INSTRUCTIONS

M-5167 STA-LEVEL AMPLIFIER

IB-727
4/30/56
Price: $1.00

Gates Radio Company
Quincy, Illinois
217-222-8200

7/7/79

M-5167 STA-LEVEL AMPLIFIER

SPECIFICATIONS

GAIN: 35 db, ±2 db with input and output pads intact.

62 db, ±2 db with input and output pads removed.

DISTORTION: 1% or less from 50 to 15,000 cycles, 0-30 db compression or gain reduction as read on compression meter.

RESPONSE: ±1 db from 30 to 15,000 cycles, 0-30 db compression.

NOISE: 65 db or better below +8 dbm or higher output at any gain setting.

ATTACK/RECOVERY TIME: Factory wired for average programming. Time constants may be varied, if desired, with the values listed on page 2 of this section.

COMPRESSION RATIO AND THRESHOLD: The compression ratio is approximately 3.3:1 and the threshold is +10 to +12 dbm output as wired at the factory, with the output control at maximum. The meter is calibrated for this setting. See text for changing these levels and ratios.

IMPEDANCES: 500/600 ohms as wired at factory. Pad values may be changed to other impedances. If pads are removed, input and output may be connected 150/250 or 500/600 ohms with transformer connections.

TUBES: (2) 6V6, (1) 6386, 12AT7, 6AL5, 0B2 and 5Y3GT.

POWER: 105/125 volts, 50/60 cycles, approximately 50 watts.

MECHANICAL: 5-1/4" high, 19" wide and 7" deep for standard rack mounting. Front panel drops down for access to components and meter zero set control. Weight, packed 30 pounds.

FINISH: Medium gloss gray with white lettering.

RECOVERY TIME FOR STA-LEVEL AMPLIFIER

Time in Seconds

R36 MEG.	R37 MEG.	SINGLE 63%	SINGLE 90%	DOUBLE SLOW 63%	DOUBLE SLOW 90%	DOUBLE FAST 63%	DOUBLE FAST 90%
1.5	1.5	2.25	10.0	2.0	8.0	.75	3.0
1.5	3.3	2.25	10.0	1.5	9.0	.75	3.0
1.5	4.7	2.25	10.0	1.1	8.0	.75	3.0
1.5	7.5	2.25	10.0	.90	6.0	.75	3.0
1.5	10.0	2.25	10.0	.80	3.0	.75	3.0
3.3	1.5	4.95	19.8	5.5	17.0	1.65	6.6
3.3	3.3	4.95	19.8	4.0	21.0	1.65	6.6
3.3	4.7	4.95	19.8	3.1	20.0	1.65	6.6
3.3	7.5	4.95	19.8	2.6	18.5	1.65	6.6
3.3	10.0	4.95	19.8	2.3	16.0	1.65	6.6
3.3	15.0	4.95	19.8	2.1	12.0	1.65	6.6
4.7	1.5	7.05	28.2	7.0	22.0	2.35	9.4
4.7	3.3	7.05	28.2	5.0	23.5	2.35	9.4
4.7	4.7	7.05	28.2	4.2	25.0	2.35	9.4
4.7	7.5	7.05	28.2	3.5	26.5	2.35	9.4
4.7*	10.0*	7.05	28.2	3.1	28.0	2.35	9.4
4.7	15.0	7.05	28.2	2.8	18.0	2.35	9.4
4.7	20.0	7.05	28.2	2.5	14.0	2.35	9.4
7.5	1.5	11.25	45.0	12.0	37.5	3.75	15.0
7.5	3.3	11.25	45.0	11.0	40.0	3.75	15.0
7.5	4.7	11.25	45.0	9.8	42.0	3.75	15.0
7.5	7.5	11.25	45.0	8.6	43.5	3.75	15.0
7.5	10.0	11.25	45.0	7.1	45.0	3.75	15.0
7.5	15.0	11.25	45.0	5.0	39.3	3.75	15.0
7.5	20.0	11.25	45.0	4.5	36.0	3.75	15.0

M-5167 STA-LEVEL AMPLIFIER

INSTRUCTIONS

INTRODUCTION

The Gates' M5167 Sta-Level Amplifier is an automatic gain amplifier designed to keep a constant average level in a program circuit. It is not an instantaneous peak limiter, and must be followed by a peak limiter for feeding a transmitter. However, it is an ideal companion unit for a peak limiter as it will keep the peak limiter operating within its optimum range with a large variation in the level from the signal source.

