



BODE VOCODER

MODEL No. 7702



16 CHANNEL MODEL OF THE BODE VOCODER

The Bode Vocoder, Model No. 7702 is a sixteen channel Vocoder, comprising a sixteen channel analyzer and a sixteen channel synthesizer section for the transfer of the overtone structure of sounds entered into the Voice inputs onto the sounds entered into the Carrier input. The frequency ranges of these sixteen channels extend from 50 Hz to 5080 Hz. They are indicated on the front panel between the row of output jacks for the control voltages derived in the analyzer channels and the row of input jacks leading to the voltage controlled amplifiers in the synthesizer channels. The performance of these 16 channels is further enhanced by a high frequency channel extending from 5080 Hz to 15000 Hz, which mainly covers the region of "s" sounds and explosive consonants, and which can be operated in the "direct" mode, in which it functions as a bypass, or in the "switched" mode, in which it is only activated in the presence "s" sounds and consonants.

The availability of this high frequency enhancement channel has proven extremely useful for the processing or "copying" of percussive sounds entered into the Voice input, such as violin pizzicato, drum sounds, bell sounds, and the like, and thus places this Vocoder into a completely new category of instruments in its class.

The faithful transfer of attack transients is furthermore facilitated by the fast response times of the control circuits in the analyzer section, which is in the order of 6 milliseconds.

The special features of the model 7702 include the following:

*A patch select control, which activates a preselected patch made between the control voltage output jacks of the analyzer section and the voltage controlled amplifier input jacks of the synthesizer section to generate special effects (such as the "Donald Duck" effect). The preselected patch is activated either by actuating a toggle switch on the front panel or a pedal switch plugged into a rear panel receptacle.

*A sample/hold (or track/hold) control, holding a given sound spectrum (for instance a vowel or an instrument sound) entered into the Voice input when actuating a toggle switch on the front panel or a pedal switch plugged into a rear panel receptacle.

*A Vocoder bypass, either activated by a toggle switch on the front panel or by a pedal switch plugged into a rear panel receptacle.

The model 7702 has a built-in pink noise source and a voice activated switching circuit to enter the carrier signal into the synthesizer section in the presence of voiced sounds and the noise signal in the presence of unvoiced sounds.

Other features and controls include:

- a MIC/LINE switch
- a Voice level control with L.E.D. overload indicator
- a mode switch for selecting the switched or the direct bypass mode for the 5080 to 15000 Hz range
- a HISS/BUZZ balance control for properly balancing the voiced and the unvoiced sounds, and
- a HISS / HISS+BUZZ / BUZZ mode switch to activate either the unvoiced sounds alone or the entire vocoder range or the voiced sounds alone. The BUZZ mode is important for the processing of some musical sounds.

The Bode Vocoder employs the latest technology. Due to the absence of any trim adjustments in the entire 16 channel vocoding section extreme reliability is assured. The signal-to-noise ratio of this instrument is better than 60 db, the carrier feedthrough is below the noise threshold and the harmonic distortion is extremely low.

The model 7702 has high impedance line inputs and a low impedance output. The instrument is self contained with built-in power supply, switchable to 115 or 230 volts A.C., 60 or 50 Hz line. The Vocoder features standard rack mounting. The front panel size is 7" x 19", and the depth is 12" without the controls.

SPECIFICATIONS:

Voice Input Levels:	Nom Line:	0 dBm (0.7 volts)
	Mic:	-40 dBm (0.007 volts)
Input Impedance:	Line:	20 K ohms
	Mic:	30 K ohms
Carrier Input:	Nom:	0 dBm (0.7 volts)
	Input Impedance:	100 K ohms
Output:	Max Level:	+15 dBm (4.4 volts)
	Output Impedance:	600 ohms
Signal to Noise Ratio:	Bypass (P.A.) Mode:	Better than 75 dB
	Vocoder Mode:	Better than 60 dB
Frequency Range:	Overall:	50-15,000 Hz
	Vocoding Section:	50-5,080 Hz
	High Frequency Channel:	5,080 - 15,000 Hz

In the interest of product improvement Bode Sound Co. reserves the option to change the appearance design and other minor details without notice. - Patent Pending -



BODE SOUND CO.

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Short Form Operating Instructions for Bode Vocoder Model No. 7702
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1. After carefully removing the instrument from its shipping container, check for any visual evidence of shipping damage.
2. After the visual inspection of the instrument shows, that it has arrived in good condition, plug the power cord into the rear receptacle and into the power outlet. Then turn on the power.
3. Connect output of monophonic synthesizer to Carrier input. Select square wave on synthesizer and adjust to pulse wave mode. 10% duty cycle will give best results with voice processing. Adjust Carrier level until red Overload indicator light comes on. Then back off slightly.
4. Connect output of microphone mixer to Voice input and set switch left from input jack to Line position. Talk into the microphone (held close to the mouth) and adjust level so that overload indicator light comes on only at voice peaks. (There is a headroom of about 4 db above this level).
5. Connect Vocoder output to output mixer or preamplifier. With the Carrier and Voice input levels chosen as described, the Vocoder output level should be around +10 dBm.
6. For initial work with the Bode Vocoder the following control settings should be observed:
 - * Track/Hold switch - in center position on Track.
 - * Patch Select switch - in down position on Normal.
 - * 5080-15000 Hz. switch - in up position on Direct.
 - * Hiss-Buzz Balance control - in center position.
 - * Hiss/Mix/Buzz switch - in center position on Mix.
 - * Vocoder output switch - in up position on Vocoder.

Short Form Operating Instructions for Bode Vocoder Model No. 7702,
cont'd.

Initial work with the described control settings is recommended to get a feeling for the levels required to obtain optimum performance of the Bode Vocoder.

Once this feeling for the performance of the Vocoder has been developed, the features and control functions may be studied.

SPECIAL FEATURES AND CONTROLS OF THE BODE VOCODER.

TRACK/HOLD:

The Track/Hold circuit holds any vocoded vowel (in the overtone range from 50 to 5080 Hz), when

- a) pushing down the Track/Hold Switch (temporary Hold), or
- b) setting the Track/Hold switch in the upper Hold position (extended Hold).

The vowel information can be held for several minutes.

