INSTRUCTION BOOK

LEVEL DEVIL AMPLIFIER

M-5546

SPECIFICATIONS

Input Impedance: 600 ohms.

Output Impedance: 600 ohms

Input Level: -35 VU to +27 VU

Output Level: + 14 VU at Output transformer.

+8 VU at Output Terminals

Input Pads: 10 db and 20 db. "H" pads.

Output Pad: 6 db "H" pad for line isolation.

Distortion: 1% or less 50-15,000 cps up to 10 db limiting.

2% or less up to 25 db limiting.

Response: ±1 db 30-15,000 cps.

Noise: -60 db or better from 10 db limiting.

Maximum Expansion: 10 db.

Maximum Limiting: 25 db (under 2% distortion)

Limiter attack time: 10 milliseconds.

Limiter release time: 1.5 to 2.0 seconds.

Expander rise time: 2.0 seconds.

Expander release time: 4.0 to 5.0 seconds.

Gain: 50 db with no input or output pads. (No expansion or limiting).

Tubes:

2 - 5749	2 - OB2
2 - 12AU7	1 - EF86
2 - 12AT7	1 - 5V4G
2 - 12AX7	

Power: 105/125 volts, 50/60 cycles - 55 watts

Fuse: 1 Amp. - 3AG

Weight: 28 lbs. Net - Shipping weight 35 lb.

Size: 8-3/4" high - 19" wide - 8-1/2" deep.

OPERATION

The amplifier as shipped has two input pads (10 db and 20 db) connected in the circuit. If the level from the console is +8 VU, this loss (30 db) will result in a -22 VU at the input transformer. This will allow the input attenuator AT3 to operate about the center of its range. For higher or lower signal levels into the amplifier the pads should be re-wired to give the desired level (about -20 VU) at the input transformer.

The output pad (6 db) may be removed if +14 VU is needed out of the amplifier. It is not recommended that a telephone line be fed without this isolation pad.

Once the amplifier has been placed in service, it should seldom need attention. AT3 (on the rear of the front panel) is the input attenuator, and is the only control which the operating engineer will have to adjust. Once the proper position for this control has been established, the amplifier should operate for long periods of time without attention.

This control should be adjusted so that, with normal output from the console, the meter (M1) indicates in the green portion of the scale marked NORMAL. Lower than normal levels out of the console will cause the meter to indicate towards full scale, indicating a rise in amplifier gain to keep the output level constant. For instance, if the average level out of the console drops to -5 VU, the meter pointer will move to three quarters of full scale indicating 5 db of expansion. If the console output drops to less than a relative -10 VU, the meter indication will return to mid-scale, indicating that amplifier gain has been reduced by 10 db. This is considered "No signal" condition. On certain types of program material, such as symphony concerts, it may be desirable to disable the expander circuit to preserve the dynamic range of the program. This circuit may be disabled by switching S3 to the OFF position.

For higher than normal signal levels out of the console, the meter indication will move to the left, indicating a reduction in amplifier gain. This is the action of a regular peak limiter. (See "Theory of Operation for more complete details).

THEORY OF OPERATION

The Level Devil amplifier consists of 4 stages of audio amplification and a control section. The power supply furnishes unregulated voltages to non-critical stages and regulated voltages to the critical stages. Since the current fluctuations are small, the regulated voltage (216V.) is supplied by two OB2 tubes. D.C. voltage for the first stage filaments (5749) is supplied by a silicone diode bridge rectifier.

Tracing the signal from input to output, you will find 2 pads between the input terminals and the input transformer, a 10 db pad and a 20 db pad. These pads, when used singly or together, will furnish 10 db, 20 db, or 30 db loss. This will be a wide enough range for most input levels. The input transformer (T1) furnishes a push-pull signal to V1 and V2 grids, and a shunt type volume control is connected between grids. This volume control (AT3), together with R1, R2, R4 and R5 comprise a network which has a 5 db minimum loss. Since it is desirable to operate this control near mid-range, it is recommended that the input pads (AT1 & AT2) be used to adjust the input level to the input transformer to about -20 VU. The amplifier will accept signal levels between -35 VU and +27 VU. AT3 is located behind the front panel so that it cannot be accidentally moved by operating personnel. Once adjusted this control should need no attention for long periods of time.

