

INSTRUCTIONS FOR ASSEMBLY,
OPERATION, AND INSTALLATION OF
CITIZEN-SHIP "27" TYPE PR

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INDIANAPOLIS, INDIANA

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INTRODUCING THE CITIZEN-SHIP MODEL PR "27" PRINTED CIRCUIT RECEIVER:

The CITIZEN-SHIP PR "27" Receiver utilizes a printed circuit chassis which enables a modeler without elaborate test equipment to assemble his own receiver. When built according to instructions the PR will control your model as far as you can see it. The fact that the PR has all the components mounted on one side of the base makes possible the mounting of the set flat against sponge rubber to absorb vibrations and shock. The PR is compact and draws very little current which makes it satisfactory for even 1/2A models. Like all CITIZEN-SHIP products, this kit includes only the finest quality components available. A radio is as good as its parts!

NOTES AND CAUTIONS:

1. Your kit contains either a Kurman or a Sigma relay. In assembly you will use Figures 1 through 4 on the page which pertains to the type relay (Kurman has name on relay armature) your kit contains.
2. Study all parts and corresponding drawings to familiarize yourself with the unit before you begin the assembly.
3. The top of the set is plain bakelite. The bottom has the copper circuit.
4. We do not recommend the use of a soldering iron of over 35 watts.
5. Care must be taken not to overheat and burn away printed wiring on the base while soldering.
6. Take extreme care to make good soldered connections the first time.
7. **USE NOTHING BUT ROSIN CORE SOLDER:** Anything else is corrosive and will impair the performance of your set.
8. If you prefer to use a plug rather than the Fahnestock clips, cut the clips off flush with the end of the base and solder the leads through the eyelets from bottom of base. Be sure to solder the eyelets to the printed circuit.

INSTRUCTIONS FOR ASSEMBLY OF MODEL PR CITIZEN-SHIP "27" RECEIVER

1. Insert tube socket from top of base making sure the key on the base fits the notch on the tube socket. (Fig. 1, note Z)
2. Follow Fig. 1 closely and insert capacitors (disc shaped parts shown marked 15, 1500, 470, and 10; rectangular part shown marked 470MMFD; and cylindrical shaped part with brown and green stripes shown marked 1.5MMFD) (Fig. 1), and resistors (parts illustrated in Fig. 2). The leads of the capacitors and resistors should be inserted in the proper holes in the base from the TOP. Pull the leads through the base so that the component fits closely to the base, but do not break or strain the part in so doing. Bend the leads out so that the part will not shift before soldering. (Fig. 3)
3. Solder the tube socket in place. In so doing solder each terminal of the tube socket to that portion of the printed wiring with which it comes in contact.
4. Solder all capacitors and resistors in place being careful not to solder holes that have not been used, and be sure not to let the solder flow from one printed wire to another. Leads of capacitors and resistors projecting through the base must be soldered to the printed wiring through which they protrude. After soldering, cut excess leads from capacitors and resistors.
5. (A) **IF YOUR SET CONTAINS A KURMAN RELAY:** (See name on armature of relay).
Screw the relay to the base using 6-32 screws and #6 lockwashers (Fig. 1 on Kurman page). Cut two 1" pieces from the solid tinned copper wire to be used as relay leads. Insert the leads through the proper holes in the base and solder to their respective relay terminals. (Fig. 1 and Fig. 4, Note L on Kurman page). Bend leads over and solder to printed wiring on bottom of base.
Put the remaining solid wire through the topmost relay contact terminal and solder. Run the other end through the relay clip eyelet and solder. Clip any excess of lead (Fig. 4 Note Y, Kurman page).
(B) **IF YOUR SET CONTAINS A SIGMA RELAY:**
Pull relay leads through proper holes and screw the relay to the base using 6-32 screws and #6 lockwashers. (Fig. 1 on Sigma page). Solder the two leads to the printed wiring through which they protrude and clip off the excess. Use scrap of relay lead for the relay to Fahnestock clip lead. (Fig. 4, Note Y on Sigma page. Also see Fig. 5, Note X). Bend terminal on relay 90 degrees. (Note Y, Fig. 4 on Sigma page). Solder lead to relay terminal, then bend lead and pull through Fahnestock clip eyelet. Solder to eyelet and printed circuit. Clip excess of lead.
6. Push T & S Coils in proper holes and solder the protruding prongs to the printed wiring. (Fig. 1, Fig. 4, Fig. 5). These two coils are identical.
7. Push quench coil in proper holes, (Can be identified in Fig. 1 & Fig. 4) and solder the three prongs protruding through the base to the printed wiring.
8. Spot solder each Fahnestock clip to its respective attaching eyelet.
9. Check all solder joints again.