PATCH SELECT:

After making cross patches between the Analyzer Outputs and the Synthesizer Inputs, these cross patches can be activated by turning the Patch Select switch from the down (Normal) position into the up (Cross Patch) position. A typical cross patch, namely for the Donald Duck effect, is made by connecting the Analyzer output jacks to the the Synthesizer input jacks two steps to the right, or, for instance, the Analyzer jack between 400 and 504 Hz to the Synthesizer jack between 645 and 800 Hz and so forth to the left and the right.

Other patches can be found out by experimenting.

5080 - 15000 HZ DIRECT/CONSONANT CONTROLLED switch:

The Direct mode (up position of the switch) is selected for optimum intelligibility of the speech without jeopardizing the vocoding features.

For special effects the Consonant Controlled mode may be selected (down position of the switch), in which the bypassed high frequencies are only activated in the presence of "s" sounds together with synthesized "s" sounds.

HISS-BUZZ Balance:

The Vocoder is internally adjusted for optimum balance between vocoded and bypassed signals with the Carrier level set to Maximum (close to overload). Changes of this balance to suit specific needs or taste can be made by setting the balance control towards the HISS position (more high frequencies) or towards the BUZZ position (more low frequencies).

Short Form Operating Instructions for Bode Vocoder Model No. 7702,
cont'd.

HISS / MIX / BUZZ switch:

In the normal mode of this switch (the MIX position) both the vocoded (vowel) and the "s" sounds are activated.

In the BUZZ mode all hiss signals (bypassed and synthesized) are suppressed.

In the HISS mode all buzz signals (carrier) are suppressed.

Note: The Bode Vocoder model No. 7702 has a built-in Hiss/Buzz discriminator, which is operative at all times. In the presence of Buzz sounds the Buzz LED lights up, and in the presence of Hiss sounds the HISS LED lights up.

OUTPUT switch:

In the VOCODER mode the Vocoder is activated and the LED indicator lights up.

In the BYPASS mode the Vocoder is bypassed and the instrument operates as a public address unit.

FOOT SWITCH OPERATION:

The TRACK/HOLD, the PATCH SELECT and the VOCODER/BYPASS functions can be activated by optional foot switches, which plug into the receptacles in the rear of the instrument.

In the operating modes, activated by either the front panel or the foot switches the front panel indicator lights go on to indicate the status of the function selected.

Circuit Description of the Bode Vocoder.

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The circuitry of the Bode Vocoder consists of the following sections:

- a) The Vocoding Section,
- b) The Program circuitry, with control section,
- c) The Carrier circuitry, with control section,
- d) The Sample/Hold and Cross Patch switching circuit, and
- e) The output circuitry.

The Vocoding Section.

The nucleus of every Vocoder is the Vocoding section, which consists of an analyzer and a synthesizer. The analyzer of the Moog Vocoder comprises a bank of 16 band pass filters, which cover the range of speech overtones from 50 Hz to 5080 Hz. The lowest of these filters extends from 50 Hz to 159 Hz. The remaining 15 filters are 1/3 octave filters in the range from 159 to 5080 Hz. In the 16 analyzer filters the program material is analyzed in accordance with the spectral energy distribution, and the signals of each channel are rectified and converted to control voltages, which are derived at the Analyzer Rectifier outputs.

In the Synthesizer portion of the Vocoding section the control voltages of the 16 channels are then used to control the gain of 16 V.C.A.'s, which precede 16 band pass filters, that exactly correspond to the 16 band pass filters of the analyzer section, so that the overtone distribution derived from the analyzed program material (for instance voice) will be transferred to the carrier signal entered into the signal inputs of the synthesizer V.C.C.'s.

For normal operation the analyzer rectifier outputs 1, 2, 3 15, 16 can be thought of as being directly connected to the synthesizer inputs 1, 2, 3, 15, 16, as indicated by the dotted lines on the block schematic diagram.

As can be recognized in the block schematic diagram, the analyzer rectifier outputs and synthesizer V.C.C. inputs are also connected to the Sample/Hold and Cross Patch switching circuit, which will be discussed further below.

The Program Circuitry, with control section.

Before entering the Analyzer Band Pass Filter inputs, the signal received at the Program input is being preconditioned. Basically this signal, before reaching the Vocoding Section passes a microphone preamp (in case direct microphone operation is intended) and then the preamplifier, which in turn is connected to the Program overload circuit with LED indicator.

Circuit Description of the Code Vocoder, cont'd.

The Program Circuitry.....

In addition to feeding into the analyzer band pass filters, the preamplified program signal goes to the bypass line, which leads to an electronic switch to activate either the vocoder or the direct bypass; furthermore the preamplified program signal feeds into the high frequency bypass channel, consisting of a high pass with a cut-off frequency above the vocoding range, a gate and a band pass, and then feeding into the summing stage, at which also the output signals of the 16 synthesizer channels are being summed.

Furthermore the preamplified program signal feeds into the Hiss/Buzz discriminator, which has the function of activating a Hiss control signal in the presence of hiss or "s" sounds (unvoiced sounds) and of activating a Buzz control signal in the presence of vowels or voiced sounds. In the presence of "s" sounds a gate is being opened, which passes the signal of a noise generator (through a switch and balance control) to a summing stage and on to the carrier/noise input of the Synthesizer V.C.O.'s. Also, in the presence of "s" sounds a gate in the high frequency bypass line (5080 to 15000Hz) is opened provided that the switch shown under the gate is in the "switched" position.

In the presence of vowels or voiced sounds the Buzz control voltage opens a gate between the carrier preamp and the summing stage, which again feeds into the carrier/noise input of the Synthesizer V.C.O.'s.

The Carrier Circuitry.

The Carrier signal input is followed by a carrier preamplifier with an overload circuit and an overload LED at its output. The carrier signal is then admitted or barred from reaching the balance potentiometer and summing stage for the Synthesizer signal input, as described in the preceding section.

The Sample/Hold and Cross Patch Switching circuit.

The Sample/Hold circuit indicated in the block schematic diagram normally tracks the control voltages of the 16 individual channels and holds the control voltage information at a given instant, when the control voltage outputs of the analyzer rectifiers are disconnected from charging capacitors by electronic switching, and the charges are held at high input impedance operational amplifiers, the outputs of which are connected to the synthesizer VCO inputs.

