Eventide
the next step

OMNIPRESSOR

INSTRUCTION MANUAL

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THE OMNIPRESSOR

THE EVENTIDE OMNIPRESSOR* is a professional quality dynamic modifier. It combines the characteristics of a compressor, an expander, a noise gate, and a limiter in one convenient package. Its unusually wide range of controls allows it to be used in almost any application where program controlled gain change is useful. Additionally, it can generate new effects, such as infinite compression and dynamic reversal. Dynamic reversal makes high level input signals lower than corresponding low level inputs. Musically, this reverses the attack-decay envelope of plucked string and similar instruments, and gives the effect of "talking backwards" when applied to a voice signal.

The OMNIPRESSOR has a continuously variable Expansion/Compression control which goes from an expansion range of 5 to 1 (gate) to a compression range of -5 to 1 (abrupt reversal), and all possibilities in between. Attenuation and gain limit controls adjust the gain control range from a full 60 db to as little as plus and minus 1 db. Thus, with the gain limit set at 0, the unit can attenuate up to 30 db, but cannot boost the input signal. Depending upon the setting of the compression control, all signals below 0dbm will not be modified (gain *increase* limited), while all signals above 0dbm will be attenuated at the appropriate ratio. A step-variable time constant control adjusts attack/decay times over an approximate 100 to 1 ratio. A bass cut switch is provided to limit low frequency response in the level detector.

The unique metering system employs a logarithmic amplifier to generate the following useful information:

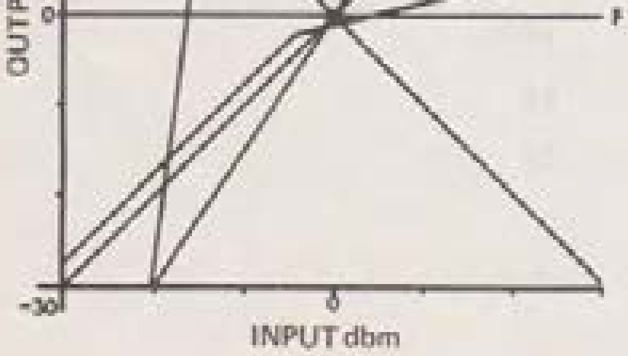
INPUT: Reads signal level over a 60db range. Input level control may be used to calibrate the meter in absolute dbm.

GAIN: Reads relative gain of OMNIPRESSOR. Shows how signal level is modified over 60db range. Used in setting up limit controls.

OUTPUT: Reads output level in dbm. Red line warns of possible limiting in output amplifier.

An IN/OUT switch is provided to bypass the OMNIPRESSOR when a return to normalcy is desired. The graph illustrates some of the unusual capabilities of the unit.

OMNIPRESSOR CAPABILITIES



A: DYNAMIC REVERSAL
An input level of +10 results in an output of -10. An input level of -10 results in an output of +10.

B: GATE
As the signal increases above -20, the device gain rapidly goes to maximum.

C: EXPANSION
A 40db input range results in a 60db output range.

D: CONTROL CENTERED
Input level equals output level

E: LIMITING
Gain is unity until input is 0dbm, above 0dbm, a 30db change in input produces a 6db output change. (Line is offset for clarity.)

F: INFINITE COMPRESSION
Output level remains unchanged regardless of input level.

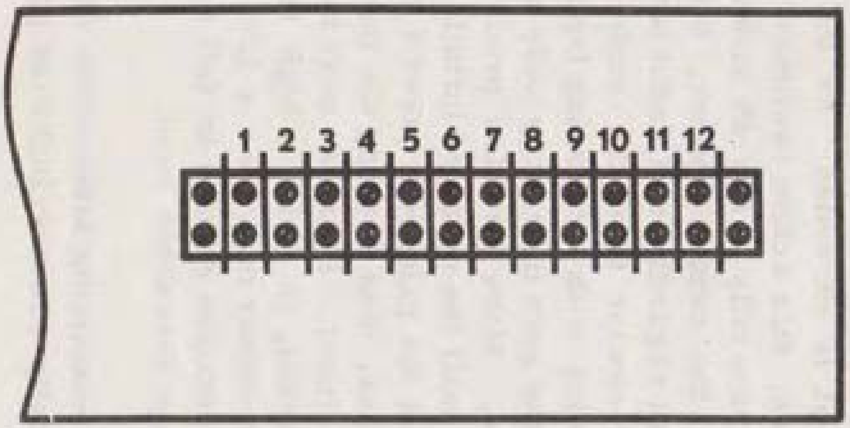
*OMNIPRESSOR is a registered trade mark of EVENTIDE CLOCK WORKS.

SPECIFICATIONS

ALL SPECIFICATIONS APPLY WITH THE "IN/OUT" KEY IN THE "IN" POSITION. WITH THE KEY IN THE "OUT" POSITION, THE INPUT SIGNAL IS BYPASSED DIRECTLY TO THE OUTPUT.

INPUT LEVEL	Input gain control furnished. With control fully clockwise, input signal peaking at -4 dbm required for full gain control range.
INPUT IMPEDANCE	20K Nominal, unbalanced to ground.
OUTPUT LEVEL	Output gain control furnished. Maximum level before clipping is +18 dbm regardless of setting.
OUTPUT IMPEDANCE	50 ohms nominal, suitable for driving load of 600 ohms or greater to full level. Unbalanced to ground.
GAIN	With input and output set as per instructions, gain control range of +30 to -30 db may be obtained. Limit controls may be used to limit maximum gain or attenuation to any desired setting.
FREQUENCY RESPONSE	Plus or minus 1 db from 30 Hz to 20 KHz. Bass cut control begins attenuation at 250 Hz in the level detector section only.
DISTORTION	Less than 1% at any input/output level combination.
SIGNAL TO NOISE RATIO	Better than 90 db. Noise floor below -70dbm with gain at +30db.
METERING	INPUT: Indicates relative input level over 60 db range. OUTPUT: Indicates output level over 60 db range. GAIN: Indicates relative gain over 60 db range.
TIME CONSTANT	Switch controls time constant over approximately 100 to 1 range. Fastest time constant gives attack time of 1 db per millisecond and decay time of .15 db per millisecond.
EXPANSION RATIO	Continuously variable from 1:1 through 10:1.
COMPRESSION RATIO	Continuously variable from 1:1 through infinity to -.1:1.
POWER	115 VAC, 50-60 Hz, ± 10%. Nominal 10 watts.
DIMENSIONS	19" (48.26 cm.) wide; 3.5" (8.89 cm) high; 9" (22.86 cm) deep.
FINISH	Black aluminum panel, white silk screened lettering.

OMNIPRESSOR INTERFACE



REAR VIEW

Terminal #	Function
1	Remote gain control output
2	Remote gain control input
3	Ground
4	Audio input
5	Audio return
6	Ground
7	Audio output
8	Audio return
9	Ground
10	Unused
11	Unused
12	Unused

The Omnipressor inputs and outputs are unbalanced to ground. All "ground" and "return" terminals are common. However, it is advisable to use the terminals as suggested to avoid the possibility of ground loops. If option O3 is ordered (balanced in/out transformer coupling), the audio input and return are both isolated from ground.

