

## THE KRAFT CUSTOM SINGLE CHANNEL RELAY RECEIVER

Kraft Superheterodyne Receiver is unquestionably the finest and most reliable unit available to radio control enthusiasts. Its sensitivity (operating range) and stability are unequalled. Its selectivity and excellent AGC (automatic gain control) system make reliable control possible on our crowded radio control frequencies. Unlike many superheterodyne receivers, the KR-1 is not particularly sensitive to noise. Consequently, it can be used with most actuators, including the motor-driven type without undue precautions.

The receiver will reject signals 5,000 cycles per second or less away from its operating frequency. However, with your transmitter off, you may notice that your receiver can be operated by nearby transmitters which are 50 kc or more away from your receiver's frequency. This has nothing to do with the receiver's selectivity. It is caused by the square wave or other chopped form of modulation used in many radio control transmitters. This type of modulation causes a dirty transmitted signal, and it may splatter over as much as plus or minus 100 kc from the actual frequency of the transmitter. Generally, this splatter is not a problem at the low power levels used in radio control. The carrier wave signal from your transmitter will usually be sufficient to turn the AGC system on of your KR-1 receiver, which reduces its gain and, consequently, will eliminate this adjacent channel interference. However, some single channel transmitters splatter so badly that you may be risking your aircraft to fly when they are in use.

The new Kraft KT-1 all transistor transmitter employs sine wave modulation, and, consequently, will produce no interference to other nearby radio control channels. It is highly recommended that this receiver be utilized with the Kraft KT-1 transmitter.

Properly installed, your receiver will require little or no maintenance or retuning for years to come. It will function with absolute reliability at any temperature from zero to over 140° F.

It is always desirable to power any radio control receiver from batteries separate from those used for the actuator. This is particularly true for single channel units. Consequently, this receiver has been designed to use the widely available, inexpensive, and very light 9 volt dry batteries. The higher operating voltage also increases the receiver's over-all reliability.

The receiver utilizes a relay for switching the desired actuator. This allows a great deal more flexibility in the choice of the actuator to be used with the receiver, as well as with the battery voltages to be used with the actuator, than is permitted with the less expensive relayless-type receivers.

