

MAXIMILIAN ASSOCIATES

OFFICE
P.O. BOX 223
Swampscott,
Mass. 01907

LAB
P.O. BOX 492
Ipswich
Mass. 01938

DESCRIPTION, INSTALLATION AND OPERATION

VOMAX SBP-4 SPEECH PROCESSOR

Introduction

The VOMAX SBP-4 is a sophisticated communication aid which connects between your microphone and transmitter. It will give your signal a considerable boost by increasing your average or "talk" power output in relation to the peak power level (PEP). The compression action is instantaneous, yet the distortion of the process is low, typically around 6% and the device may therefore be left in circuit at all times. Under adverse path conditions, effective gains in readability of 10 db or more are often experienced. Operation is foolproof due to the inclusion of a wide range automatic gain control circuit which holds the audio signal level constant at the optimum value for subsequent compression.

Functional Description

While the principle behind the VOMAX processor is quite simple, sophisticated circuitry is required for its realization. The original audio frequency spectrum of the input signal is broken up into four bands or branches by means of active filters. In each branch the signal is peak-limited and then filtered to remove the harmonics produced by this process. The separate limited and filtered signals are passed through a combiner unit which contains phase equalizing networks, to produce the processed output. This output contains very little harmonic and intermodulation distortion. The latter is a fundamental advantage of the frequency splitting scheme and is not found in RF type processing devices which may be considered the closest rival in effectiveness. For more detailed information, see HAM RADIO for June 1976, also product reports in QST (AUG '77) and CQ (OCT '77), describing the earlier Model SBP-3.

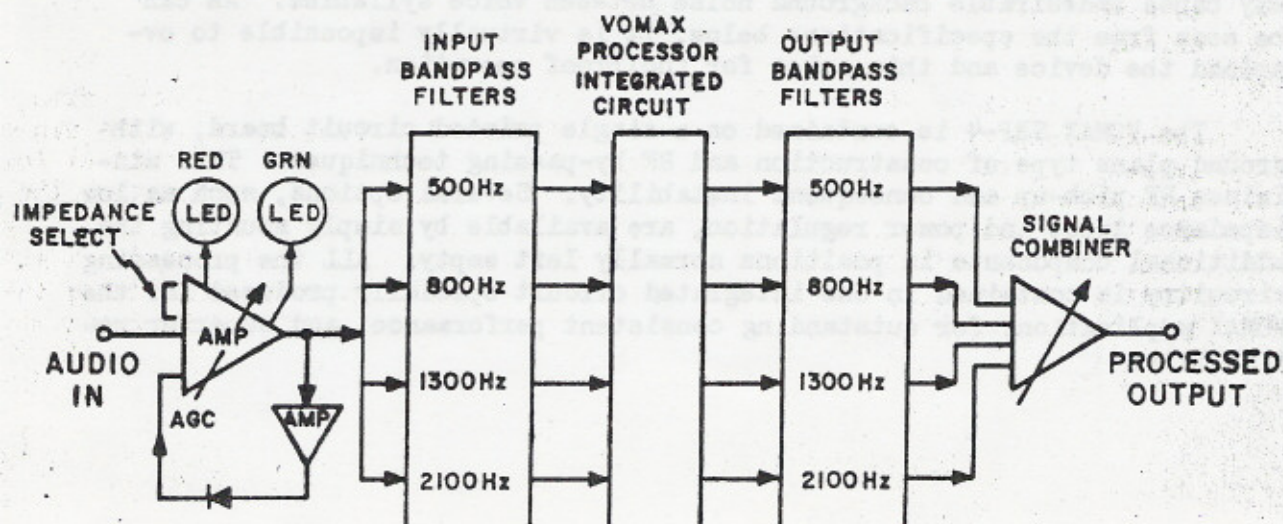
The block diagram on p.2 indicates the process. A virtually distortionless, wide range AGC system holds the signal level constant ahead of the compression circuitry and ensures that optimum limiting is always achieved. The AGC also actuates a green light emitting diode or LED on the front panel to signify that full compression is being obtained. A red LED will indicate an excessive (by 15 to 18 db) gain setting, which may cause undesirable background noise between voice syllables. As can be seen from the specifications below, it is virtually impossible to overload the device and this makes for foolproof operation.

The VOMAX SBP-4 is contained on a single printed circuit board, with ground plane type of construction and RF by-passing techniques. This minimizes RF pick-up and consequent instability. Several options, such as low impedance input and power regulation, are available by simply mounting the additional components in positions normally left empty. ALL the processing circuitry is contained in one integrated circuit specially produced for the VOMAX application, for outstanding consistent performance, and superior reliability.