The push-pull signal from V1 and V2 plates are coupled to the grids of V3 (12AU7) which is a differential amplifier.

A differential amplifier is one which amplifies the difference between two input signals (push-pull), and tends to cancel inphase signals such as bias thump generated in the preceeding stage. This inphase signal rejection is highest when the transconductance (GM) of the two sections is equal. Thus, it is important to keep this amplifier stage balanced as well as the first stage (V1 & V2).

This balance is accomplished by R22. Its action can be observed in step #4 of the Balancing Procedure (under Maintenance). This second stage, while giving relatively low gain (about 2), is used for two reasons. First, it replaces an interstage transformer; second, it gives more complete cancellation of gain control bias "thumps" while furnishing a low impedance single ended output to the following line amplifier. V4 (EF-86) and V5 (12AU7 parallel connected) comprise the line amplifier. This is a conventional two stage amplifier, feeding a plate to line transformer (T2). A tertiary winding on the output transformer provides about 18 db of feedback voltage to the EF-86 cathode. A 6 db pad isolates the amplifier from the line. +8 VU is available at the output terminals. With the limiter and expander switches (S2 & S3) in the OFF position, the Level Devil is a linear amplifier with 50 db gain with no input pads and volume control at minimum attenuation.

The peak limiting control section consists of V9A (½ 12AT7) a phase inverter; and V8 (12AX7), a full wave rectifier. Signal voltage is taken from V5 plate through C21 and V9A grid. The push-pull output of this phase inverter feeds a 12AX7 (V8), a diode connected rectifier. A gating voltage of -39 V. biases the rectifier so that no negative voltage is passed until the signal voltage overcomes this gate. 27.6 V. RMS will just equal the gate and this is considered the threshold of limiting. At signal voltages higher than 27.6 V. RMS, V8 passes negative voltage to its load R3 and C1 in parallel. The grid return (through R4 and R5) is connected to this point so that any negative voltage developed across R3-C1 is applied as bias to V1 and V2. This reduces V1 and V2 stage gain and prevents the output level from rising. R40 is connected in series with the rectifier load to increase the rise time of the developed voltage across the rectifier load. Thus, the Level Devil can be classed as an average level device rather than as instantaneous peak limiter. S2 grounds the rectifier output and disables the peak limiting circuit.

The expander circuit consists of V7 (12AX7) voltage amplifier, V6 (12AT7) rectifier and control tube, and V9B (1/2 - 12AT7) rectifier. V6B is a series resistance tube whose cathode current flows through R7, the cathode bias resistor for V1 and V2. Circuit values are established so that V6 cathode current through R7 raises the cathode bias on V1 and V2 to a point that reduces V1 and V2 stage gain by 10 db.

Expansion is achieved by applying negative bias to V6B grid, which reduces V6B cathode current and allows V1 and V2 stage gain to rise 10 db. It should be noted that 10 db is the maximum amount of expansion available under any conditions, even if V6B is removed from the circuit. The expander amplifier, whose signal is taken from V5 plate through C14, supplies this negative bias. V7A and V7B amplify the signal and drive the bias rectifier V6A. V7A is biased so that at the same time that the expansion gate is overcome, this stage is saturated so that the 10 db increase in amplifier output will not cause an increase in signal voltage at V7A plate. This is done to minimize "Capture" effect so that the expander will release at the proper signal level. A voltage dividing network between V7A and V7B sets the expander amplifier gain. V7B furnishes voltage to rectifier V6A whose gate is set at 64 V. so that a 45.5 V. RMS signal will equal the gate. The attack and release time of the negative bias developed by V6A is controlled by R37, R39, C11 and C12. The rise time of this network is about 1.5 seconds and the decay time is about 4 seconds. This appears to be optimum for broadcast service.

