

OWNER'S
MANUAL

**Model
234**

Pt. No. 74090

TEN-TEC INSTRUCTION SHEET
MODEL 234 SPEECH PROCESSOR

UNPACKING

Carefully remove your Model 234 from the packing carton and examine it for signs of shipping damage. Should any shipping damage be apparent, notify the delivering carrier or dealer immediately, stating the full extent of the damage. It is recommended that you keep the shipping cartons. In the event that storage, moving, or reshipment becomes necessary, they come in handy. Make sure you haven't overlooked anything.

GENERAL

The Model 234 is a high performance rf-type speech processor designed to operate with most transceiver systems. It will provide an average 5 to 6 dB increase in average power output in ssb service. This power increase, coupled with its unique ability to tailor the speech passband, can make the difference between a solid contact and none when conditions are marginal. Because it is a r-f processor, the harmonic distortion that must occur in the clipping process is completely removed by the second crystal filter. Unlike conventional clipper/compressor systems, Model 234 provides the capability to tailor the frequency response of the system for optimum processor punch.

SPECIFICATIONS

Power Requirements: 11-16 VDC @ 75 mA
 Microphone Channel Input Impedance: 500 k
 Operating Input Level: 25 mV
 Maximum Input Level: 400 mV
 Maximum Output Level:
 A.) No Processing: 400 mV
 B.) Full Processing: 75 mV
 Minimum Input for Full Processing: 5 mV
 Controls: PROCESS GAIN; PASSBAND ADJ.; IN-OUT SWITCH
 Semiconductors: 2 ICs; 10 Transistors; 5 Diodes
 Filters: 2 Four Pole Monolithic
 Size HWD: 2-1/2" x 4-3/8" x 7-5/8"
 Weight: 1 lb., 5 oz.

INSTALLATION

The Model 234 is installed between the microphone and the transmitter. It is equipped with a 1/4" microphone connector and requires 11 to 16 VDC for operation. The front panel has two types of microphone jacks allowing use with virtually any microphone. The four-pin jack is wired to provide power for the Model 214 Microphone.

POWER - The Model 234 requires 11 to 16 VDC at 75 mA. Ripple should not exceed 50 mV. All TEN-TEC transceivers provide an AUX 12V output on the rear panel which provides power for the Model 234. Shielded wire (small coax) is preferred for this lead. Most other solid state transceivers also provide 12 volt outputs on the rear of the transceiver or power supply. Other suitable supplies may be used: a) Small power line calculator type adaptors (be sure to check ripple. NOTE - some adaptors supply AC voltage!), b) Batteries supplying 12V.

The power supply connects to the 12 VDC phono jack on the rear panel. Center terminal is positive, the shell negative. The power consumption of less than one watt is small enough so that no switch is necessary when using a line adaptor, but a separate switch is recommended when batteries are used. The front panel PROCESSOR switch does not disconnect power from the unit. Voltage to power the Model 214 Electret Microphone, supplied through the processor, is required whether the processor is in use or not.

MICROPHONES - The Model 234 processor was designed for use with the companion Model 214 Electret Microphone. However, the input impedance is approximately 1M ohms, so that almost any high or medium impedance microphone that can provide a minimum of 10 mV on the majority of voice peaks may be used. CAUTION: "power mikes" (microphones with built-in amplifiers) are not recommended because of possible RFI problems and excessive output levels.

If you wish to use your present microphone, and its plug will fit neither of the two jacks on the Model 234, remove the plug on the microphone and exchange it with the 1/4 inch microphone plug on the output lead of the Model 234. The 1/4 inch MIC jack on the front panel is wired the same as the output line plug:

Barrel	-	Shield ground (braid)
Ring	-	Microphone (clear or white)
Tip	-	Press-to-talk (PTT)

The 4-pin microphone jack is wired for use with the Model 214 Electret Microphone:

Pin 1	--	Audio
Pin 2	--	Ground
Pin 3	--	Press-to-talk (PTT)
Pin 4	--	+Volt

The +Volt terminal is the supply voltage to the electret head at 8.5V DC through a 10k ohm resistor (850 microamps, max).

AUDIO OUTPUT - The connection of the processor to your transmitter or transceiver is via the double shielded cable from the rear of the Model 234. The output impedance is low and is capable of driving virtually any microphone circuit. If the audio input to the exciter uses a different plug than that supplies, use the connector which you previously removed from your microphone.

