

# OWNER'S MANUAL

MODEL ST-11

and  
FACTS  
about

A circular logo consisting of a central black dot with radiating lines of varying lengths, creating a stroboscopic effect.

**STROBOTUNER<sup>®</sup>**

with  
+2  
Extended Range



455 EISENHOWER  
LOMBARD, ILLINOIS 60148

## ST-11 DOMESTIC MODEL

### CAUTION:

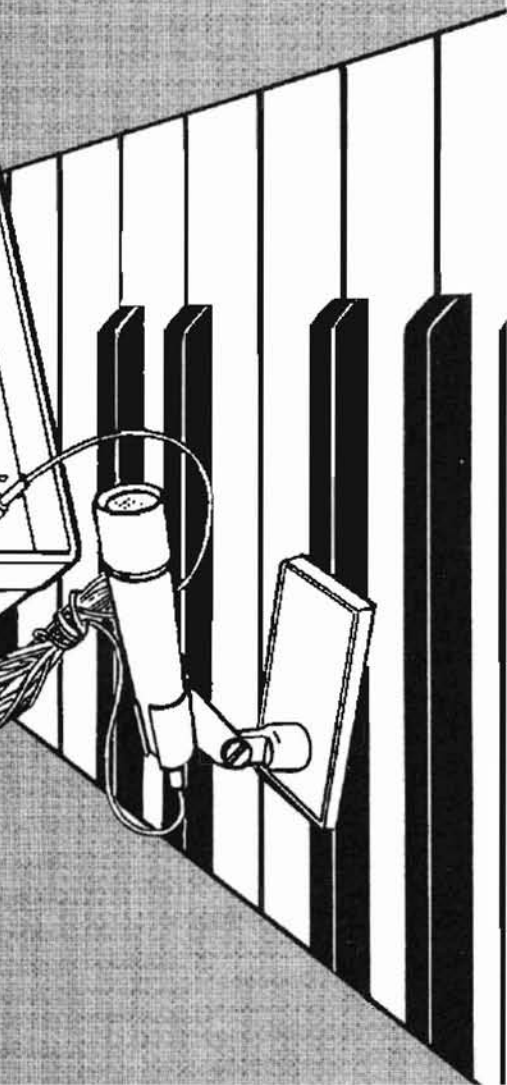
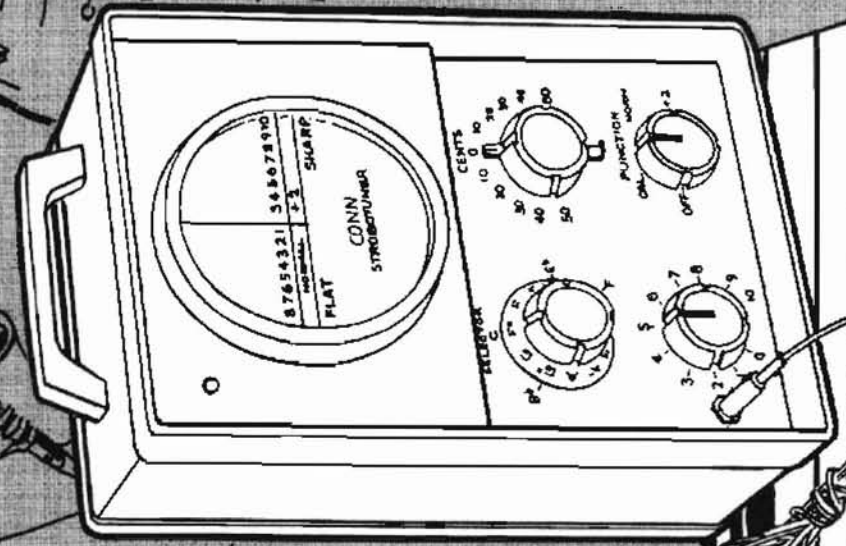
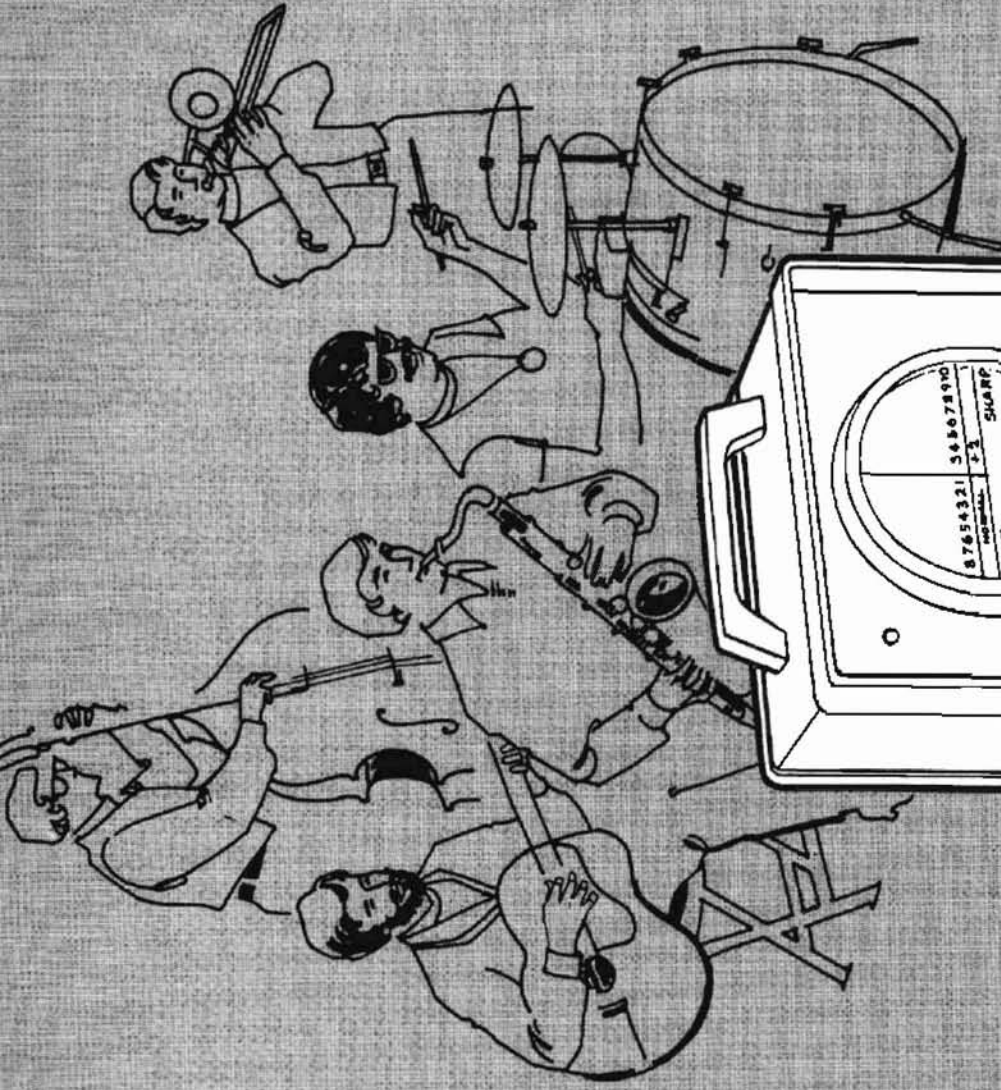
For your protection this device is equipped with a 3-prong grounding type power supply plug. The third round prong is a connection which when used properly will lessen the possibility of accidental electrical shock.