If the amplifier is limiting 15 or 20 db when the signal is removed, it is desirable that the amplifier not rise to the full gain (expanded condition). If it did go to full gain, there would be a noticable rise and then fall in the background level. To accomplish this, a rectifier (V9B) is gated so that when the amplifier limits 10 db or more, a negative bias is applied to V7B grid. This cuts

off V7B and allows the expander time constant to discharge, and the amplifier returns to normal gain, when the signal is removed. The expander circuit may be disabled by operating S3 to the OFF position.

It should be mentioned that, because of the difference in average power between complex waves and sine waves, the expansion cannot be checked with a sine wave signal.

Field testing has shown that when the amplifier is used to feed a T.V. transmitter directly (no limiter amplifier following the Level-Devil) an over-shoot of not more than 1 db can be expected with the application of a 10 db overload of complex wave signal. This would indicate that a separate peak limiter is not necessary for F.M. and T.V. transmitters. If a peak limiter is used following the Level-Devil, it is recommended that not more than 1 or 2 db of limiting be used. The no-signal noise figure will be degraded directly as the amount of limiting used.

MAINTENANCE

DC voltages and signal voltages (AC) have been tabulated on the schematic diagram. This should be an aid in troubleshooting; but since these voltages are an average of many units, allow ±20% tolerance in all readings. A more accurate tabulation of these voltages may be made by the station engineer when the unit is installed. Using the same meters that would be used for trouble-shooting, measure the voltages and record them on the schematic diagram. These voltages will then apply to your individual unit rather than to an average of several units.

Tubes and parts are operated far below their maximum ratings to assure long trouble free service. When it is necessary to replace V1, V2 or V3, it will also be necessary to rebalance these stages. This procedure is set forth in steps:

1. Connect a noise meter to the output of the Level-Devil. The amplifier should be terminated with a 600 ohm load resistor.

2. Throw switches S2 and S3 to the OFF position. This disables both the expander and limiter functions.

3. Turn switch S1 to its #2 position. This effectively ties Grid #1 and Grid #2 of V3 together and applies a small AC voltage to them. This voltage can be varied by adjusting hum balancing pot R67. Set this voltage to about -40 dbm on the noise meter.

4. Adjust R22 to a position where the voltage read on the noise meter is minimum. It may be necessary to raise the voltage applied to V3 grids to keep the indication above the noise level. This null should be quite sharp.

5. Switch S1 to #3 position. This applies the AC voltage to the grids of V1 and V2. The applied voltage may have to be reduced at this point because of the additional gain of V1 and V2.

6. Adjust R6 to a position where the voltage read on the noise meter is minimum. This is a fairly broad null. Tubes may have to be selected to find a pair that will balance within the range of R6.

7. Throw switches S2 and S3 to the ON position. Turn S1 to the #1 position and, while the noise meter is still connected, balance R67 for minimum reading.

The above balancing procedure should be carried out at as low a voltage as is practical to keep the readings above the noise level because more accurate nulls are obtained in this manner.

Meter (M1) may be zeroed by R12 located on the rear of the front panel. With no signal into the amplifier and switches S2 and S3 in the OFF (down) position, remove V6 (12AT7) from its socket and adjust R12 so that M1 reads full scale. Replace V6 in it's socket. After V6 has reached operating temperature, the meter should read in the green portion of the scale. If this tube is replaced, it may be necessary to select one that meets the above requirement.

I N S T A L L A T I O N & A D J U S T M E N T .

