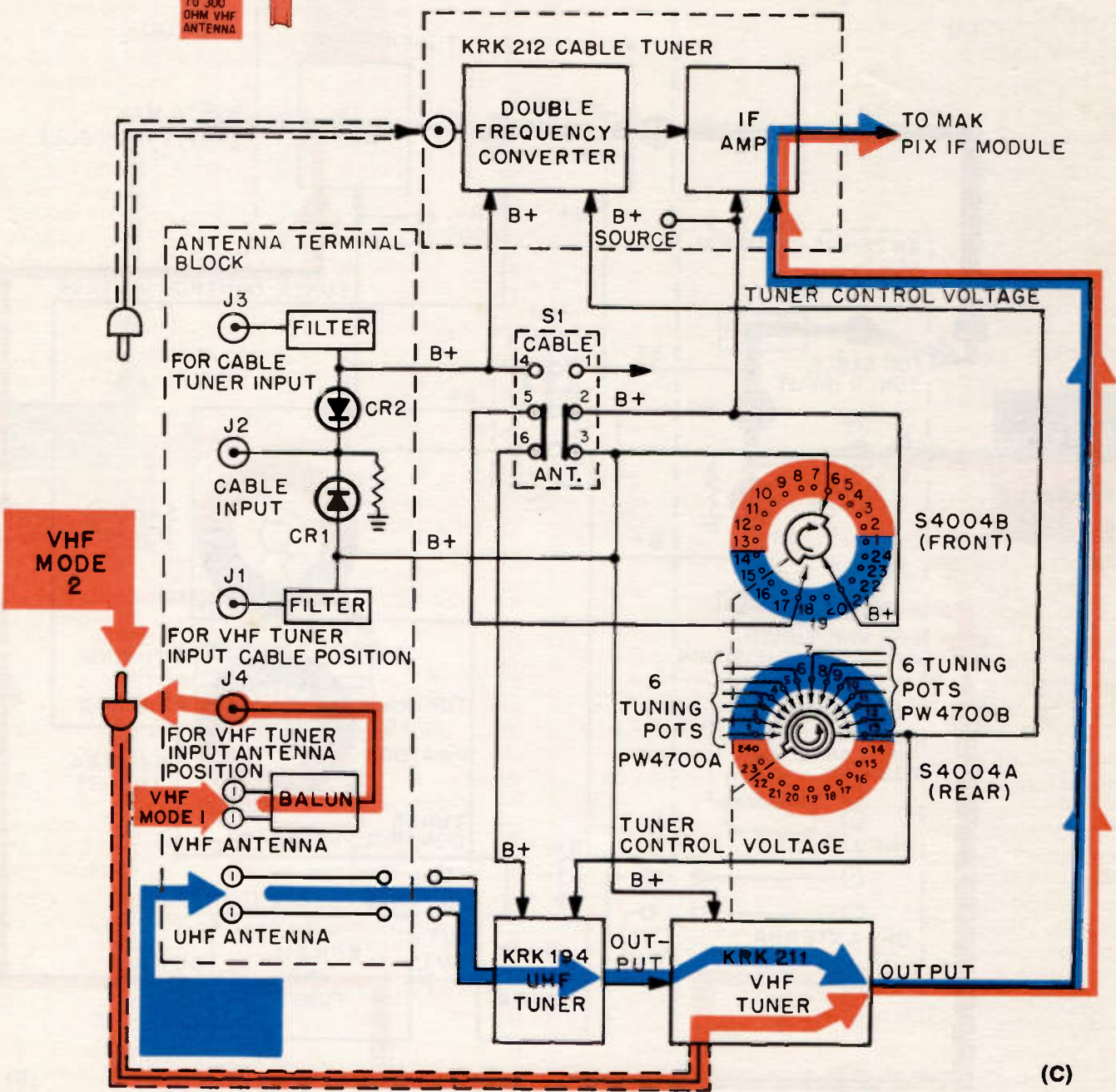