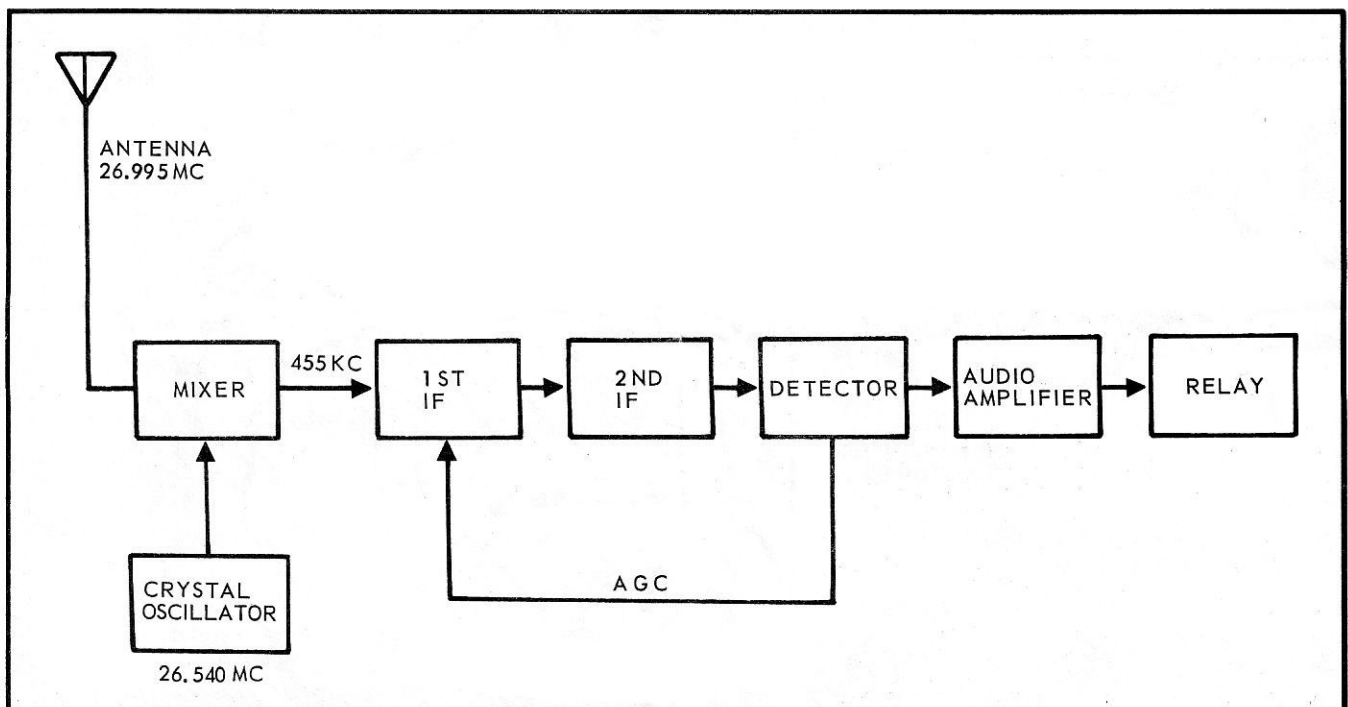
### SUPERHETERODYNE RECEIVER

When two signal frequencies are combined, two additional frequencies are created. One is the sum of the two combining frequencies, the other is the difference between these two frequencies. In your superheterodyne receiver the incoming frequency is combined in the mixer with the frequency generated by the crystal controlled local oscillator in the receiver. The difference between these frequencies is called the intermediate frequency, and this is amplified by the intermediate frequency amplifiers. For example, suppose the operating frequency is 26.995 Mc and our intermediate frequency amplifier is designed to work at 455kc. The local oscillator the receiver must operate on a frequency which is 455 kc above or below 26.995 Mc. Thus, we may use a crystal in the receiver of 26.995 minus 455 kc, which equals 26.540 Mc or 26.995 Mc plus 455 kc, which equals 27.450 Mc. In our radio control receiver, the local oscillator frequency is generally operated below the signal frequency. Therefore, for a transmitter frequency of 26.995 Mc, the receiver crystal's frequency will be 26.540 Mc. However, for ease of identification, the top of the crystal will usually be marked with the operating frequency of the receiver rather than the actual frequency of the crystal.

In receivers of this type, there is also another transmitter frequency which may operate the receiver. This is known as the image frequency and will be 910 kc (twice 455 kc) below the main frequency. Remember that the intermediate frequency is 455 kc and that our local oscillator generates a signal this amount below the operating frequency of 26.995 Mc. Naturally, it also operates 455 kc above the frequency of 26.085 Mc.

This is known as the image frequency. Our mixer stage is tuned to 26.995 Mc, but at these high frequencies the tuned circuit is not sharp enough to give very much attenuation to the image frequency. Fortunately, the image frequencies do not create a problem because the part of the frequency band which they fall in is not widely used.