5749 TUBE BALANCE.

In some cases the dynamic balance of a pair of tubes in push-pull operation does not coincide exactly with its static balance. Since the balance control in this amplifier is a dynamic balance control, a pair of tubes may indicate balance and still have a tendency to "bloop" when a signal of high enough level to limit is applied. When the 5749 tubes are replaced because of loss of emission or failure, a pair of tubes should be selected that balance both dynamically and statically. The dynamic balance has already been covered and will not be repeated here. To select a pair of tubes as to static balance proceed as follows:

1. Insert 2 - 5749 tubes in their respective sockets and allow them to heat up to operating temperature.
2. Connect a voltmeter (on highest voltage range) between V1 - plate and V2 plate.
3. Switch voltmeter to lower ranges to measure potential between plates. If voltmeter is polarized wrong, reverse test leads.
4. Continue choosing tubes until a pair is found that has no voltage difference between plates (#1 plate to #2 plate).
5. Tube should be selected that will balance at some setting of R6.
6. After a pair of tubes has been found that balance statically, check the dynamic balance as described in the preceding paragraphs.

It is desirable to choose a pair of tubes that balance both statically and dynamically, but if such a pair cannot be found, the static balanced pair will allow "thump" free operation with only a minor increase in amplifier distortion during limiting. The "thump" may be measured by connecting a 'scope to the amplifier output to observe the waveform. Apply 1000 cps tone of high enough level to cause the amplifier to compress about 10 db. This tone should be switched on so as to apply it suddenly. If the waveform on the 'scope remains stationary, the amplifier is stable. If the 'scope pattern oscillates vertically, "thump" or D.C. shift of the operating point is present. In this case, select another pair of tube and re-balance.

PARTS LIST

Compressor - Expander Amplifier

Symbol No.	Drawing No.	Description
A1	396 0045 000	Lamp, #47
AT1	994 5734 002	20 db "H" Pad, 600/600 ohms
AT2	994 5733 002	10 db "H" Pad, 600/600 ohms
AT3	550 0189 000	Potentiometer, 50K ohm, 2 W.
AT4	994 5484 002	6 db "H" Pad, 600/600 ohms
F1	398 0017 000	Fuse, 1 Amp, 3AG
(J1,P1 & P2)	250 0025 000	Chassis Receptacle and AC Line Cord
M1	913 1412 001	Level Meter
R12	550 0021 000	Control, 500 ohm, 2 W.
R17	540 0202 000	Res., 100K ohm, 1/2 W., 10%
S1	600 0253 000	Rotary Selector Switch
S4	604 0005 000	Switch
TB1,TB2	614 0214 000	Terminal Board
XA1	406 0136 000	Pilot Light, 52410-991 (Red)
XF1	402 0022 000	Fuseholder

Amplifier Section

C3,C6,C9	508 0032 000	Cap., .1 uf., 200 V.(Min. Lead Lgth $\frac{1}{4}$")
C2,C5	506 0028 000	Cap., .1 uf., 400 V.(Min. Lead Lgth $\frac{1}{4}$")
C4	506 0026 000	Cap., .47 uf., 200 V. (Min.Lead Lgth $\frac{1}{4}$")
C7,C8	508 0048 000	Cap., .047 uf., 400 V. (Min Lead Lgth $\frac{1}{4}$")
C10	522 0289 000	Cap., 25 uf., 25 V.(Min. Lead Lgth $\frac{1}{4}$")
C27	508 0027 000	Cap., .015 uf, 200 V. (Min. Lead Lgth $\frac{1}{4}$")
C1	508 0033 000	Cap., .15 uf. 200 V. (Min. lead lgth. $\frac{1}{4}$")
R1,R2	540 0077 000	Res., 15K ohm, 1/2 W., 5%
R3	540 0204 000	Res., 15 megohm, 1/2 W., 10%
R4,R5	540 0029 000	Res., 150K ohm, 1/2 W., 5%
R6,R22	550 0057 000	Control, 250 ohm, 2 W.,
R21	540 0053 000	Res., 1500 ohm, 1/2 W., 5%
R8	540 0083 000	Res., 27K ohm, 1/2 W., 5%
R9	540 0374 000	Res., 56K ohm, 1 W., 5%
R10,R13	548 0076 000	Res., 100K ohm, 1/2 W., 1%
R11	540 0191 000	Res., 12K ohm, 1/2 W., 10%
R14,R18	540 0138 000	Res., 5.1 megohm, 1/2 W., 5%
R15,R19	540 0121 000	Res., 1 megohm, 1/2 W., 5%
R7	540 0329 000	Res., 750 ohm, 1W. 5%