INSTALLATION AND OPERATION OF
MODEL PR
CITIZEN-SHIP "27" RECEIVER.

1.0 FREQUENCY OF RECEIVER: -

Your Citizen-Ship Type PR "27" Receiver is designed to operate on the "examination free" 27.255 megacycle band in conjunction with the Citizen-Ship "27" Transmitters. (See transmitter instructions packed with that unit.)

2.0 GENERAL REQUIREMENTS: -

The PR "27" receiver has to have a wire antenna which requires that the receiver be tuned to accommodate the length of antenna installed in the plane or ship. This is best done after complete installation and requires the use of a milliammeter that will read from 0 to 1.5 milliamperes. (See enclosed BROCHURE describing special Citizen-Ship meter for that purpose.)

3.0 MOUNTING

3.1 The "crash-proof" mounting (Figure 5) is the method of mounting the components of the set so that they are stressed to best resist the shock of a crash. In Figure 5, the receiver is shown glued directly to the sponge rubber. Rubber bands from the plywood mount around the receiver at each end can be used in place of the glue which allows the receiver to be more readily removed. Also, a 1/4 to 3/8" thick soft balsa sheet relieved to fit the soldered back of the receiver and placed between the sponge and the receiver will provide the additional support needed in extra hard crashes to completely minimize any chance of damaging the printed circuit board.

3.2 Although the vertical mounting is probably preferable, the receiver can also be mounted on sponge rubber in a horizontal position.

3.3 Since it is necessary to tune the receiver after installation it is recommended that an access space be provided on top of the fuselage. The easiest solution is to have the space under the center of the wing open. After tuning, the wing may be put in place.

3.4 The receiver and batteries must be mounted to give proper balance to the plane. Batteries should be mounted forward of the receiver. It is convenient to mount them on the front of the plywood board if vertical mounting is used.

3.5 Wire and metal parts, such as batteries, should be kept about an inch away from the tuning coils S & T, but aside from these nothing else is critical.

4.0 RECOMMENDED BATTERIES: -

4.1 Voltages required are 1-1/2 on the filament or "A" batteries and 60 or 67-1/2 on the plate or "B" batteries.

4.2 Recommended filament batteries are 2 pen cells in parallel.

4.3 Plate or "B" batteries recommended:

(1) Eveready #457 or Burgess K45 or equivalent, 67-1/2 volts - 7-1/2 oz.

(2) Three hearing aid 22-1/2 volt batteries in series giving 67-1/2 volts.

(3) Two Burgess hearing aid Type V20E batteries or equivalent in series giving 60 volts-3 oz.

4.4 We strongly recommend the heavier single 67-1/2 volt battery to give long life and reliability. The PR "27" idles at about 1-1/2 milliamps and decreases its plate current when receiving a signal. This constant drain on the hearing aid batteries lowers their voltage and decreases the sensitivity of the receiver as well as lowering the idling current to a value that approaches the operating current of the relay. (See Par. 10 on BATTERY LIFE).

5.0 SOURCES OF BATTERIES:-

Many hobby shops carry a complete line of batteries for Radio Control. If not available at your local hobby shop, pen cells may be obtained in any drug or hardware store. The 67-1/2 volt Eveready #457, or equivalent, may be obtained at any radio store or radio parts jobber. The hearing aid batteries are stocked by radio parts jobbers or hearing aid distributors.

6.0 WIRING THE RECEIVER:-

6.1 After provision has been made for mounting the receiver in the fuselage, set the batteries around to obtain the desired balance. (The assumption is made that the modeler has some knowledge of free flight. Plane should balance at 50% of chord for a lifting stabilizer and 33-1/3 to 40% with a non-lift stabilizer.) It is recommended that two pen cells for filament supply and two other pen cells for the escapement be mounted in battery boxes for ready changeability. The 67-1/2 volt "B" battery has glove fastener clips marked + and -. If hearing aid "B" batteries are used, some box or clip may be made to hold them, or they may be wired in series.

6.2 Fig. 7 shows the schematic wiring diagram of the batteries and receiver. Flexible wire with some slack should go to the Fahnestock clips. Several wires (-A, -B, and - Escapement) all return to the Fahnestock clip marked "Common" and since it is inconvenient to put more than one wire in a clip, these should be soldered together at another point as shown in the schematic.

6.3 The schematic shows a DOUBLE POLE SINGLE THROW SWITCH to shut off the filament and simultaneously open the escapement lead. This is necessary with the "27" receiver because the normally closed contact actuates the escapement when the plate current DECREASES with signal which also occurs when the filament is turned off.