OPERATION

Apply +12 VDC to the rear connector. Plug the output line into the transceiver, microphone into the appropriate MIC jack on the front of the Model 234.

Tune exciter or transceiver and power amplifier, if any, in the normal manner. For this purpose, it is preferable to use a dummy load in place of your transmitting antenna. With the processor switch OUT, adjust the exciter drive for normal operation. Switch to PROCESS, set the GAIN at maximum and adjust the OUTPUT LEVEL control on the rear panel for equal exciter ALC action while addressing your microphone normally. Reduce the GAIN control to the 10 o'clock position. This procedure is necessary to equalize the peak levels between the PROCESS and OUT positions. However, as will be noticed from the increased input power (plate mills or collector amps) to your exciter or amplifier, the average output is greatly increased with the processor in the circuit.

For initial setup, turn the PASSBAND control to 12 o'clock center. This control is unique to the Model 234. It allows the operator to cut either the treble or bass response of the transmit audio and thereby optimize the response of the entire system for maximum readability and fidelity. The optimum setting for this control is best determined by having another station listen to your audio and making in/out comparisons. This control has almost no effect on the amount of processing (limiting). This is a function of the GAIN control setting.

Limiting, or removal of the high amplitude, low energy voice peaks, is indicated by the front panel LED (light emitting diode). The level, or depth of processing is proportional to the length of time the light is on during modulation.

PLEASE REMEMBER that the purpose of the processor is to increase the readability of your signal at the other end. No processor will increase your peak power output, this is determined by your amplifier circuit and its power supply. Speech processing does increase the average power level. This means that your transmitter spends a greater percentage of time operating at its peak power level. As a result, you will find that your transmitting equipment runs warmer than usual. This is normal because your average power has been increased. A 6 dB increase in average power is a four times increase in the power dissipated in your final amplifier, for example. If the increase in operating temperature seems excessive, limit the input power to the maximum CW rating when initially tuning up the transmitter. The 1 dB or so of peak power reduction will be more than offset by the many decibels of increase in average talk power. (All TEN-TEC transceivers are designed to work at full ratings regardless of processor power improvement.)

PROBLEMS - The two primary causes of difficulty with speech processors are overdriving and rf feedback. Overdriving is indicated by excessive ALC action and large differences between peak current readings with and without the processor in use. The most common cures are to reduce your drive level on the transmitter, and/or check the setting of the OUTPUT LEVEL control on the processor.

Even though great care has been taken to avoid the pick-up of rf energy, when large rf currents are present in the vicinity of the processor, they may induce sufficiently high voltages in the circuitry which cause distortion when rectified by one or more of the many semiconductor junctions in use. The presence of rf feedback can be detected by one or more of the following symptoms:

- 1.) The occurrence is only on some bands.
- 2.) The symptoms disappear or are reduced when your amplifier is switched off.
- 3.) The symptoms are dependant on the beam heading of your rotary antenna.
- 4.) The signal becomes normal when a dummy load is substituted for your transmitting antenna.

Curing rf interference requires elimination or reduction of the ground currents. Use baluns or coax fed antennas. Run your coax and control cables all the way down a metal tower. In your shack, do not place the processor next to an antenna tuner. Keep the input and output connections short. Connect the cases of your various pieces of equipment together with heavy braid or copper tape (preferable to wire). Run one heavy wire to ground. Some ground systems form a resonant loop at the operating frequency which can be broken up by an added connection to ground -- a ground stake or cold water pipe, for instance.

In any case, make sure the original system is beyond reproach before the installation of the processor. Symptoms may appear as critical or erratic tuning indications, deterioration of speech quality with slight changes in frequency or tuning, etc. These problems can only be aggravated by the installation of a speech processor and must be cured to achieve effective and proper operation.

TECHNICAL DESCRIPTION

The Model 234 Speech Processor uses radio frequency clipping of a single sideband signal as the processing method. This results in the most effective speech intelligibility improvement available without requiring special equipment at the receiving station.

Normal speech used in communications consists of audio frequency elements dispersed over a 3 kHz bandwidth with a typical peak-to-average power ratio of ten to one or 10 dB. When applied to a typical single sideband transmitter, the internal automatic level control circuit (ALC) will adjust the transmitter gain so the peak power of the audio signal corresponds to the transmitter peak output. Under these conditions, the peak power might be 100 watts and the average power only 10 watts. Some ALC systems can improve this ratio by 1 or 2 dB, which is a form of rf compression.

