189.

OPERATING INSTRUCTIONS

model 1176 LN
PEAK LIMITER

Universal Audio

products of

UNITED RECORDING ELECTRONICS INDUSTRIES
8460 SAN FERNANDO RD., SUN VALLEY, CALIFORNIA 91352 (213) 767-1000
TELEX 65-1389 UREI SNVY
a UREI company

model 1176 LN

PEAK LIMITER

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ADDENDUM

MODEL 1176 LN
Effective Serial No. 7053

The Model 1176 Peak Limiter has been used in many applications for more than 10 years and has become the world's most popular limiter. In our continued effort to update its versatility we have changed the input circuitry to a bridging differential amplifier. Its input impedance is 20 kohm when used as a balanced amplifier, and 10 kohm used in the unbalanced (signal ended) mode. References to the previous 600 ohm, bridged-T input should be disregarded.

In addition paragraph 2-3 in Section II, Theory of Operation, should read as follows:

> "The signal is applied to a differential input amplifier (IC 2, Sections A and B). The input will work with signals from either balanced or unbalanced sources. The common mode rejection ratio is adjusted with R2 and is typically better than 40 dB.
>
> The input signal is then coupled through the input level control to an "L" section, consisting of R6 as the series element and field-effect transistor FET Q1 as the voltage variable shunt element (VVR)."
> (.....text continues unchanged.)
>
> Note: The schematic with Suffix "G" included in this manual is up-to-date and shows the components for the input circuit described in this addendum.

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SECTION I

GENERAL INFORMATION

1-1. FEATURES:

F.E.T. Gain reduction ahead of first stage.
Pushbutton selection of compression ratios.
Ultra-fast attack time, even on first program peak.
Attack and release time adjustable from front panel.
Low distortion...does not increase with limiting.
No balancing required...extremely stable operation.
Provision for stereo operation (using two units).
Self-contained power supply for 120 or 240 volts ac.

The Model 1176LN from Universal Audio, sets new high standards of performance and versatility for peak limiting devices. A true peak limiter, the Model 1176LN is all solid-state, using no vacuum tubes.

Limiting is accomplished by utilizing an F.E.T. as a voltage-variable resistor, ahead of the first stage of amplification. Unique circuitry permits severe limiting without added distortion, and no balancing is ever required. Attack time is front panel adjustable, from less than 20 microseconds to 800 microseconds. The exceptionally fast attack time of less than 20 microseconds is independent of program peak frequency or duration, and is the time in which complete recovery to the limited level is accomplished. There is no undershoot. A 50 kHz peak is fully stabilized at the limited level within one cycle, using the tone burst test method. Release time is also adjustable on the front panel from 50 to 1100 milliseconds.

The 1176LN has switch selectable compression ratios, providing the ultimate in versatility to accommodate all types of program material with optimum results. A feature of the 1176 is the use of pushbutton switches to select compression ratios of 20:1, 12:1, 8:1 or 4:1. Another pushbutton switch assembly selects the functions of the front panel meter, and applies power to the unit.

Requiring only 3-1/2" of vertical space in a standard 19" rack, the compact Model 1176LN is completely self-contained, and operable from either 110-125 vac or 220-240 vac, 50/60 cycles.

The power supply is extremely well regulated and impervious to wide fluctuations in supply voltage.

Provision is made to utilize two Model 1176LN Limiters for stereo operation, so that a program peak in either Channel A or Channel B will accomplish equal limiting in both channels. This prevents disorientation of point-source sounds, which occurs when two independent limiters are used for stereo. An inexpensive accessory, Model 1176SA Stereo Network, is required for stereo operation.

SPECIFICATIONS

INPUT IMPEDANCE	:	600 ohms, bridged-T control (floating).
OUTPUT LOAD IMPEDANCE	:	Floating output designed to work into 600 ohm load.
EXTERNAL CONNECTIONS	:	Jones barrier terminals at rear.
FREQUENCY RESPONSE	:	± 1 dB 20 Hz to 20 kHz.
GAIN	:	45 dB ± 1 dB.
DISTORTION	:	Less than 0.5% T.H.D. from 50 Hz to 15 kHz with limiting, at 1.1 seconds release setting (as with all limiting devices, distortion of low-frequency peaks increases as release time is shortened). Output capability +24 dBm with less than 0.5 T.H.D.
SIGNAL-TO-NOISE RATIO	:	Greater than 81 dB with input signal at threshold of limiting, over a bandwidth of 30 Hz to 18 kHz.
ATTACK TIME	:	Less than 20 microseconds for 100% recovery. Adjustable to 800 microseconds with front panel control.
RELEASE TIME	:	50 ms minimum, 1.1 seconds maximum (for 63% recovery). Adjustable with front panel control.
THRESHOLD VS. OUTPUT LEVEL	:	(Sinewave Signal)