Pins 1 and 2 are normally connected together. If it is desired to operate the gain control section independently of the level detector section, this connection may be broken. A DC voltage applied to pin 2 with reference to pin 3 can now be used to control the Omnipressor gain. A positive voltage increases gain, a negative voltage decreases it. Gain control range is somewhat greater than when used with the Omnipressor level detector, but distortion may increase beyond specification if greater than 30db of increase or reduction is attempted. If it is desired to operate many gain control sections from one level detector section, a DC coupled buffer amplifier must be supplied. Contact the factory for suggestions if special hookups are to be attempted.

CONTROL DESCRIPTION

IN/OUT KEY

This control switches the Omnipressor in and out of an audio circuit. When the switch is in the OUT position, the unit is completely bypassed by a DC path, and power need not be applied.

PILOT LIGHT (above IN/OUT KEY)

This lamp becomes illuminated when the IN/OUT KEY is in the IN position and power is applied to the Omnipressor. It indicates that the unit is in-circuit.

BASS CUT/NOR

This switch determines the frequency response of thelevel detector circuit. In the NOR position, the level detector section has the same frequency response as the gain control section. In the CUT position, bass signals are attenuated and have relatively less effect on the overall compression/expansion operation of the Omnipressor.

FUNCTION EXPAND/ COMPRESS

This is the main control on the Omnipressor. It determines the units' basic mode of operation. Fully counterclockwise, the Omnipressor gain ~~varies~~ varies sharply from full attenuation to maximum gain as a threshold level is exceeded. As the control is rotated clockwise, this action becomes less sharp until the gain varies only a few db from no input to full input. At the center divider, the Omnipressor gain is constant regardless of input level. As the control is turned clockwise from the center divider, the gain begins decreasing with increasing input level. For small rotations, the gain may vary only a few db for large input changes. More rotation produces substantial compression, until the point of infinite compression is reached and the gain decreases 1 db for each db of signal increase, thus keeping the output level constant regardless of input. Rotation past this point produces dynamic reversal, in which a high level input produces a lower level output than does a low level input. Fully clockwise rotation results in full output attenuation above a certain threshold input.

ATTN LIMIT

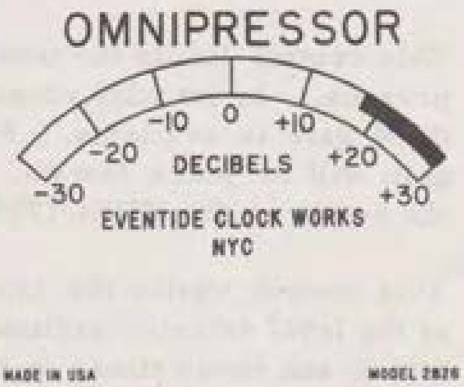
This control limits the maximum attenuation of the Omnipressor. In its fully counterclockwise position,

	30 db of attenuation is available. Fully clockwise, maximum attenuation will be just a few db. This control overrides the action of the FUNCTION knob.
METER	Indicates input level, gain level, and output level of the Omnipressor. It is discussed in greater detail in a later section.
INPUT/GAIN/ OUTPUT lights	These lamps indicate that the meter is reading Input, Gain, or Output, respectively.
GAIN LIMIT	This control limits the maximum gain of the Omnipressor. In its fully counterclockwise position, 30 db of gain is available. Fully clockwise, maximum gain will be just a few db. This control overrides the action of the FUNCTION knob.
TIME CONSTANT	This control varies the attack/decay time constant of the level detector section. (The ratio between attack and decay times is not adjustable, and is set to the most desirable point.) In the fully counterclockwise control position, the time constant is fastest. It is varied in multiples of between 2 and 3 per step to give a total control range of about 100/1.
OUTPUT LEVEL	The OUTPUT LEVEL control sets the Omnipressor gain after the gain control module. It can be used to compensate for different system operating levels and for various types of input signals.
OFF/INPUT/ GAIN/OUTPUT	This switch combines power control and meter function. Its operation is self-explanatory.
PILOT LIGHT (above control)	Indicates that AC power is being supplied to the unit and that the unit is operating.

METERING SECTION

The Omnipressor has a comprehensive and versatile metering circuit which can be used as an aid in setting the various controls, as a determiner of proper operation, and even as a general studio troubleshooting instrument. The meter is used to read each of three different parameters, depending upon the setting of the function switch. These parameters are:

SIGNAL INPUT LEVEL   OMNIPRESSOR GAIN   SIGNAL OUTPUT LEVEL



(The arc between 17 and 30 indicates the maximum output level available unless option 03 is installed.)

METER SCALE

Which of the three functions being read may be determined by which light is illuminated directly above the meter face. The metering function switch is combined with the power switch on the extreme right hand side of the panel.

For each of the meter functions, the reading is in relative decibels. The function of the meter in each operational mode is described below.

INPUT MODE — The meter reads the relative input level after the input attenuator. The setting of the input level control affects the meter reading, so that the meter may be adjusted to read levels in the range of about -40 to +20 with the input control fully clockwise, to about -20 to +40 with the input control substantially reduced. Levels above +40 are rarely encountered in audio work, and no attempt should be made to measure high voltages with the unit as doing so will damage the input circuit.

A typical measurement may be made as follows: assume you wish to know the absolute level in dbm of an audio signal. First, plug in a calibrated source, if available, and set the Omnipressor input control so that the Omnipressor meter reading is equal to the source amplitude. If a calibrated source is not available, parallel a standard VU meter with the Omnipressor input and set the Omnipressor meter for the same reading as the VU meter. The Omnipressor is now calibrated and may be used to read any audio level within the meter range.

GAIN MODE

In this mode, the meter reads the relative gain of the Omnipressor. The actual gain is dependent upon the setting of the input level control and the output level control. Unless calibrated as described below, the meter may be regarded as reading gain increase or gain decrease. With the compression control set at the dividing line, the meter should read within 1 db of zero, indicating no compression or expansion, regardless of input signal level.

If it is desired to calibrate the gain meter precisely, leave this control centered and adjust the input meter reading to the actual input amplitude as described above. Then, turn the meter to the output position and set the output level control for the same reading as obtained in the input position. The Omnipressor is now calibrated to read absolute gain.

OUTPUT MODE

In the output position, the meter reads the actual signal output level in dbm.

Dbm readings are referred to 600 ohms. Since the Omnipressor input is high impedance bridging, and the output is low impedance, the readings in "dbm" above are actually readings of a voltage level corresponding to the dbm reading. The reading will be in dbm only if the input signal is across a 600 ohm line, or the output is feeding a 600 ohm load.