The purpose of speech processing is to reduce the peak to average ratio and thereby transmit more average power. The clipping function removes the low energy, high amplitude peaks which do not contribute to articulation while leaving the lower level speech components unaltered. However, any form of processing, especially clipping, creates distortion consisting of harmonics and intermodulation products which must be filtered before transmission. By first converting the audio to an rf ssb signal and then clipping, the distortion can be effectively removed using a precision crystal filter. The processed signal is then converted back to audio for connection to the transmitter.

A unique feature of the Model 234 is the PASSBAND adjustment. This permits precise setting of the beat frequency oscillator in relation to the crystal filters used for ssb generation and distortion elimination. The result is the ability to tailor the total response of the transmitting system so your voice sounds most like you.

SSB GENERATOR 80530

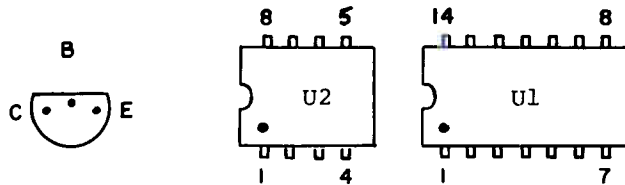
This board contains the low level audio stages, LED driver, balanced mixer, and ssb filter. Integrated circuit U1 contains four independent operational amplifiers. U1A is the input buffer amplifier which determines the input impedance (1M) and drives the GAIN control on the front panel. U1B provides the gain required to set the level of process limiting in the later stages. The audio signal from U1B is converted to double sideband in balanced mixer, U2, and then to ssb after passing through the crystal filters Y2 and Y3. Beat frequency oscillator, Q1, supplies carrier injection to U2. The passband tuning function is performed by varying the BFO frequency by changing the reverse bias on varactor diode, D3. Audio from U1B is also applied to amplifier U1C and then rectified by the voltage doubler, D1-D2. U1D compares the rectified audio with the voltage set by potentiometer R19 and activates the front panel LED to indicate clipping action.

An oscilloscope is required for proper setting of R23-mixer balance, R19-LED SET, C14-BFO set, and T1-mixer tune. They are factory set and should not require subsequent alignment.