In the Sample/Hold mode the tracking capacitors are connected through electronic switches to the analyzer rectifier outputs. In the Cross Patch mode the tracking capacitors are connected through electronic switches to the Synthesizer input jacks.

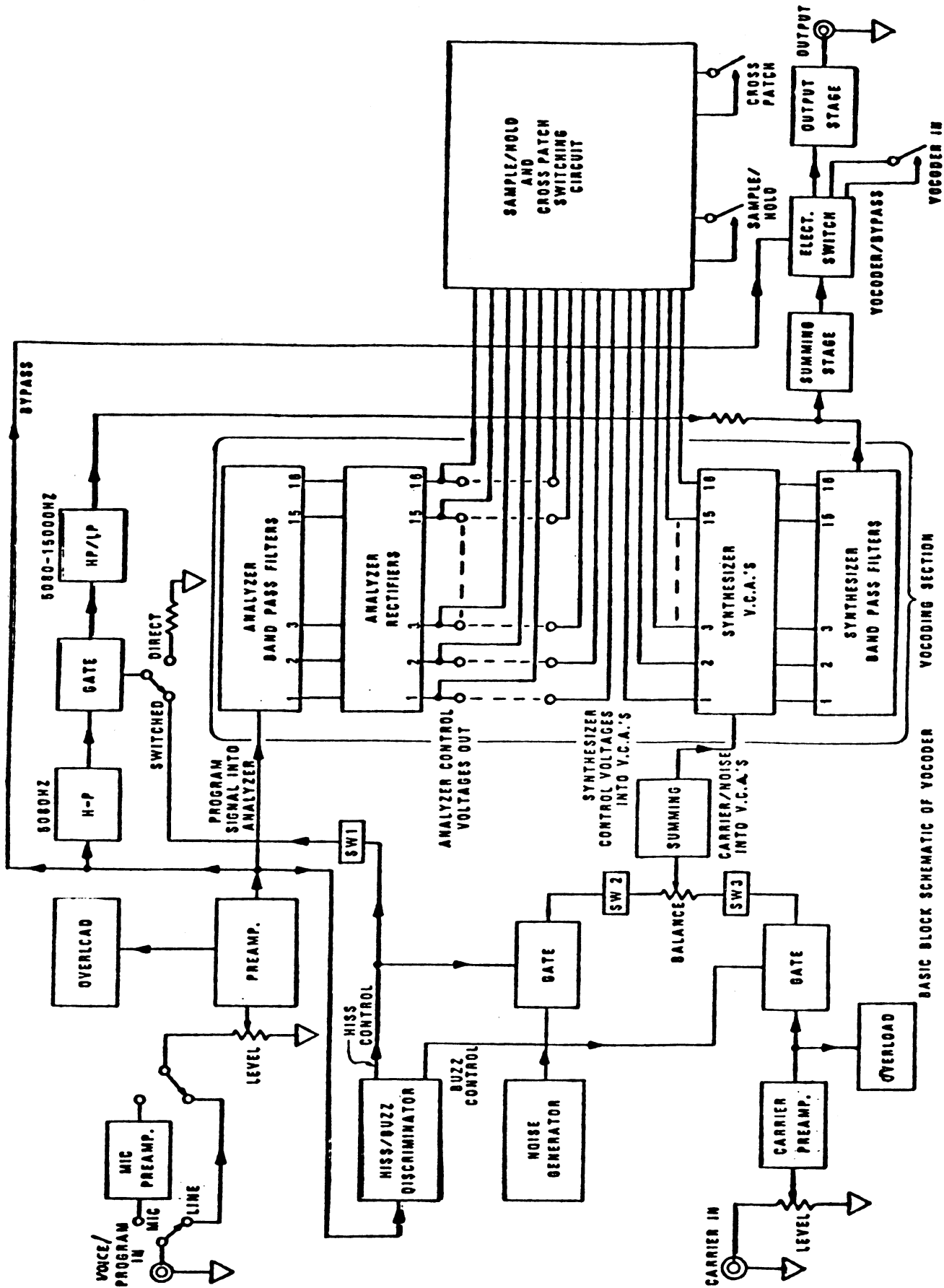
Circuit Description of the Bode Vocoder, cont'd.

The Output Circuitry.

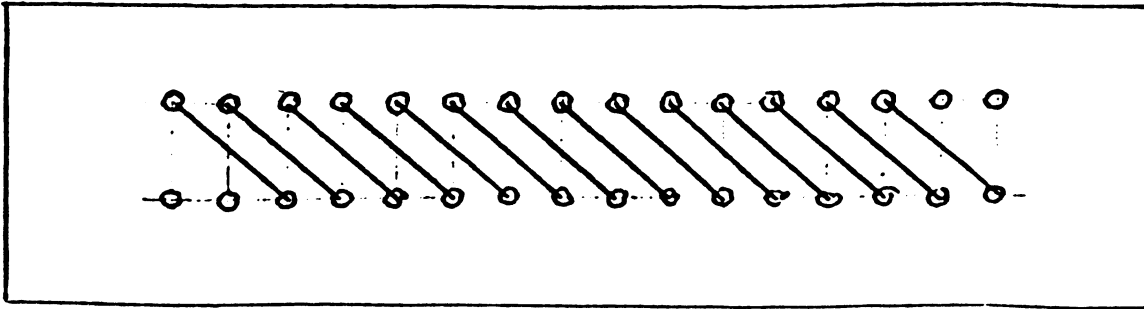
The output circuitry consists of the summing stage, which receives (as discussed earlier) the output signal from the Synthesizer band pass filters and from the high frequency bypass circuit. Thus, the signals from the Vocoding Section (50 to 5080 Hz) and from the high frequency bypass section (5080 to 15000 Hz) are complementing each other to cover the entire range from 50 to 15000 Hz.

Also, as discussed earlier, an electronic switch admits either the composite Vocoder signal or the direct program input signal to the output stage, so that the instrument can be operated at will in the Vocoder or the Public Address mode.