APPLICATIONS

YOUR OMNIPRESSOR LOVES YOU AND WANTS TO BE YOUR FRIEND! If you don't understand it. If you don't fondle its controls properly, it will cause you hours of confusion, and tempt you to dash it on the rocks or put it in a sack and drown it. PLEASE READ this applications section before blaming your Omnipressor for malfeasance or deviltry.

The Omnipressor, like most Eventide equipment, is a signal processor with wide-ranging use. It is not the normal, tame limiter or compressor which only tries to keep signals within a certain range. It is not a simple noise gate which is either off, letting nothing through, or on, letting everything through at unity gain. Rather, it is a special effects unit, which, in addition to the above, can generate such effects as infinite compression, dynamic reversal, extreme expansion, etc. The Omnipressor has a 60 db control range in addition to a wide dynamic range at constant gain. Because of this wide range, it is possible to overload system components following the Omnipressor if it is used improperly. Note, for instance, that with input and output controls wide open, and with the gain reading +30 on the meter, it is possible to obtain up to 50db gain from the unit. If you connected an amplifier with 50db gain between your console out and your tape recorder in, you might reasonably expect some distortion, right? Right!

Before using the Omnipressor in a session or in a performance, familiarize yourself with its operation. The ATTN and GAIN LIMIT controls serve to prevent uncontrolled operation by the novice user. Turn on the Omnipressor and turn the input level control to zero. With no input, the level detector stage is producing the maximum possible control voltage. With no input, putting the FUNCTION knob in the expand section causes a great reduction in gain. As the input increases, the control voltage gets closer to 0, and the gain reduction decreases, until, at some threshold set by the input level control, the gain starts increasing past unity (0db). This is expansion—increasing gain with increasing signal thus increasing dynamic range. Note how sharply the FUNCTION control varies the gain with no input signal. Also note that as the signal level approaches the threshold, the function control has a less pronounced effect, until, at the threshold, full rotation has almost no effect. Experiment with the two LIMIT controls. Again remove the input signal. Turn the two limit controls fully clockwise. Observe that the function control can only vary the meter by a few db, despite the fact that with no input, maximum expansion or compression should occur. Rotate the FUNCTION control to maximum expansion and vary the ATTN LIMIT control. Notice that the meter varies from negative full scale to almost center scale. Now, rotate the GAIN LIMIT control. Note that this control has no effect on the meter reading. Turn the FUNCTION control to maximum compression and repeat the experiment with the LIMIT controls. Note that now the GAIN LIMIT varies the meter reading from center to positive full scale, and the ATTN LIMIT control has no effect.

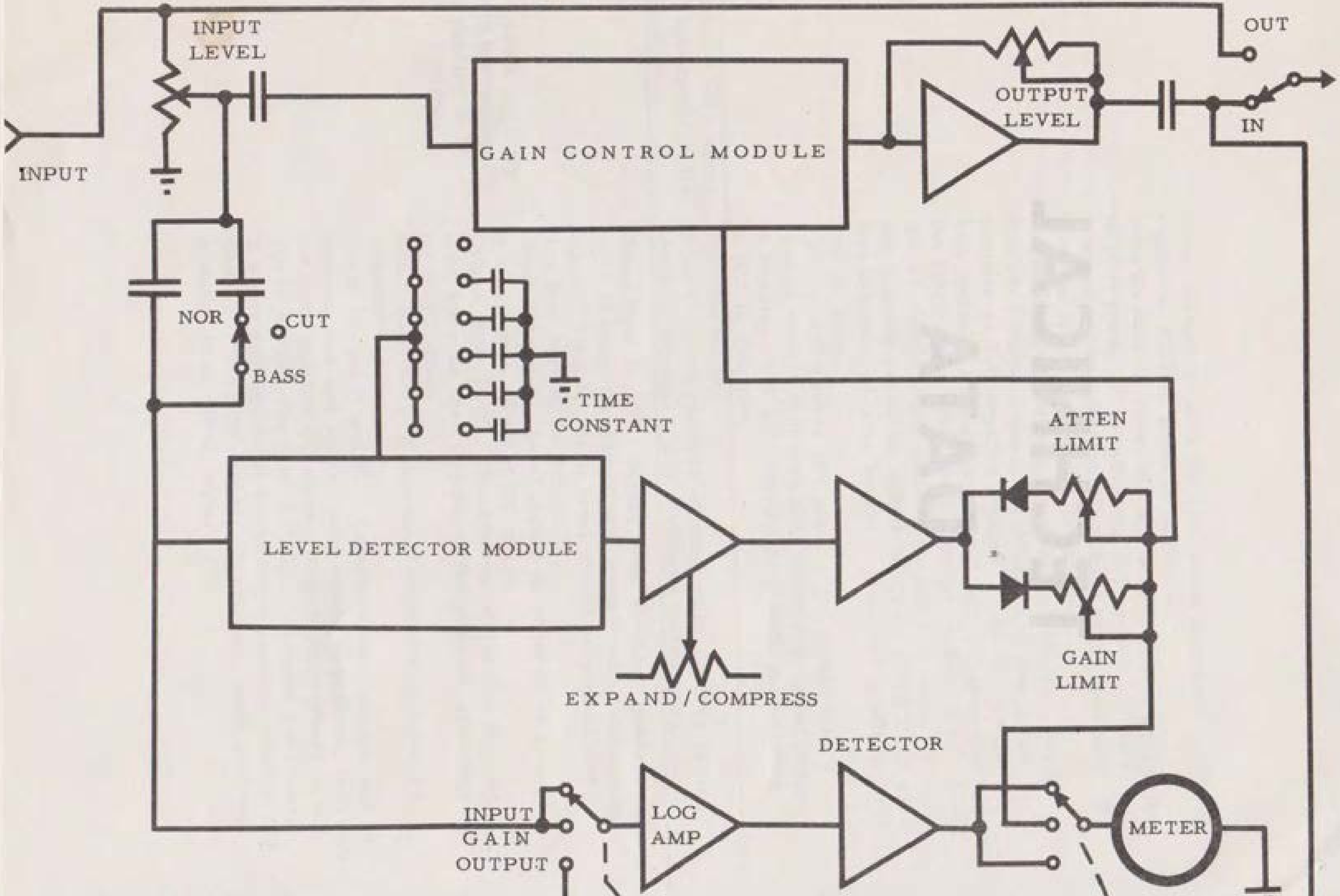
The LIMIT controls are very important in setting up the unit. They can prevent runaway gain, runaway attenuation, runaway engineer, and many other problems. For instance, if you wish to increase average program level by 10 db, but limit compression to a maximum of 15 db, set the GAIN LIMIT control with no input and the FUNCTION knob at full compress so that the meter reads +10 in the GAIN position. Now, turn the FUNCTION knob to full expand and set the meter at -5 with the ATTN LIMIT control. You are now free to set the compression ratio, input level, and time constant for the most pleasing performance without worrying that you will get too much gain, too much attenuation, or uncontrolled operation, regardless of signal levels or peaks. This type of setability is perfect for sound reinforcement or broadcast use where unattended operation is the rule and wild effects are not desired. Controllable compression in sound reinforcement is particularly advantageous because feedback can be prevented conclusively while still permitting maximum output.

