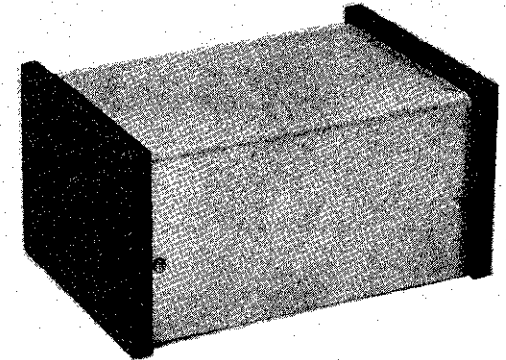
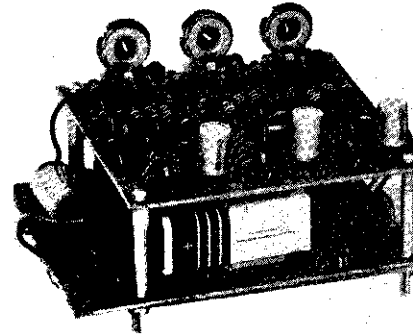


## *Wind Chimes Assembly Instructions*



For thousands of years men have been soothed and entertained by the gentle tinkle of pieces of glass, wood or metal being blown together by the force of the wind. These wind chimes have passed down to the present practically unchanged but whether they be under-a-buck imports or expensive hand cast bells they all have one drawback in common - the wind never seems to be blowing exactly right. Either there's not enough breeze to stir smoke or the limbs are about to blow off the trees.

The Electronic Wind Chimes don't rely on the wind for power so you can use them indoors or out, windy days or still. If they're too loud you can turn them down; if they're too soft you can turn them up and you can change the pitch and sustain so they sound like metal chimes, bamboo rods - or tin cans if you like. Best of all you can turn them on or off with the flip of a switch.

### SOLDERING

Use care when mounting all components. Use only rosin core solder (acid core solder is never used in electronics work). A proper solder joint has just enough solder to cover the round soldering pad and about 1/16 inch of the lead passing through it. There are two improper connections to beware of: Using too little solder will sometimes result in a connection which appears to be soldered but actually there is a layer of flux insulating the component from the solder bead. This situation can be cured by re-heating the joint and applying more solder. If too much solder is used on a joint there is the danger that a conducting bridge of excess solder will flow between adjacent circuit board conductors forming a short circuit. Unintentional bridges can be cleaned off by holding the board up-side down and flowing the excess solder off onto a clean, hot soldering iron.

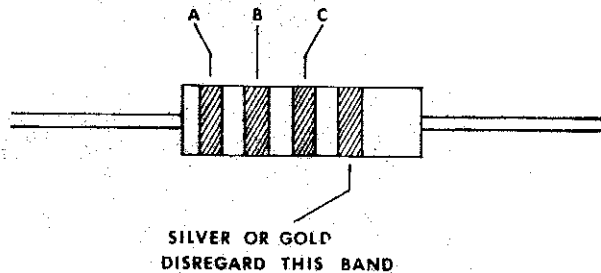
Select a soldering iron with a small tip and a power rating not more than 35 watts. Soldering guns are completely unacceptable for assembling transistorized equipment because the large magnetic field they generate can damage solid state components.

CIRCUIT BOARD ASSEMBLY

- ( ) Prepare for assembly by thoroughly cleaning the conductor side of the 3721A circuit board with a scouring cleanser. Rinse the board with clear water and dry completely.

Solder each of the fixed resistors in place following the parts placement designators printed on the circuit board and the assembly drawing figure 1. Note that the fixed resistors are non-polarized and may be mounted with either of their two leads in either of the holes provided. Cinch the resistors in place prior to soldering by putting their leads through the holes and pushing them firmly against the board; on the conductor side of the board bend the leads outward to about a 45° angle. Clip off each lead flush with the solder joint as the joint is made.