Four different applications are listed below to show the engineer the possible uses and to explain its operation so that other applications may be worked out.

1. The Sta-Level Amplifier may be used to automatically control the program level out of the speech input console. This relieves the operator from most gain riding operation and keeps correct level into telephone line and peak limiting amplifier.

2. Automatically adjusts for differences in level between console input channels. Microphone, turntable, remote, net and projector channels may be faded in or switched in with the attenuators set at the normal position, and the Sta-Level will adjust for sub-normal or abnormal conditions.

3. May be used as an automatic fader. Turntables may be faded down 20 or 30 db by adjusting microphone level higher than the turntable level when the microphone is used, and it will fade down the turntable to background level. After the announcement, the turntable will return to normal level automatically.

4. May be used to control the level on individual incoming remote lines, a very valuable feature during extended remote broadcasts. Remote amplifier may be adjusted 15 db below maximum level, the Sta-Level adjusted to mid-compression range, and the level will then be automatically controlled with ±15 db level variation into the remote amplifier. This allows the console operator to attend to other duties during this time.

The Sta-Level Amplifier has built-in input and output attenuation to permit its use in most applications without external pads. The input volume control greatly extends the range of the input pad and allows precise adjustment of the input level. The output attenuator has a variable section to allow the output level to be precisely adjusted over the necessary range for most applications. Both variable controls are located on the front panel to permit rapid operation. The fixed sections of both attenuators are readily accessible, behind the hinged front panel, for change by the station engineer to accommodate other than standard values of attenuation

and/or impedances. Standard 1/2 watt resistors are used to change attenuator values.

Many other features and facilities are incorporated in the Gates' Sta-Level Amplifier. To prevent repetition, and allow full description of them, they will be covered in the following sections of the book.

RECEIVING

The M5167 Sta-Level Amplifier is shipped with all parts, including the tubes, installed. Before installing, check for damage incurred in transit and be sure that all the tubes are secure in their sockets.

INSTALLATION

The amplifier is 5-1/4" high, 19" wide and requires 9" rack depth. It has standard panel slots for rack mounting. The net weight is approximately 18 lbs. The unit should be mounted in a rack convenient for the operator and where the compression meter may be easily read. The unit can be operated without the use of the compression meter. For details refer to the section labelled "Operation". The compression meter may be removed from the panel, or a second meter connected in series with it, for a remote meter application.

After mounting the Sta-Level Amplifier in the rack, connect 115 volts (50/60 cycles) to terminals 7 & 8 on TB2. Use #18 AWG wire, or larger. Connect the input to TB1-1 & 3. The input impedance should be 600 ohms, balanced. Other impedances may be used if the attenuator section is changed by the station engineer. Connect earth and/or shield ground to TB1-2 and/or TB2-6. Both terminals connect to the amplifier chassis ground. Connect the output line to TB2-4 & 5. The Sta Level Amplifier is factory connected for 600 ohms but may be changed by the station engineer by changing the output attenuator section, if desired.

The input and output wiring should be in shielded, twisted pair. They may both run in the same medium level cable if the attenuator sections are left intact. In applications utilizing maximum gain, with the attenuator sections removed, the input and output wiring must be separated and run in cables with the appropriate level classification.

OPERATION

The Sta-Level Amplifier is automatic in most of its applications and, after the initial set-up, requires little attention. Allow the amplifier to warm up a few minutes before attempting to set levels in the system.

In its most usual application, the Sta-Level Amplifier is connected as a "no-gain" device between the output of the studio console and the telephone line to the transmitter. In other uses it may be connected between the console output and the limiting amplifier input or, in some instances, to the transmitter input. The station engineer, in all cases, must determine how the amplifier will be used in his particular system.

Once the method of use has been decided upon, and the amplifier connected into the system in this manner, setting of levels is a simple matter.