Another control not customarily found on dynamic modifiers is the BASS CUT/NOR switch. Unlike the LIMIT controls, it is not exceptionally useful. Its main application is to prevent large gain variations from being initiated by low frequency signals. A typical use would be in communications or advertising applications, where it is frequently desirable to give a signal as much "punch" as possible. Information in voice signals is generally carried in the range above 500Hz, although fundamentals are present below this frequency. By using a short time constant and cutting bass response, an improvement in intelligibility can be obtained in listening environments with less than optimum signal to noise ratios. Additional applications would be in processing signal tracks with leakage present. If, for instance, the bass drum leaked onto the voice track which you are limiting, the bass can be prevented from affecting the gain control operation. (Note that this does not reduce the amplitude of the leakage. Refer to the Noise Gate description for more information on reducing leakage.)

There are certain things that the Omnipressor will <u>not</u> do. It is not, and is not intended to be, a fast peak limiter. The Omnipressor cannot be used as the last element in a disc cutting chain or to prevent overmodulation in a transmitter. The unit works on RMS level and will not significantly modify the level of individual high frequency, high amplitude peaks. This is a specialized application which requires an attack time on the order of microseconds, and such devices do not generally modify the sound of the audio material, but simply protect following devices from overload.

The above material gives general considerations for the operation of the Omnipressor. The remainder of this applications section is organized as a group of individual "application notes:. This section will be added to periodically, and if you wish to obtain updates, please be sure to fill in the warranty card. If you have a specific application you wish to make known, send us a note. Unique ideas will be credited to their source.

TECHNICAL DATA



OMNIPRESSOR
BLOCK DIAGRAM

THEORY OF OPERATION

The unique features of the Omnipressor, Infinite Compression and Dynamic Reversal, are obtained by a process known as "open loop" operation. A standard, non-open loop compression amplifier operates as follows: the input signal goes through a gain control stage, after which the level is detected. If the output level is too high, a voltage is applied to the gain control stage to lower the output. Thus, the higher the compression ratio, the higher the gain of the amplifier necessary in the level detector to control the output level. Obtaining extremely high compression requires extremely high gain, which requires critical circuitry and can cause instability. This standard type of operation is referred to as "closed loop" because the processed signal level is used to determine further changes in its own amplitude.

Open loop processing, as employed by the Omnipressor, uses a completely independent level detector and gain control stage. The level detector produces a DC output proportional to the AC RMS input. This voltage is linear with respect to the input level variation in decibels. An input change from -30dbm to -10 dbm produces the same DC change as does an input change from +10 to +30 dbm, even though the actual input change measured in absolute terms is much greater. Likewise, the gain control module gives a fixed db change for a given control change in control voltage, regardless of whether the module gain is -30 db or +30 db.

Now, consider what happens when an input signal is applied to both the gain control module and the level detector module. We apply a 0 dbm signal and note that the level detector output is +1 volt. (All the numbers in this example are chosen for simplicity. Actual values will be different.) Now, we apply a +10 dbm signal and note that the level detector output is +2 volts. Assuming that the gain control module works on the same levels (.1 volt per decibel), we can take the DC output from the level detector, apply it to an inverting amplifier, and thence to the gain control module. Depending upon the gain of the inverting amplifier, various compression ratios are available.

INVERTING AMPLIFIER GAIN	INPUT LEVEL CHANGE	OUTPUT LEVEL CHANGE	COMPRESSION RATIO
.5	10db	5db	2
.75	10db	2.5 db	4
.90	10db	1db	10
.95	10db	.5db	20
.99	10db	.1db	100
1	10db	0	infinite
1.5	10db	-5db	-2
4	10db	-40db	-.25

As can be seen, a wide variety of compression ratios can be obtained with no critical high gain-gain DC amplifiers. By using a non-inverting amplifier, increasing the signal input level increases the gain control module gain, creating expansion. Placing an amplifier whose gain can be varied between -5 and +5 between the level detector output and the gain module control input achieves a continuously variable expander/compressor with wide control range.

The continuously variable amplifier is implemented as follows: (see schematic, IC9). The operational amplifier is connected in a differential configuration, with a variable resistor (FUNCTION control) from pin 3, the non-inverting input, to ground. When this resistor as at 0 resistance, the input path through the lower 2.7K resistor is ineffective, and the amplifier becomes an inverting amplifier with a gain of -1. With the resistor at the other end of rotation, it is in effect out of the circuit, and the amplifier has a gain of about +1. When the resistor is set at 2.7K, the only input the amplifier sees is a common mode signal, and the gain is 0. This point corresponds to the front panel demarcation between expansion and compression. Although the gain only varies between +1 and -1, the effective gain is higher because of scaling resistors elsewhere in the circuit.

The amplifier immediately following the variable gain stage is used to limit the maximum gain increase or reduction in accordance with the front panel control settings of the GAIN LIMIT and ATTN LIMIT controls. The output of IC8 goes to the gain control module through two variable resistors in series with diodes of differing polarity. Although the resistors are in the feedback loop and theoretically have no effect on the voltage on the summing point, the amplifier output voltage is in practice limited by the power supply voltage, and increasing the series resistance limits the available voltage swing to the gain control module. The diodes isolate the controls from each other so that one operates with a positive voltage swing and the other with a negative voltage swing. The meter, when switched to the gain position, also operates from the output of this amplifier. It is a standard microammeter which os offset by the meter center trim pot to give a center scale reading with no control voltage. The meter is calibrated in db, which, as was stated earlier, is directly proportional to control voltage.

A switch is provided which lowers the sensitivity of the level detector to low frequency signals. The frequency response of the level detector only is affected. If the FUNCTION knob is set at center, or the two LIMIT controls are fully CW, this switch has no effect. The switch selects the capacitance in series with the 100K input resistor. Since the gain control module and level detector module inputs are both virtual grounds, the response in each case is that of a series RC circuit.

The output circuit is an operational amplifier buffered by a complementary PNP/NPN transistor amplifier inside the feedback loop. This configuration provides increased current driving capability. Note that the output is referenced to ground. If a balanced output is desired, a transformer must be added.

The input/output metering circuit is a wide dynamic range level detector. It employs a Texas Instruments type 75N76502N logarithmic amplifier integrated circuit. This device generates a bipolar log over a 90 db dynamic range. IC's 3, 4, and 5 are used to amplify the input signal to a proper level to feed the log amplifier. The three amplifier chips are cascaded, and the power supply limits the output voltage to about ± 4 volts, so that with high input levels, the last two amplifiers in the chain go into a controlled clipping mode to avoid overloading the log amp. IC 1 converts the output of the log amp to DC, suitable for driving the panel meter.