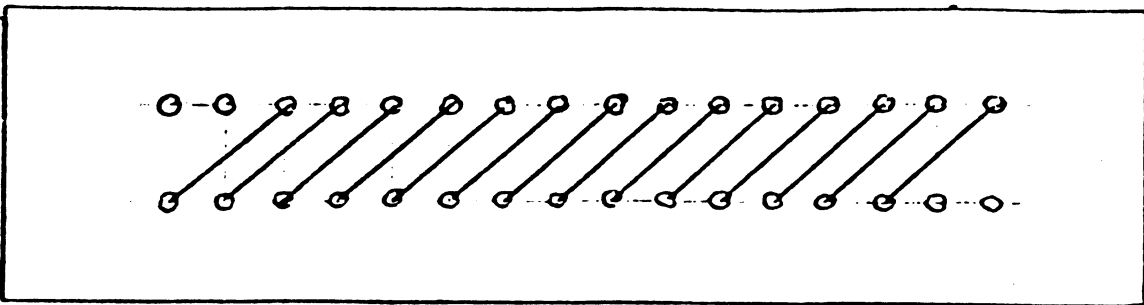
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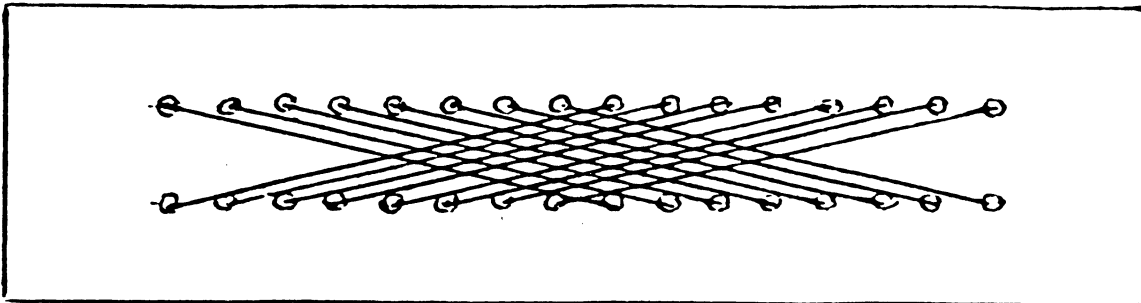
BODE VOCODER PATCH SHEET No. 1
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 For Model No. 7702.



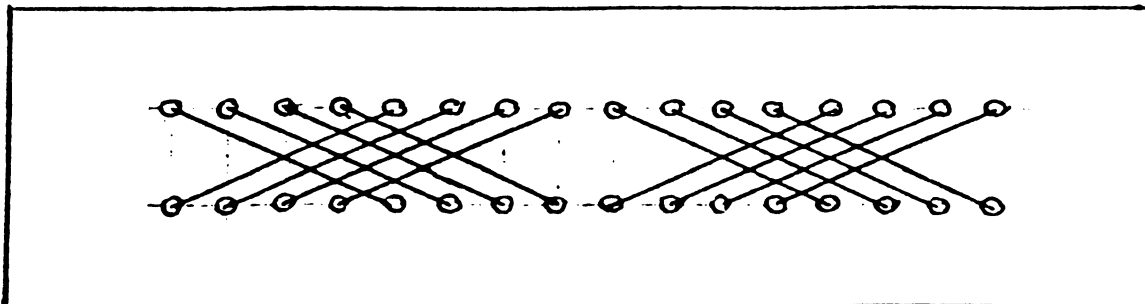
2-step left-to-right diagonal patch, produces raising of speech formants, such as in "Donald Duck" effect.



2-step right-to-left diagonal patch, produces lowering of speech formants.

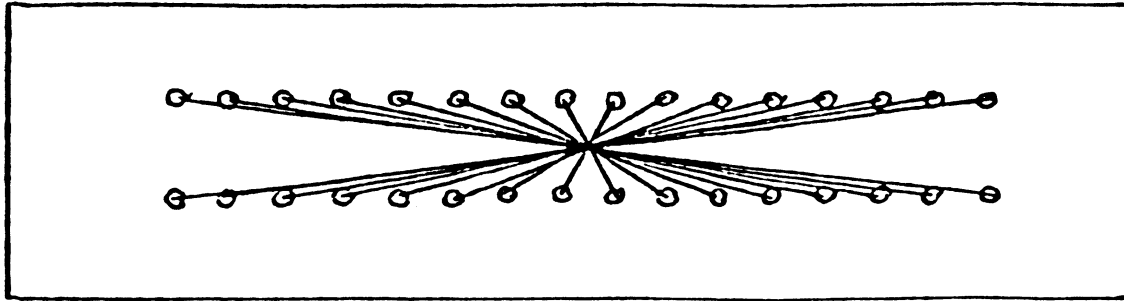


Single cluster X-patch, produces speech scrambling close to instrumental sound.

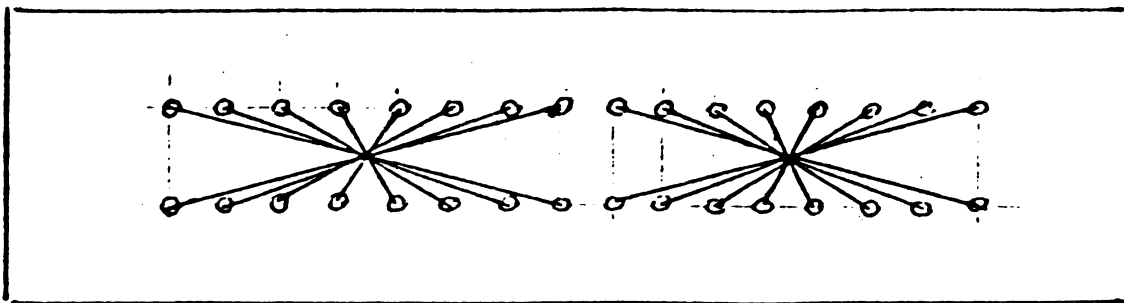


Double cluster X-patch, modification of above.