To use this protection feature simply insert the power cord into a 3-way adapter (not supplied) and insert the adapter into a suitable wall receptacle or extension cord. The small wire attached to the adapter is the ground wire which is to be connected to any known ground source such as unpainted cold waterpipe, gas line, or radiator. As most household receptacle boxes are grounded, the wire from the adapter can be attached to the screw holding the receptacle faceplate. Simply loosen the screw and slide the "C" shaped connector behind the screw head and retighten.

If an extension power cord is used regularly it would be wise to invest in the 3 wire type, which has (or can be converted to) a receptacle plug with a ground connection. Any local hardware store or electrical supply store will be able to help you select the proper cord.

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# SOME FACTS about



Your new Strobotuner is a result of many years of research and experience in building electronic tuning devices.

C. G. Conn pioneered highly accurate tuning devices many years ago with the introduction of the STROBOCONN. Wide acceptance of the Strobotuner led to the development of the light-weight Strobotuner which for years has been the standard of the industry. Modern transistors and integrated circuits have led to this advanced model Strobotuner—the most reliable and accurate machine yet produced.

The ST-11 is designed for use on 120 volt, 60 Hz. household power supplies commonly used in North America. If the tuner is to be used in Europe or other areas where different voltages and power frequencies occur, a special export model must be used as serious damage and erroneous readings will result. When traveling overseas with the ST-11 local power availability should be checked to determine compatibility with the ST-11 tuner.

Your new model is built with the most modern and efficient components available. There are no tubes to burn out, weaken, or create heat. The Strobotuner is assembled with solid-state parts. It is actually a digital computer that maintains its accuracy indefinitely using a small amount of electrical power. The Strobotuner is designed with nine integrated circuits assuring many continuous hours of accurate use. As a result of the sophisticated circuits the Strobotuner is accurate within one cent (1/100th of a semitone).

# HOW THE TUNER WORKS

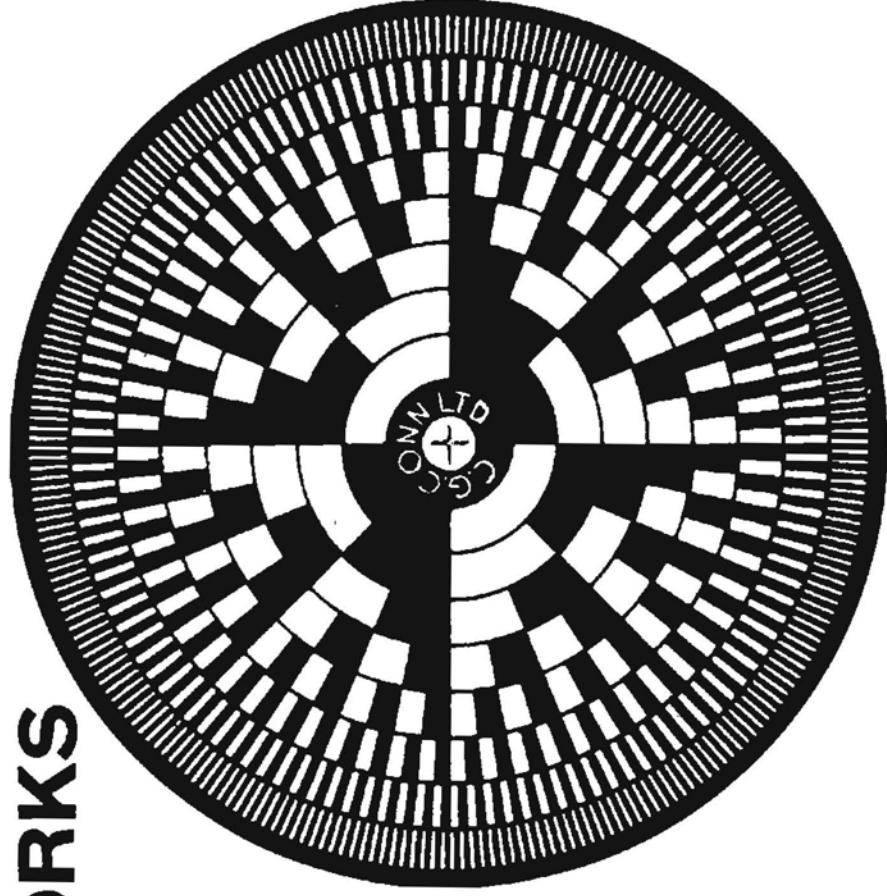


Fig. A

The Strobotuner works on an optical illusion known scientifically as the *stroboscopic effect*—so the name **STROBOTUNER**. The stroboscopic effect is responsible for the apparent backward rotation of objects such as wagon wheels seen in motion pictures when the wagon is clearly moving forward. This same effect causes the wheel to appear to slowly rotate forward or even appear motionless when the wagon is going "full speed" ahead.

Your Strobotuner operates in a similar manner only the "wheel" in the tuner is a motor driven disc like the one shown in figure "A".

A synchronous motor turns the disc at 12 different speeds depending on the note setting of the **SELECTOR KNOB**. The disc is made of plastic which light will show through. Neon lamps are

placed behind the spinning disc and are the source of the orange glow when the tuner is running. The neon lights actually go off and on (too rapidly for the eye to see) at exactly the same frequency as the tone played into the microphone. When everything is exactly synchronized, (neon lights and the spinning disc) the stroboscopic effect is shown as a semi-circle of motionless lines around the disc. If the tone is sharp the lines will appear to revolve to the right or clockwise. If the tone is flat the lines in the disc will appear to rotate to the left or counter-clockwise. If in tune the lines will appear to stand perfectly still.

The stroboscopic effect has remained over the years the most convenient and accurate method for visually displaying musical intonation.