Various power supply voltages are required by the Omnipressor. Detailed information is furnished in the troubleshooting section. The positive voltages are derived from a monolithic regulator chip and zener diodes. The negative voltages are derived from a PNP transistor regulator and zener diodes. Lamp voltages are supplied directly from the power transformer with a series dropping resistor.

ALIGNMENT INSTRUCTIONS

To align the Omnipressor, the following equipment is required:

Sine wave generator capable of output level at least 5V peak to peak on sine or triangular output, frequency adjustable from 20Hz to 20KHz.

Audio voltmeter capable of measuring level from -40 to +10 dbm.

Volt/ohm/milliameter, 20,000 ohms per volt or greater.

Distortion meter.

The VOM and audio voltmeter may be replaced by a calibrated, DC coupled oscilloscope. It is recommended that a scope be used if available so that abnormal operating conditions such as oscillation, distortion, clipping, etc. can be observed when they occur. This is better than finding that alignment is impossible and then referring to the trouble shooting procedure.

Including the front panel controls, there are 14 variable resistors in the Omnipressor. Despite this apparent complexity, there is little interaction between controls, and every effort has been made to assure a straightforward alignment procedure. If at any time a control cannot be adjusted to give the proper indication or response, first make sure that the instructions have been followed completely. For instance, generator level may not be properly adjusted or the front panel controls may be at the wrong settings. If you are certain that the alignment procedure is being followed and it is still impossible to obtain the desired result, refer to the troubleshooting section.

INITIAL CONTROL SETTINGS

IN/OUT KEY	IN
INPUT LEVEL	12 O'clock
BASS CUT/NOR	NOR
FUNCTION	Dead Center
ATTN/GAIN LIMIT	FULL CCW
TIME CONSTANT	2 Clicks from full CCW
OUTPUT LEVEL	12 O'clock
METER	GAIN POSITION

Apply a 1KHz, 0 dbm signal to the input of the Omnipressor.

1: Measure DC voltage at IC10 pin 6 and adjust R5 until this voltage reads 0 VDC, plus or minus 100 millivolts.

2: Measure DC voltage at IC9 pin 6 and observe that this voltage is 0. Temporarily remove input signal. If this voltage varies by more than 50 mv, adjust front panel function knob until voltage at IC9 pin 6 is O. Next, remove the knob, being careful not to disturb the control setting, and replace it on its shaft pointing to the dividing line between compress and expand.

3: Adjust R9 until the front panel meter reads 0 (center scale). With the input still removed, turn the function knob to full expand. The meter should swing down scale. Adjust R11 until the meter reads -30. Turn the FUNCTION knob to full compress. The meter should now swing up scale to +30. If it is a few db low, readjust R11 to read +30. If it is a few db off scale, do nothing.

4: Reapply the input signal and re-center the FUNCTION knob. Attach the level meter and the distortion meter to the Omnipressor output. Adjust R13 for an output voltage level of 0 dbm. Adjust R12 for minimum distortion. (If the unit was badly misaligned, it may be necessary to readjust R13 for 0 dbm output.)

5: Decrease the signal generator output level to -10 dbm. Adjust the FUNCTION knob in the expand range until the meter reads -10 dbm. Measure the output of the Omnipressor and adjust R10 for an output level of -20 dbm. Readjust the signal generator for +5 dbm out. The meter should now read +5 gain and the output level should be +10 dbm, plus or minus 1 db.

6: Reduce the signal generator frequency to 80 Hz. Measure the output distortion from the Omnipressor and adjust R4 for minimum. This should be a very broad adjustment.

7: Temporarily set the bass cut switch to CUT. Note that the output level drops to about -2db. Return the switch to NOR.

8 Turn the meter switch to the INPUT position. Set the signal generator level to 0 dbm and the frequency to 1KHz. Observe that the signal level at pin 6 of IC5 is about .6V peak to peak. Reduce the generator level by 18 db and adjust R1 until IC4 pin 6 has .6V peak to peak. Reduce the generator level by an additional 18 db and adjust R2 until IC3 pin 6 reads .6V peak to peak. Increase the generator level by 6db and adjust R3 until the front panel meter reads -30. Increase the input level control until the meter is reading -20. Increase the generator output in 10 fb steps and confirm that the meter is tracking properly. Factory selected resistors also govern the metering circuit tracking. If it is impossible to align the meter within ±2db, slightly adjust R1 and R2. R1 has most of its effect near center scale, R2 near bottom scale.

This completes the Omnipressor alignment.

TROUBLESHOOTING PROCEDURE

The Omnipressor is a reliable, solid state device. Under normal circumstances, it should require neither preventive or corrective maintenance. All units are "burned in" at the factory for a period long enough to eliminate early failure of semiconductor components. If your Omnipressor sppears to be defective, the FIRST STEP is to make sure that it's being operated properly. IF ALL ELSE FAILS, READ THE INSTRUCTIONS. If that fails too, follow the below suggestions and procedures.

In all electronic equipment, the first components to suspect in case of difficulty are the mechanical ones. The most likely parts to become defective, especially after long use, are the front panel lamps and controls. (Defective lamps will not affect operation). The next most likely to fail are the internal controls (due to environmental stresses) and the power supply components (due to thermal stresses). Next in line are the input and output circuits, which interface with the outside world and are thus subject to misconnection. Under normal use, all these failures (except the lamps) are unlikely. They should be kept in mind, however, because other failures are even more unlikely.

SYMPTOM	POSSIBLE REMEDY
No lights, no output	Plugged into 115VAC, 60 Hz outlet? Fuse OK? Switch OK? Open top cover. Visually check AC wiring and fuse holder. Check switch contacts for continuity. Check power transformer wiring to PC board.
Lights function normally. No output or AC hum on output.	Check all power supply voltages with scope: IC10-7 +15VDC, 10 mv ripple, tolerance $\pm$ .5V IC10-4 -15 VDC, 50mv ripple, tolerance $\pm$ 1V Check signal presence at input. If not present, check contacts on IN/OUT switch for mechanical propriety. Check presence of 7.5 VDC at gain module. Check signal at IC6-6. If present but distorted, suspect output transistors. Check for signal at emitter of output transistors. If present, check harness wiring. Remove rear panel jumper between pins 2 and 1 (VC out, VC in). If signal reappears, problem is in level detector.
Signal throughput OK but gain doesn't change in accordance with input.	Is signal level in excess of -4dbm available? If not, external preamp must be used. Is signal present at .22uf capacitor on board at level detector module input? Adjust time constant switch from min to max. If unit starts working, may be shorted capacitor. Vary input level above and below 0 dbm. Voltage at IC pin 3 should vary above and below ground. If it does not, and input is present, suspect RMS module.