Symbol No.	Drawing No.	Description
R16	540 0210 000	Res., 470K ohm, 1/2 W., 10%
R20	540 0054 000	Res., 1600 ohm, 1/2 W., 5%
R23,R24,R26	540 0204 000	Res., 150K ohm, 1/2 W., 10%
R25	540 0179 000	Res., 1200 ohm, 1/2 W., 10%
R27	540 0214 000	Res., 1 megohm, 1/2 W., 10%
R28	540 0166 000	Res., 100 ohm, 1/2 W., 10%
R29	540 0205 000	Res., 180K ohm, 1/2 W., 10%
R30	540 0327 000	Res., 620 ohm, 1 W., 5%
R31	540 0349 000	Res., 5100 ohm, 1/2 W., 5%
T1	478 0144 000	Input Transformer
T2	478 0120 000	Output Transformer
V1,V2	370 0153 000	Tube, 5749 (Use RCA only)
V3,V5	370 0195 000	Tube, 12AU7
V4	370 0144 000	Tube, EF86/6267
XV1,XV2	404 0058 000	Socket
XV3,XV4,XV5	404 0059 000	Socket

Control Section

C11,C20	506 0031 000	Cap., .25 uf., 200 V. (Min. Lead Length ¼")
C12,C19	508 0032 000	Cap., .1 uf., 200 V. (Min. Lead Length ¼")
C13,C15,C18	508 0048 000	Cap., .047 uf., 400 V. (Min. Lead Length ¼")
C14,C16 C17,C21	506 0028 000	Cap., .1 uf., 400 V. (Min. Lead Length ¼")
C22	506 0026 000	Cap., .47 uf., 200 V. (Min. Lead Length ¼")
C23	502 0031 000	Cap., 200 mmf., 200 V., Mica.
R32	540 0052 000	Res., 1300 ohm, 1/2 W., 5%
R33	540 0079 000	Res., 18K ohm, 1/2 W., 5%
R34	540 0025 000	Res., 100 ohm, 1/2 W., 5%
R35	540 0075 000	Res., 12K ohm, 1/2 W., 5%
R36	540 0094 000	Res., 75K ohm, 1/2 W., 5%
R37	540 0218 000	Res., 2.2 megohm, 1/2 W., 5%
R38,R41,R42, R44,R46	540 0214 000	Res., 1 megohm, 1/2 W., 10%
R39	540 0142 000	Res., 7.5 megohm, 1/2 W., 5%
R40,R52	540 0097 000	Res., 100K ohm, 1/2 W., 5%
R43,R60	540 0090 000	Res., 51K ohm, 1/2 W., 5%
R45,R49	540 0202 000	Res., 100K ohm, 1/2 W., 10%
R47	540 0196 000	Res., 330K ohm, 1/2 W., 10%
R48,R59	540 0184 000	Res., 3300 ohm, 1/2 W., 10%