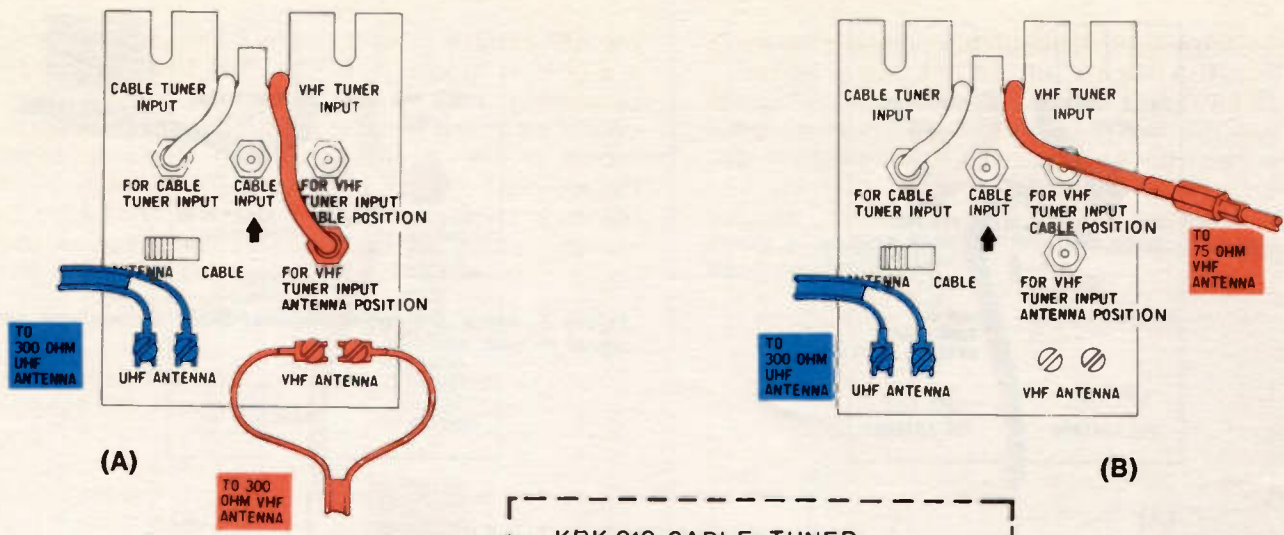