- 6.4 A closed circuit jack which will accept a phone plug is shown in series with the "Plus B" lead. This is for the purpose of inserting a meter to tune the receiver. This jack and plug are included with our Citizen-Ship Test Meter. (See enclosed BROCHURE.)

7.0 ANTENNAE: -

- 7.1 Several arrangements of antennae are possible. A stiff steel wire about 18" long may be cemented vertically at any convenient point and a lead run to the antenna terminal. A wire may be stretched from the back edge of the wing to the top of the fin. It may be possible to use either too short or too long an antenna to allow proper tuning of the receiver. This is discussed in Paragraph 8.0 on TUNING. The longer the antenna the more pick-up of signal is obtained, but the receiver will operate as far away as the control is useful with only an 18" vertical antenna and its associated lead-in.

- 7.2 Leave some slack in the antenna lead-in from the antenna to the antenna clip on the receiver so hard landings do not pull this lead out of the clip. The receiver will operate with no antenna when the transmitter is close, but goes out of range at about 100 yards.

8.0 TUNING AND ADJUSTING: -

- 8.1 Looking at the top of the receiver identify T & S coils. (Fig. 4 and Fig. 5). The T coil adjusts the tuning and the S coil adjusts the sensitivity.
- 8.2 If the receiver is properly connected, including the antenna, and the filament turned on, the plate current, as read by a meter plugged into the jack (as described in paragraph 6.4) or wired in series with the $\frac{1}{2}$ B lead, may be anywhere between 0.5M.A. and 1.5M.A. plus. If current is off meter scale insert a 500,000 ohm potentiometer or volume control, such as used in a radio set, in the series with $\frac{1}{2}$ B (Fig. 8) and bring reading on scale. (A simple way to insert the potentiometer is to remove the $\frac{1}{2}$ B lead from the Fahnestock clip and connect the potentiometer between the lead and the clip.) Turn OUT (counter-clockwise) the slug marked S, (Identify S coil slug Fig. 4 & Fig. 5), until the meter reads a steady maximum.

CAUTION: The following adjustments must be made with a non-metallic screw driver such as fiber or bakelite.

Turn slug of quench coil (identify quench coil slug Fig. 4) in or out to find the lowest plate current reading or valley - i.e. a definite minimum as slug is rotated in or out. This is the most sensitive quench coil setting.

Turn on the Transmitter and press the operate button. Turn slug T (identify in Fig. 4 and Fig. 5) in and out until plate current drops. Tune slug T for LOWEST value of plate current that shows a definite valley - i.e. goes through a minimum as the slug is rotated in or out.

- 8.3 Next turn in (clockwise) slug S until the plate current starts to fall. Back off the screw about 1/2 to 1 turn so the plate current remains steady at its highest value.
- To better the adjustments you have made, use your FL Transmitter at a distance and again retune. With our LC Transmitter it is possible to remove the antenna and make a close-up tuning check.

- 8.4 It is possible that if the sensitivity control S is set too close, adjusting the tuning slug T may make the plate current go down and stay down. No minimum valley could be found under this condition. Simply turn out the slug S and proceed as above.

- 8.5 The varying length of leads used on your meter may affect the sensitivity adjustment S. (It is recommended at this point that relay be set. (See Paragraph 9.0) Remove the meter and turn S in until the escapement operates indicating a drop in plate current. Back off about 1 turn and make sure that the escapement always releases when the transmitter is off. If it tends to be "sticky" or stay down, back S off until it operates properly. Backing off too far reduces sensitivity and range.

9.0 RELAY SETTING: -

- 9.1 The normal maximum idling current of your set is approximately 1-1/2 milliamps. It will be slightly higher with 67-1/2 volt "B". The weakest signal that will operate the receiver triggers the plate current to 0.5 milliamps and strong signals make it go lower.
- 9.2 Set the relay (see Paragraph 9.4a or 9.4b) to drop out (actuate the escapement) at approximately 0.85 milliamps and pull in (release the escapement) at 1.2 milliamps. (See Fig. 6).
- 9.3 These values of relay pull in and drop out can be easily checked by wiring a 500,000 ohm potentiometer or volume control as described in Paragraph 8.2. (Wire in the series with $\frac{1}{2}$ B (Fig. 8). Turn the shaft to insert resistance which decreases plate current and the values may be observed at which the escapement operates.
- 9.4a IF YOUR SET IS FURNISHED WITH A KURMAN 10,000 ohm RELAY (See name on armature of relay) PROCEED AS FOLLOWS:

CAUTION: DO NOT ADJUST THE SPRING TENSION. This is factory set for best operation. The procedure to adjust the relay to the values shown in 9.2 is as follows: When the relay is energized (receiver turned on) the armature is pulled toward the pole piece by magnetic force and the contact on the armature hits the top adjustable contact. Turning the top contact (Fig. 4, Note P) counter-clockwise (looking at top of relay) decreases the value of the plate current at which the armature will drop out (thereby actuating the escapement) and vice versa.