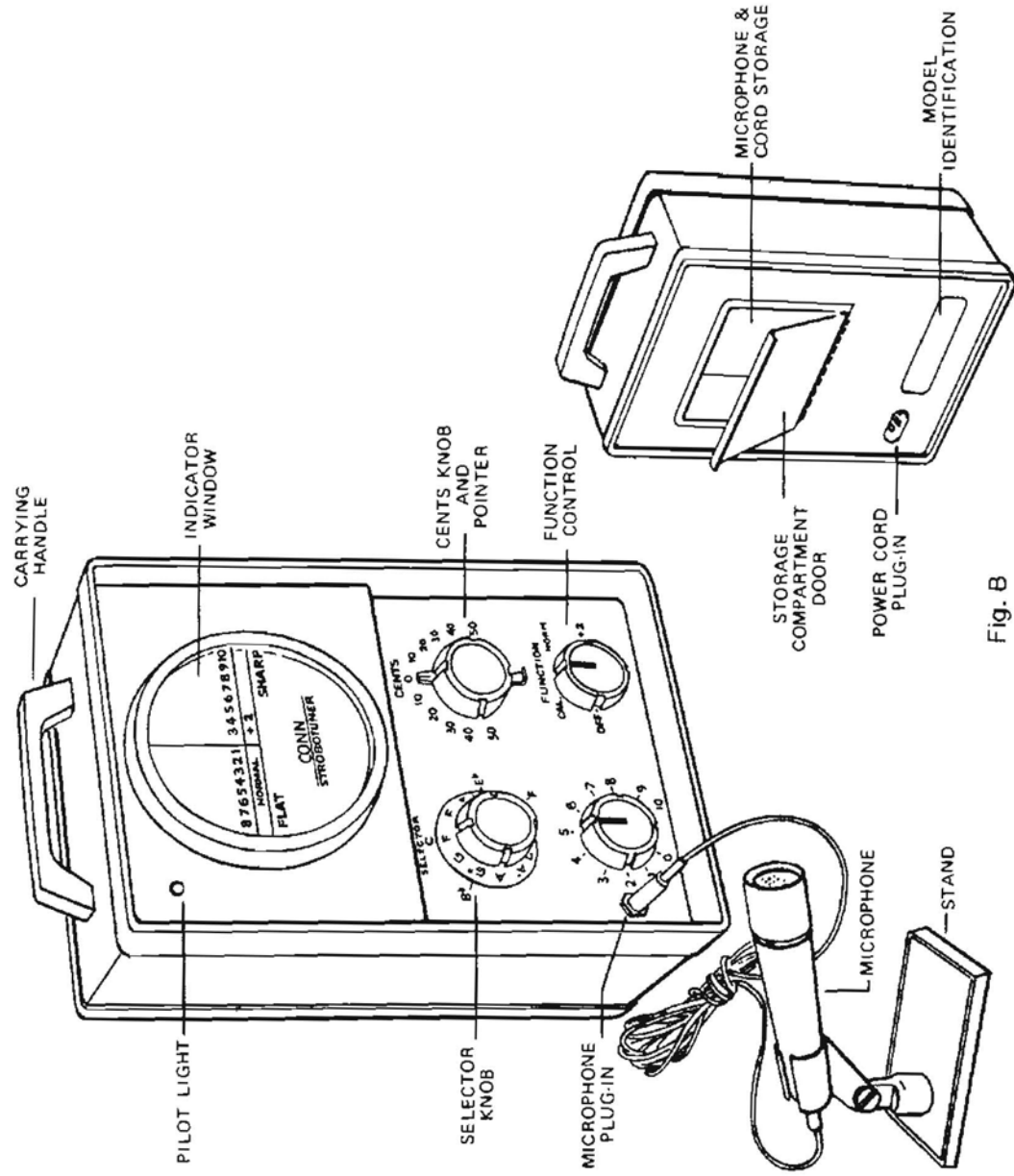


Fig. B

## OPERATING INSTRUCTIONS

Operating your Strobotuner is simple. And to get the most accuracy and best operation from the machine, a little time should be invested in becoming familiar with it. Developing the habit of following the sequence of instructions below will insure the proper operation and calibration.

Look at figure "B" and become familiar with the names of the controls. The storage compartment contains the microphone, microphone stand, microphone cord, plug, and power cord. Notice how all of these parts fit neatly into the compartment. They must go back into this small area in the same

way as they were packed at the factory. Pull the storage compartment door open and take out the cords and microphone.

Connect the power cord to the plug-in on the back side of the tuner. Connect the other end of the power cord to a source of electrical power suitable for your model tuner.

Insert the microphone plug into the receptacle on the front of the tuner. If you wish to use the microphone stand, merely insert the microphone into the flexible holding clips on the top of the stand similar to figure B.

## CALIBRATION

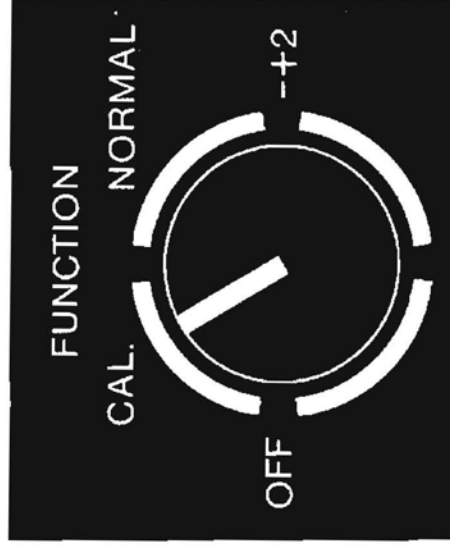


Fig. C

It is important to calibrate the Strobotuner before each use. Turn the FUNCTION KNOB to the CAL position as in figure C. Doing this turns the tuner on and sets the machine for calibration. Be certain that the pilot light is on. If it is not, check the power cord connections and the source of electricity.

The disc seen through the indicator window should be rotating. Do not be concerned if the disc starts spinning slowly at first—this is perfectly normal.

Since the tuner has all solid-state circuits, no lengthy warm up is necessary. Sixty seconds after FUNCTION KNOB is turned on, the machine is fully stabilized, and the calibration procedure can proceed. Study the indicator window in figure D.

Notice to the **left** of center on the window that the various bands where tuning will be indicated are numbered 1, 2, 3, 4, 5, 6, 7 and 8. When calibrating with the function knob pointing to CAL a semi-circle band of lines should appear in the band labeled number 2. If the tuner is in perfect calibration, the lines should appear motionless.\* If the lines are rotating

\*Note: Due to the great sensitivity of the Strobotuner the word "motionless," suggests that the lines should appear as stationary as possible—a very slight movement is normal.