Symbol No.	Drawing No.	Description
R50	540 0191 000	Res., 12K ohm, 1/2 W., 10%
R51	540 0204 000	Res., 150K ohm, 1/2 W., 10%
R53	540 0054 000	Res., 1600 ohm, 1/2 W., 5%
R54	540 0104 000	Res., 200K ohm, 1/2 W., 5%
R55	540 0220 000	Res., 3.3 megohm, 1/2 W., 10%
R56	540 0228 000	Res., 15 megohm, 1/2 W., 10%
R57,R58	540 0210 000	Res., 470K ohm, 1/2 W., 10%
S1,S2	913 1502 001	Switch, D.P.D.T.
V6,V9	370 0112 000	Tube, 12AT7
V7,V8	370 0116 000	Tube, 12AX7
XV6,XV7, XV8,XV9	404 0059 000	Socket
	Power Supply Section	
C23	524 0079 000	Cap., 15-15-10 uf., 450 V.
C24	524 0013 000	Cap., Plug-In, 30-30 uf., 525 V.
C25	508 0162 000	Cap., 1 uf., 600 V.
C26	524 0036 000	Cap., 3000 uf., 15 V.
CR1,CR2, CR3,CR4	913 3013 001	Silicon Rectifier
L1,L2	476 0009 000	Filter Choke
R61	540 0191 000	Res., 12K ohm, 1/2 W., 10%
R62	540 0190 000	Res., 10K ohm, 1/2 W., 10%
R63,R63A	540 0751 000	Res., 8200 ohm, 2 W., 10%
R64	542 0088 000	Res., 5K ohm, 10 W.
R65	542 0801 000	Res., 2.2 ohm, 1 W., 10%
R67	550 0019 000	Control, 250 ohm, 2 W.
T3	472 0054 000	Power Transformer
V10,V11	370 0002 000	Tube 0B2
V12	370 0018 000	Tube 5V4-G
XC24,XV12	404 0016 000	Socket
XV10,XV11	404 0032 000	Socket

WARRANTY

This equipment is warranted by Gates Radio Company of Quincy, Illinois to be free from defects in workmanship and material and will be repaired or replaced in accordance with the terms and conditions set forth below:

1. Gates Radio Company believes that the purchaser has every right to expect first-class quality, materials and workmanship and has created rigid inspection and test procedures to that end, and excellent packing methods to assure arrival of equipment in good condition at destination.

2. Gates Radio Company will endeavor to make emergency shipments at the earliest possible time giving consideration to all conditions.

3. Gates Radio Company warrants new equipment of its manufacture for one (1) year and (six (6) months on moving parts), against breakage or failure of parts due to imperfection of workmanship or material, its obligation being limited to repair or replacement of defective parts upon return thereof f.o.b. Gates Radio Company's factory, within the applicable period of time stated. Electron tubes shall bear only the warranty of the manufacturer thereof in effect at the time of the shipment to the purchaser. Other manufacturers' equipment covered by a purchaser's order will carry only such manufacturers' standard warranty. These warranty periods commence from the date of invoice and continue in effect as to all notices, alleging a defect covered by this warranty, received by Gates Radio Company prior to the expiration of the applicable warranty period.

The following will illustrate features of the Gates Radio Company warranty:

Transmitter Parts: The main power or plate transformer, modulation transformer, modulation reactor, main tank variable condensers all bear the one (1) year warranty mentioned above.

Moving Parts: As stated above, these are warranted for a period of six (6) months.

Electron Tubes: As stated, electron tubes will bear such warranty, if any, as provided by the manufacturer at the time of their shipment. Gates Radio Company will make such adjustments with purchasers as given to Gates Radio Company by the tube manufacturer.

All other component parts (except as otherwise stated): Warranted for one (1) year.

Abuse: Damage resulting from abuse, an Act of God, or by fire, wind, rain, hail, in transportation, or by reason of any other cause or condition, except normal usage, is not covered by this warranty.

4. Operational warranty - Gates Radio Company warrants that any new transmitter of its manufacture, when properly installed by purchaser and connected with a suitable electrical load, will deliver the specified radio frequency power output at the output terminal(s) of the transmitter, but Gates Radio Company makes no warranty or representation as to the

coverage or range of such apparatus. If a transmitter does not so perform, or in the event that any equipment sold by Gates Radio Company does not conform to any written statement in a contract of sale relative to its operating characteristics or capabilities, the sale liability of Gates Radio Company shall be, at the option of Gates Radio Company, either to demonstrate the operation of the equipment in conformance with its warranty, or to replace it with equipment conforming to its warranty, or to accept its return, f.o.b. purchaser's point of installation and refund to purchaser all payments made on the equipment, without interest. Gates Radio Company shall have no responsibility to the purchaser under a warranty with respect to operation of equipment unless purchaser shall give Gates Radio Company a written notice, within one (1) month after arrival of equipment at purchaser's shipping point, that the equipment does not conform to such warranty.