Specifications (numbers in parenthesis apply to low impedance input)

Compression	15 db
Input at Compression Threshold*	2 (0.3) mV pk
Input for full Compression (green LED Threshold)	12 (2) mV pk
Input for red LED turn-on	90 (15) mV pk
Microphone Impedance	>10 (<1) K Ω
Frequency Response, (Green light on) Band edges Passband ripple	-6 db, 400 to 2600 Hz ±1 db, 480 to 2200 Hz
Harmonic Distortion	less than 10% typically 6%
Output Level, adjustable from	0 to 100 mV pk
Signal to noise ratio at compression threshold	over 36 db
Dynamic Range of AGC	over 36 db
Power Requirement	8.5 to 16V (12V nominal) DC 35 mA, maximum ripple 50 mVp-p, floating or negative ground
Dimensions	2" high 4½" wide 8" deep 5cm 11.4cm 20.3cm
Weight	14 oz. (400g)
Accessory AC power pack available	

* Compression threshold is defined as the input level which produces an output level 6 db below the maximum attainable



Installation

POWER: The VOMAX processor is designed to operate from external DC supplies (ripple not to exceed 50 mV p-p). While the unit is intended for 12-13V operation, voltages between 8.2 and 16 may be used with no effect on performance, except for the brightness of the level indicating lamps or LED's. Supplies may consist of:

- (a) small power line adaptors (check ripple).
- (b) series of "D" cells or a 9V transistor battery, preferably alkaline or mercury.
- (c) 12V automotive supply with negative ground.

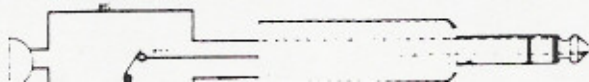
The supply connects to the unshielded wire pair from the rear connector plug. If there is no obvious color coding of the insulation, the plated or silver wire is negative. (Check connector diagram). The supply must either be isolated from ground (floating) or have its negative side grounded. In the latter case, it is to your advantage to use the negative rather than the "GROUND" wire, as an RFI filter is contained in the unit. This prevents RF energy from being fed to the processor via the power connection. The current consumption is 35 mA (20 mA when the microphone is not addressed), which is hardly likely to deplete a car battery, even over several days, or cause much of an increase in your electric bill when a small power line adaptor is used. However, in a car, it is a wise precaution to connect the unit to a point controlled by the ignition switch. In any case, the power is disconnected internally by the front panel "IN-OUT" switch. This is important when you use an external dry battery as your power source. A 9V transistor radio battery will give many hours of service as long as you remember to have the switch in the OUT position when the station is not in use. Accidental reversal of the power supply due to misconnection will cause no damage.

MICROPHONES: As normally supplied, the input impedance of the processor is high (1 M Ω) and virtually any high or medium impedance microphone may be used, as long as the output exceeds 12 mV pk on the majority of voice peaks. This is easily attained by most popular microphones (an Astatic D104 crystal unit will produce over 100 mV pk!). The use of microphones with built-in amplifiers or so-called "power-mikes" is not recommended since this only invites RFI problems and makes the level adjustment unnecessarily critical. The processor accepts a standard PL-55 $\frac{1}{4}$ " mike plug. A PL-55 plug is supplied for your convenience. If your present microphone connector is of a different type, remove it (but do not discard) and substitute the PL-55:

The shield of the cable is connected (soldered) to the sleeve (outermost or longest lug).

The audio wire is next soldered to the (middle) "ring" on the plug.

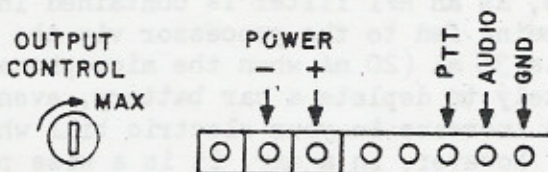
If your mike has a push to talk switch (PTT), the third wire must be soldered to the innermost or shortest lug or "tip" of the lug. Leave blank if there is no PTT feature.



Some modern transceivers, such as the Yaesu FT 901, are designed to accept low impedance microphones in the range of 200 to 600Ω. Conversion of the VOMAX-4 to low impedance is easy. Remove the cover, and insert the resistor supplied (120 or 150KΩ) into the empty holes on the circuit board near the front panel indicated by arrows. Trim wire ends before insertion. Solder into place using an iron with a small tip.

AUDIO OUTPUT: The interconnection of the processor to your exciter or transceiver is straight forward, using the shielded multi-conductor cable leaving the output connector. The usual wire colors are white or clear, red and black, providing audio output, PTT action and a spare respectively. Due to manufacturing changes, different colors may be encountered, so check the connector diagram before installation. If the audio input to the exciter uses a different plug than the processor input, use the connector which you previously removed from your microphone.

CONNECTOR ARRANGEMENT: Looking at the rear of the processor the terminals are arranged as shown.



The mating plug is polarized, making reversal impossible. Do not use excessive force, make sure that plug and receptacle are in proper alignment.