	Check voltage at IC10 pin 6 for same parameters. If no variation, IC10 is probably defective. Turn R6 fully to either end and look for same parameters. at IC-9 pin 6. If not present, IC9 is bad. Turn R6 to other end and observe DC voltage sense reversal. If not, R6 or harness wiring is defective. Leave R6 at either end, remove input signal. Check IC8 pin 6 output signal. It should be at nearly full positive or full negative voltage. Turn R6 to other end, polarity should reverse. If not, IC8 defective. Set GAIN and ATTN LIMIT controls to full CCW. Turning R6 should swing meter from full + to full-. If only one polarity available, either GAIN or ATTN limit control defective or wire broken. If neither available, R11 may be open. Vary R6 and observe IC7 pin 6. DC should vary ± several volts. If it does not, either rear panel jumper is missing, R10 is defective or grossly misadjusted, or IC7 is defective.
Signal paths OK, meter reads improperly in the GAIN position.	Defective meter. If meter is not centered at unity gain, R9 may be improperly adjusted. See alignment instructions.
Meter reads properly in GAIN but improperly or no reading in INPUT or OUTPUT.	Check input to IC5. Signal level should be present roughly 10 db below input level with input level all the way up. Check IC5 pin 6. Same level should be present with less than 3mv of DC offset. Check IC4 pin 6. Level should be about 15 db greater with less than 30 mv of DC offset. Reduce input 15 db. Check output of IC3 (pin 6). AC level same as last step should be present, less than 10 mv of DC offset. Check IC2 firmly in socket. Orientation is same as soldered-in IC's. Check IC2 pin 5 and 10. Complementary signals half way between sine and square wave should be present, both with the same positive DC offset. Check power supply to IC2: Pin is +6VDC, Pin 2 is -6VDC. (tolerance ± 3/4 volt). If power and inputs OK but no output present, replace IC2. Check IC1 pin 6 for output. If present, check 22uf capacitor. If no short, replace IC1.

APPLICATION NOTE #1

"Your Backwards Omnipressor"

As we state in our promotional literature, one of the novel features of the Omnipressor is its ability to make signals sound backwards. This is a consequence of the Dynamic Reversal feature, which enables loud sounds to come out more softly than soft sounds. Speech waveforms, for instance, generally consist of loud peaks followed by trailing-off envelopes. By making these envelopes louder than the peaks, the illusion that the sound is coming out backwards is generated. Likewise, drum sounds consist of peaks roughly coincident with mechanical impact, followed by a decay envelope. The Omnipressor amplifies this envelope and "swallows" the impact.

The reversal effect is not limited to voice and drums. In general, any material with wide dynamic range can be "reversed". Plucked string instruments, virtually all percussion, and many natural sounds can be processed to good effect. Certain other material does not sound good in the reversal mode. Specifically, program material consisting of more than one type of sound will give inconsistant results at best. Trying to process an entire program source rather than individual tracks will generally meet with ignominious failure, although solos can be picked out and reversed on occasion.

CONTROL SETTINGS

IN/OUT KEY	IN
FUNCTION	3 O'clock initial setting
ATTN/GAIN LIMIT	FULL CCW
TIME CONSTANT	CENTER OF RANGE
INPUT LEVEL	+10 PEAK on INPUT
OUTPUT LEVEL	AS DESIRED
METER	GAIN after input set up

Experiment with the operational controls to obtain the most pleasing effect. It will probably be desirable to limit the maximum gain somewhat with the GAIN LIMIT control to prevent high noise levels with no signal. This applies particularly to taped material in which noise reduction was not employed.

ADDITIONAL POSSIBILITIES

If you can make forward things sound backwards, you should be able to make backward things sound forwards! Play a vocal tape backwards and reverse the dynamics. The voice should come out sounding almost normal, but the words will be pure gibberish. NSA is considering this method of encrytping data. Be the first on your block......... If you want tremendous "punch" on recorded material, record it normally, and then play it backwards through the Omnipressor set barely into the reversal mode, and re-record it. Playing the second tape backwards (i.e., voice forward), should result in a signal almost completely devoid of dynamic range. Also, you can use the second recording as an opportunity to add some echo, which will then precede the signal in real time. The reason backwards compression is so effective is that the program material is devoid of sharp attack transients which tend to bring down the succeeding program material.

APPLICATION NOTE #2

BASIC SET UP FOR STANDARD OMNIPRESSOR FUNCTIONS

Our advertisement opposite depicts in cartoon form and text the various standard operating modes of the Omnipressor. This note gives the initial control settings to achieve the effects depicted. The following settings apply to all modes:

IN/OUT KEY....... IN   BASS CUT/NOR........... NOR
TIME CONSTANT. . CENTER position initially, experiment later.
INPUT LEVEL..... Signal should drive meter to center scale or above in INPUT.

INFINITE COMPRESSOR

ATTN/GAIN LIMIT	FULL CCW
OUTPUT LEVEL	AS DESIRED
METER	OUTPUT
FUNCTION	2 O'clock . Apply signal from oscillator and vary amplitude. Adjust FUNCTION knob until varying input produces no output variation. Use GAIN LIMIT as needed to prevent clipping.

EXPANDER

ATTN/GAIN LIMIT	FULL CCW
METER	GAIN
FUNCTION	11 O'clock. Adjust FUNCTION until desired expansion is obtained. Use GAIN LIMIT if needed for wide expansion range.

NOISE GATE

ATTN LIMIT	CCW
GAIN LIMIT	FULL CW
METER	GAIN
FUNCTION	8 O'clock
OUTPUT LEVEL	AS DESIRED
INPUT LEVEL	Bring up INPUT until desired gating action is obtained.

LIMITER

ATTN LIMIT	CCW
GAIN LIMIT	FULL CW
METER	GAIN
FUNCTION	4 O'clock
INPUT LEVEL	Adjust INPUT as threshold control for proper action.

DYNAMIC REVERSER

ATTN LIMIT	CCW
GAIN LIMIT	CCW
METER	GAIN
FUNCTION	2-3 O'clock
OUTPUT LEVEL	AS DESIRED

Adjust function control and other controls for best effect.

APPLICATION NOTE #3

VOLTAGE CONTROLLED AMPLIFIER

The Omnipressor may be used as a high quality voltage controlled amplifier for modulation, electronic music, channel gain variation, amplitude scaling, filter generation, or, in fact, any application in which a fader or potentiometer is used. Characteristics in the voltage control mode include accurate voltage vs. amplitude curve, good tracking, low distortion regardless of signal level (below clipping level), and wide control range.

The gain control section of the Omnipressor has a linear control voltage vs. decible output characteristic. This is equivalent to a logarithmic control voltage vs. output voltage curve. This makes it especially useful for audio and musical applications in which logarithmic response and logarithmic signal decay envelopes are prevalent. The control range available is in excess of 60db. Gain is increased with a positive control voltage and decreased with a negative control voltage.

SET UP

IN/OUT KEY	IN
INPUT LEVEL	INPUT meter should read at center of range. If gain reduction only is to be used, set input level higher. If increase desired, lower input level.
OUTPUT LEVEL	AS DESIRED

(NO OTHER CONTROLS WILL AFFECT OPERATION)

*******REMOVE REAR PANEL JUMPER BETWEEN PIN 1 AND PIN 2*******

OPERATION

Negative DC voltages will decrease the Omnipressor gain, positive voltages will increase it. Control voltage input impedance is about 10K ohms. If the control is too sensitive (and it will be for most synthesizer control voltage outputs), scaling can be effected by a simple series resistor.