Backing the top contact out so far that the armature hits the pole piece before it hits the contact would result in a minimum value. Adjust top contact for proper drop-out value. Turning the bottom contact to move up toward the top contact decreases the value of pull-in current (releasing escapement) and vice versa. Adjust bottom contact for proper pull-in value. The less movement allowed to the armature by the contacts, the less difference between the pull-in and drop-out.

9.4b IF YOUR SET CONTAINS A SIGMA 4F-8000S RELAY, PROCEED AS FOLLOWS:

This relay has adjustable contacts and adjustable spring tension. (Fig. 4, Note P)

The procedure to adjust the relay to the values in 9.2 is as follows:

When the relay is energized (receiver turned on) and the armature is pulled in by magnetic force, the movable contact on the armature hits the BACK contact.

This BACK contact acts as a stop for the armature. This contact should be set so that when the relay is energized the armature does not hit the pole piece in the coil. There should be .005 gap under this condition.

The FRONT contact operates the escapement. This FRONT contact should then be turned toward the movable contact so about .005 movement is possible. The smaller this gap is, the smaller will be the differential between pull-in and drop-out.

The hex screw head on top tightens or loosens the spring on the armature and determines the pull-in setting of the relay. Turn clockwise for higher pull-in, counter clockwise for less.

Do not use a screw driver - obtain a socket wrench that fits the hex.

10.0 BATTERY LIFE: -

10.1 To properly know the voltage of your batteries, it is desirable to have a multimeter that will read 1-1/2 and 67-1/2 volts for the receiver, and 135 volts for the transmitter. This meter, also including a 1-1/2 milliammeter, is available and especially designed for this application.

(See Citizen-Ship test meter in enclosed BROCHURE.)

10.2 Decline of the filament voltage has little effect on the maximum value of the plate current until it goes down to 1.1 volts, but the "B" voltage reduction will lower the maximum plate current until it becomes dangerously close to the operating point of the relay. (THIS WILL LOCK THE SHIP INTO A TURN AND MIGHT CRASH IT.) The relay could be set to operate at lower values closer to the 0.5 or drop-out value, but this also might impair reliability and will reduce range.

10.3 It is therefore advisable to replace the "B" battery when the maximum plate current declines to about 1-1/4 m.a. which occurs around 50 volts of $\frac{1}{2}$ B.

11.0 TESTING AND FLYING: -

11.1 The above instructions have described not only how to make the radio receiver operate properly, but have mentioned the action of the escapement as a means of telling when the relay properly operates as the result of a signal sent to the receiver.

11.2 If the above instructions have been carefully followed and the transmitter operating properly (see transmitter instructions) every time the operate button on the transmitter is pushed, the escapement should operate ONCE only. If it skips or chatters, do not fly. Check that the plate current is DECREASING as described in 9.1. If this action is correct, check relay setting and finally see that the escapement itself is not skipping or sticking.

11.3 All these checks should be repeated on the ground with THE MOTOR RUNNING. If the receiver is not suspended freely enough, vibration may make the relay chatter, or even vibrate the escapement, and cause it to operate.

Carefully check the T & S coil slugs to see whether they may have a tendency to rotate up or down from excessive vibration. (THIS IS IMPORTANT). If this happens either mount the receiver more loosely or put a drop of model airplane cement at the edge of the slugs and coil form. Be sure not to fill the screwdriver slot with glue.

11.4 Practically all models are now using glow or diesel engines, but if ignition is used it may have the same effect as sending a signal from the transmitter - i.e., drive the plate current DOWN and operate the relay and escapement. A suppressor resistor of about 10,000 ohms in the spark plug lead will generally fix this, but it may be necessary to isolate the ignition system from the receiver.

12.0 IF ALL THE ABOVE CHECKS OUT, GO AHEAD AND FLY. HAVE FUN!

WARRANTY

The parts of your CITIZEN-SHIP PR "27" radio control kit are warranted to be free from defects as shipped. However, the tube will not be replaced because of an open filament. Each tube is tested before shipment.