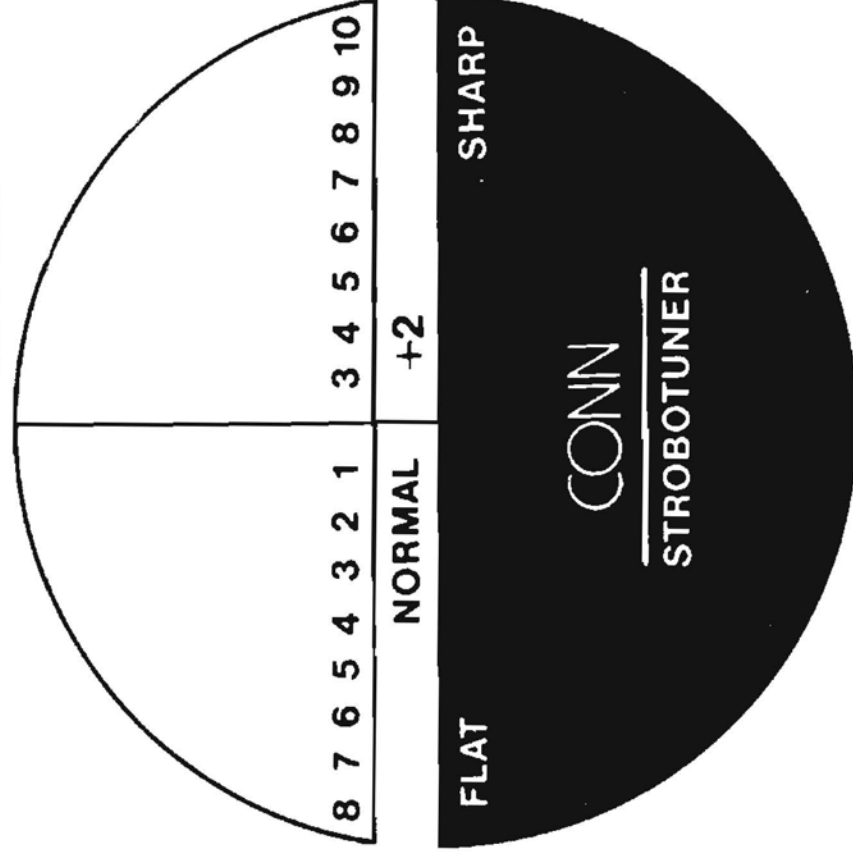


Fig. D

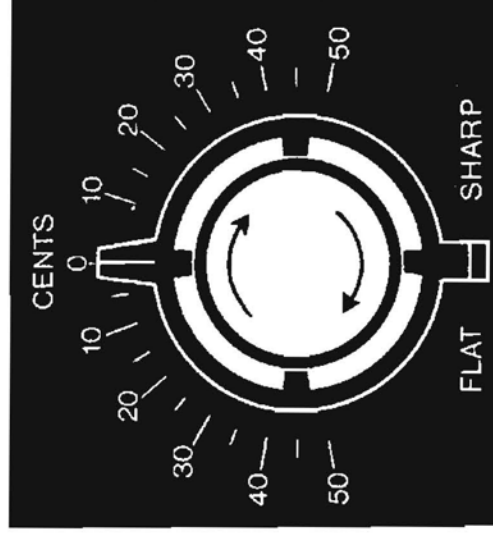


Fig. E

to the right (clockwise), turn the CENTS KNOB figure E also to the right, (clockwise) until the lines stop rotating. If lines are rotating to LEFT turn CENTS KNOB also to left (counterclockwise). In turning the CENTS KNOB right or left, the reference pointer connected to it may not be pointing to zero as in figure F.

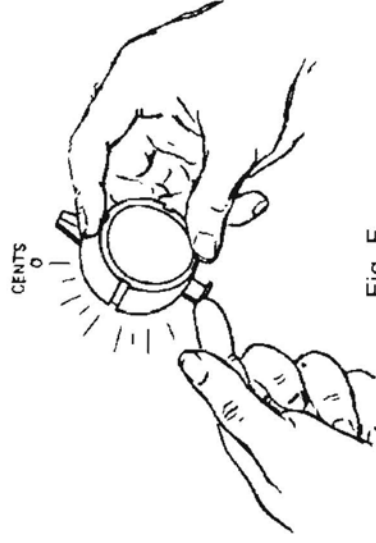


Fig. F

To realign the pointer to zero without disturbing the calibration simply hold the knob perfectly still with two fingers and with one finger of the other hand move the pointer adjustment lug until pointer is straight up and aligned with zero. If the knob itself has not been moved, the line pattern appearing in the window will still be motionless and you are now ready to operate the machine for tuning.

**IMPORTANT:**

Make it a habit to always calibrate the Strobotuner *first* before tuning.

## ABOUT NOTATION

Engineers and musicians agreed years ago to use a system showing which musical octave each was talking about. Happily this system is in universal use today and is the simplest and most exact way to refer to musical pitch. Make a mental note that "middle C" can be also stated as C<sub>4</sub>. The octave above middle C is C<sub>5</sub>; two octaves above middle C is C<sub>6</sub>. It is logical that an octave below middle C is C<sub>3</sub>; two octaves below middle C is C<sub>2</sub>, etc. You will get a better understanding of this notation and how it relates to music by looking at the range chart on page 14. You will find that referring to this chart often will help you in learning the note symbols if they are new to you. For convenience we will refer to various musical pitches as C<sub>4</sub>, A<sub>4</sub>, F<sub>♯2</sub>, etc. from here on in this book.

## USING THE TUNER

After calibrating, turn the function switch to NORMAL position as in Figure G.

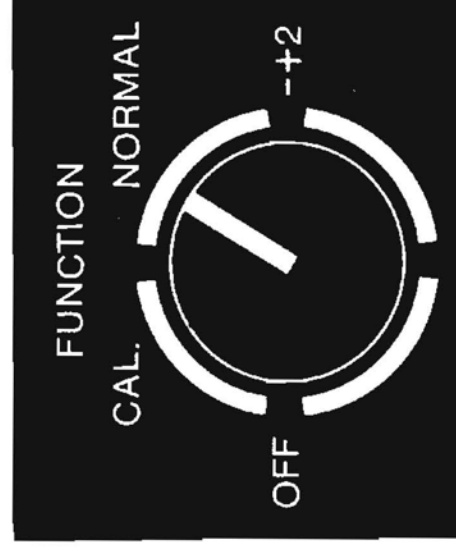


Fig. G

Refer to the bands where the note will be seen on the tuner window. All twelve semitones of octave C<sub>4</sub> through B<sub>4</sub> will be found in the number 4 band of the tuner. All semi-tones of C<sub>5</sub> through B<sub>5</sub> will be found on the number 5 band of the tuner. Now look at the SELECTOR KNOB figure H.

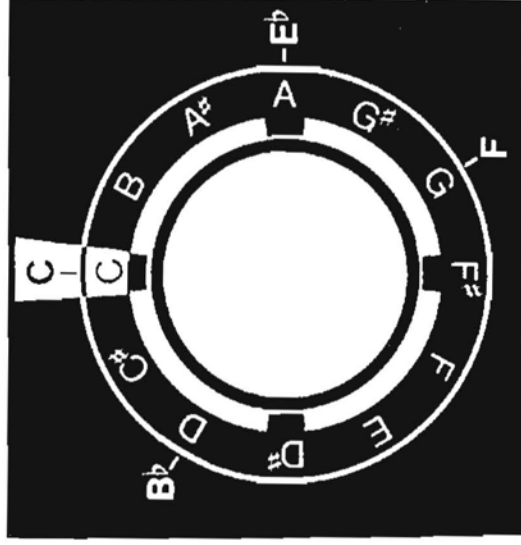


Fig. H

The knob itself has all twelve semitones marked on it, while around the outside of the knob are index lines. We will be concerned with the "C" index now—the others are explained later.