COMPRESSION RATIO SETTING	INPUT LEVEL AT MINIMUM LIMITING THRESHOLD ± 2 dB	*RELATIVE OUTPUT AT THRESHOLD
20 to 1	-19 dBm	+12 dBm
12 to 1	-20 dBm	+11 dBm
8 to 1	-21 dBm	+10 dBm
4 to 1	-22 dBm	+ 9 dBm

*with output level interstage gain control set to provide a reserve gain of approximately 10 dB.

STEREO INTERCONNECTION	:	Pin jacks at rear of chassis. Requires 1176SA Network Accessory to couple two units.
POWER REQUIREMENTS	:	110-130 Vac 50/60 Hz, 6 watts. Switch provided for 220-260 Vac, 50/60 Hz.
ENVIRONMENTAL	:	Max. ambient operating temperature 160° F.
DIMENSIONS	:	3½" vertical, for mounting in standard 19" rack. Depth behind panel 8".
WEIGHT	:	11 lbs. (Shipping weight 14½ lbs.)

SECTION II

THEORY OF OPERATION

2-1. GENERAL. The 1176LN Limiter consists of:

Self-contained Power Supplies
Voltage-Variable Resistor Attenuator
Preamplifier
Output Amplifier
Gain Reduction Control Amplifier
Meter Driver Circuit

A block diagram discussion of the theory of operation is given in the following paragraphs.

2-2. POWER SUPPLY. Two zener diode regulated supplies are provided in the 1176LN Limiter, +30 vdc and -10 vdc. The 60 Hz line is supplied to transformer T3 through fuse F1 and the normally closed contacts of S8-A pushbutton on the front panel. The contacts of S8-A are closed when the METER selection pushbuttons are in any position except OFF. Plus 30 vdc is developed by rectifying the secondary voltage of T1 with diodes CR7 and CR8 and filtering with C25, R84 and C23. This voltage is regulated by zener diode CR5.

Minus 10 vdc is developed by rectifying the secondary voltage of T3 with diodes CR9 and CR10 and filtering with R86, C26, R85 and C24. This voltage is regulated by zener diode CR9.

2-3. VOLTAGE - VARIABLE RESISTOR ATTENUATOR. The input signal is coupled through the input level control and input transformer T1 to an "L" section consisting of R6 as the series element and field-effect transistor Q1 as the voltage-variable shunt element (VVR). Below the threshold of limiting the VVR has a high resistance due to its quiescent bias. Starting at the threshold point the bias is reduced causing the VVR resistance to decrease. The rate of change of bias as well as the threshold point is controlled by the compression ratio pushbutton switches.

2-4. PREAMPLIFIER. Transistors Q2, Q3 and Q4 comprise the low-noise preamplifier. A large amount of overall negative feedback results in low distortion and more than adequate drive capability. The preamplifier output is applied simultaneously to the output level control and to a signal voltage divider for use in the gain reduction control amplifier.

2-5. OUTPUT AMPLIFIER. The signal from the output control is coupled to the output amplifier consisting of Q5 through Q9 and associated components, and then to the output transformer T2. This circuit uses a special transformer designed by U.R.E.I. for low phase shift, flat response, and excellent overload characteristics.

2-6. GAIN REDUCTION CONTROL AMPLIFIER. This amplifier receives its input from a signal voltage divider on the output of the preamplifier. The signal from the divider is selected by the compression ratio pushbutton switches. Transistors Q12 and Q13 make up a phase inverter and emitter-follower. The output of Q13 is supplied to rectifier diode CR4 and to another phase-inverter emitter-follower combination Q14 and Q15. The output of Q15 is supplied to rectifier diode CR3. Since the two signals are out of phase, CR3 and CR4 full wave rectify the signals. When filtered by C27 this produces a dc voltage proportional to the signal amplitude. This is a positive going voltage which subtracts from the bias on the VVR. Diodes CR3 and CR4 are biased to create a threshold of limiting, by a dc voltage divider which is selected by the compression ratio pushbutton switches.