Since the assembly, construction, and successful operation of the assembled set are the responsibilities of the builder, the warranty does not cover incorrect assembly or bad workmanship. A minimum charge of \$2.50 plus parts will be charged for any set returned for the purpose of being put in operating condition.

No repairs can be made if the printed circuit board is damaged.

CITIZEN-SHIP RADIO CORPORATION
820 EAST 64th ST.
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BILL OF MATERIAL AND PARTS PRICE LIST FOR PR "27" RECEIVER.

1	Chassis (base) - complete with clips and eyelets	\$ 4.00
1	Tube Socket	.50
1	Tube (3V4)	2.10
1	Kurman 10,000 ohm Relay	7.00
	or	
1	Sigma 4F-8000S Relay	7.00
1	Quench Coil	2.25
1	T Coil	1.00
1	S Coil	1.00
1	Ceramic Disc Capacitor - 470 MMFD \pm or - 20%, 3/8" diameter	.25
2	Ceramic Disc Capacitor - 15 MMFD \pm or - 10%, 1/4" diameter	.25 each
1	Ceramic Disc Capacitor - 10 MMFD \pm or - 20%, 1/4" diameter	.25
1	Ceramic Disc Capacitor - 1500 MMFD GMC, 19/32" diameter	.50
1	Mica Capacitor - 22R - 470 MMF \pm or - 10%	.70
1	Gimmick Capacitor - 1.5 MMFD \pm or - 20%	.25
1	BTS Resistor 33,000 ohm \pm or - 10% (in kit with Kurman Relay)	.18
	or	
1	BTS Resistor 22,000 ohm \pm or - 10% (in kit with Sigma Relay)	.18
1	BTS Resistor 100,000 ohm \pm or - 20%	.18
1	BTS Resistor 22 megohms \pm or - 20%	.18
2	Binding Head Machine Screws - 6/32 X 3/16 Plated	.10
2	Shakeproof Washers #6	.10
1	Piece Solder	
1	5" Tinned Copper Wire (in kit with Kurman Relay)	
1	Instruction Manual	
1	Decal	
1	Citizen-Ship Brochure	

MINIMUM ORDER THAT WILL BE SHIPPED - \$1.00 PLUS POSTAGE, SO WE SUGGEST THAT IF YOU NEED ONLY ONE PART, YOU MIGHT ADD AN ADDITIONAL PART OR PARTS TO MAKE UP THE MINIMUM ORDER.