Operation

Plug your microphone into the speech processor and the output and power connector into rear receptacle. Plug audio output into the exciter (transceiver) mike input socket. Apply DC power to the unit. Initially, tune up your exciter or transceiver and power amplifier, if any, in the normal manner. It is preferable to use a resistive ("dummy") load for this purpose in place of your transmitting antenna. Set the processor output control quite low initially - clockwise rotation increases level - and leave the exciter gain in the usual position for your microphone. (The control is accessible through the hole at the rear, using a small screwdriver for adjustment). Switch in ("IN") the processor and address your microphone normally. Advance the processor gain control until the green light stays on at least 50% of the time. This signifies that adequate input exists for full processing. Any further advance of the processor gain will not give any higher average power output, but will only increase the background noise of your outgoing transmission between words. The red light will come on when the gain is set appreciably higher than needed.

The rear panel output control may be set in one of several ways:

1. Oscilloscope pattern: If an oscilloscope is available for monitoring the envelope of the RF output, simply advance the control until the normal peak power output is obtained.
2. ALC: If your exciter/power amplifier features an automatic level control which can be monitored, simply set the control to give a small indication of ALC action.
3. Audio Signal Source: Another method is to use an audio signal source (around 1 KHz) in place of the microphone and advance the output control until the normal maximum indications, i.e. power and/or plate meter readings are reached. A sustained whistle into the microphone, preferably by another person, may be substituted for the audio signal.

The peak output of the processor has now been set to approximately that of the microphone and the IN-OUT switch can be operated without changing the peak output of the transmitter. However, as can be seen from the increased input (plate millamps or collector amps) to your amplifier, oscilloscope pattern or thermal meter indication, the average power output is greatly increased with the processor IN. Perhaps the best proof of this will be the incoming reports, especially when path conditions are marginal, or the greater ease of making unusual radio contacts.

As a result of the new installation, you may find that your transmitting equipment becomes warmer than usual. This is normal because your average power output has increased considerably and this in turn requires higher input power and some increase in power dissipation. If this seems excessive, limit the power input to the maximum CW rating when initially tuning up the transmitter. The 1 db or so of peak power reduction will seem insignificant compared to the many decibels increase in average talk power.

RF Feedback

The incidence of this problem is quite rare (about 3%); however, where it occurs, the process of elimination can be quite tedious, because of the varied sources of such feedback paths.

Every precaution has been taken to avoid the pick-up of RF energy; in fact, static (voltage) coupling has been eliminated through shielding and by-passing. However, when large RF currents circulate in your ground system, these can pass through the case of the processor and induce voltages in the interior circuits. These voltages may be high enough to be rectified by one or more of the many semiconductor junctions in use, causing severe distortion of the modulation. RF feedback can be diagnosed by one or more of the following observations:

- (1) The effect is present on some bands only.
- (2) The symptoms disappear or are reduced when your amplifier is switched out.
- (3) The symptoms are dependent on the direction of your rotary antenna.
- (4) The signal becomes normal when an artificial or dummy load is substituted for your antenna.

The obvious objective is to eliminate or at least reduce the magnitude of the ground currents. With co-ax feed to your antenna always use a "balun" at the top, even with gamma matches. If you use a metal tower, make sure it is well grounded. Run your co-ax cables and control wires inside the tower and/or tape them to one of the legs.

In the shack, connect the cases of your various units together with heavy wire as short as possible; 1' wide copper tape is preferable to wire. Run one heavy wire to your power line ground. In theory, no other ground should be used. However, the power ground may form a near resonant loop with your outside (tower) ground, so that an additional connection, possibly to a cold water pipe, may break up such a resonance.

Do not place the processor adjacent to an antenna tuning unit. Keep the input and output connections short, so that they do not act as receiving aeri-als and put current into your ground system via the VOMAX case. In the SBP-4 (in contrast to the SBP-3) feedback caused by the power connection has been eliminated by an internal bifilar RF choke.

Make sure your system is above reproach before installation of the processor. Symptoms of incipient feedback must be eliminated using the above recommendations. These symptoms may consist of critical or erratic tuning procedure and indications, deterioration of speech quality with slight detuning, etc. If these are allowed to persist, installation of the processor will almost certainly aggravate the problem.

Warranty

Your VOMAX SBP-4 speech processor is warranted for a period of eighteen months from the date of original purchase against defects in workmanship or component failure. After this period, necessary repairs will be charged at cost. This warranty is limited to repairing or replacing defective parts and becomes invalid if the unit has been tampered with, misused or damaged. DO NOT ship the SBP-4 to the factory without authorization.

Maximillian Associates reserves the right to improve the VOMAX models without prior notice or liability to retrofit previous models.

K4XL's **BAMA**

This manual is provided **FREE OF CHARGE** from the "BoatAnchor Manual Archive" as a service to the Boatanchor community.

It was uploaded by someone who wanted to help you repair and maintain your equipment.

If you paid anyone other than BAMA for this manual, you paid someone who is making a profit from the free labor of others without asking their permission.

You may pass on copies of this manual to anyone who needs it. But do it without charge.

Thousands of files are available without charge from BAMA. Visit us at <http://bama.sbc.edu>