2-7. METER DRIVER CIRCUIT. Gain reduction is indicated on the front panel VU meter by measuring the bias on the VVR. Field-effect transistor Q11 provides an impedance transformation from the high impedance VVR bias line to the relatively low input impedance of operational amplifier IC. Zero gain reduction is indicated by a quiescent current through the VU meter. When limiting occurs, and the VVR bias is reduced, the current in the VU meter is reduced by an amount corresponding to the amount of gain reduction.

SECTION III

INSTALLATION

3-1. GENERAL. Involved in installation are thermal considerations, input and output connections, remote meter connections, power transformer switching to accommodate either 115 vac or 230 vac 50/60 Hz. The 1176LN Limiter is designed to be mounted in a 19" rack and requires 3-1/2" of vertical rack space.

3-2. THERMAL CONSIDERATIONS. Although ambient temperature range is not critical, to prolong the equipment life and to achieve optimum performance, the limiter should not be mounted directly over high heat producing equipment such as power amplifiers, power supplies, etc.

3-3. INPUT AND OUTPUT. Connections for input and output are provided on the terminal strip mounted on the rear of the unit. This eliminates interference from cables on the front of the equipment and a permanent harness can be fabricated inside the rack.

3-4. REMOTE METER. Two terminals are provided on the rear of the limiter to connect a remote meter. A strap between these terminals is installed at the factory. To use a remote meter remove this strap and connect leads to any standard VU meter. The internal meter leads must be shorted together. The remote meter will then perform the functions normally performed by the internal meter. (If the remote meter is slightly off on the GR position try reversing the wires to the remote meter.)

3-5. INSTALLATION FOR 230 VAC SERVICE. As normally supplied, unless a tag on the AC Power Cord indicates otherwise, your 1176LN is ready to operate from 110-120 VAC, 50/60 Hz. For 220-240 VAC 50/60 Hz operation, a recessed slide-switch is provided on the rear of the chassis, to the left of the power cable. Using a small screwdriver in the horizontal slot of the switch, push DOWN firmly until the numbers 230 appear above the slot. The line fuse should be changed from 1/8A to 1/16A (type 3AG, Slo Blo).

CAUTION: BEFORE INITIAL OPERATION, INSPECT THE SLIDE SWITCH TO BE SURE IT IS SET CORRECTLY FOR LOCAL VOLTAGE.

3-6. STEREO INTERCONNECT OF TWO 1176LN UNITS. The stereo interconnect accessory SA-1176 is provided with adhesive backing allowing it to be mounted on the rear of either 1176LN Limiter or to a nearby surface. Two female phono plugs are provided for connection to a similar jack on each 1176LN Limiter. These cables may have to be reversed during calibration. See Sections IV and V.

SECTION IV

OPERATING PROCEDURE

4-1. GENERAL. There are six controls normally involved in operating the 1176LN Limiter. These are: (1) METER function, (2) COMPRESSION RATIO, (3) INPUT level, (4) OUTPUT level, (5) ATTACK, (6) RELEASE. Each one is discussed below.

4-2. METER Function. The front panel VU meter can be selected to indicate GAIN REDUCTION, +8 dBm output, or +4 dBm output. This is done by depressing the appropriate METER pushbutton. Power is applied to the limiter when any of the METER pushbuttons except OFF, is depressed. To use a remote meter follow instructions in Section III.

4-3. COMPRESSION RATIO. The 1176LN Limiter has four pushbutton selectable compression ratios: 20:1, 12:1, 8:1, and 4:1. The lowest two compression ratios tend to compress the dynamic range rather than limit only the transient peaks. In broadcasting, the limiter would normally be used with a high compression ratio in order to achieve a maximum transmitted signal without overmodulation. In recording, both high and low compression ratios are useful, depending on the program material and the desired effect. Peak limiting helps to avoid distortion due to overdriving; reduction of dynamic range improves the subjective signal to noise ratio. Selection of the various ratios is accomplished by depressing the desired pushbutton switch.

4-4. INPUT Level. To set up the limiter start with INPUT and OUTPUT controls fully CCW and feed a sample of the program material into the limiter. Insure that gain reduction is enabled by rotating the ATTACK control a few degrees CW. Select meter to indicate gain reduction (GR). Rotate INPUT control CW until desired amount of limiting is achieved as viewed on front panel or remote VU meter. (Limiting should not exceed 3 to 4 dB except where the program material contains extremely large peaks.)