Semiconductor Voltage Readings

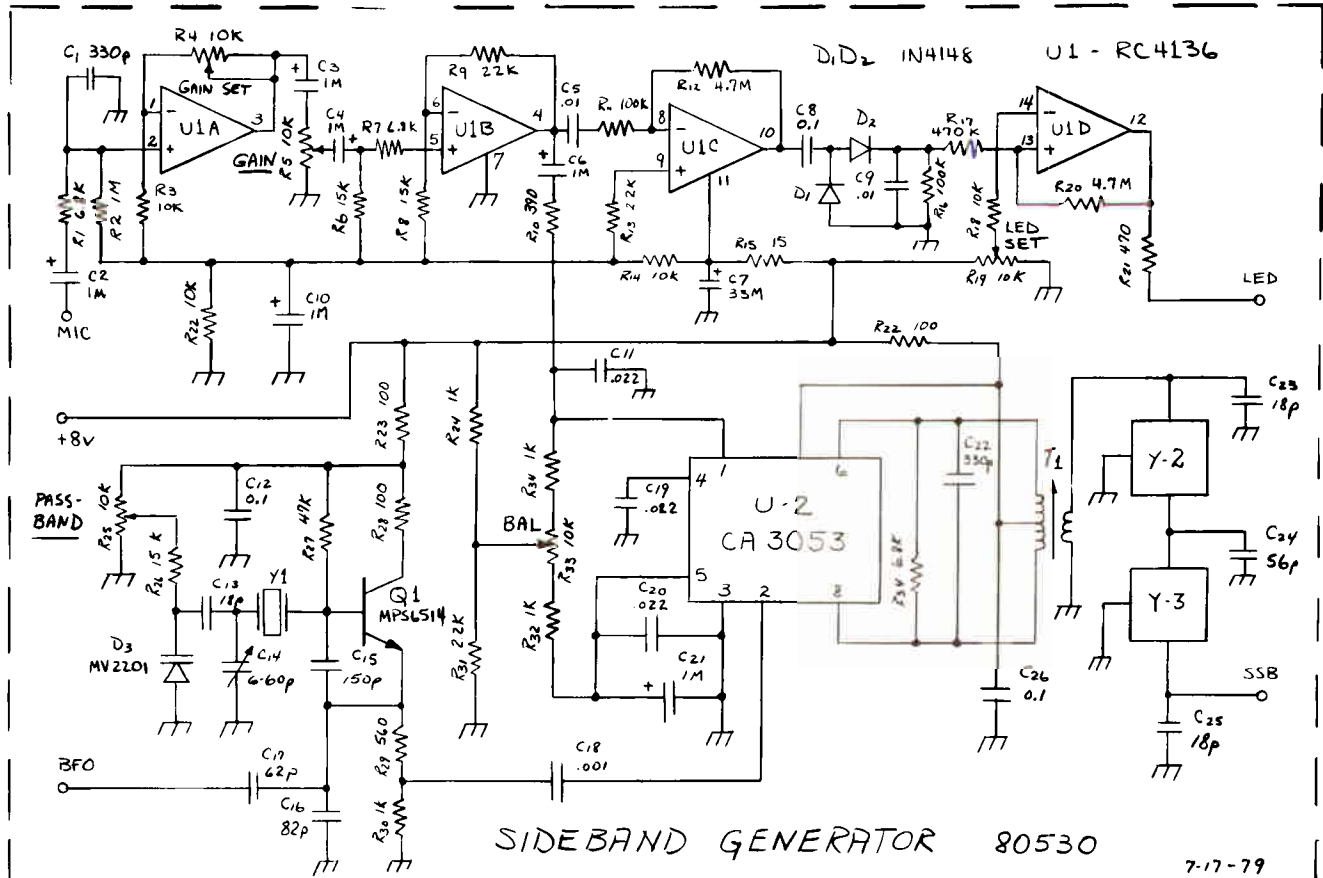
Pin	U1	U2
1	4.3	5.6
2	.25*	1.7
3	4.3	GND
4	4.2	1.0
5	3.6	5.6
6	4.2	8.0
7	0	8.0
8	.25*	
9	4.1	
10	3.8	
11	8.4	
12	1.4	
13	.3	
14	.9	

Transistor	Collector	Base	Emitter
Q1	7.7	5.9	5.5



Semiconductor pins viewed from top of PC board

* Hi Impedance



SIDE BAND GENERATOR 80530

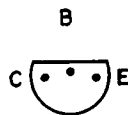
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CLIPPER-DETECTOR 80531

The signal from the ssb generator is fed to two active limiter stages Q1 to Q3 and Q4 to Q6. These remove the high level low energy peaks from the signal which is then filtered by the four-pole crystal filter Y1-Y2. The processed signal is buffered by Q8 and returned to audio in the balanced product detector D2-D3-T1. There are no adjustable components on this board.