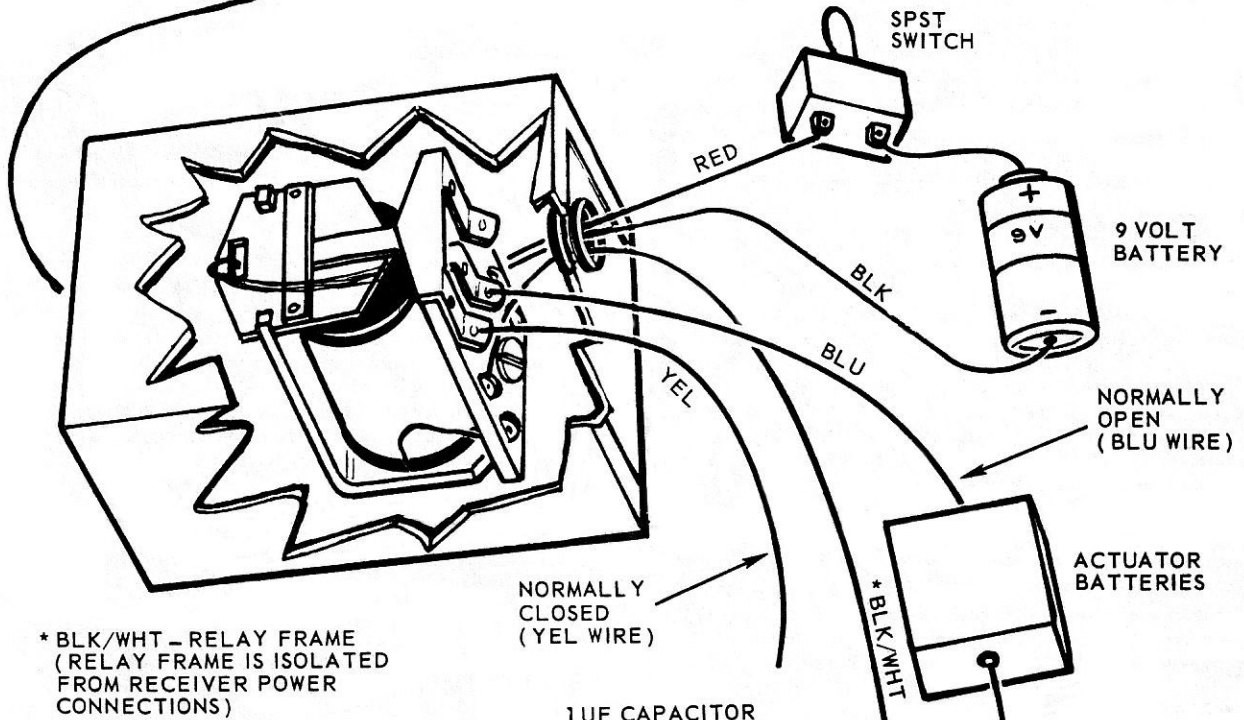
The reason the superheterodyne receiver is able to reject other nearby transmitter frequencies is because the high frequency is converted to a low intermediate frequency of 455 kc. The signal is then amplified through several sharp tuning stages which narrow the bandwidth of the receiver to the point where it will reject all but the desired frequency.



ANTENNA 12-30 INCHES  
(KEEP CLEAR OF PUSH RODS,  
METAL PARTS etc.)

RECEIVER BATTERIES

| BURGESS | EVEREADY |                               |
|---------|----------|-------------------------------|
| NO. 2U6 | NO.216   | FLAT TRANSISTOR RADIO TYPE    |
| P6      | NO. 226  | SAME SIZE AS "C" MEDIUM CELL  |
| L6      | NO. 206  | SAME SIZE AS STANDARD PENCELL |



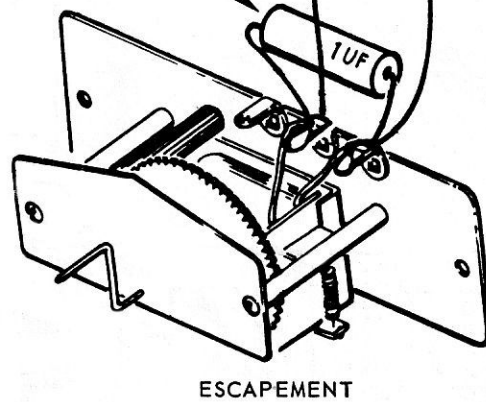
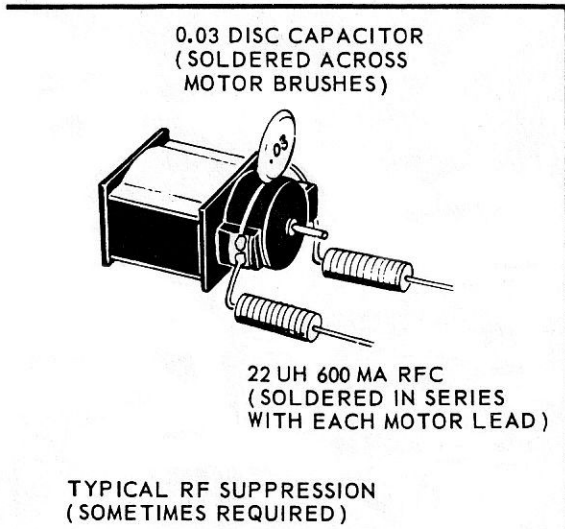
\* BLK/WHT - RELAY FRAME  
(RELAY FRAME IS ISOLATED  
FROM RECEIVER POWER  
CONNECTIONS)

NORMALLY  
CLOSED  
(YEL WIRE)

NORMALLY  
OPEN  
(BLU WIRE)

ACTUATOR  
BATTERIES

1UF CAPACITOR  
(FOR ARC SUPPRESSION)



## INSTALLATION

The receiver should be loosely mounted in foam rubber for mechanical protection and to prevent vibration from interfering with normal relay operation. The receiver should be kept clear of push rods, wiring, metal parts, etc. Keep all wiring as short as possible. Be sure that every solder connection is perfect and that the solder joints are protected against vibration by tight-fitting sleeving. The receiver is not particularly sensitive to noise, but avoid excessive metal to metal contact in push rods, linkages, etc., wherever possible.