THESE FIGURES FOR KURMAN RELAY

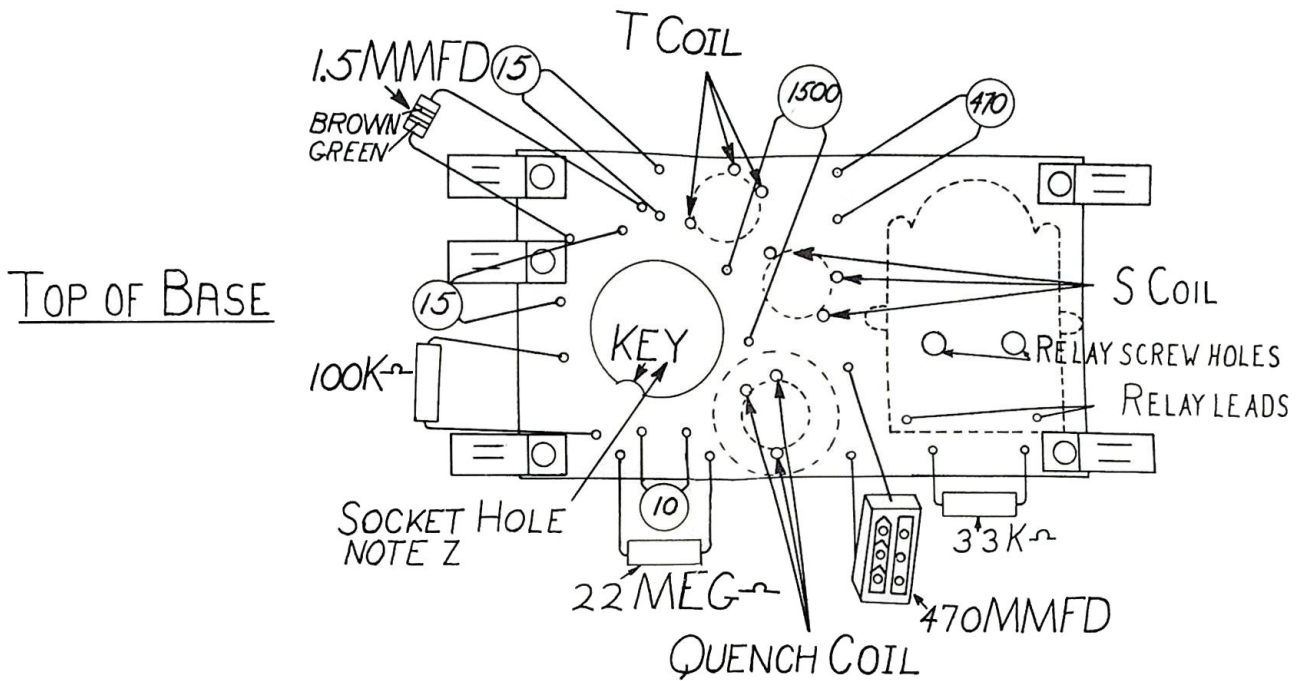


Fig 1

RESISTOR CODE

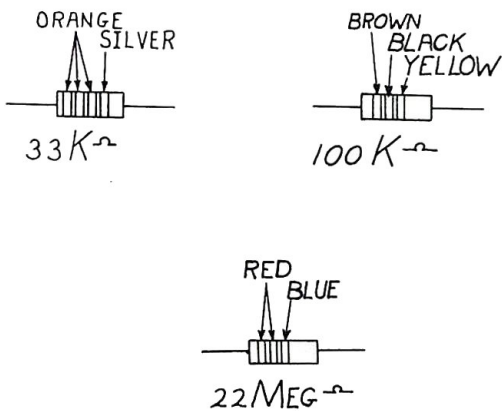


Fig 2

METHOD OF HOLDING PARTS
IN PLACE WHILE SOLDERING



Fig 3

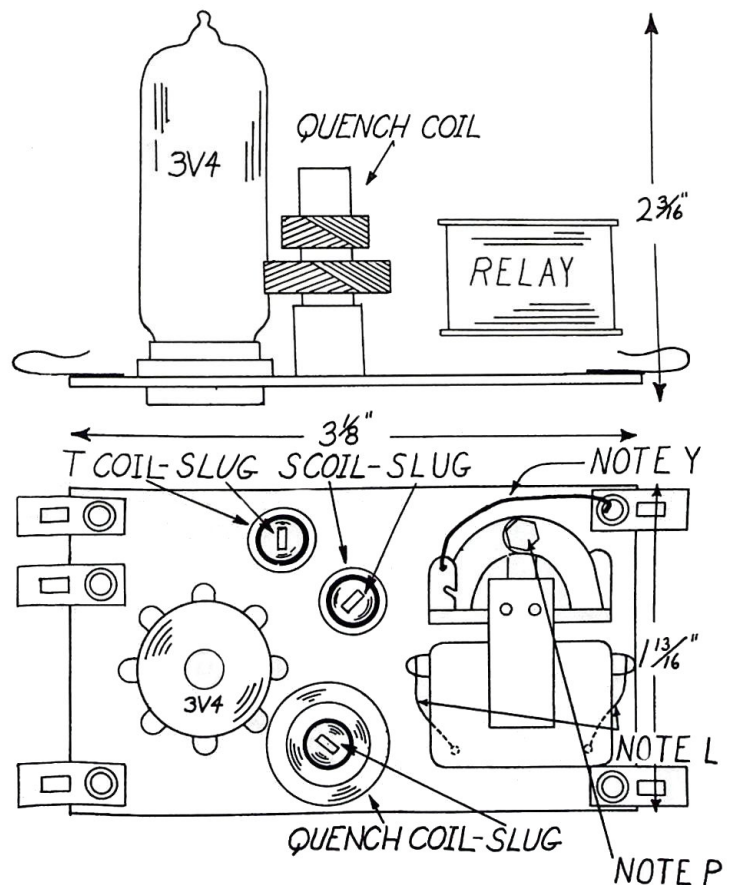