DESIGNATION	VALUE	COLOR CODE A-B-C
( ) R1	6800 ohms	blue-grey-red
( ) R2	100K ohms	brown-black-yellow
( ) R3	82K ohms	grey-red-orange
( ) R4	6800 ohms	blue-grey-red
( ) R5	6800 ohms	blue-grey-red
( ) R6	47K ohms	yellow-violet-orange
( ) R7	150K ohms	brown-green-yellow
( ) R8	6800 ohms	blue-grey-red
( ) R9	6800 ohms	blue-grey-red
( ) R10	220K ohms	red-red-yellow
( ) R11	68K ohms	blue-grey-orange
( ) R12	6800 ohms	blue-grey-red
( ) R13	27K ohms	red-violet-orange
( ) R14	27K ohms	red-violet-orange
( ) R15	27K ohms	red-violet-orange
( ) R16	27K ohms	red-violet-orange
( ) R17	27K ohms	red-violet-orange
( ) R18	27K ohms	red-violet-orange
( ) R19	27K ohms	red-violet-orange
( ) R20	27K ohms	red-violet-orange
( ) R21	27K ohms	red-violet-orange
( ) R52	10K ohms	brown-black-orange
( ) R53	150 ohms	brown-green-brown



- ( ) Install the .05 mfd. ceramic disc capacitor C28 in the space provided. Solder in place.

Electrolytic capacitors are polarized and must be oriented so that the " + " lead of the capacitor goes through the " + " hole in the circuit board. Mount the following electrolytic capacitors and solder them in place. Values of these components are marked on the body of the part.

DESIGNATION	VALUE
( ) C1	30 mfd. 10v. electrolytic capacitor
( ) C2	30 mfd. 10v. electrolytic capacitor
( ) C3	30 mfd. 10v. electrolytic capacitor
( ) C4	30 mfd. 10v. electrolytic capacitor
( ) C5	30 mfd. 10v. electrolytic capacitor
( ) C6	30 mfd. 10v. electrolytic capacitor

- ( ) Mount and solder in place C29 ( 250 mfd. 10v. electrolytic capacitor). Note that the " + " lead of this capacitor must be bent to the side slightly to reach the " + " hole in the board.
- ( ) Using three pieces of solid wire left over from resistor lead trimming, form and install the three jumpers illustrated in figure 1 and shown as solid lines on the circuit board.

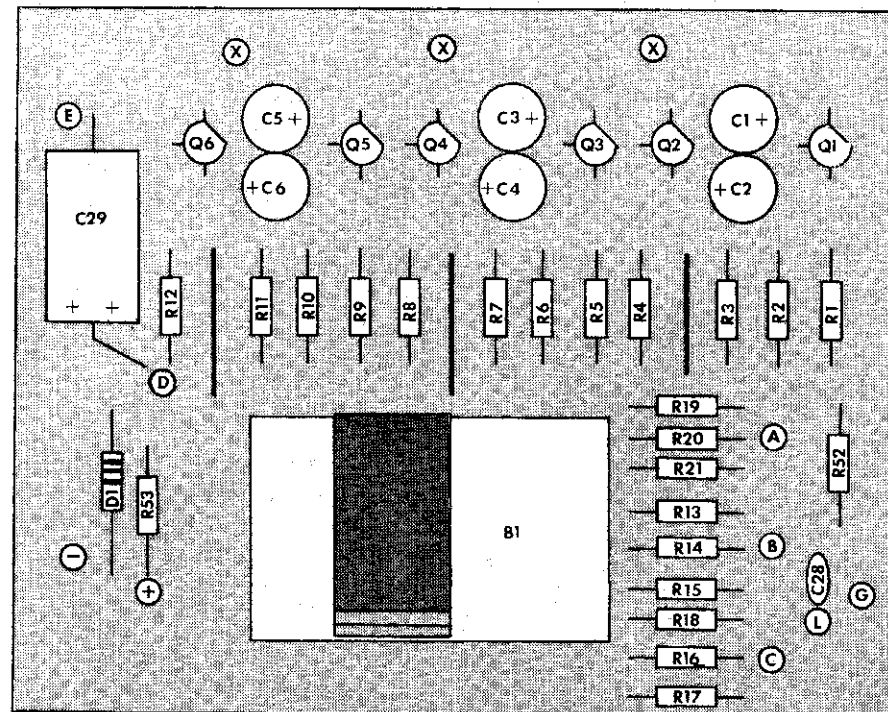


FIGURE 1

Install transistors Q1 through Q6. Orientation of the transistors is keyed by the flats on the sides of their cases.

DESIGNATION	DESCRIPTION
( ) Q1	2N5129
( ) Q2	2N5129
( ) Q3	2N5129
( ) Q4	2N5129
( ) Q5	2N5129
( ) Q6	2N5129

- ( ) Install the 6.8v. Zener diode D1. Note that orientation of the diode is keyed by the colored rings around the body of the part.

THIS COMPLETES PRELIMINARY ASSEMBLY OF THE 3721A CIRCUIT BOARD. SET THIS BOARD ASIDE AND BEGIN ASSEMBLY OF 3721B.