Pin Voltage Readings

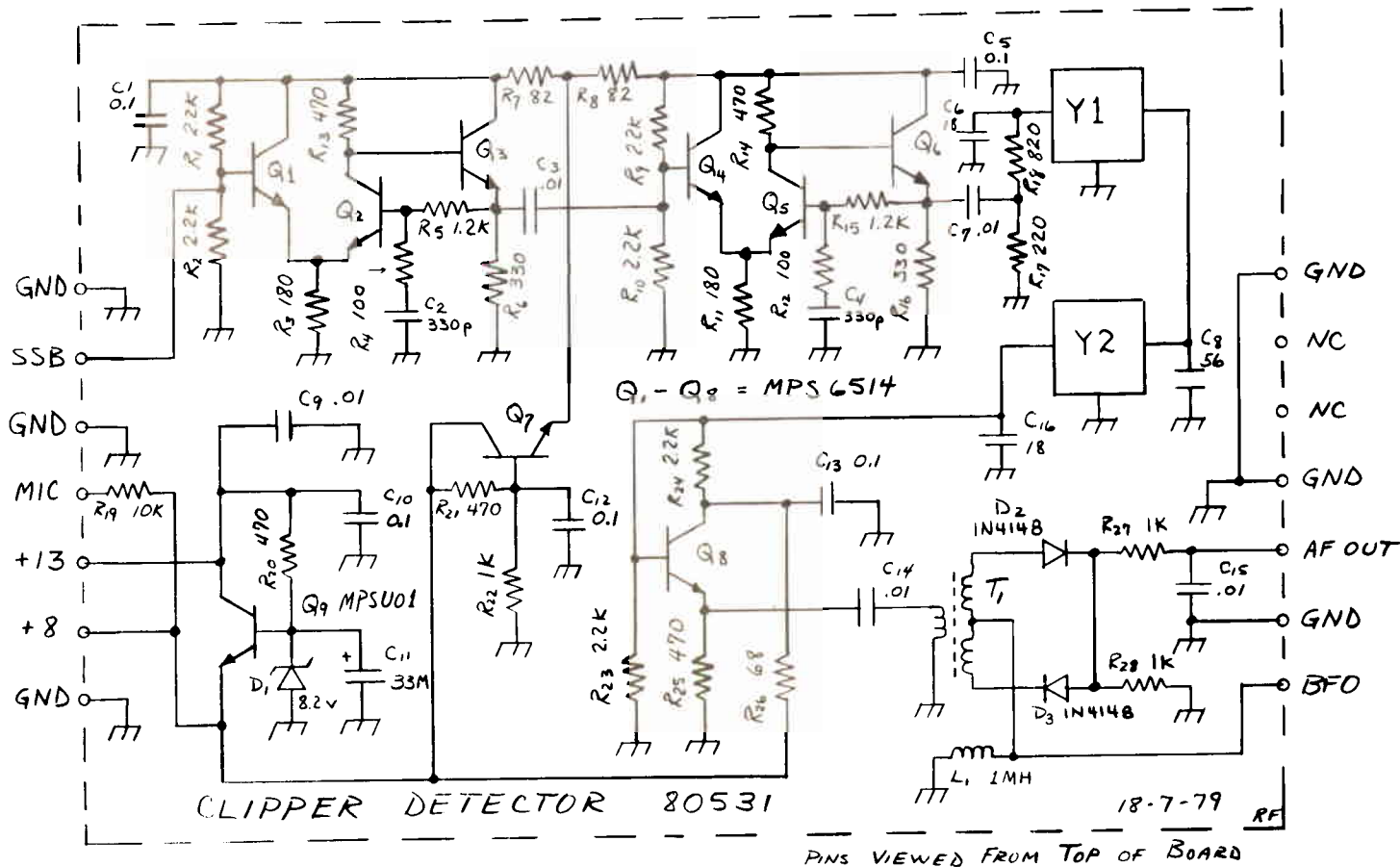
Pin	Volts	Pin	Volts
BFO	0	GND	0
GND	0	+8V	8
AF	0	+12V	13
GND	0	+MIC	3
NC	-	GND	0
NC	-	SSB	1.9
GND	0	GND	0