The audio signal in the Omnipressor is theoretically "modulated" by the control voltage. However, due to the logarithmic characteristic of the control, and the unipolar nature of the control (reversing control polarity does not reverse output phase), it is not recommended that the Omnipressor be used as a balanced modulator (multiplicative mixer) except on an experimental basis.

APPLICATION NOTE #4

OMNIPRESSOR TRACKING AND PANNING

One Omnipressor can be used to control the gain of several by appropriate connection of control inputs and outputs. Applications include stereo and quad strapping to prevent image shift in multichannel systems. A method of connection using minimal external circuitry is presented.

Omnipressors in the voltage control mode can also be used for stereo and quad panning. A sample connection circuit is shown.

The principles of voltage control as applied to the Omnipressor are discussed in Application Note # 3. Figure 1 shows how it is possible to interconnect an indefinite number of Omnipressors as stereo, quad, or what-have-you program limiters. The voltage outputs are half-wave rectified so that only negative excursions (gain reduction) are accepted. The outputs of the rectifiers go to what is in effect a linear OR gate. Whichever Omnipressor is compressing the most has its control voltage applied to the other Omnipressors. Thus the level of all channels is controlled, and the gain of each element in the system remains fixed with respect to the others.

If it is desired to have the gain of one channel control the gain of all the others, a simpler connection is possible. Just connect pin 2 of the controlled units to pin 1 of the controlling unit. Since the output impedance of the Omnipressor is low (1 K, or less), adding a couple of loads will not cause too great an error. If it is desired to control a large number of channels from one unit, it would be a good idea to add a voltage follower buffer to the control output.

A voltage controlled "pan pot" (or quad panner) can be implemented with the Omnipressor. See figure 2 for details. In the diagram, the diodes limit the control voltage swing when the pot is turned all the way towards V+, so that at the center the channel gain is unity, and at V+, the variable R can be adjusted for a gain of +3 or +6 db, depending upon the style of panner you prefer. Then, V– and V+ should be adjusted so that when the pot is fully toward V–, the gain is -30 db. The advantage of this system is that a stereo panner can be effected with a single, low quality linear pot, and a quad panner can be effected with a cheap joystick. Other methods of generating signal position information may also be used. For instance, a signal location may be determined with a light pen and a CRT readout interfaced to a digital mini computer, and the computer could generate the control voltage for the Omnipressors through a digital to analog interface.