Set the selector knob to the note and index C as in figure H. For example, the note we wish to tune is C on the piano; and since the piano is in the key of C we use the "C" index. Any C on the piano keyboard will be indicated with this setting. C<sub>1</sub> will appear in the first band (number 1). C<sub>2</sub> will appear in band 2, and C<sub>3</sub> in band 3, etc.

What about another note such as E? Turn the SELECTOR KNOB setting so that E aligns with the C index (Figure I). All octaves of E will now show on the tuner. A little practice in finding notes of the piano on the tuner will help in familiarizing you with the

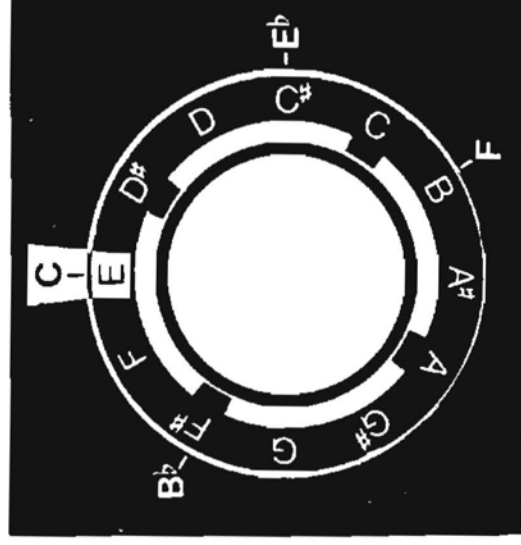


Fig. I

Strobotuner so that it can be quickly and accurately used.

Produce a concert C from any source such as a musical instrument or tuning fork. Direct this tone toward the microphone turning the GAIN CONTROL clockwise so that the disc lights up steadily when tone is produced. The amount that the GAIN CONTROL KNOB must be turned to produce a steady light depends upon how loud the tone is. If the tone is distant or very faint the knob will have to be turned to a higher number. In any case turn the GAIN CONTROL knob just enough to produce a steady, clear pattern.

The actual intonation of any note will be shown as a band of lines in an appropriate band in the window. Correct intonation is shown when the band of lines stands motionless.

# TRANSPOSING INSTRUMENTS

Many wind instruments are of the transposing type—that is, they do not produce the same pitch that is read from the staff. There are three commonly used transposing keys: B $\flat$ , E $\flat$ , and F. To save you the mental process of transposing everything to C before you use the tuner, other index marks around the SELECTOR KNOB are provided for these instruments.

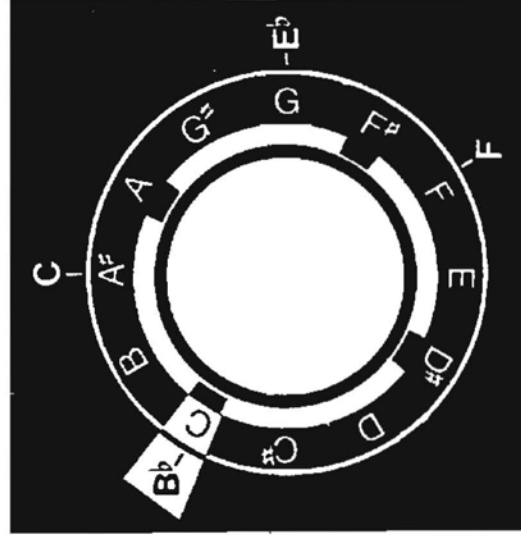


Fig. J

When tuning a B $\flat$  trumpet for example, the B $\flat$  index is used to set the SELECTOR KNOB. Figure J shows the SELECTOR KNOB setting for the trumpet (and other B $\flat$  instruments) when tuning the written note C. This setting

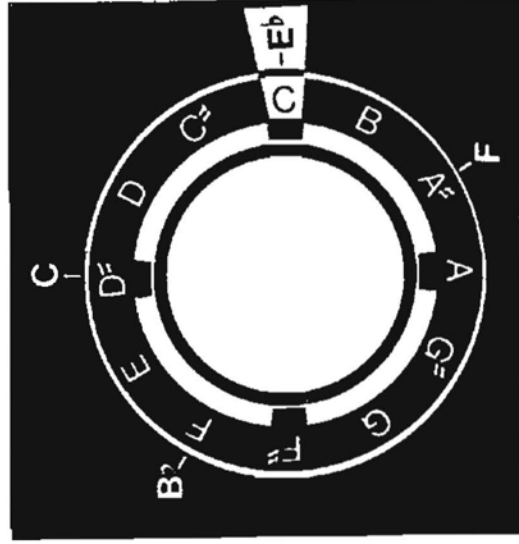


Fig. K

will show all octaves of the written note C produced by the trumpet.

Figure K shows the selector knob setting when tuning the written note C for alto and baritone saxophone (and other E $\flat$  instruments).

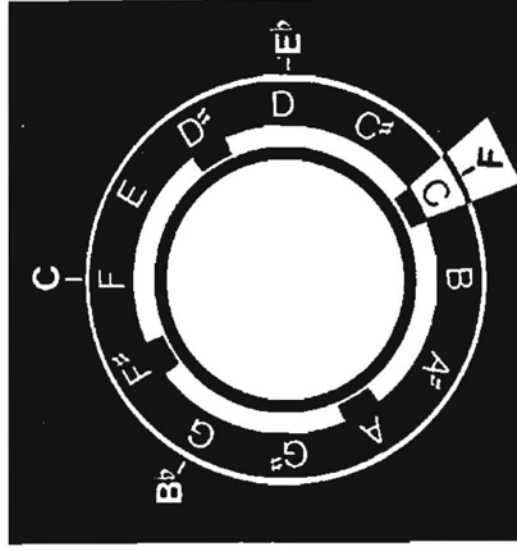


Fig. L

Figure L shows the selector knob setting when tuning the written note C for French horn in F (and other F instruments).

Obviously if some other note than C is to be tuned the selector knob must be turned to the proper note AND index for that instrument.

## + 2 EXTENDED RANGE

Your Strobotuner has an extraordinary feature built into it. You may have noticed that extremely high notes appearing on band 7 and 8 are more difficult to read than notes appearing on band 4 or 5. This is due to the very fine lines printed on the outside edge of the spinning disc compared to the thicker lines toward the center of the wheel. To help you read band 7 and 8 more clearly a special setting of the FUNCTION knob is used, called + 2. Using the + 2 you will find that reading of notes normally found in bands 7 and 8 will be much easier to

see as they will be seen in band 5 and 6. So, when tuning notes that would normally appear in band 7 or 8 simply turn the FUNCTION knob to the + 2 setting. See figure M.