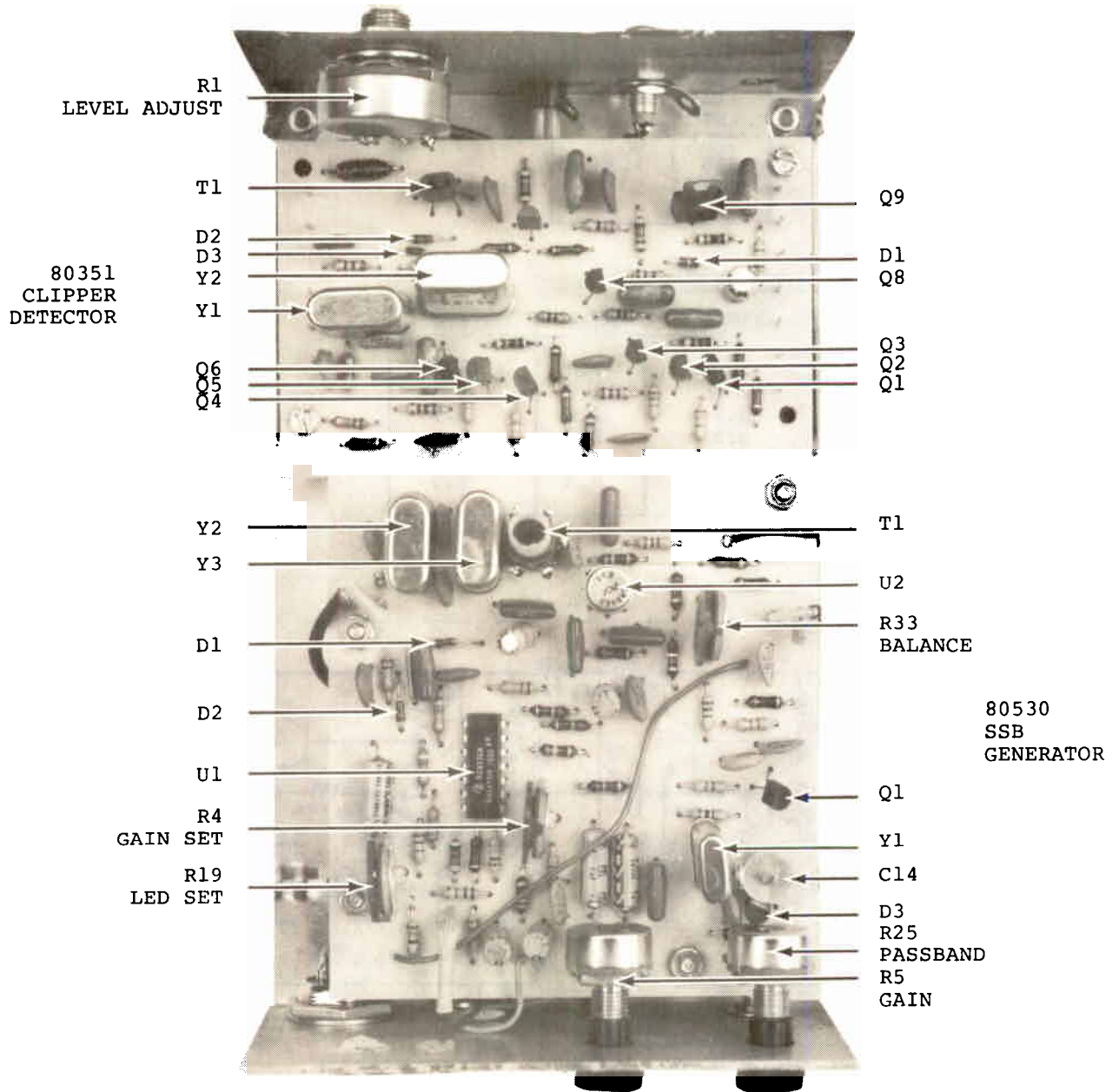
Transistor pins viewed from top of PC board