Fig 4

THESE FIGURES FOR SIGMA RELAY

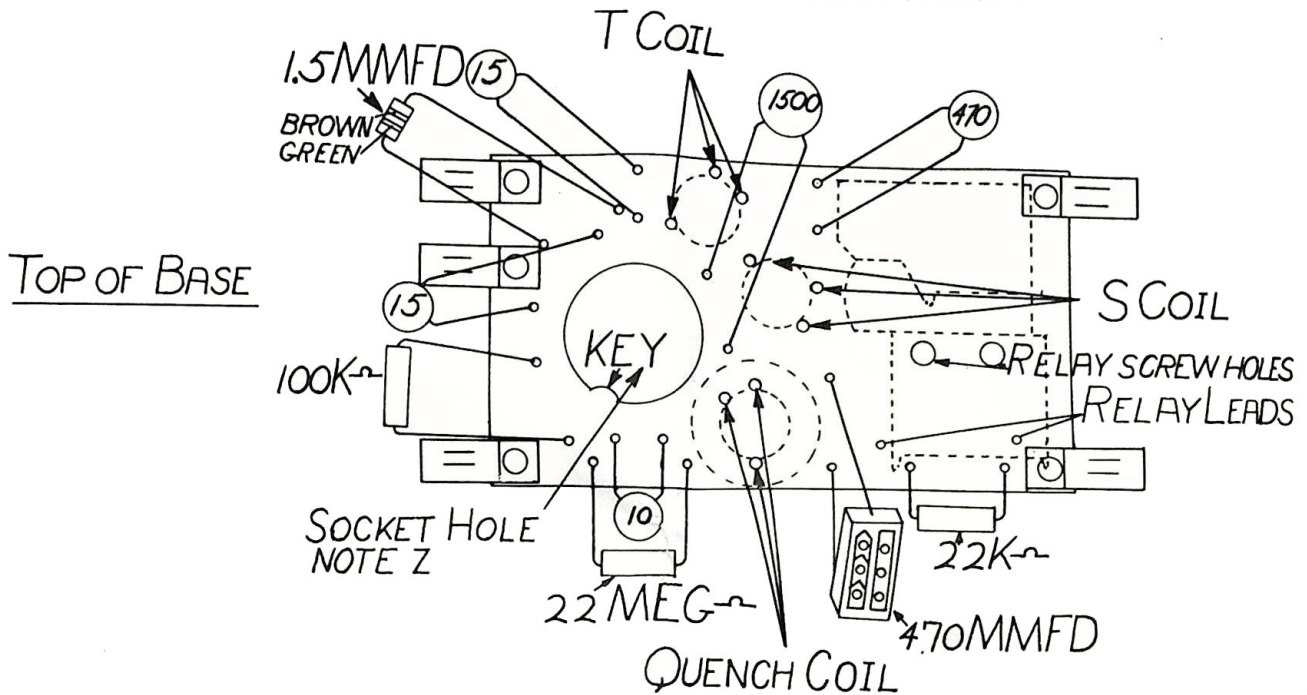


Fig 1

RESISTOR CODE

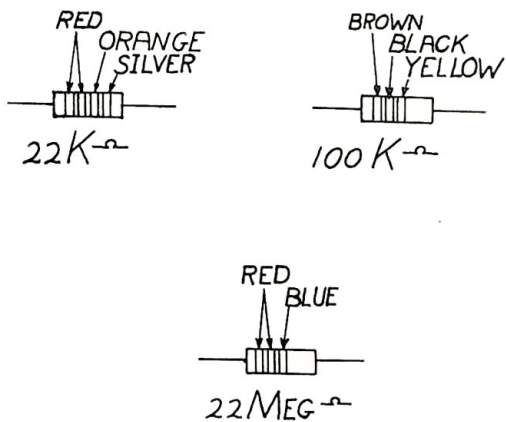


Fig 2

METHOD OF HOLDING PARTS IN PLACE WHILE SOLDERING



Fig 3