Remember, when using the + 2 setting . . . notes normally read in band

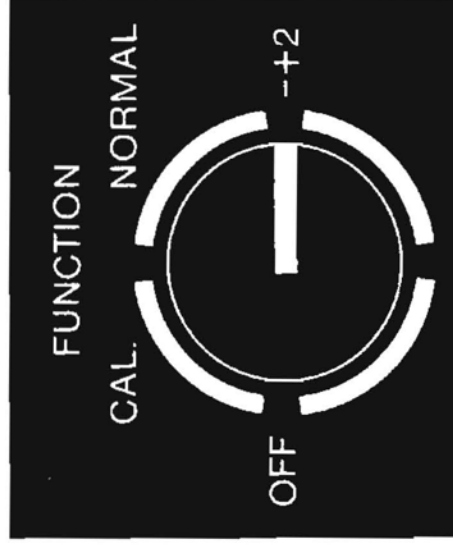


Fig. M

7 will appear in band 5—two bands lower. The notes normally read in band 8 will appear two bands lower in band 6, etc.

Special + 2 guide numbers are provided on the Strobotuner window to the **right** of center. You can see that these numbers indicate which octave is **ACTUALLY** being shown when using the + 2. Your experimenting with notes comparing patterns with and without + 2 will quickly give insight into this important feature.

Of interest to the hobbyist, pipe organ tuner, and recording equipment enthusiast is that the + 2 feature will allow the Strobotuner to accurately indicate frequencies up to 31,600 cycles—beyond the range of normal human hearing! This is accomplished by setting the function knob on + 2 and reading bands 7 and 8.



# PIANO TUNING

The popularity of the Strobotuner is due to the large number of piano technicians who find that the Strobotuner can increase their speed in learning to tune accurately and is a handy reference to maintain consistency in their work.

If you wish to study the technique of tuning pianos with the Strobotuner we suggest that you obtain the specially prepared manual, "Notes on the Use of the Strobotuner in Piano Tuning". Ordering information will be found on page 17.

The following procedure is intended to familiarize the experienced piano technician with the Strobotuner. It is not a course in piano tuning as there are many complexities to tuning which are beyond the scope of this manual.

If the piano is to be tuned to A-440 use the calibration procedure given on page 6.

If the piano is to be tuned to a standard such as a tuning fork simply:

1. Turn function knob to **NORMAL** position
2. Sound tuning fork or other sound source
3. "Stop" one appropriate band of lines by turning the **CENTS** knob
4. Hold the **CENTS** knob stationary and reset its pointer to "O"

Your Strobotuner is now calibrated to the frequency of the sound source and tuning may proceed.

## TEMPERAMENT OCTAVE

Choose your temperament octave with care. Make certain that the "break" or change in string construction is not in this octave. Mute all but one string per key so that only one string sounds when key is struck.

As an example, assume the octave C<sub>4</sub> to B<sub>4</sub> is our temperament octave using A-440 standard. Assume also

that the Strobotuner is calibrated and ready to use. Tune chromatically upward starting with C<sub>4</sub>. Watch only band 4 which will indicate all of the 12 notes in this octave. As you proceed from C<sub>4</sub> to C<sub>♯4</sub>, you must turn the **SELECTOR** switch to C<sub>♯</sub> using the C index. Obviously the switch must be appropriately set each time a new note is to be tuned. Since C<sub>4</sub> to B<sub>4</sub> is your temperament octave you should adjust the string tension so that each one of these notes "stops" the pattern in band 4 only. **IF YOU SEE PATTERNS IN BANDS 5, 6, 7, or 8 IGNORE THEM FOR NOW UNTIL THE TEMPERAMENT OCTAVE IS TUNED.**

Go back and recheck each note of the temperament octave until you are satisfied that one string of all 12 notes in this octave "stops" the pattern in number 4 band on Strobotuner window.

## INHARMONICITY

As you know, most pianos with perfectly tuned octaves do not sound well, are quite lifeless and produce aural "beats" when the octave is struck. This is due to the complex tone of the piano string. The reason for this octave phenomenon is that the piano string produces several tones simultaneously other than the one it is tuned to.

For example, one string—say C<sub>4</sub>—is sounded. This string produces other notes such as C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub>, in addition to C<sub>4</sub>. Admittedly, C<sub>4</sub> is by far the most prominent to the ear. But the human ear—particularly a sensitive musician's ear—will hear C<sub>5</sub>, C<sub>6</sub>, and C<sub>7</sub> also.

The job of the meticulous piano tuner would be greatly simplified if when sounding C<sub>4</sub>, the lesser tones (C<sub>5</sub>, C<sub>6</sub>, and C<sub>7</sub>) were exactly twice, four times, and eight times the tone of C<sub>4</sub>. This is not the case in the piano tone. As the

Strobotuner will show, the higher C's are SHARP when C<sub>4</sub> is sounded. It is this physical trait of the piano string (inharmonicity) that makes it necessary to "stretch" octaves to make them pleasing to hear.

You will find that the degree of inharmonicity varies greatly between octaves. In any case the Strobotuner will show when inharmonicity is present — and how much is present.

## TUNING THE HIGHER OCTAVES

Having set the temperament octave you can now tune the C<sub>5</sub> - B<sub>5</sub> strings. The tuner SELECTOR knob should be set on C. Strike C<sub>4</sub> of the temperament octave. However, observe the band 5 in the tuner window and you will probably see a pattern of lines rotating slowly clockwise. If this is the case you can be certain that inharmonicity is present and you will have to sharpen C<sub>5</sub> so that the C<sub>4</sub> - C<sub>5</sub> octave will not have unpleasant "beats". With the Strobotuner it is simple to do this.

Merely strike C<sub>4</sub> and adjust the CENTS knob clockwise until the *number 5 pattern* stands still. Then mute out all but one string of C<sub>5</sub>, strike it, and adjust the tuning pin for that string until the number 5 pattern stands still. Tune all of the octave C<sub>5</sub> - B<sub>5</sub> notes by striking the C<sub>4</sub> - B<sub>4</sub> notes an octave below, resetting the tuner CENTS knob and pointer each time. Then strike the C<sub>5</sub> - B<sub>5</sub> notes with the same respective setting, adjusting tuning pins to stop the patterns in band 5.

Continue your tuning procedure upward throughout the C<sub>6</sub> - B<sub>6</sub> and C<sub>7</sub> - B<sub>7</sub> octaves. Use the same technique of striking the note an octave below that which you are tuning. Simply look at the band of lines an octave above the struck note to set the tuner. Then adjust string tension of the note you wish to tune from this setting ob-

tained from the lower note. As your speed increases you will probably omit resetting the Strobotuner CENTS knob pointer and simply read direct.

Earlier model Strobotuners had an absolute high range of B<sub>7</sub>. However, your solid state model has a number 8 band making a practical C<sub>8</sub> to B<sub>8</sub> range. This extra band allows C<sub>8</sub> to be tuned directly. And the + 2 feature allows you to see the C<sub>8</sub> and C<sub>7</sub> - B<sub>7</sub> pattern more clearly.