## ANTENNA

The antenna length is not critical and may be any convenient length from 12 to 30 inches. Naturally, the longer antenna will give more range, but even the short 12 inch antenna will provide more than adequate sensitivity. The antenna must be kept clear of all push rods, metal parts, the receiver case, wiring, etc. It should be run in as straight a line as possible. Generally speaking, it is most convenient to merely run the antenna back to the tail of the aircraft either inside the fuselage or externally and fastened to some convenient point, such as the model aircraft fin.

## TUNING

A hole is provided in the receiver case to allow for final RF tuning. No other tuning adjustments are necessary, and the warranty is void if tuning of the IF transformers is attempted. The receiver should be installed in the model with the connection to the batteries, actuators, and switches made. Slide the receiver out of the compartment just far enough to expose the tuning hole in the cover. A hex-type plastic tuning wand is used to match the hex hole in the tuning slug. Remove your transmitter's antenna, and if a helper is available, have him push the tone button of the transmitter and hold it. Have your helper walk out with the antenna off of the transmitter until the actuator ceases to function, indicating that the relay is now not pulled in. Then rotate the receiver's tuning slug back and forth until the relay pulls in again and the actuator operates. Have your helper then walk out further until a point is reached where the receiver's tuning becomes very sharp. A range of 10 to 15 feet from the receiver, with the transmitter's antenna off, should easily be obtained. Retuning will only be required when the receiver is changed to a different installation or if the receiver's antenna length is changed.

## ARC SUPPRESSION

It is most desirable that arc suppression be included across the coil terminals of your escapement or across the brush terminals of any motorized actuator. A one microfarad electrolytic capacitor is included with the receiver. The installation diagram shows the capacitor will dampen the inductive kick of the coil and will prevent the relay contacts from excessive arcing. Many inexpensive toy-type motors put out an extremely high level of electrical noise. The diagram shows RF chokes hooked in series with the motor's leads to minimize their radiation of electrical noise interference. This noise suppression will not be necessary with any of the better motorized devices. However, even with this noise suppression, some electrical motors may be found to be unusable with this or any other radio receiver.

## CHANGING FREQUENCY

The owner should be aware that retuning of the RF slug of the receiver has no effect whatsoever on the operating frequency of the receiver. This frequency can only be changed by changing the receiver's local oscillator crystal. Should you desire to have your receiver changed to another radio control frequency, return it to the factory along with your transmitter. Do not attempt to change the frequency by changing crystals yourself. The transmitter and receiver crystals are ground with specific tolerances. While these tolerances are extremely close, it is entirely possible that they could be far enough off to substantially degrade the performance of the receiver. Therefore, realignment is desirable when changing the receiver from one frequency to another. Enclose your check or money order for \$ 7.50 to cover the cost of changing crystals in your transmitter and receiver as well as realignment and a thorough operational check of both.

## TROUBLE SHOOTING

If the receiver fails to operate, the most frequent sources of trouble are:

1. Bad switch
2. Improper or defective wiring
3. Run down batteries
4. Transmitter not matched closely enough to the receiver
5. Defective transmitter

### GUARANTEE

The Kraft Custom Superheterodyne Receiver is guaranteed against defects in workmanship and material for 90 days from the date of purchase. This guarantee does not cover semiconductors, crystals, or relays. In case of trouble, return the unit to the factory. Enclose \$ 2.00 to cover the cost of return postage, insurance and handling. If the unit is judged to be defective, we will immediately repair or replace it and return it to you at no charge. If our inspection indicates that it has been tampered with or physically damaged, we will send you a repair estimate. No COD shipments will be made. Failure to include the handling charge will indefinitely delay the return of your unit.

### CONCLUSION

We take great pride in our electronic design and workmanship and in the careful thorough testing of every unit we manufacture. Our standard of manufacture is that we would personally use any unit which leaves our plant in our most prized model under any conditions. If you have any comments or criticism regarding our equipment, we would most appreciate hearing from you.

Very truly yours,

*Phil Kraft*

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