4-5. OUTPUT Level. After setting up INPUT control as in Paragraph 4-4 select meter to indicate either +4 or +8 output and rotate OUTPUT control until desired output level is achieved. Return meter to indicate GR during operation.

4-6. ATTACK Control. The attack time of limiting is adjustable from less than 20 to more than 800 microseconds. Fast attack times are required for fast rise time signals produced by most percussion instruments. The attack time should be lengthened when the program contains vibrato effects which the limiter might possibly follow. Fastest attack is achieved when the ATTACK control is fully CW.

4-7. RELEASE Control. Release time is variable from 50 to 1100 milliseconds. Fast release times may be utilized for program material containing a minimum of low frequency information. When low frequencies are to be limited, the release time should be lengthened to avoid distortion which may be caused by the limiter following each half cycle. Fastest release time is achieved when the RELEASE control is fully CW.

4-8. STEREO OPERATION. When two 1176LN Limiters are interconnected for stereo operation with an SA-1176 stereo accessory the ATTACK and RELEASE controls will interact. First, since the release time capacitors are in parallel, the fastest attack time will be double that of a single unit. Attack time on each limiter can be separately adjusted to control both units. Maximum release time is the same as that of a single unit. A good procedure would be to set the RELEASE control on one of the units to maximum and use the RELEASE control on the other to control release time.

SECTION V

RECALIBRATION

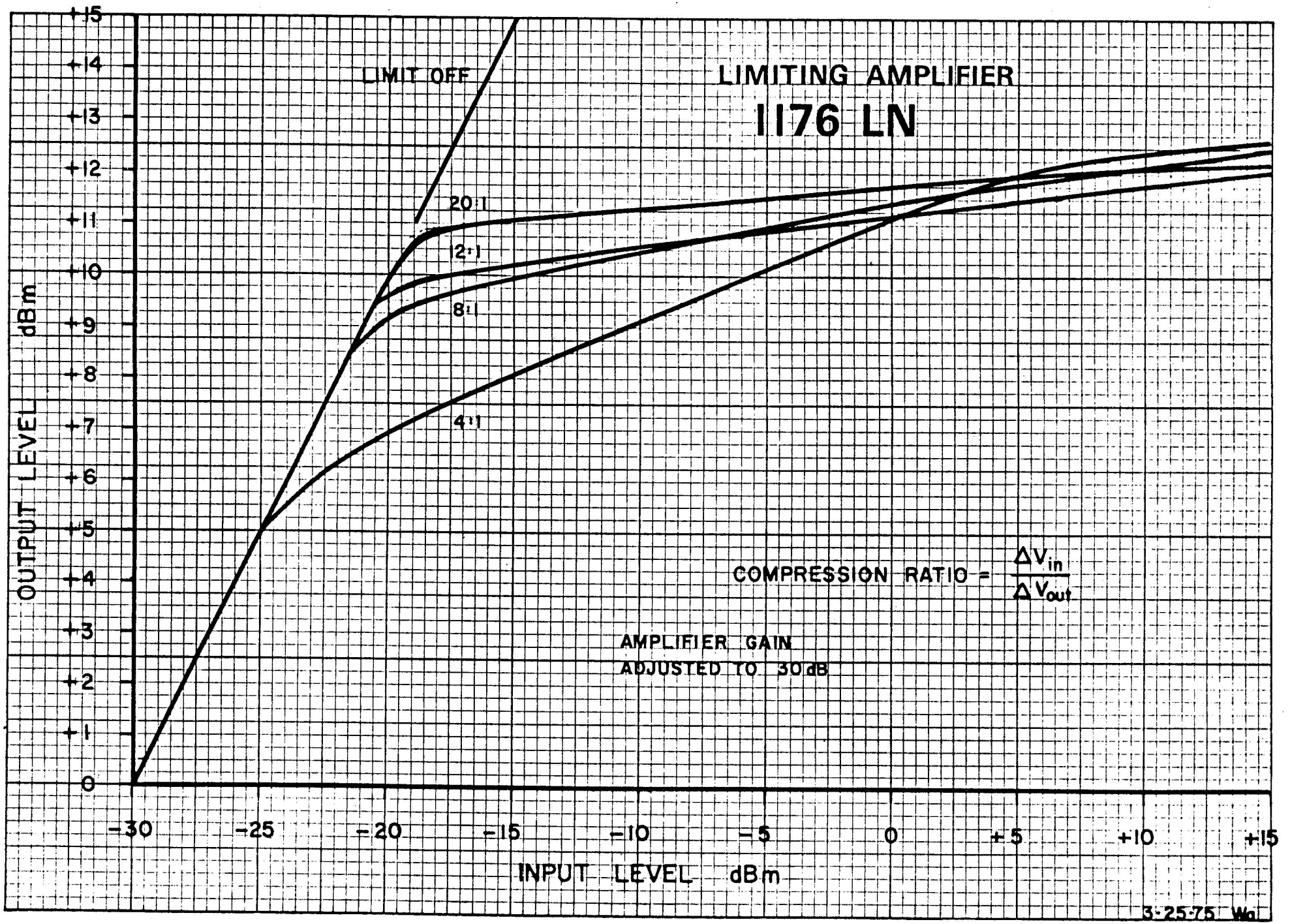
5-1. GENERAL. There are only three controls involved in calibration of the 1176LN. These are VVR or "Q" bias R81, meter tracking R54, and zero set R55. These controls may require periodic adjustment as components age and will need readjustment if field effect transistors are replaced.