Figure 4—Mode 1 and 2 antenna terminal block connections and signal processing. (A) Mode 1 connections. (B) Mode 2 connections. (C) Mode 1 and 2 signal processing.

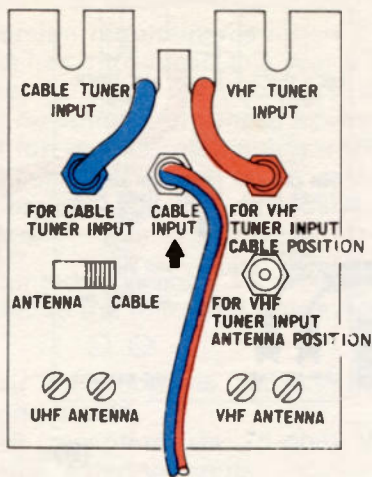
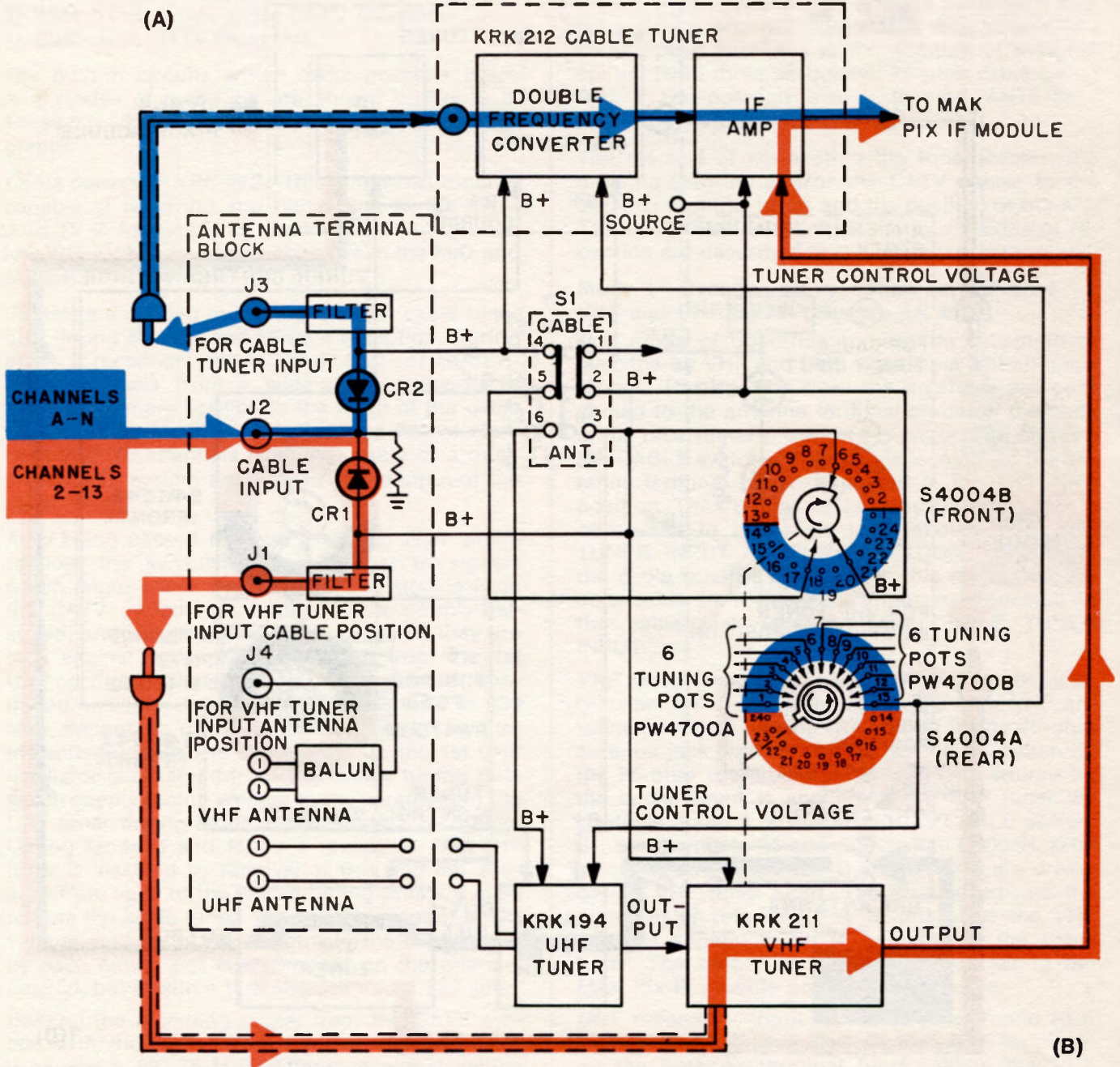


Figure 5—Mode 3 antenna terminal block connections and signal processing.