- ( ) Thoroughly clean the conductor side of the 3721B circuit board.

Install the fixed resistors as follows. NOTE: R49, R50 and R51 will not be installed at this time.

DESIGNATION	VALUE	COLOR CODE A-B-C
( ) R22	680K ohm	blue-grey-yellow
( ) R23	39K ohm	orange-white-orange
( ) R24	680K ohm	blue-grey-yellow
( ) R25	39K ohm	orange-white-orange
( ) R26	680K ohm	blue-grey-yellow
( ) R27	39K ohm	orange-white-orange
( ) R28	1 megohm	brown-black-green
( ) R29	1 megohm	brown-black-green
( ) R30	1 megohm	brown-black-green
( ) R31	1 megohm	brown-black-green
( ) R32	1 megohm	brown-black-green
( ) R33	1 megohm	brown-black-green
( ) R34	5600 ohm	green-blue-red

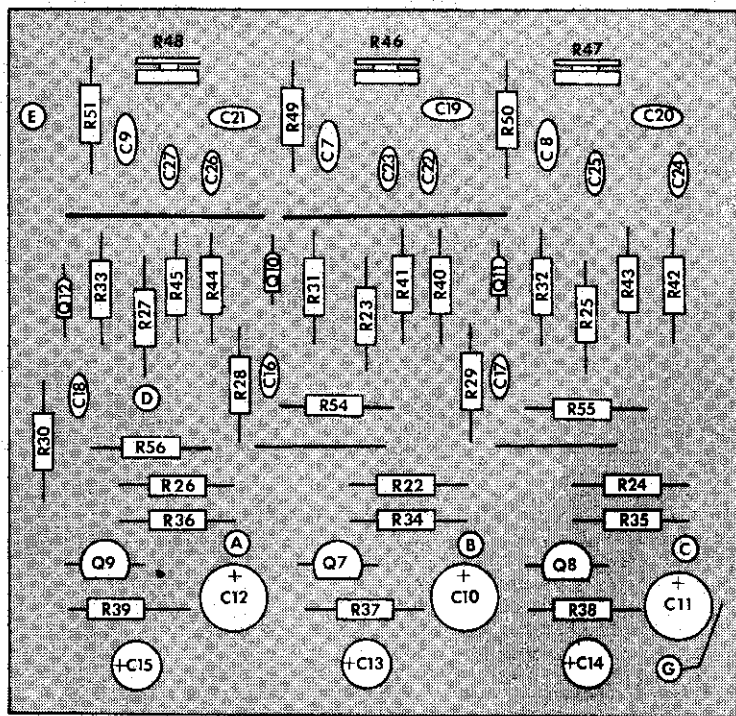


FIGURE 2

( )	R35	5600 ohm	green-blue-red
( )	R36	5600 ohm	green-blue-red
( )	R37	270 ohm	red-violet-brown
( )	R38	270 ohm	red-violet-brown
( )	R39	270 ohm	red-violet-brown
( )	R40	68K ohm	blue-grey-orange
( )	R41	68K ohm	blue-grey-orange
( )	R42	82K ohm	grey-red-orange
( )	R43	82K ohm	grey-red-orange
( )	R44	47K ohm	yellow-violet-orange
( )	R45	47K ohm	yellow-violet-orange
( )	R54	15K ohm	brown-green-orange
( )	R55	15K ohm	brown-green-orange
( )	R56	15K ohm	brown-green-orange

Install the ceramic disc capacitors as follows:

DESIGNATION	VALUE
( ) C7	0.01 ceramic disc
( ) C8	0.01 ceramic disc
( ) C9	0.01 ceramic disc
( ) C16	470 pf. ceramic disc
( ) C17	470 pf. ceramic disc
( ) C18	470 pf. ceramic disc
( ) C19	0.005 mfd. ceramic disc
( ) C20	0.005 mfd. ceramic disc
( ) C21	0.005 mfd. ceramic disc
( ) C22	0.001 mfd. ceramic disc
( ) C23	0.001 mfd. ceramic disc
( ) C24	0.001 mfd. ceramic disc
( ) C25	0.001 mfd. ceramic disc
( ) C26	0.001 mfd. ceramic disc
( ) C27	0.001 mfd. ceramic disc

Install electrolytic capacitors as follows. Be sure to observe polarization.