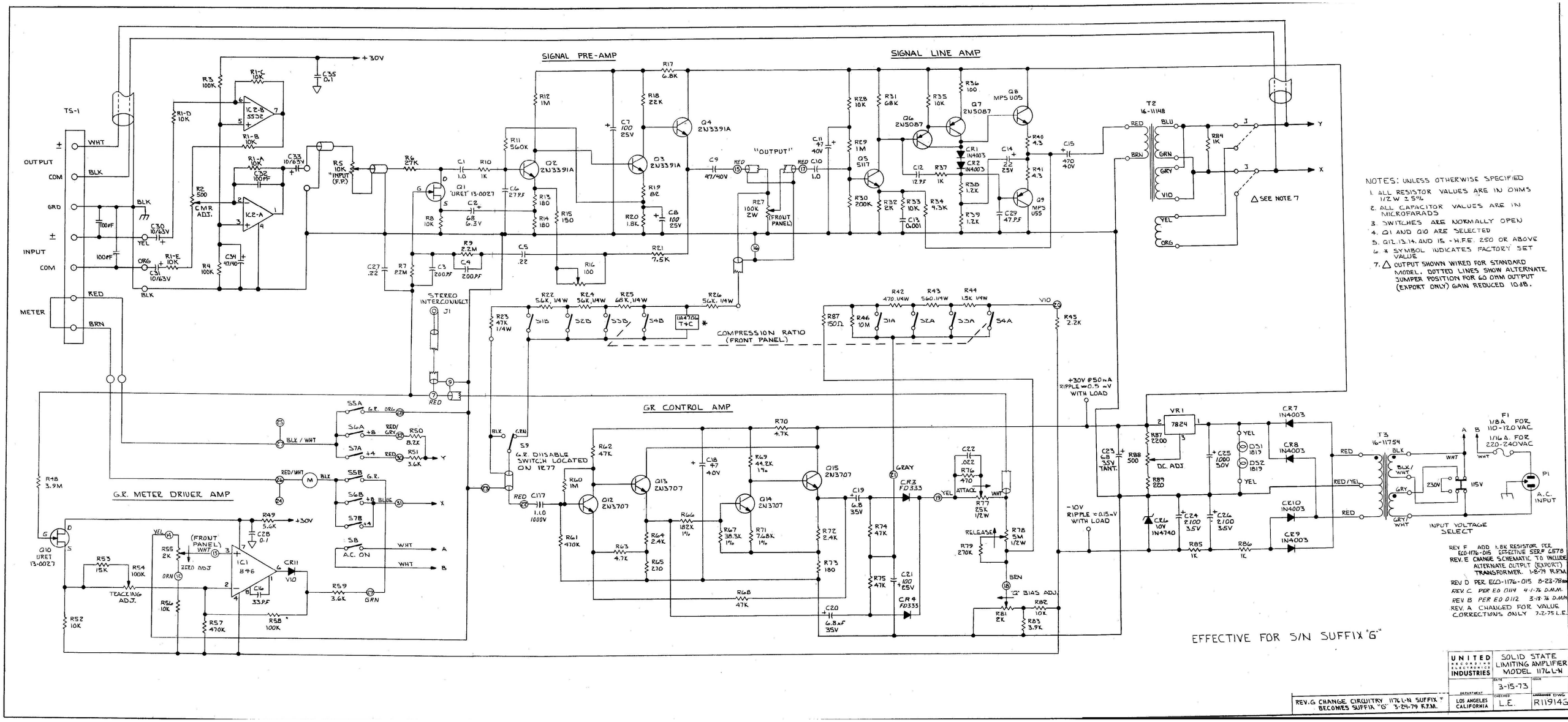
5-2. VVR BIAS or "Q" BIAS (R81). This control is adjusted with gain reduction disabled (attack control fully CCW.) Select meter buttons for +4 or +8. Adjust R81 fully CCW, output control fully clockwise, and apply a sine wave input signal of 1 kHz to the limiter. Adjust the input control for a reading of +1 on the output meter. Slowly adjust R81 for an output decrease of 1.0 dB. R81 is now properly adjusted.