Feed an average complex wave program into the console, and peak the console V.U. meter to 100 (or Ø V.U.). Adjust the input level control (R1) until the compression meter reads about 15 db at the same time that the console V.U. meter reads 100.

If the Sta-Level Amplifier is to feed a telephone line, the output control (R27) is adjusted to provide a level of +8 V.U. If the amplifier is used to feed a peak limiter, adjust the output control to the center of its range and adjust the input control of the following amplifier for proper level.

If an output of less than +8 V.U. is required an additional "H" pad of the proper loss must be installed at the output of the amplifier.

The operating levels of the system do not require constant surveillance when the Sta-Level Amplifier is in use. It will actually compress up to 40 db with very low distortion, which allows an additional 10 db safety factor over the normal range of 30 db. Amplifiers in the system ahead of the Sta-Level Amplifier will probably not operate over this extreme range, thus the levels may have to be reduced or kept within maximum limits by the operator.

Different types of program material require different recovery times on automatic gain type amplifiers. The Sta-Level Amplifier has a front panel switch, marked "Double" and "Single", to change the recovery time. In the "Single" position, the recovery time is fixed and does not change much with occasional short peaks or steady reoccurring peaks. It is slow in recovering from heavy peaks and is best used on classical music or material requiring the most dynamic range. The attack time is slower in the "Single" position also, at least 75 milliseconds is required to cause compression.

For speech and most popular misic it is best to use the "Double" recovery time position. In this position the recovery time is largely a function of the type program material used. Most speech and other short occasional peaks have a rapid recovery time and the average level of modulation is kept very high. Music with long passages or similar program material will result in a slower recovery time automatically, thus retaining most of the dynamic range. The attack time is down to 25 milli-seconds in the "Double" position.

It is best to use the Sta-Level before putting it on the air the first time, to determine the best position of the recovery time switch on different types of program material. If all the operators are fully familiar with the operation, they will be able to use the unit to full advantage.

PRINCIPLES AND THEORY OF OPERATION

The amplifier is the gated automatic gain type, using rectifier signal to increase the bias voltage on the variable mu tube, thus reducing the gain. Push-pull stages are used throughout to cancel the bias thump and to prevent motor-boating. Negative feedback is used to balance the output stages; V2, V3 and V4. This reduces the noise and distortion and makes tube selection far less critical. V1 is a premium tube with good balance between sections and does not require feedback.

The input pad is rated at approximately 20 db. It is a balanced H type and is installed to prevent overloading of the input transformer with high signal levels. Levels as high as ⨍24 dbm may be fed into the amplifier terminals without distortion with this pad installed. If the pad is removed, the maximum line input level is ⨍4 dbm and the amplifier gain is increased approximately 20 db.

The output pad is rated at approximately 10 db minimum to 16 db maximum. One side of the shunt value is variable to achieve this 6 db level adjustment. This pad has been carefully tested to assure that the small impedance mis-match resulting from this range adjustment will not affect frequency response or other characteristics. If the value or impedance of the pad is changed by the station engineer, he must be sure that the pad retains these qualities. It may be necessary to reduce the value of the variable resistance by adding a shunt resistor across it when reducing the attenuation of the pad from the factory value. Increasing the attenuation may call for a change in the variable section also.

If both pads are removed, the maximum gain of the amplifier will increase up to approximately 62 db. In certain applications this is desirable to eliminate the use of a line or program amplifier. The minimum input threshold of compression is approximately -44 dbm under these conditions. The mid-range input level for 15 db of compression would be about -30 dbm. The output level would be approximately ⨍24 dbm with 15 db of compression. Of course, either the input or output pad could be removed without removing the other if the application demanded.

V1A, V1B, V2A, V2B, V3 and V4 are connected in the conventional way for a push-pull amplifier. The stages are R-C coupled and negative feedback is taken from the plates of the output stage back to the cathodes of the second stage. The output of the 6V6 stage is also fed to the cathodes of V6, where rectification occurs if the peak signal exceeds the positive bias applied. Normally, the bias voltage is ⁄25 volts. The RMS value of signal voltage at this point must exceed 17.5 volts to cause rectification since the peak value of 17.5 volts RMS is approximately 25 volts.