This operation of the + 2 feature is explained in detail on page 9 of this manual.

## TUNING THE BASS STRINGS

After tuning the treble strings you have gained enough practice in using the Strobotuner so that tuning bass strings below C<sub>4</sub> will be faster.

Make sure that the CENTS knob and pointer are **returned to zero** setting used for the tuning standard and the function knob is on NORMAL. Tune the B<sub>3</sub> string until the number 4 band pattern is motionless. This procedure will compensate for any inharmonicity in the B<sub>3</sub> string and will make the B<sub>3</sub> - B<sub>4</sub> octave a pleasant sounding interval. Proceed downward through A<sub>2</sub><sup>♯</sup>, A<sub>3</sub>, G<sub>3</sub><sup>♯</sup>, etc., using the number four band pattern to tune to.

## WOUND STRINGS

Wound bass strings will produce a definite change in the inharmonicity as seen on the tuner. Wound bass strings have a higher harmonic content than do treble strings. You will have to decide which band you wish to refer to in the octave stretching process. Some of the lower notes will show very strong patterns in bands two or three octaves above the note being tuned. You must decide which of these bands is the most pronounced and use that one as a reference. A good deal of personal expertise and

judgment must be used here. For example, if when tuning C<sub>2</sub>, band number 5 pattern is very pronounced—more than band 3 or 4,—then you should use the number 5 band when adjusting the string. Remember it is the stronger octave harmonic which your ear hears and it is this same harmonic which produces the clearest Strobotuner pattern. Use as your tuning reference the band which shows the clearest pattern.

## A<sub>0</sub>, A#<sub>0</sub>, B<sub>0</sub>

The lowest three notes on the piano are below the direct range of the Strobotuner. However, these three keys can be tuned the same as the other bass strings by striking the key and watching the Strobotuner to indicate which *upper* band has the strongest pattern. Then simply tune the string to “stop” that pattern.

## OTHER THOUGHTS ON TUNING

You will quickly learn the best microphone placement to obtain the clearest pattern. You may find that in the high strings where the sustaining time is short, striking the key in rapid succession will produce the best pattern. In using the tuner you will immediately discover that notes are flatter shortly after being struck. You will have to determine by ear which part of the tone is the best in tune—the initial sound or the sustained pitch. Usually this decision is easy, as the amount of discrepancy is small.

## TUNING THE UNISONS

Most piano technicians like to mute out all of the strings at once, tune the single strings, and then the unison strings. Unison strings are usually tuned aurally; however, the Strobotuner can be used if you wish. If you are new to the piano tuning profession you may want to check your ear with the tuner. As a training and reference device the Strobotuner has few equals.

## TUNING ORGANS

Tuning electronic organs is a simple matter using the Strobotuner. In all cases the service manual for the particular organ must be consulted for the precise tuning the instrument was designed for. If the organ is of the tube type a 10 or 15 minute warm up time should be allowed prior to tuning. A patch cord can be devised to make a direct connection between the organ speaker and the Strobotuner—thus eliminating the need of the microphone. The patch cord hook-up has the additional advantage of eliminating any room noises which would interfere with the tuning process.

Most people who tune organs prefer to tune all octaves of the same note, i.e., tune all octaves of C then reset tuner to C#, D, etc. This procedure saves switching the tuner back and forth from one note to the next frequently. In contrast to piano tuning, the organ tuner does not need to be concerned with inharmonicity and the process of “stretching” octaves can be ignored.



# ACCESSORIES

ORDER FROM YOUR STROBOTUNER DEALER

## PROTECTIVE COVER

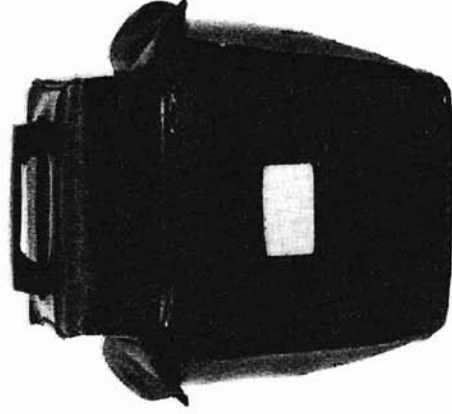
An ideal accessory to protect your Strobotuner. Made of heavy expanded vinyl reinforced with heavy stitching and extra material. Slips over the carrying handle . . . . . #9999 . . . \$12.00

## DELUXE "ROADIE" COVER

A must for the tuner that travels. Cover is black grained vinyl, 3 large pockets—2 with snap flaps—one large expandable pocket with zipper. Pockets are large enough to carry microphone, power cord, and a lot more. A rugged cover with heavy stitching and reinforcements. Front of cover has rigid panel built in to protect viewing window and front knobs. Complete with sewn-in holder for identification card. Slips over Strobotuner in seconds. . . . . #8882-3 . . \$26.95