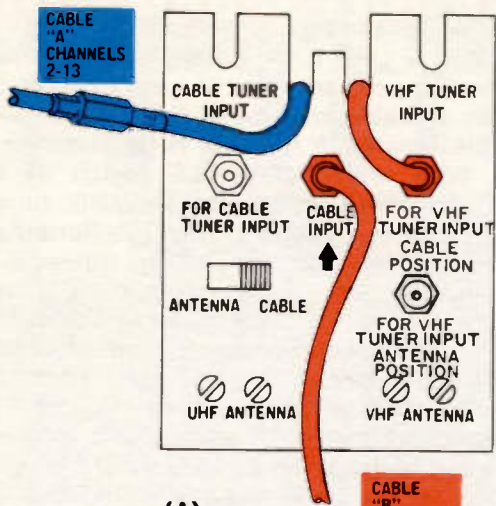
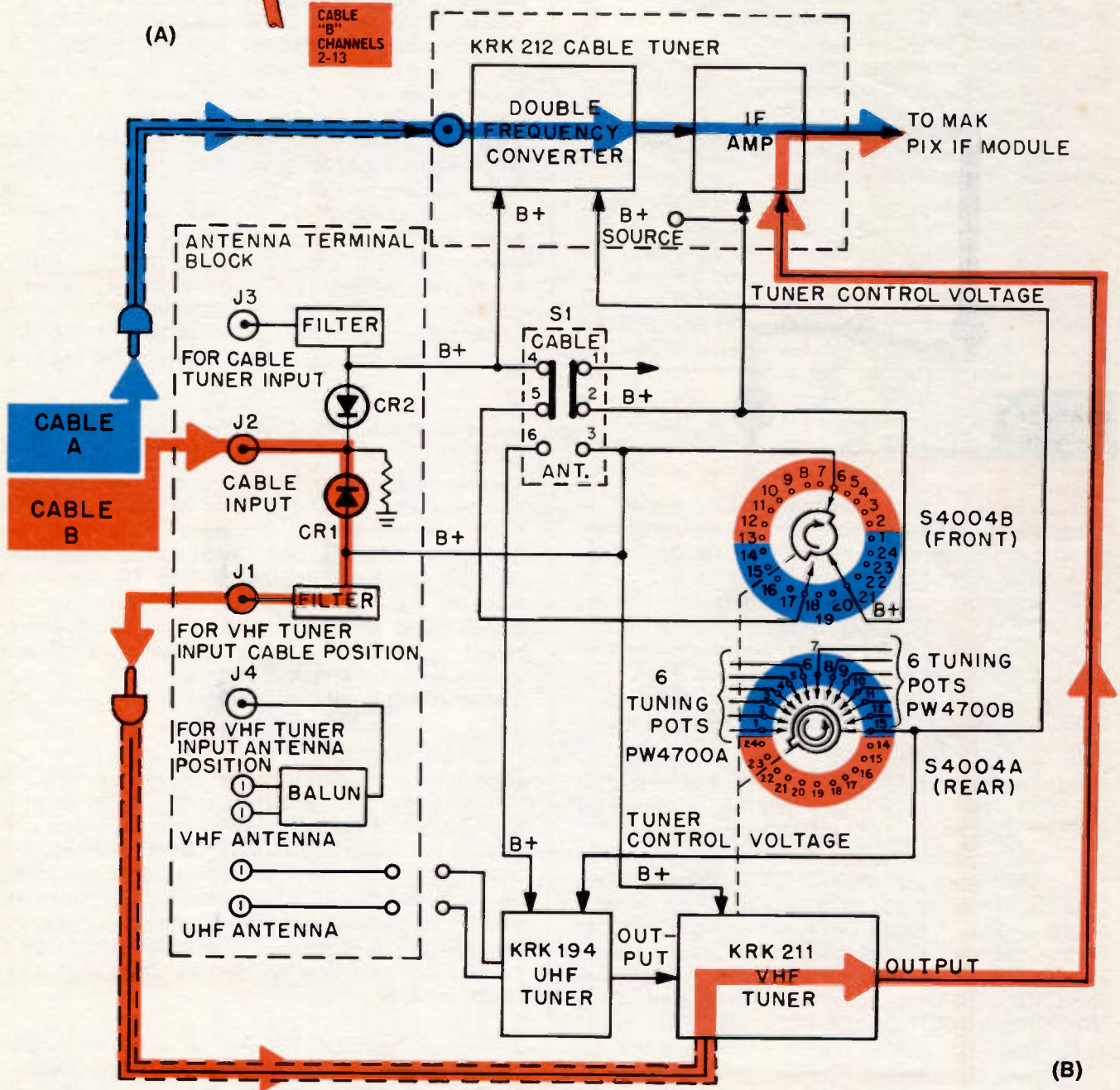


Figure 6—Mode 4 antenna terminal block connections and signal processing.



plied to the UHF tuner via contacts 21 and 18 of switch S4004B and contacts 5 and 6 of the ANTENNA/CABLE switch, S1. Tuner control voltage, from 12 tuning pots on two separate circuit boards, is applied to the varactors in the UHF tuner via contact 13 of switch S4004A. The IF output of the UHF tuner is fed through the VHF tuner to the IF amplifier in the cable tuner and then to the MAK Pix IF module on the main chassis. DURING UHF reception, B+ voltage is applied to the VHF tuner from a source in the cable tuner via contacts 2 and 3 of ANTENNA/CABLE switch S1.

#### **Mode 2—Over-the-air reception via 75-ohm VHF and 300-ohm UHF inputs (Figures 4B & C)**

Operation in this mode is the same as that in Mode 1 except that the input to the VHF tuner is from a 75-ohm antenna cable, which, as shown in Figure 3B, is connected *directly* to the 75-ohm VHF tuner cable instead of through the 300-ohm VHF input and balun.