Semiconductor Voltage Readings

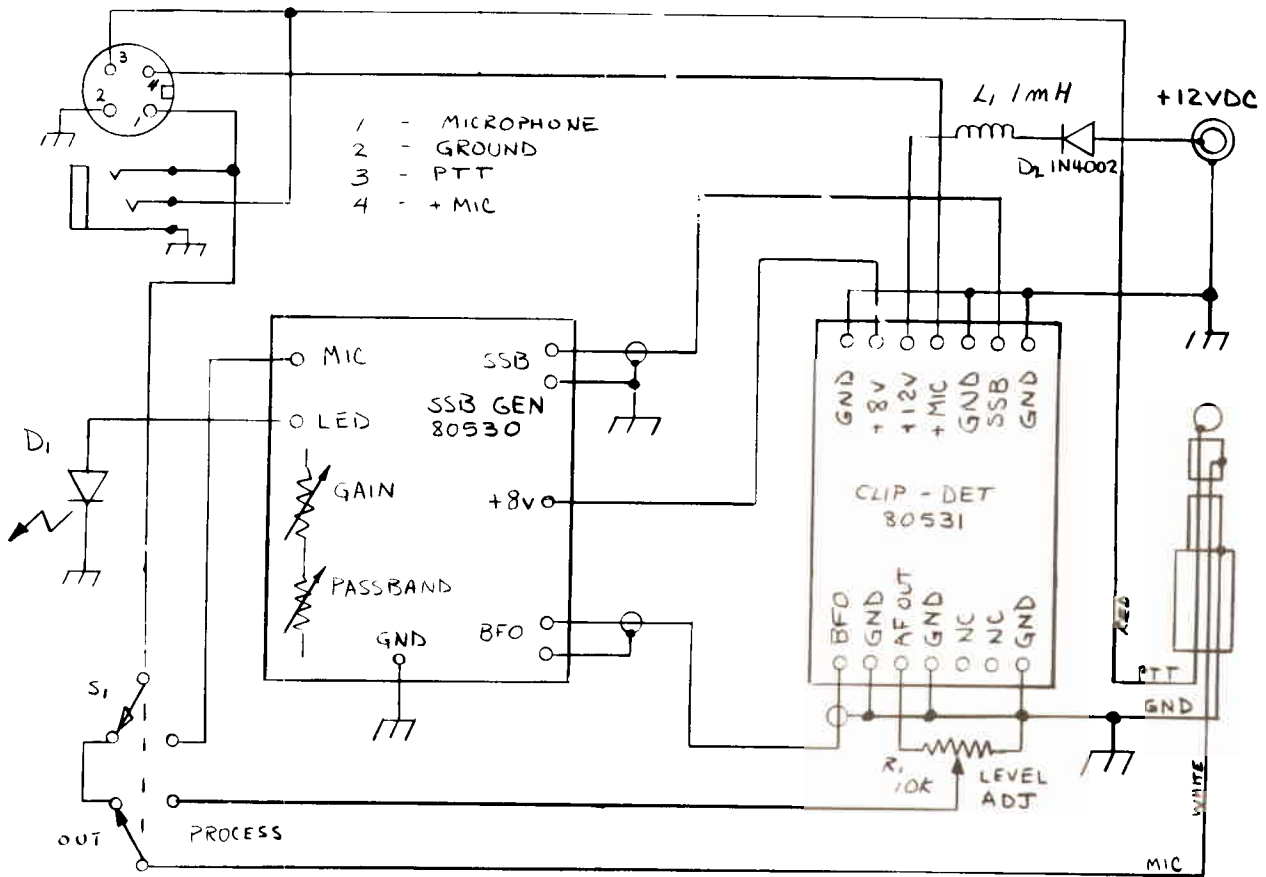
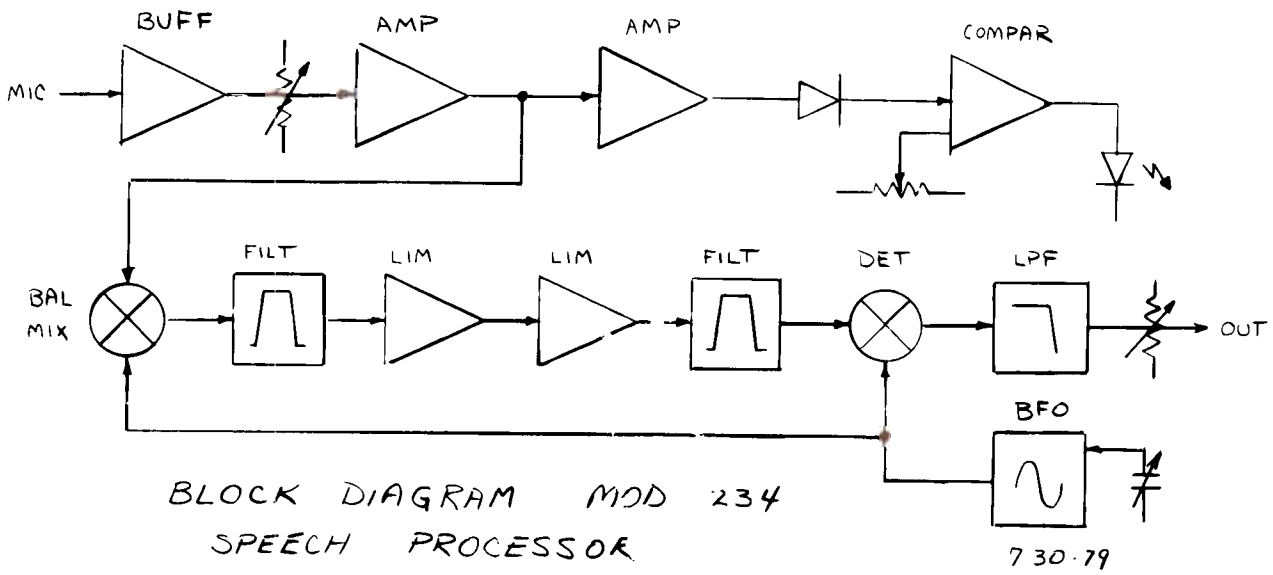
Transistor	Collector	Base	Emitter
Q1, Q4	3.9	1.9	1.2
Q2, Q5	2.6	1.9	1.2
Q3, Q6	3.9	2.6	1.9
Q7	8.5	5.7	5.0
Q8	7.9	4.0	3.3
Q9	12.5	9.1	8.5