DESIGNATION	VALUE
( ) C10	30 mfd. 10v. electrolytic
( ) C11	30 mfd. 10v. electrolytic
( ) C12	30 mfd. 10v. electrolytic
( ) C13	10 mfd. 10v. electrolytic
( ) C14	10 mfd. 10v. electrolytic
( ) C15	10 mfd. 10v. electrolytic

- ( ) Using the long leads trimmed from capacitors C16, C17 and C18, form and install the four jumpers illustrated in figure 2 and indicated on the circuit board with solid lines.

Install trimmer potentiometers.

DESIGNATION	DESCRIPTION
( ) R46	50K trimmer potentiometer
( ) R47	50K trimmer potentiometer
( ) R48	50K trimmer potentiometer

Install transistors Q7 through Q12. Orientation of the transistors is keyed by the bullet shape of the case or the flat on the side of the case.

DESIGNATION	DESCRIPTION
( ) Q7	2N4871 unijunction transistor
( ) Q8	2N4871 unijunction transistor
( ) Q9	2N4871 unijunction transistor
( ) Q10	2N2712
( ) Q11	2N2712
( ) Q12	2N2712

Install R49, R50 and R51. Note that on each of these resistors the leads which are the closest to the edge of the circuit board will in a later step mate with holes on the 3721A board. On each of these resistors leave this lead long.

DESIGNATION	VALUE	COLOR CODE A-B-C
( ) R49	220K ohm	red-red-yellow
( ) R50	220K ohm	red-red-yellow
( ) R51	220K ohm	red-red-yellow

Using the insulated wire provided make the following connections to the 3721B circuit board. In each case 1/4 inch of the insulation should be stripped from the end of the wire being soldered to the circuit board.

- ( ) Solder a 4 inch length of wire to point "A".
- ( ) Solder a 2-3/4 inch length to point "B".
- ( ) Solder a 2 inch length to point "C".
- ( ) Solder a 2-1/4 inch length to point "D".
- ( ) Solder a 1-1/2 inch length to point "E".
- ( ) Solder a 1-1/2 inch length to point "G".

THIS COMPLETES PRELIMINARY ASSEMBLY OF THE 3721B CIRCUIT BOARD.

#### FINAL ASSEMBLY

- ( ) Cut the black lead of the battery connector so that a 2-1/2 inch length remains on the connector and strip 1/4 inch of insulation from this lead.
- ( ) Solder the black lead of the battery connector to the hole marked "-" on the circuit board 3721A.
- ( ) Strip 1/4 inch of insulation from both ends of a 5 inch length of insulated wire.
- ( ) Solder one end of this wire to the "+" point on the 3721A circuit board.
- ( ) Solder the remaining end of this wire to one of the outer lugs on power switch S1 as illustrated in figure 3.
- ( ) Solder the red lead of the battery connector to the center lug of power switch S1.
- ( ) Temporarily mount the 3721B circuit board above the 3721A circuit board using four 4-40 X 1-1/2 inch machine screws, four 1 inch spacers, and four 4-40 nuts. Note that the conductor side of the 3721B board will be facing the component side of the 3721A board. Make sure that the leads from R49, R50 and R51 on the 3721B board pass through the three holes marked "X" on the 3721A board. Solder these connections on the 3721A board.
- ( ) Strip 1/4 inch of insulation from each of the seven insulated wires previously soldered to the 3721B circuit board.