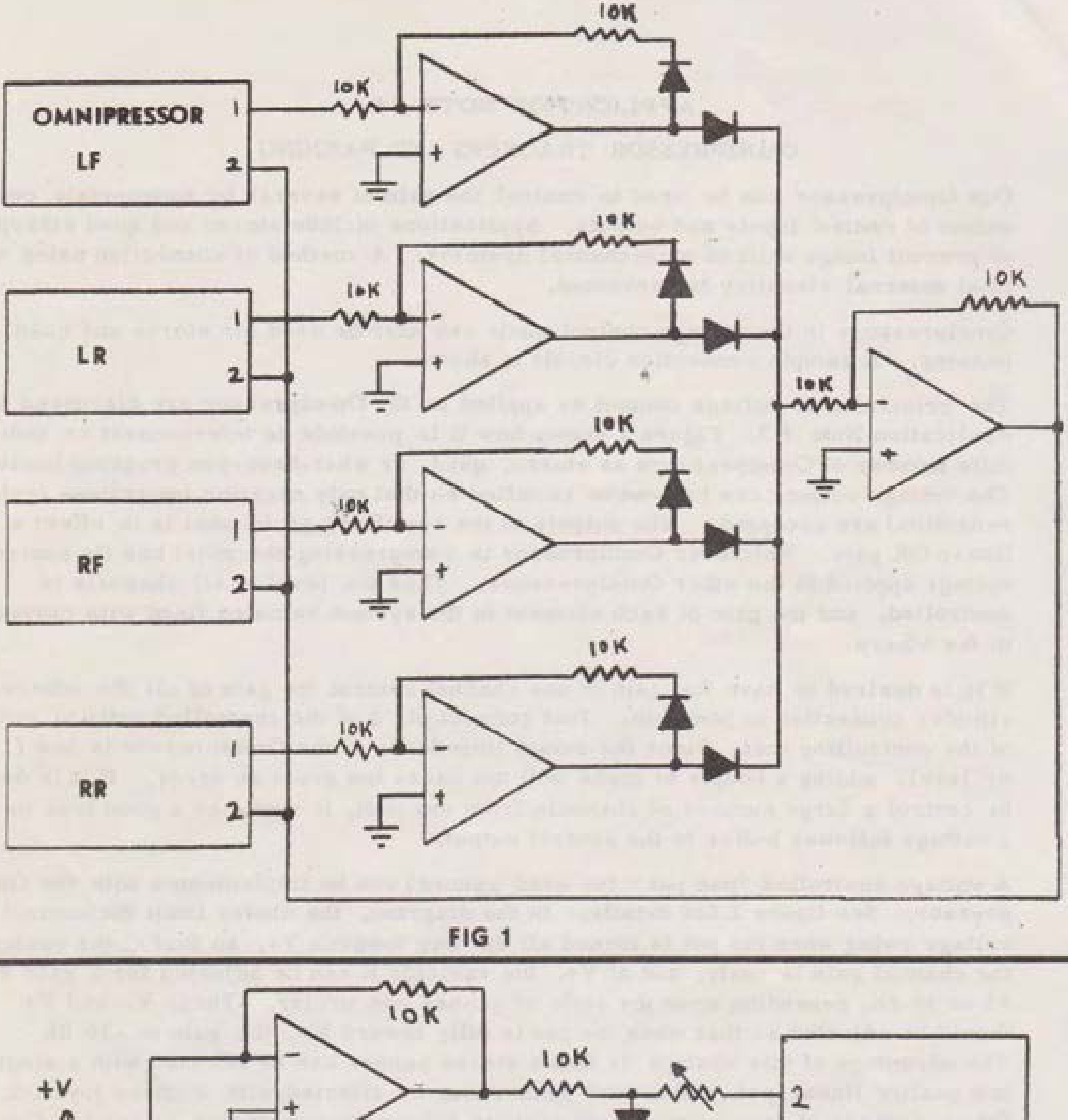

OMNIPRESSOR
LF
LR
RF
RR
1
2
10K
-
+

FIG 1

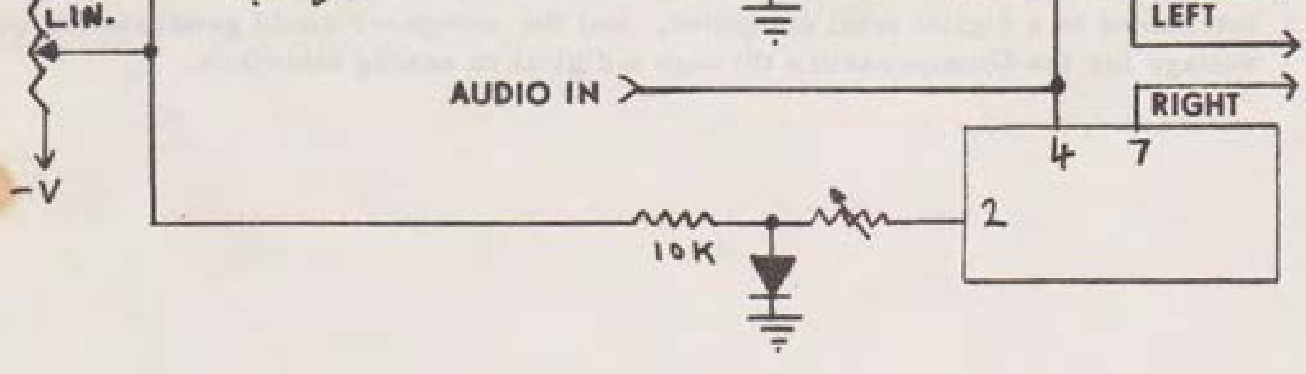
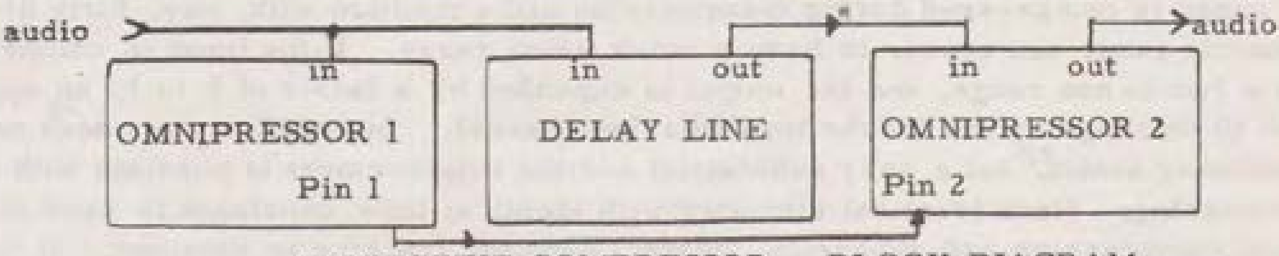

+V
-V
1K
LIN.
10K
AUDIO IN
LEFT
RIGHT
2
4
7
-
+

FIG 2

APPLICATION NOTE #5
PREDICTIVE COMPRESSION

In a previous note, we discussed the possibility of compressing material in reverse order to eliminate the compressor's inherent problem with fast attack transients. In a limiter, fast transients are in effect eliminated by signal clipping before the system gain can adjust to the new level. In a normal compressor, short bursts of high level material can get through before the gain can adjust. The first method creates varying amounts of distortion. The second engenders such phenomena as "p popping". The unique ability of the Omnipressor to separate the gain control from the level detector enables one to built what is most conveniently termed a "predictive" compressor. Such a unit should go a long way towards eliminating the unavoidable imperfections standard units have.



PREDICTIVE COMPRESSOR---BLOCK DIAGRAM

Connect two Omnipressors and an Eventide Digital Delay Line together as shown above. Note that in one Omnipressor, only the gain control section is used, and in the other, only the level detector section is used. What you have just fabricated is a compressor that can read the future, or, in more common parlance, one which has a negative attack time. It works as follows: A signal comes into the level detector which reacts to it depending upon the settings of the controls. Simultaneously, the signal is fed into the delay line which delays it by one or more milliseconds. The signal is then fed to the gain control section of the second Omnipressor. During this delay interval, the level detector has reached the optimum output voltage for the input signal, and before the time the signal reaches the gain control module, the gain has adjusted to the level of the signal.

This predictive mode of operation requires some experimentation to match the signal delay time to the Omnipressor time constant, but when the system is properly adjusted, a very close approximation to the "ideal compressor" is realized.

LIMITATIONS

This type of operation is particularly effective in applications in which only one signal must be processed. To maintain synchronism, a channel of delay is required for each channel of audio, whether or not that channel is to be otherwise processed. This would become cost prohibitive in any configuration exceeding stereo. The predictive compressor still will not protect against microsecond or single cycle high frequency peaks. To do this, a fast attack limiter is necessary.

Equipment necessary to realize "predictive compression" has only recently become available. There is much room for experimentation. We would be pleased to know of your results and techniques.

APPLICATION NOTE #6

USE OF THE OMNIPRESSOR AS A NOISE REDUCTION UNIT

The Omnipressor makes a good compression/expansion noise reduction unit for enhancing the the transmission capability of some medium such as tape, digital equipment, low grade phone lines, etc. While it will not replace a good noise reduction unit such as the DBX or the Dolby for tape (devices intended primarily for noise reduction applications have frequency response tailoring), it will serve in a pinch when one of these devices is not available.

If the Omnipressor is set up as a compressor on the input end (feeding the tape machine or phone line) and as an expander on the output end, then the input dynamic range is compressed during transmission and a medium with, say, forty db dynamic range can appear to have a much wider range. If the input is compressed by a two to one range, and the output is expanded by a factor of 2 to 1, an apparant 80 db range exists for the transmission channel. In practice, this does not precisely obtain, but a very substantial audible improvement is possible with such processing. Since identical circuitry with identical time constants is used to produce compression and expansion, perfect dynamic tracking is obtained. If compression and expansion ratios are set properly, the system should be transparent to the listener.

INITIAL SET UP

IN/OUT KEY	IN
INPUT LEVEL	Set for reading of about +10 in INPUT position of meter switch.
BASS CUT/NOR	NOR
FUNCTION	2 to 1 compression—see below.
LIMIT CONTROLS	FULL CCW
TIME CONSTANT	SHORT
OUTPUT LEVEL	To fully drive transmission channel.
METER	After setting input level, in GAIN position.

Apply an input to the Omnipressor from an oscillator, and vary the amplitude in plus and minus 10db steps. Set the FUNCTION control until the meter reads plus and minus 5 db steps in the compression range. The unit is now set for 2 to 1 compression. You are now ready to transmit or record. If simultaneous reception is required, another Omnipressor must be set up identically, except for a 2 to 1 expansion range. The procedure is identical to the above, except the FUNCTION knob will be in the expand range and the sense of the meter readings will be reversed. If the material is to be recorded instead of transmitted, the same Omnipressor may be used for decoding.

Only the basic set-up is given above. You might wish to experiment with compression/expansion ratios. Also, with certain types of signals, it might be desirable to put the BASS CUT/NOR switch on CUT. Remember that the set-up for encode and decode (compress and expand) should be identical except for the complementary setting of the FUNCTION control.