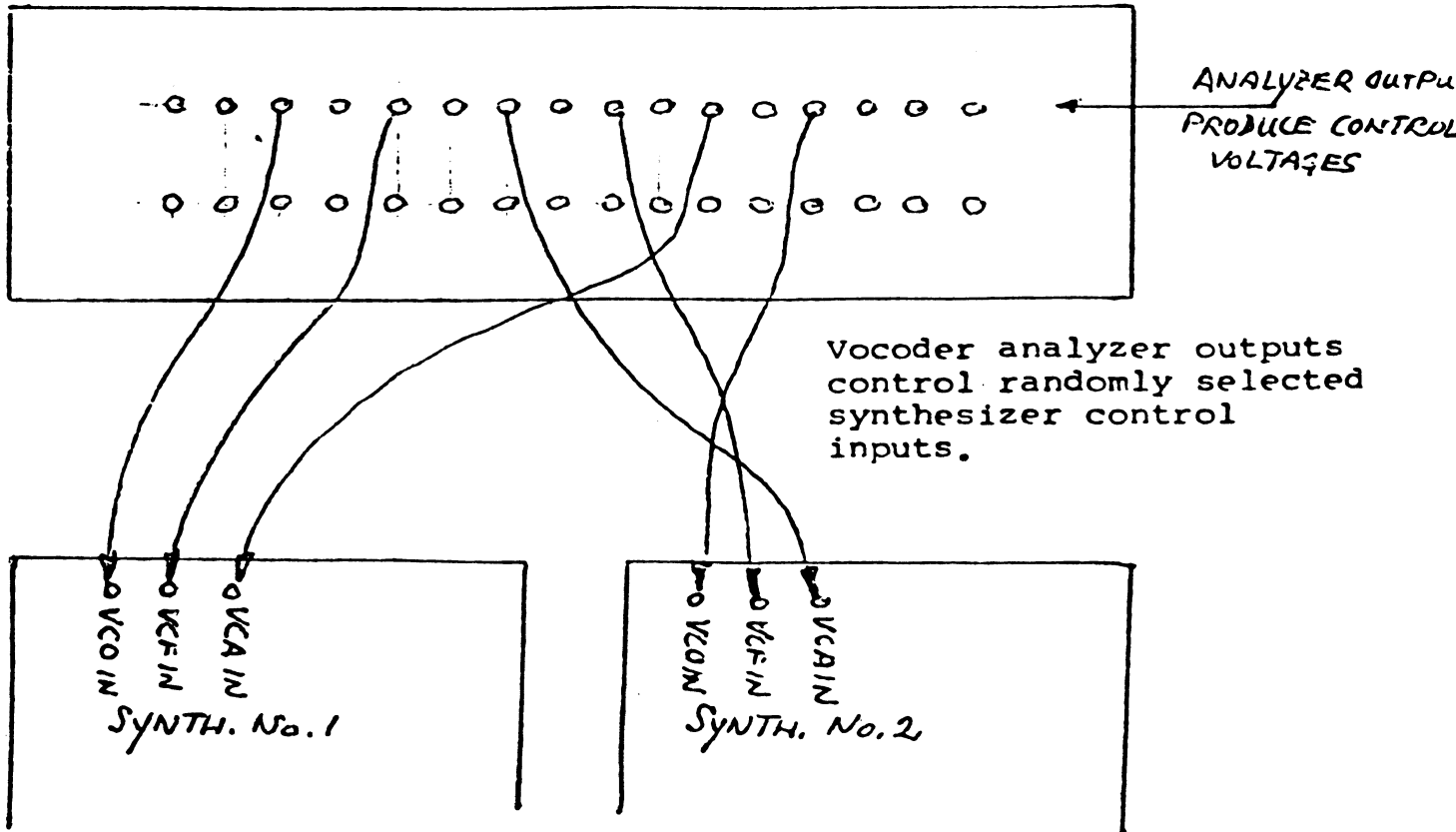
BODE VOCODER PATCH SHEET No. 2.
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 For Model No. 7702.