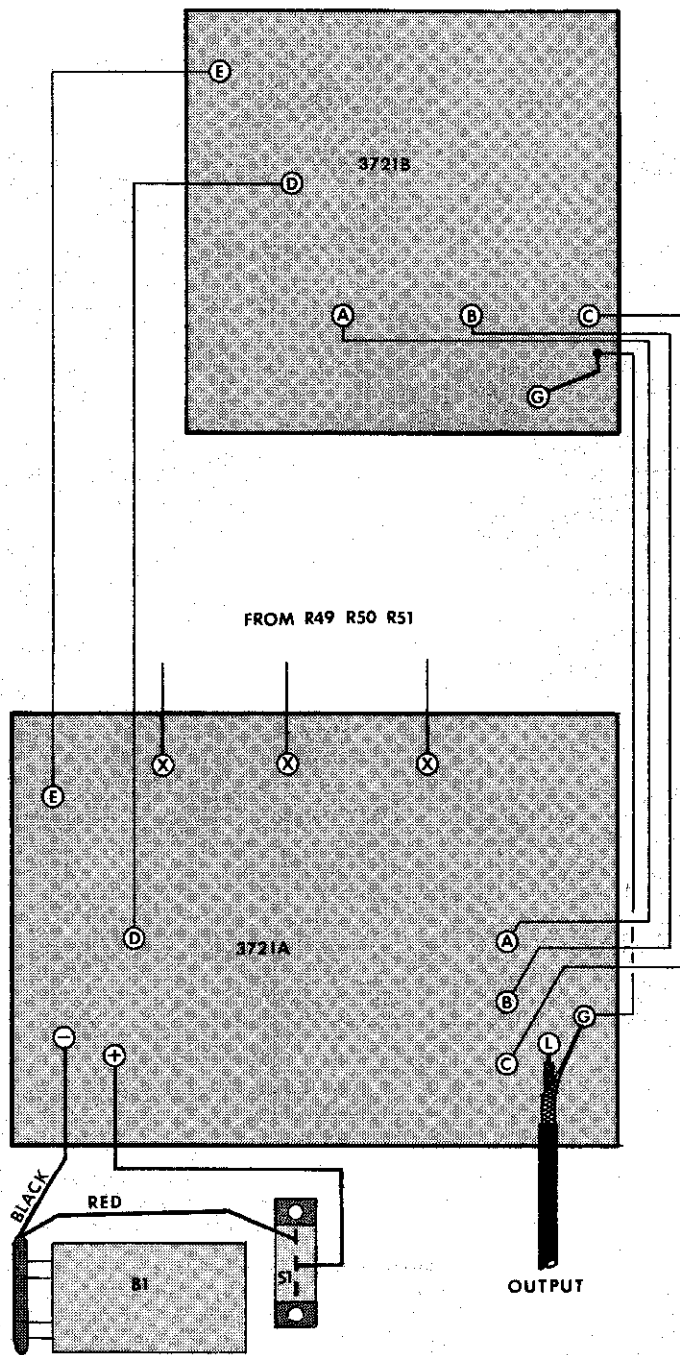


FIGURE 3

- ( ) Insert the free end of the wire originating at 3721B point "A" into the hole marked "A" on the 3721A circuit board and solder this point.
- ( ) In the same manner connect point "B" to point "B"
- ( ) In the same manner connect point "C" to point "C"
- ( ) In the same manner connect point "D" to point "D"
- ( ) In the same manner connect point "E" to point "E"
- ( ) In the same manner connect point "G" to point "G". Note that there are two "G" holes on the 3721A circuit board and that the smaller hole should be used in this step.

If you are going to mount the Wind Chimes in the 3711C or similar case the co-ax output line which will be installed next will pass through a hole in the side of the case and will be captive. For testing purposes this line can be lightly tack soldered to the circuit board and then disconnected and re-soldered when the unit is installed in the case. If no case is to be used the line may be permanently soldered in place.

- ( ) Prepare the RG-174U co-ax by stripping 3/4 inch of the outer insulation, unwinding the braided inner shield and stripping 1/4 inch of insulation from the inner conductor. Twist and tin the shield wires.
- ( ) Insert the center conductor of the co-ax into 3721A point "L" and solder.
- ( ) Insert the shield of the co-ax into the remaining 3721A point "G" and solder.
- ( ) Prepare the other end of the co-ax as above and insert the center conductor into the RCA plug until the wire protrudes from the tip. Solder this connection by heating the tip of the plug and feeding solder into the hole. Clip off any excess wire.
- ( ) Solder the shield to the body of the plug.

THIS COMPLETES ELECTRICAL ASSEMBLY.

#### SET-UP AND OPERATION

The unit is now ready to test. Check over all connections to make sure that there are no solder bridges or cold solder joints. Re-check the installation of Diode D1 and all transistors. Re-check the polarity of all electrolytic capacitors. When you are sure that all components are properly installed snap a fresh 9v. battery (we recommend mercury batteries such as Burgess H146X or equivalent) into the battery connector and clip the battery into the battery holder.

Plug the output into one of the auxiliary inputs of a hi-fi amplifier and turn the amplifier and Wind Chimes on. Using either a screwdriver or your fingers rotate the adjusting discs of trimmer controls R46, R47 and R48 fully clockwise as viewed from the closest edge of the circuit board.

You are now ready to test the three individual tone producing oscillators built into the Wind Chimes. The three trimmer potentiometers (R46, R47, R48) on circuit board 3721B act as sustain controls for the three chimes and regulate the tone between a dull "thunk" and a ringing chime like tone. One at a time turn the adjusting slots of the three trimmers from the extreme clockwise to the extreme counter-clockwise limits of their rotation. For some part of each trimmer's rotation a constant tone should be heard from the amplifier and this tone should increase in pitch as the control is rotated counter-clockwise. At some point before the extreme counter-clockwise limit of the controls is reached the tone should cease. After the effect of each trimmer is tested return it to its clockwise limit and do not pay any attention to any dull strike tones that you hear at this point.