PINS VIEWED FROM TOP OF BOARD



MODEL 234 SPEECH PROCESSOR



MODEL 234 SPEECH PROCESSOR

LIMITED WARRANTY AND SERVICE POLICY

GENERAL

TEN-TEC, Inc. warrants all products to be free from defects in material and workmanship for a period of one year after date of purchase, under these conditions:

- 1.) Registration: The warranty card must be returned promptly to establish the warranty period unless otherwise stated on the card. Our card file also serves as a check on stolen equipment which may be sent in for repair. Please notify us immediately if your TEN-TEC equipment is stolen.
- 2.) Original Purchaser: This warranty applies only to the original purchaser. Your warranty card listing from whom purchased establishes you as the original purchaser.
- 3.) Communication with the Factory: If trouble develops, contact the TEN-TEC dealer from whom you purchased the unit. He is obligated to try to correct the malfunction or return the unit to us. If he is unable to correct the fault, you or the dealer should contact the factory by mail or by telephone (615-428-0364), giving serial number if assigned, symptoms of fault and conditions under which they appear. You will be advised whether to return the unit to us or to try a replacement plug-in assembly that will be sent to you. To facilitate service calls, please use our direct Repair Department telephone number, 615-428-0364. (NO COLLECT CALLS, PLEASE.)
- 4.) In-Warranty Field Repairs: To expedite repairs TEN-TEC will send replacement assemblies prior to receiving the suspected defective one from you. The replacement will be billed on a 30 day memo, and credit will be issued when the defective unit is returned to us. No remittance or deposit is required. If the defective assembly is not returned within 30 days, you will be billed. Unit will be shipped to you, transportation paid by TEN-TEC. Shipping charges to the factory are to be borne by you.
- 5.) Return to Non-Selling Dealer: If you return the in-warranty unit to an authorized TEN-TEC dealer who did not sell the unit to you, he may, at his option, repair the unit or handle the return to the factory. Under these conditions TEN-TEC will repair or replace all defective components without charge, but reasonable labor charges may be levied by the servicing dealer. TEN-TEC is not liable for labor charges under these conditions.
- 6.) Proper Delivery: If the unit is returned to the factory, it must be adequately packed. A note should be included outlining the problem, conditions under which it appears, and attempted remedies. The more specific you are, the better the possibility of a complete fix. Shipping charges to the factory are to be borne by you. Unit will be returned transportation paid by TEN-TEC.
- 7.) Exclusions: This warranty does not apply to damage caused by mishandling, lightning, voltages in excess of rating, reverse polarity of DC supply, or changes in circuits. Claims for damage in transit should be filed with the carrier. This warranty, however, is NOT voided for attempted repairs of defective units or for incorporation of additional components such as switches, etc. when there is no change in the basic circuit. Under no circumstances is TEN-TEC liable for consequential damage to person or property by use of this unit.
- 8.) TEN-TEC reserves the right to make any improvements to its products which it may deem desirable without obligating itself to install such improvements in its previously manufactured products.
- 9.) This warranty is given in lieu of any other warranty, expressed or implied.

SERVICE OUTSIDE OF U.S.A.

- 1.) Service Centers: The policies listed in this warranty do not necessarily apply outside the U.S.A. Many overseas TEN-TEC dealers are qualified service centers. Contact the dealer nearest you for warranty service information.
- 2.) Transportation: In the event that you deal directly with TEN-TEC, Inc., all shipping charges to and from the factory are to be borne by you.

TRANSCEIVERS

- 1.) Extended Pro-Rata Warranty on Models 546/580 Output Transistors: The output transistors on these models are unconditionally guaranteed against damage for a period of one year after date of purchase, under any load condition or mode of operation, except for static discharge on the antenna or direct lightning strike. If they fail after the warranty period, the following replacement schedule will apply, provided that our service department makes the repair. (Prices listed are maximum and subject to reduction, depending on current transistor prices at time of repair.)