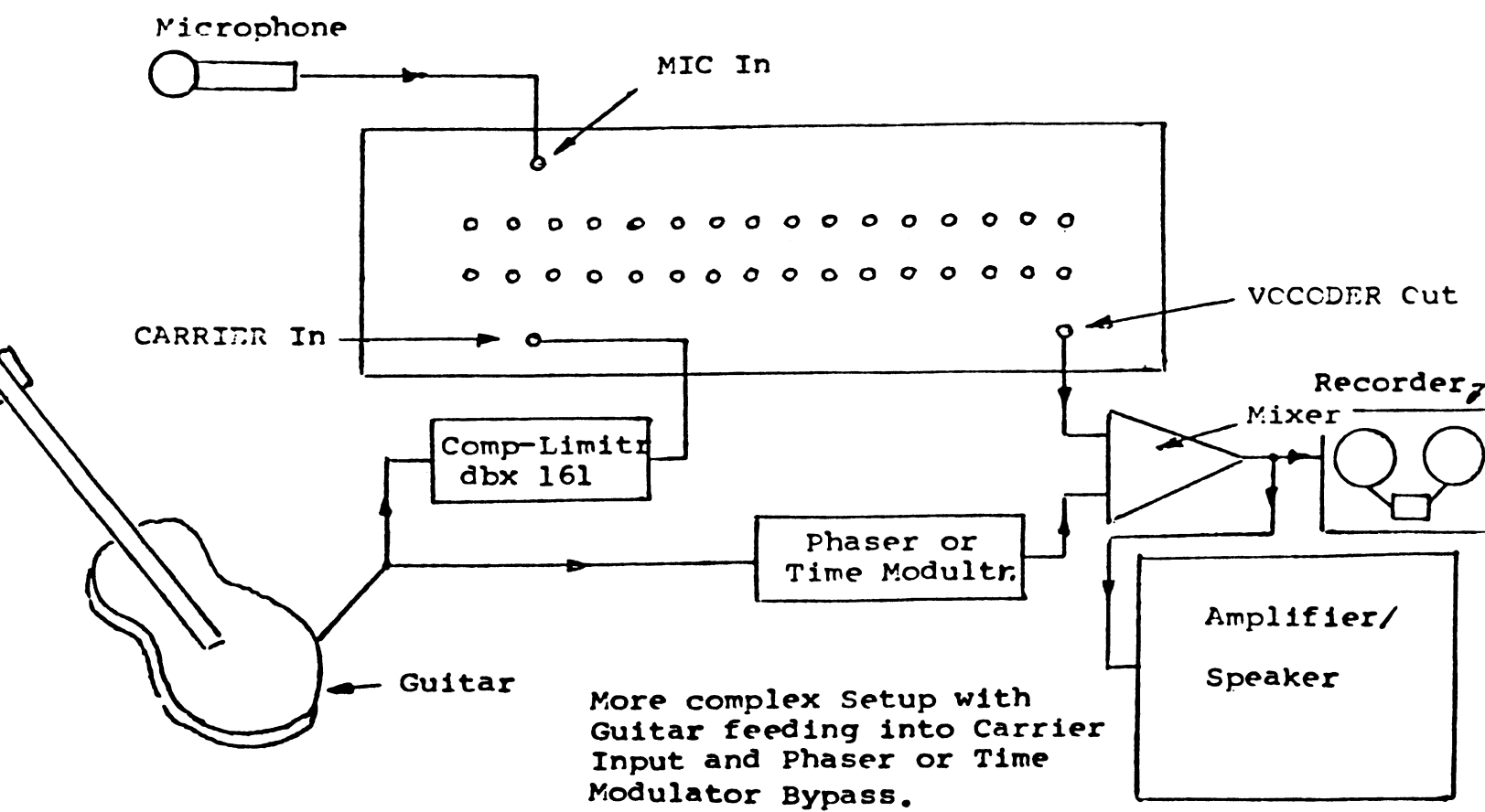
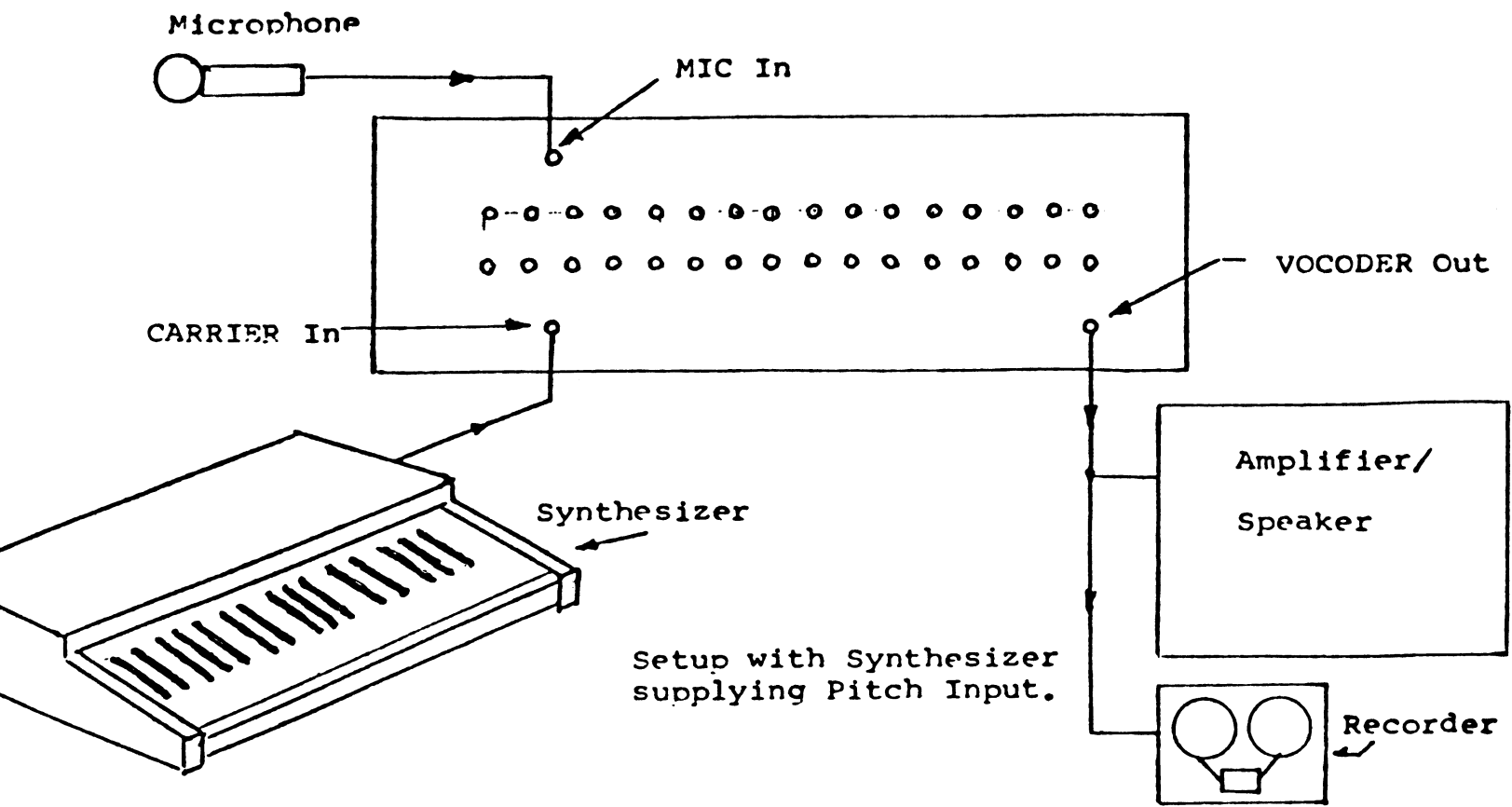
Single cluster inverter