Once satisfied that all oscillators are operating properly you can proceed to preliminary adjustments. Beginning with R46, once again advance the trimmer in a counter-clockwise direction until the point is reached at which the oscillator begins to produce a steady tone and then back off in a clockwise direction until the tone just stops. At this point there will be two things that you will be listening for: A random pattern and the sustain of the oscillator. You will hear a number of dull sounding strikes generated by the two oscillators which at this stage are de-tuned but you should also hear a single ringing tone being generated by the oscillator associated with R46. Listen to this tone for a few minutes to make sure that the strikes are random. Also the circuitry of the Wind Chimes includes an automatic "squelch" circuit that causes the chimes to ring with greater sustain at some times than others. If the sustain trimmers are advanced too far this "squelch" will cause the tone to break into sustained oscillation. Since the squelch action is random it will be necessary to listen for a few minutes to make sure that this is not happening. If sustained oscillation should occur the trimmer should be nudged very slightly clockwise.

When satisfied with the setting of R46 proceed in a like manner with the adjustment of R47 pausing to assure yourself that the strikes are random and that the "squelch" will not cause sustained oscillation. When satisfied with R47 proceed to R48.

## CASE MOUNTING

If you are mounting your unit in a 3711C case such as the one illustrated proceed as follows:

Install the grommet in the hole provided in the rear apron of the case. It's a tight fit and using the blade of a small screwdriver to push the edge of the grommet into the hole will help.

Remove the output co-ax leads soldered to circuit board points "G" and "I," and slip the coax through the grommet. Permanently re-connect the co-ax to the circuit board.

Mount the circuit boards to the base plate as shown in figure 4. Note that on one end the 4-40 X 1 1/2 inch bolts go up through the base plate, through 1/4 inch stand-offs, through the 3721A board, through 1 inch stand-offs, through the 3721B board and are secured with a 4-40 nut. On the other end a 1/2 inch 4-40 bolt goes through the base plate, through a 1/4 inch stand-off, through the 3721A board and is secured with a 4-40 nut. There will be approximately 1/4 inch of excess on the middle 4-40 X 1/2 inch bolts that can be clipped off with heavy cutters.

Slide the wood ends into the top of the case and secure with #4 wood screws. If at all possible pre-drill the holes with a 1/16" drill. Make sure that the aluminum is snug against the wood and note that the most shallow cut on the blocks will go on the bottom.

Mount the power switch to the case using the 4-40 X 1/4 inch bolts and 4-40 nuts provided.

Complete the assembly by fitting the base and circuit boards to the case. Note that the 3721B circuit board is cut short to clear switch S1. Pre-drill the wood ends for the screws which hold the base plate in place and note that these same screws also mount the rubber feet.