5. Any item alleged by a purchaser to be defective, and not in conformance with a warranty of Gates Radio Company shall not be returned to Gates Radio Company until after written permission has been first obtained from the Gates Radio Company home office for such return. Where a replacement part must be supplied under a warranty before the defective part can be returned for inspection, as might be required to determine the cause of a defect, purchaser will be invoiced in full for such part, and if it is determined that an adjustment in favor of the purchaser is required, a credit for an adjustment will be given by Gates Radio Company upon its receipt and inspection of a part so returned.

6. All shipments by Gates Radio Company under a warranty will be f.o.b. Quincy, Illinois or f.o.b. the applicable Gates Radio Company shipping point.

7. Gates Radio Company is not responsible for the loss of, or damage to, equipment during transportation or for injuries to persons or damage to property arising out of the use or operation of Gates equipment. If damage or loss during transportation occurs, or if the equipment supplied by Gates Radio Company is otherwise damaged, Gates will endeavor to make shipment of replacement parts at the earliest possible time giving consideration to all conditions. It is the responsibility of a purchaser to file any claim for loss or damage in transit with the transportation company and Gates will cooperate in the preparation of such claims to the extent feasible when so requested.

8. Gates Radio Company, in fulfilling its obligations under its warranties, shall not be responsible for delays in deliveries due to depleted stock, floods, wars, strikes, power failures, transportation delays, or failure of suppliers to deliver, acts of God, or for any condition beyond the control of Gates that may cause a delayed delivery.

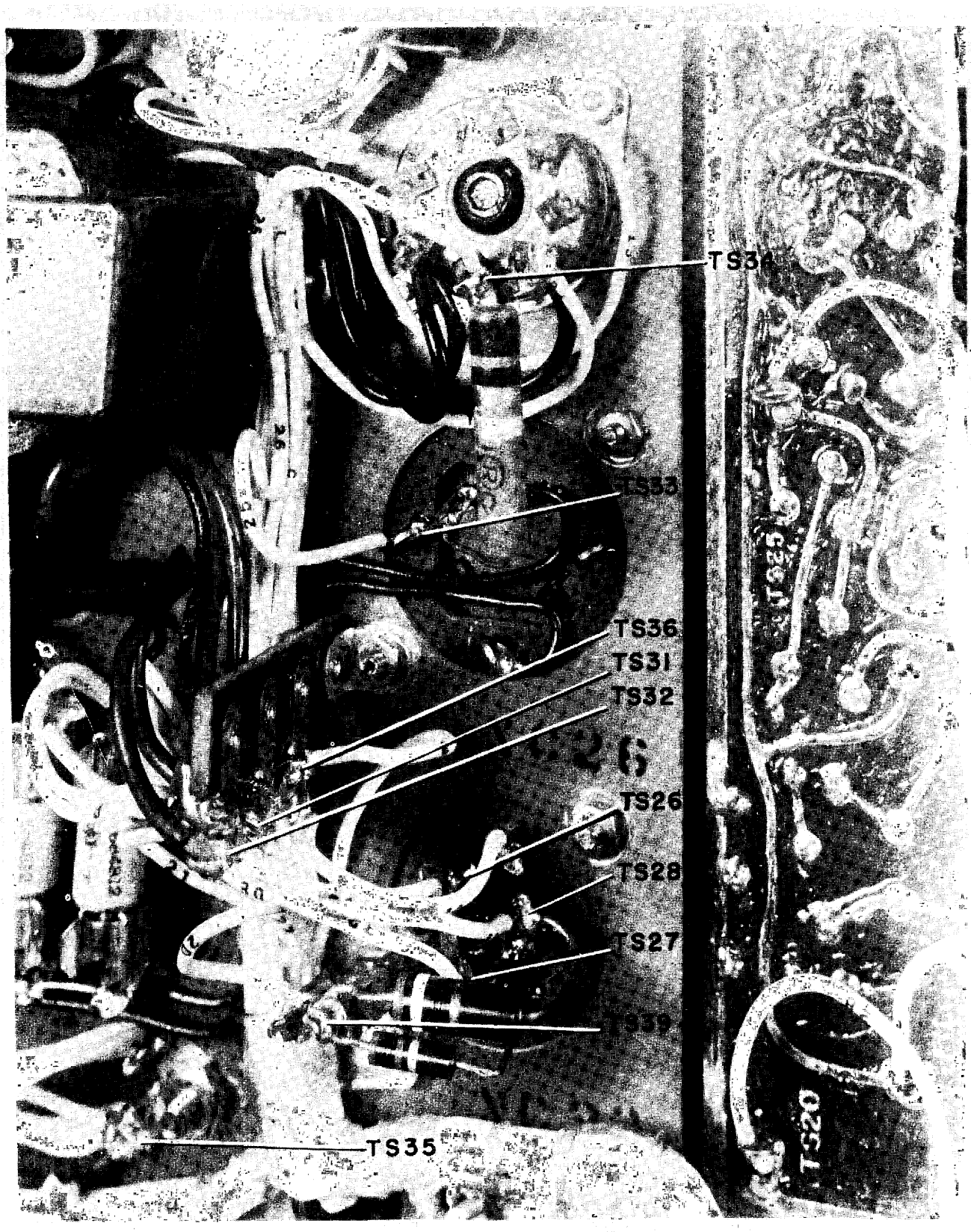
9. This warranty may not be transferred by the original purchaser and no party, except the original purchaser, whether by operation of law or otherwise, shall have or acquire any rights against Gates Radio Company by virtue of this warranty.