Double cluster inverter

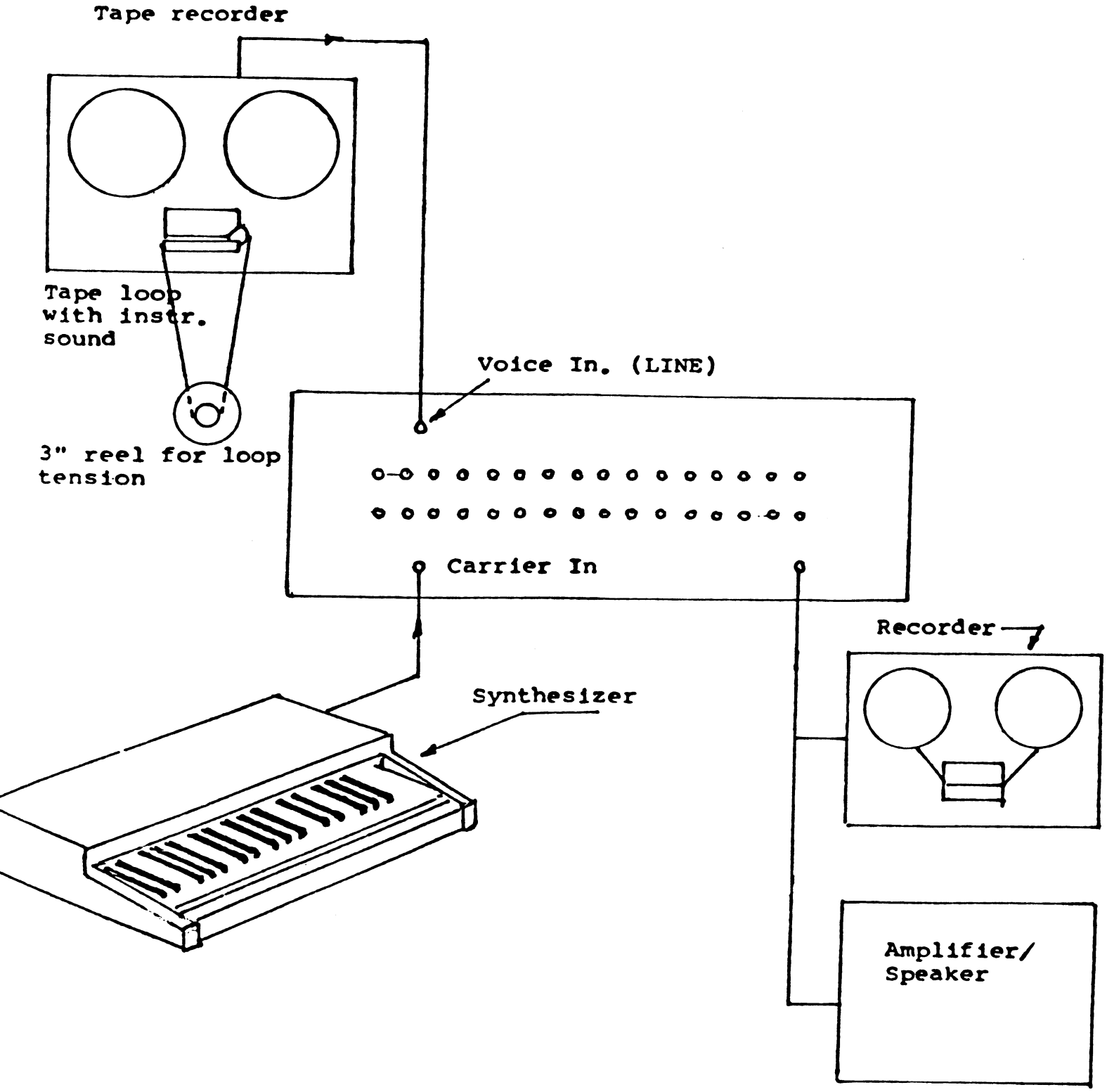


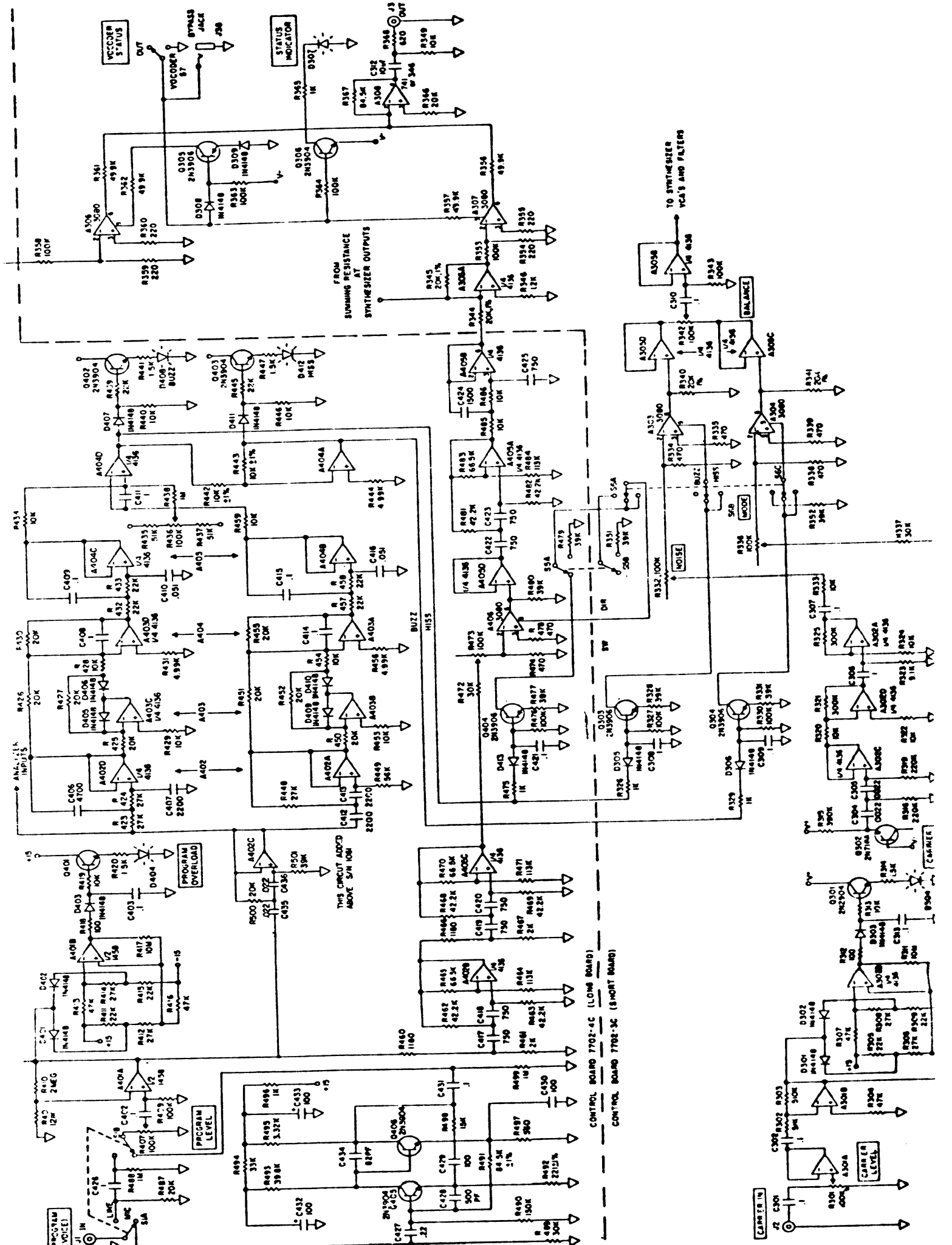
INSTRUMENT SIGNALS WITH BORN VOCODER
 Model No. 7702
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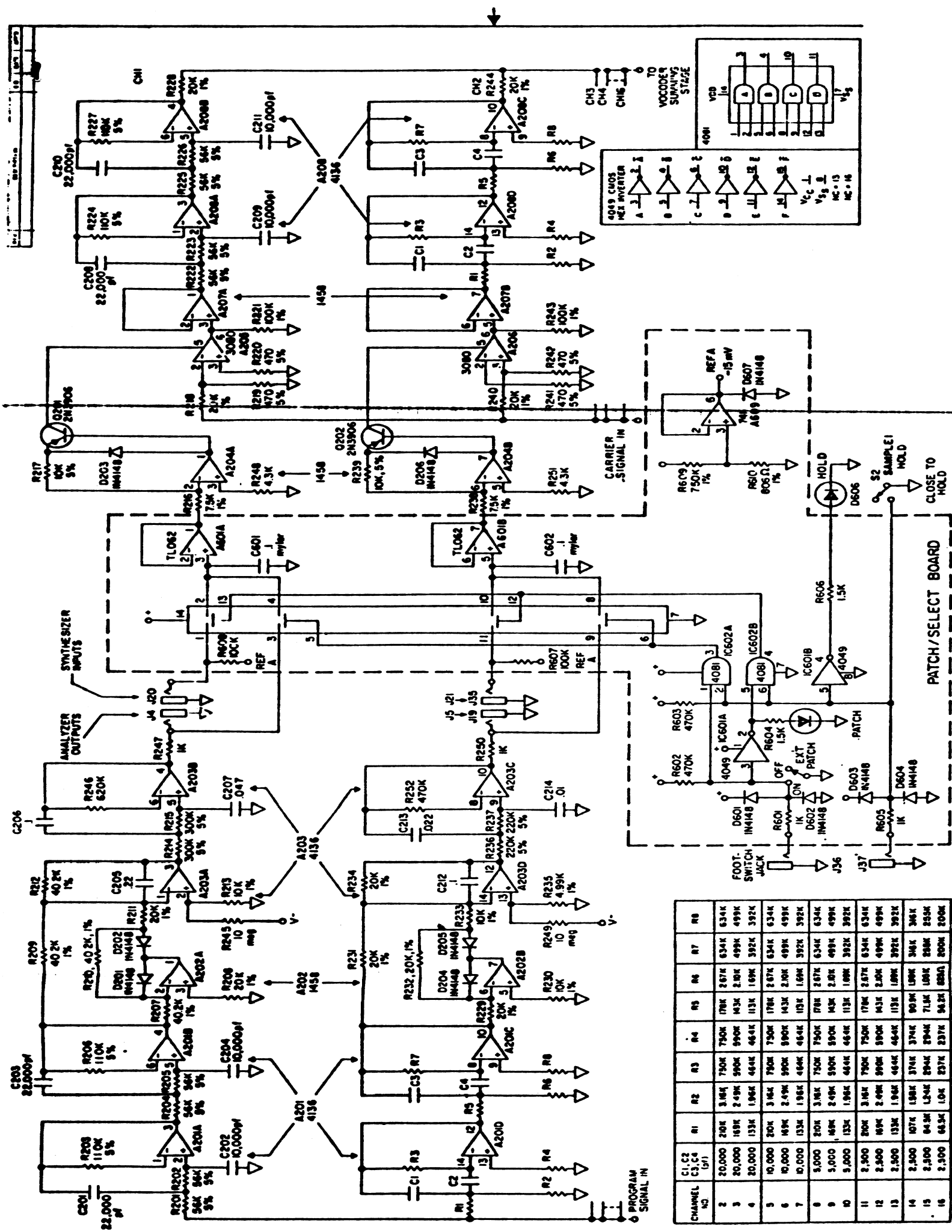
SYSTEM SETUP WITH BODE VOCODER
Model No. 7702 for copying of
instrumental sounds.

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CONTROL BOARD 7702-AC (LONG BOARD)
CONTROL BOARD 7708-3C (SHORT BOARD)



CHANNEL NO.	C1, C2 (pF)	R1	R2	R3	R4	R5	R6	R7	R8
2	20,000	20K	3.16K	750K	178K	287K	634K	634K	634K
3	20,000	168K	2.49K	990K	143K	2.0K	499K	499K	499K
4	20,000	133K	1.96K	664K	46.4K	113K	1.09K	392K	392K
5	10,000	20K	3.16K	750K	178K	287K	634K	634K	634K
6	10,000	149K	2.49K	990K	143K	2.0K	499K	499K	499K
7	10,000	133K	1.96K	664K	46.4K	113K	1.09K	392K	392K
8	5,000	20K	3.16K	750K	178K	287K	634K	634K	634K
9	5,000	149K	2.49K	990K	143K	2.0K	499K	499K	499K
10	5,000	133K	1.96K	664K	46.4K	113K	1.09K	392K	392K
11	2,500	20K	3.16K	750K	178K	287K	634K	634K	634K
12	2,500	149K	2.49K	990K	143K	2.0K	499K	499K	499K
13	2,500	133K	1.96K	664K	46.4K	113K	1.09K	392K	392K
14	2,500	107K	1.58K	374K	374K	90.9K	1.9K	34K	34K
15	2,500	84.3K	1.24K	294K	294K	71.4K	1.5K	26.6K	26.6K
16	2,500	64.5K	1.0K	237K	237K	54.2K	1.1K	20.6K	20.6K