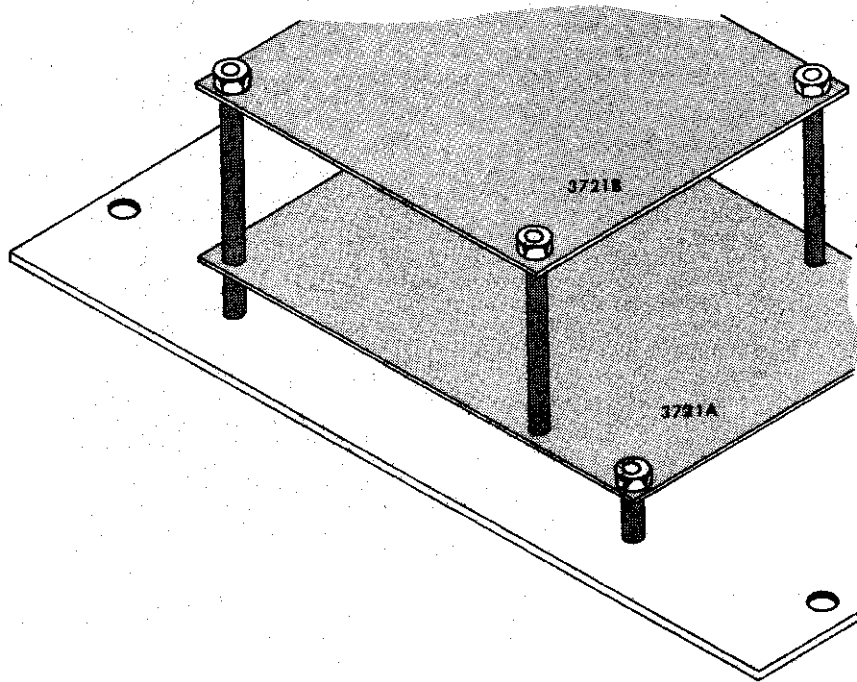


FIGURE 4

## DESIGN ANALYSIS

The operation of the Wind Chimes as a system can most easily be explained by referring to the simplified block diagram of figure 5 which shows one of the three identical channels that make up the complete unit.

The principle operational units are a random voltage generator, a comparator and a ringing oscillator. What would normally be reference voltage for the comparator is in this case the varying output of the random voltage generator. The random voltage is compared to the voltage developed across  $C_T$  as it charges through  $R_T$  and a pulse is generated whenever the capacitor voltage is found to be within about a half volt of the reference. The pulse from the comparator triggers the ringing oscillator which produces a tone similar to chimes.

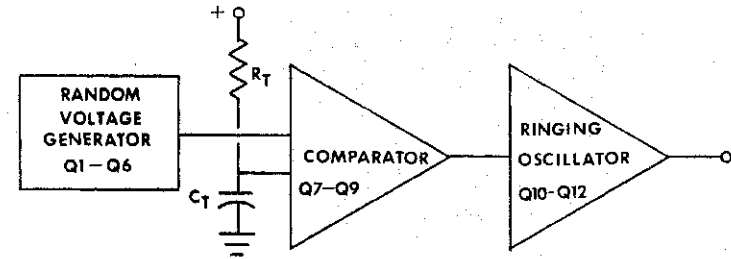


FIGURE 5

A complete schematic is shown in figure 6. The random voltage generator comprises transistors Q1 - Q6 which are wired to form 3 separate astable multivibrators. The time constants of these astables have been selected so that their combined periods and duty factors produce a long duration pseudo-random pattern. The outputs of the astables are summed by resistive networks (R13, R14 and R15; R16, R17 and R18; R19, R20 and R21) to produce three different randomly varying voltages. Each of these voltages is smoothed by a capacitor (C10, C11 and C12) and applied to the base 2 terminal of a unijunction transistor (Q7, Q8 and Q9). The emitter of each UJT connects to a capacitor (C13, C14 and C15) which is charged through a resistor from supply (R22, R24 and R26).

At some random time the conditions necessary for the firing of the UJT are met causing the capacitor to discharge through the emitter-base 1 junction and a pulse to develop across the Base 1 resistor (R37, R38 and R39). Each time the unijunction fires it leaves the voltage on the capacitor at a lower value than before it fired so the sequence continues to repeat randomly.

The ringing oscillators are parallel T types consisting of a single transistor gain stage (Q10, Q11 and Q12) with a parallel T notch filter in the feedback loop. A trimmer potentiometer (R46, R47 and R48) in each T adjusts the loss of the network so that the circuit is held just below the point of oscillation. Each pulse from the UJT kicks the circuit into the rapidly decaying oscillation characteristic of a chime. The outputs of the three individual oscillators are mixed in a resistor matrix (R49, R50, R51 and R52) and capacitively coupled to the output.

Zener diode D1 is used to eliminate voltage variations resulting from battery aging which would otherwise change the gain (and consequently sustain characteristics) of the ringing oscillators.

Resistors R54, R55 and R56 couple some of the random voltage generator output directly to the ringing oscillators in such a way that when the random voltage is high the gain and sustain duration of the oscillators is increased. This squelching action allows the sustain on some of the strikes to be considerably longer than would otherwise be possible because of the danger of the circuit breaking into continuous oscillation. Coincidentally it also produces a more realistic sound by making the sustaining characteristics as well as the strikes random in nature.