10. Gates Radio Company reserves the right to modify or rescind, without notice, any warranty herein except that such modification or rescission shall not affect a warranty in effect on equipment at the time of its shipment. In the event of a conflict between a warranty in a proposal and acceptance and a warranty herein, the warranty in the proposal and acceptance shall prevail.

11. This warranty shall be applicable to all standard Gates catalog items sold on or after March 1, 1960.

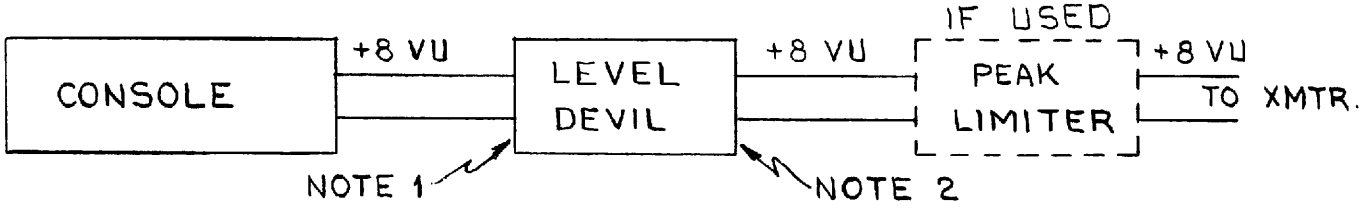
Gates Radio Company
Quincy, Illinois

1/6/60



POWER SUPPLY TIE POINTS
FOR LEVEL DEVIL
M-5546 AF-184

				FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS				A-31683	
									SCALE	
104	103	102	101	GR. NO.	LIST OF PARTS					
QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION		MATL.



NOTE 1 - CONNECT INPUT PADS FOR DESIRED LOSS.
(SHIPPED WITH 10 db & 20 db PADS WIRED IN CIRCUIT)

NOTE 2 - 6 db OUTPUT PAD MAY BE REMOVED
IF +14 VU OUT IS NEEDED.

CH. BY DATE	MTL.		TITLE RECOMMENDED METHOD OF CONNECTING, LEVEL DEVIL M554G, IN CIRCUIT.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC GSM102.
DR. BY EGL DATE 6-17-58	ENG. CWK	FIN.		A-31683

2 - 51K
10K POT

2 - .047μ