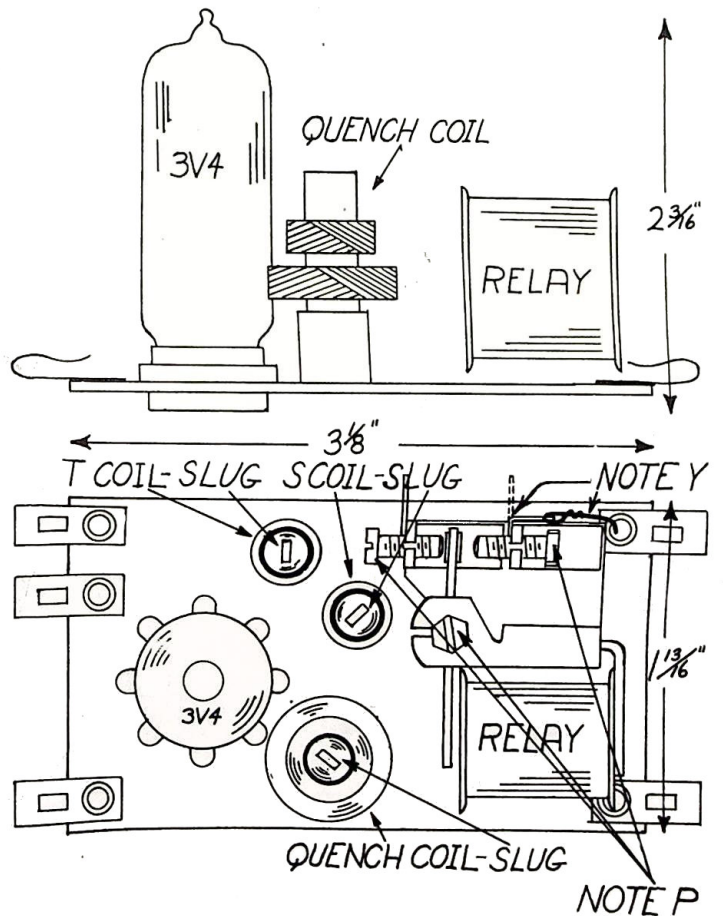


Fig 4

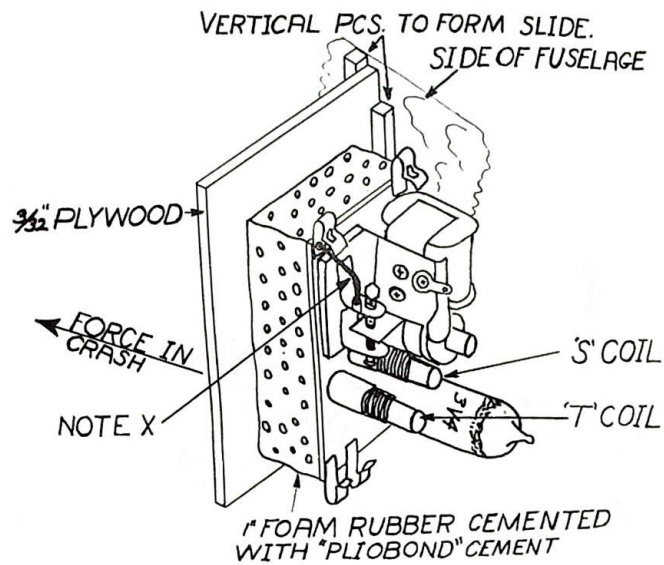


Fig 5

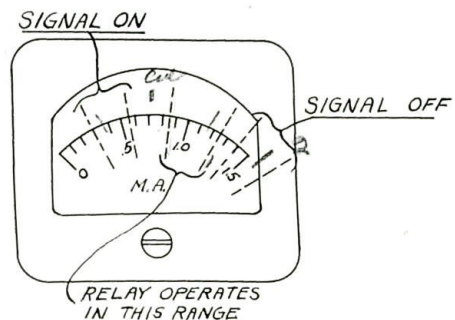
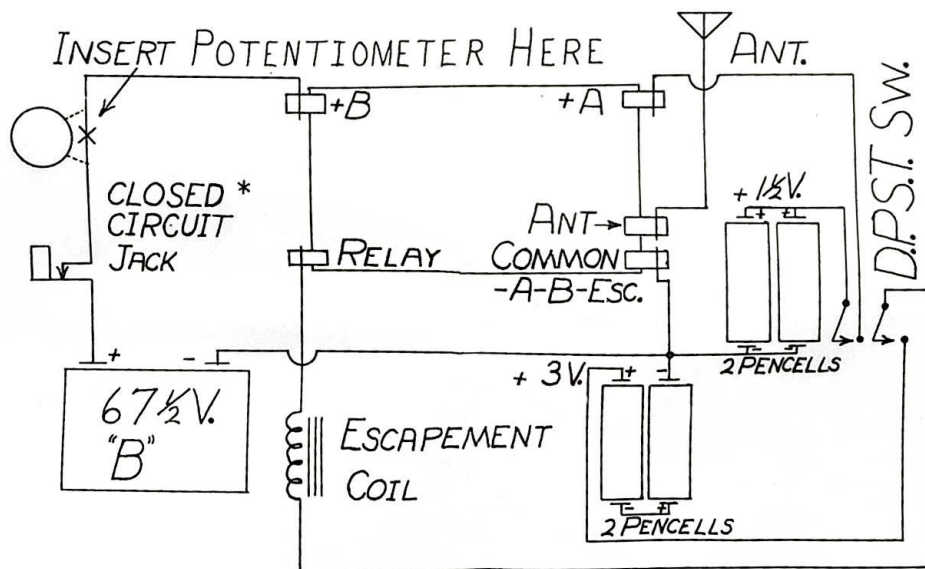


Fig 6



* INCLUDED WITH
C/S TEST METER

Fig 7