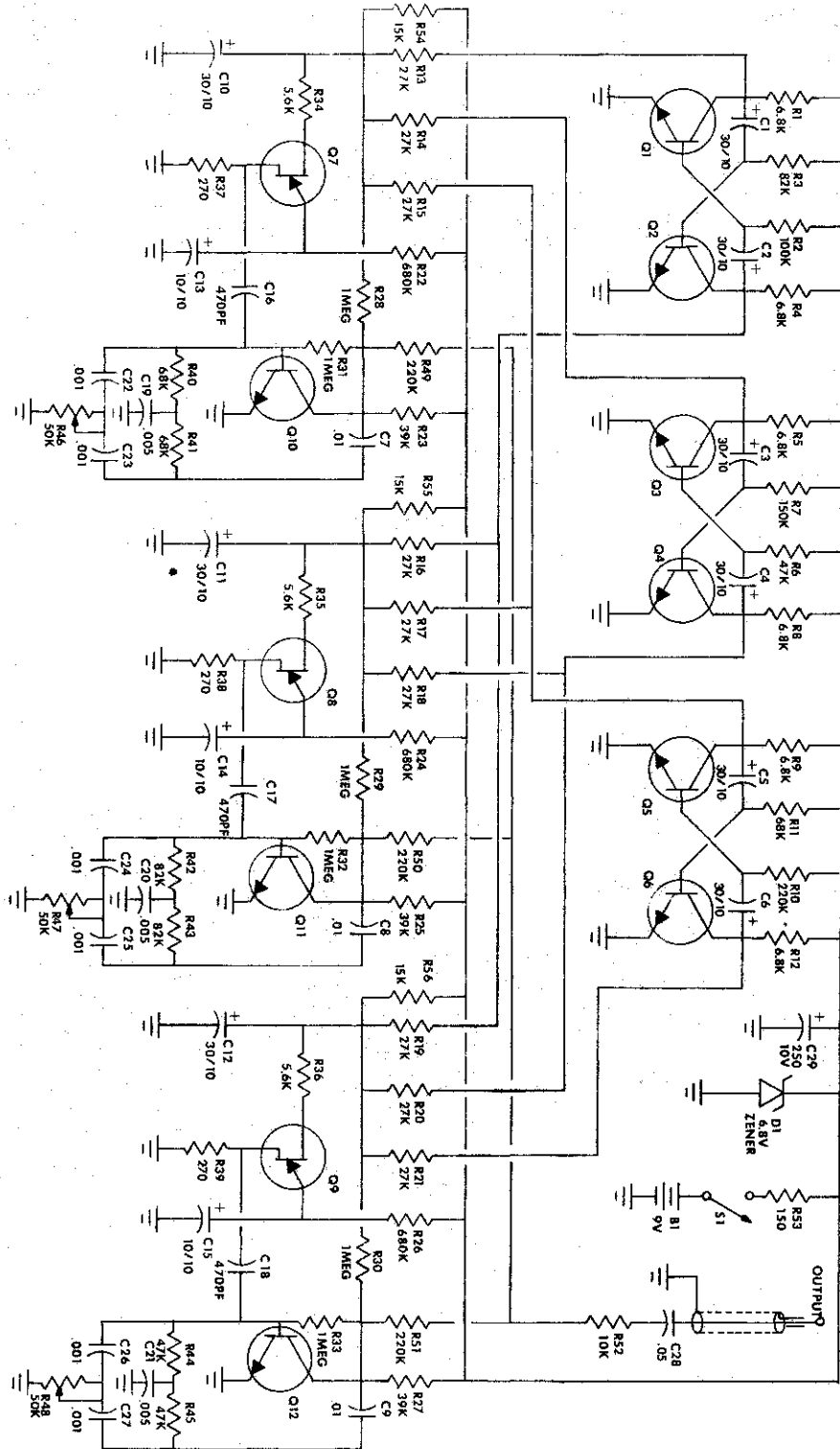


FIGURE 6

IN CASE OF DIFFICULTY

Recheck the wiring with the parts placement diagrams, wiring diagram and, if applicable case wiring diagram. Check the value of the parts to make sure that the proper part has been installed in each position. Check polarity of diode, capacitors and transistors. Many kits which are returned for repair are malfunctioning due to poor solder connections. Look over all solder connections to see that they are as described in the assembly section of this manual. Finally check for solder bridges, wire bits or other foreign matter which may be lodged in the wiring or across conductors on the circuit board.

A repair service is available should you be unable to determine the difficulty. Before sending a unit in for repair please write:

PATA Electronics, Inc.  
 Service Department  
 P. O. Box 14359  
 Oklahoma City, OK 73114

..... Give as full a description of the malfunction as possible. It is possible that some malfunctions can be diagnosed by mail but if no diagnosis can be made you will be supplied with a repair address and shipping instructions. Repairs are charged at the rate of \$4.00/hr. plus parts and shipping. Repairs ordinarily take about one hour but repair times in specific cases cannot be estimated in advance.