Front



Back

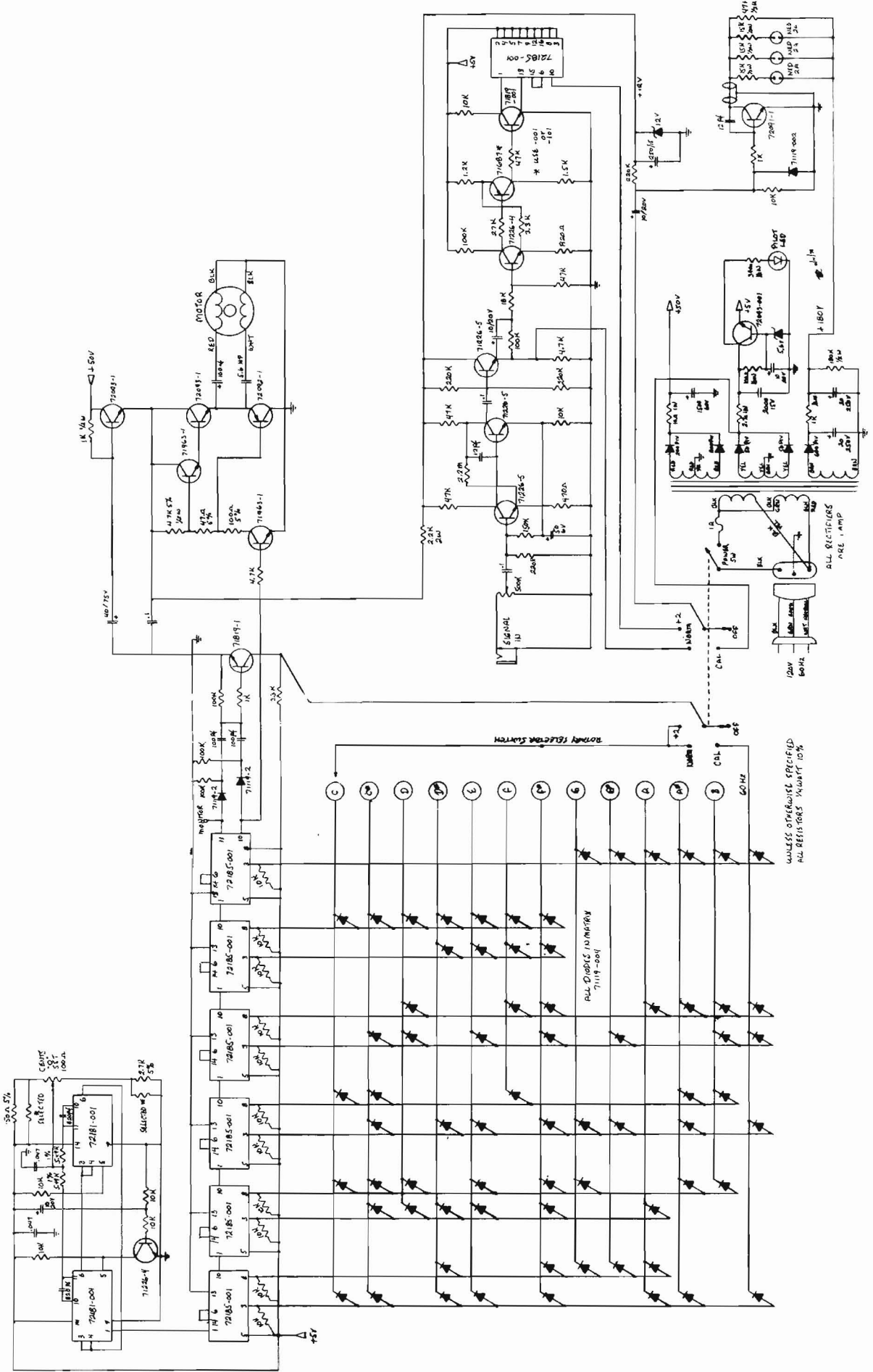
## SERVICE & REPAIR

The solid state circuitry used in the Strobotuner is as reliable as modern manufacturing techniques permit. However, as the machine is used continuously, service could be necessary.

A full repair facility is maintained by C. G. Conn, Ltd., where Strobotuner repairs are done. We strongly urge

you to return the instrument to this facility if any repairs are necessary. The Conn Corporation reserves the option to avoid any warranty claims where repair to a Strobotuner under warranty is attempted by any person not employed by the Conn Corporation.

# ST-11 SCHEMATIC





# STROBOTUNER (SOLID STATE)

## PARTS LIST

43633	Plate Mounting S	72186-2	Lamp, LED
44986	Plate Mounting L	59618-1	Capacitor 250 UF 15V
48446-2	Fuse, Pigtail	59807-1	Capacitor 40 UF 75V
50903-2	Power Cord, 3 Wire With Plug	59970-13	Capacitor .10 UF 100V
50357-6	Disc, Scanning	59970-14	Capacitor .047 UF 100V
55015-9	Control 500K	70534-1	Capacitor 100 MFD 50V
55052-4	Jack	71497-12	Capacitor 100 PF 100V
56242-2	Potentiometer, "Cents", 100 Ohm	71497-111	Capacitor 12 PF 500V
56542-101	Plug, Recessed 3P	71552-1	Capacitor 10 UF 20V
57809-2	Hub	71681-1	Capacitor 50 UF 6V
57810-2	Nut, Hub	72326-1	Capacitor 20-20 MF 250V
57824-3	Switch, Selector	72327-1	Capacitor 1500 MF 60V
57828-3	Window Dial	72328-1	Capacitor 2000 MF 15V
57829-6	Front Panel	72329-1	Capacitor 820 PF 500V 5%
57874-101	Microphone, W/Cord & Plug	72521-1	Capacitor 5.6 MFD 100V NP
57874-102	Microphone Stand	43743	Resistor 100 Ohm 1/2W
58691-5	Case	45223-1	Resistor 47K 1/2W
59292-2	Shield, Motor	52041	Resistor 15K 1/2W
59616-4	Lamp NE D24	55162	Resistor 1K 1/2W
59689-10	Knob, "Function"	55162-1	Resistor 1K 1/2W
59689-10	Knob, "Gain"	55177	Resistor 180K 1/2W
59689-11	Knob, "Selector"	58187	Resistor 390 Ohm 1/2W
59689-12	Knob, "Cents" Control	58557	Resistor 10 Ohm 1W
70107-3	Motor	59518-1	Resistor 2.2K 2W
71119-2	Diode GP	71521-3	Resistor 1K
71119-4	Diode GP	71521-7	Resistor 10K
71226-1	Transistor NPN	71521-21	Resistor 100K
71226-4	Transistor NPN	71521-36	Resistor .22 Meg
71226-5	Transistor NPN	71521-38	Resistor .10 Meg
71411-2	Diode, Zener 12V 1W	71521-41	Resistor 47K
71411-13	Diode, Zener 5.6V	71521-42	Resistor 27K
71443-102	Insulator, Transistor	71521-46	Resistor 10K
71657-2	Clip, Window	71521-48	Resistor 1K
71687-101	Transistor PNP	71521-50	Resistor 470 Ohm
71719-10	Cover, Escutcheon	71521-63	Resistor 3.3 K
71819-1	Transistor NPN	71521-68	Resistor 4.7K
71963-1	Transistor NPN	71521-74	Resistor 820 Ohm
72079-1	Rectifier 1A 50 PIV	71521-90	Resistor .15 Meg
72079-3	Rectifier 1A 200 PIV	71521-101	Resistor 4.7K
72079-5	Rectifier 1A 600 PIV	71521-102	Resistor 3.3K
72090-2	Transformer, Power	71521-103	Resistor 1.5K
72091-1	Transistor NPN	71521-104	Resistor 1.2K
72092-1	Transistor PNP	71521-105	Resistor 100 Ohm
72093-1	Transistor NPN 4923	71521-113	Resistor 47 Ohm
72097-2	Light Amplifier	71521-130	Resistor 18K
72097-3	Generator Board	71521-160	Resistor 2.2 Meg
72097-4	Matrix Board	71667-1	Resistor 4.7K 1/2W
72101-2	Switch, "Function", Off/Norm/Cal/ +2	72182-2	Resistor 5.49K 1%
72179-1	Socket, I.C. 14P	72232-2	Resistor 270 Ohm
72179-2	Socket, I.C. 16P	72232-3	Resistor 150 Ohm
72181-1	Integrated Circuit 74121	72314	Resistor 2.7 Ohm 1W
72185-1	Integrated Circuit 7476		

NOTE: All Resistors 1/4W Unless Stated Otherwise.

Order above parts from Strobotuner Service Dept., 455 Eisenhower, Lombard, Illinois 60148  
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