5-3. METER TRACKING ADJUST. Set R54 to approximately 1/2 rotation, meter switch to +4 and attack control OFF. Apply a 1 kHz sine wave of approximately -10 dBm to the input. Set ratio to 20:1. Adjust output for 0 VU. Turn attack control ON and observe drop in output level. This is the actual amount of gain reduction. Adjust input and output controls for a 10 dB drop in output when the attack control is turned ON. Switch meter to read GR, attack control OFF, and adjust zero set for "0" VU. (This control is accessible through a hole in the front panel.) Switch attack control ON and adjust tracking control for a reading of -10. Switch attack OFF and readjust "0" if it has changed. The adjustment procedure must be repeated several times because of interaction between the zero adjust and tracking controls.

5-4. ZERO SET. This control was adjusted during tracking adjust calibration but may be adjusted any time to reset GR zero.

5-5. STEREO INTERCONNECTION. To calibrate the 1176SA stereo accessory, first remove signals from both limiters and disable gain reduction by rotating the ATTACK controls fully CCW. Connect the 1176SA to both limiters. Select the METER function switches for GR indication. Adjust meter zero adjustment on 1176SA until both meters read zero. If the meters cannot be zeroed, reverse the stereo interconnect cables and the meters can then be zeroed. A given pair of 1176LN's will normally track properly through at least 10 dB of gain reduction. In some instances, transconductance of the two VVR FET's (Q1) will differ to the extent that equal gain reduction will not be obtained as limiting is increased. This condition is more apt to be present in 1176LN's with widely different serial numbers, as FET's within the same factory run are normally quite well matched. Should this anomaly be observed, it will be necessary to select FET's for Q1 which match more closely in transconductance. This is better done at the factory, or by a factory authorized repair station.





NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTOR VALUES ARE IN OHMS 1/2 W ± 5%
2. ALL CAPACITOR VALUES ARE IN MICROFARADS
3. SWITCHES ARE NORMALLY OPEN
4. Q1 AND Q10 ARE SELECTED
5. Q12, 13, 14, AND 15 - H.F.E. 250 OR ABOVE
6. * SYMBOL INDICATES FACTORY SET VALUE
7. △ OUTPUT SHOWN WIRED FOR STANDARD MODEL. DOTTED LINES SHOW ALTERNATE JUMPER POSITION FOR 60 OHM OUTPUT (EXPORT ONLY) GAIN REDUCED 10 dB.

REV F ADD 1.8K RESISTOR PER ECO-1176-015 EFFECTIVE SER# 2578
REV. E CHANGE SCHEMATIC TO INCLUDE ALTERNATE OUTPUT (EXPORT) TRANSFORMER. 1-8-79 R.F.M.
REV D PER ECO-1176-015 8-23-78
REV C PER ED 0114 4-1-76 D.M.M.
REV B PER ED 0112 3-18-76 D.M.M.
REV A CHANGED FOR VALUE CORRECTIONS ONLY 7-2-75 L.E.

REV. G CHANGE CIRCUITRY 1176 L-N SUFFIX "F" BECOMES SUFFIX "G" 3-24-79 R.F.M.

EFFECTIVE FOR S/N SUFFIX "G"

UNITED RECORDING ELECTRONICS INDUSTRIES	SOLID STATE LIMITING AMPLIFIER MODEL 1176 L-N	
DEPARTMENT: LOS ANGELES CALIFORNIA	DATE: 3-15-73	ISSUE
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