#### **Mode 3—Wide-band, single-cable CATV reception (Figures 5A & B)**

This mode of operation is used for reception from a wide-band, single-cable CATV system. As described previously, such a system provides the subscriber up to 26 TV channels over a single 75-ohm cable by using not only the standard low and high VHF TV bands but also the MID and SUPER bands, which are divided into fourteen 6-MHz channels designated by the letters A through N, as shown previously in Figure 1. Channels 2 through 13 are processed by the VHF tuner, and channels A through N are processed by the cable tuner.

The cable from the wide-band CATV system is connected to the CABLE INPUT jack on the antenna terminal block of the receiver, as shown in Figures 4A & B. The cable from the KRK 212 cable tuner in the receiver is connected to the jack labeled "FOR CABLE TUNER INPUT" on the antenna terminal block. The 75-ohm cable from the VHF tuner is connected to the jack labeled "FOR VHF TUNER INPUT CABLE POSITION." The ANTENNA/CABLE switch, S1, is placed in the CABLE position.

*Reception of channels 2-13*—When any of the 12 standard VHF channels are selected by rotating the VHF CHANNEL SELECTOR to positions 2-13, B+, from a source on the cable tuner, is applied to the VHF tuner via contacts 21 and 18 of switch S4004B. The same contacts also apply B+ voltage to the anode of diode CR 1 of the signal splitter on the antenna terminal block. This forward biases diode CR 1, which, in turn, couples the signal from the CABLE INPUT jack to the jack labeled "FOR VHF TUNER INPUT CABLE POSITION." The signal is fed from this jack to the VHF tuner via the 75-ohm tuner input cable. The IF output of the VHF tuner is fed to the IF amplifier stage in the cable tuner, and then to the MAK Pix IF module in the main chassis.

*Reception of channels A-N*—During Mode 3 operation, the 12 UHF tuner positions and corresponding tuning pots are used to select twelve of the fourteen available wide-band CATV channels, which are designated A through N, as described previously. With ANTENNA/CABLE switch S1 in the CABLE position, positioning the UHF tuner system to any of the twelve preset positions (labeled A through L for cable operation) applies B+ voltage to the frequency converter portion of the KRK 212 varactor-tuned cable tuner via contacts 21 and 18 of S4004B and contacts 5 and 4 of the ANTENNA/CABLE switch, S1. The same contacts also apply forward bias to the anode of diode CR 2 of the signal splitter. With diode CR 2 forward biased, the signal from the CABLE INPUT jack is coupled through the diode and associated filter to the jack labeled "FOR CABLE TUNER INPUT." The signal then is fed from this jack to the input of the cable tuner via the 75-ohm input cable. Tuning voltage for the varactors in the cable tuner is selected by the rotor of switch S4004A and applied to the cable tuner via contact 13 of switch S4004A. The frequency-converter portion of the cable tuner first converts the selected MID- or SUPER-band channel to a frequency in the UHF range and then converts this UHF signal to the standard TV IF frequency. The TV IF output of the frequency converter is fed to the IF amplifier stage in the cable tuner, which, in turn, couples it to the MAK Pix IF module on the main chassis of the receiver.

#### **Mode 4—Dual-cable CATV reception (Figures 6A & B)**

This mode is used for reception from two separate 75-ohm CATV cables, each of which provides up to 12 standard VHF TV channels (2-13). As shown in Figures 6A & B, one CATV cable, designated "A," is connected directly to the 75-ohm cable from the input of the frequency-converter portion of the cable tuner. The other CATV cable, designated "B," is connected to the CABLE INPUT jack of the receiver antenna terminal block. The ANTENNA/CABLE switch is placed in the CABLE position.

*Reception from CATV cable "A"*—The method of selecting and processing the VHF TV signals from CATV cable "A" is the same as that described previously for reception of wide-band channels A-N during Mode 3 operation, except that the cable "A" signals are applied *directly* to the input of the frequency-converter portion of the cable tuner instead of being processed through the diode CR 2 portion of the signal splitter, as were wide-band channels A-N.

*Reception from CATV cable "B"*—The method of selecting and processing the VHF TV signals from CATV cable "B" is exactly the same as that described for the reception of channels 2-13 during Mode 3 operation. □