This would be the threshold of compression and signals above this point are rectified and applied to the grid return of V1. This bias voltage is approximately -2.4 volts for 5 db compression, -6V. for 10 db, -11.6V. for 15 db, -19V. for 20 db, -30.5V. for 25 db, -43V. for 30 db, -59V. for 35 db and -76V. for 40 db of compression. From these figures you can see that the bias to compression ratio is not a linear function. Drawing A-11734 shows this function by the rising characteristic of the curve at the higher compression figures.

The compression ratio may be increased up to 6:1 instead of 3.3:1 by raising the bias on the cathode of V6. The bias may be raised by increasing the value of R32, the 24,000 ohm resistor. The output and input levels of the amplifier must be raised to start the compression action and the distortion will increase along with these levels. The reason the compression ratio is changed is because the RMS voltage is increased logarithmically with the increase in level in db. The rectified bias is still a function of the RMS voltage. Thus, it does not require such a change in db to obtain the required bias level with high signal levels as with low signal levels.

If the bias point is reduced below ⁄25 volts the compression ratio will become lower than 3.3:1. Ratios as low as 1.6:1 are practical under certain types of operation. This means that with 16 db increase on the input, the output would increase 10 db. Thus, the amplifier would not be a great aid in keeping a constant level in the output. The bias may be reduced by reducing the value of R32 from 24,000 ohms to the selected value.

The 3.3:1 compression ratio and the associated output threshold level of ⁄10 to ⁄12 dbm with the output pad at minimum attenuation ~~(or ⁄20 to ⁄22 dbm output with the output pad removed)~~, appears to be the optimum value for general use. The use of a control to adjust this bias point does not seem wise since it could easily be set to the wrong point if changed in a hurry without proper checking of the operation. This is a DC circuit and can be wired to a bias selector switch if it is desired to install one. A control may also be installed by the engineer if he desires one and will prevent maloperation.

The attack and recovery time constants are listed on page 2 of the Specifications. Again average values were chosen for normal operation. These values are marked (*) for a reference point and may be changed to suit the individual application. In the "Single" position of the switch, C10 and C11 are in parallel. The attack time determined by their capacity and R35 (56 ohms). The recovery time is determined by R36. The time may be calculated by multiplying R (in megohms) and C (in microfarads). Thus, .05 times 1.5 is .075 or 75 milli-seconds for the attack time. And 4.7 times 1.5 is 7.05 seconds for 63% recovery, times 4 or 28.2 seconds for 90% recovery. This basic R-C formula checked very closely with the actual circuit timing in tests and may be considered adequate for calculating other circuit values.

In the "Double" position of the recovery time switch the problem becomes much more complex, however. Rather than work with the dual recovery times of the two circuits involved, the figures listed in the chart are actual measured time. With single short peaks or a few short peaks, the recovery time is fast because very little charge is stored in C11. With sustained peaks C11 does charge up and must discharge through R37 and R36 in series. These resistors actually form a voltage divider that is paralleled with the voltage dividing action of C11 and C10. Thus, an extreme range of recovery time may be achieved by changing the resistance values as indicated by the chart. The attack time is not affected by C11 in the double position, thus, it is .05 times .5 (.025) or 25 milli-seconds under any type of program material.

V5 is a voltage regulator tube with 105 volts regulation. It is adjusted to draw approximately 5 MA and it is necessary to look closely to see it glow. It can be seen by looking at the base of the tube when it is shielded from an external light source. Its purpose is to prevent the bias point from shifting with the line or supply voltage.

C13 is inserted from the center-tap of the filament winding to ground to bias the filaments above the cathode voltage of the tubes. Since the highest cathode voltage is on the 6V6 tubes, the filament bias will be a few volts more positive, due to filament-cathode rectification. After the initial rectification which charges the capacitor to peak value, there is no more current flow from filament to cathode and thus little or no hum induced in the tubes from this flow. Grounding either side of the filaments will cause serious hum in the amplifier. Even grounding the center-tap of the filament winding will result in much more than normal hum in most applications. This is a good check to make if the amplifier is noisy and new tubes will not correct the noise.

MAINTENANCE

One of the best aids in maintenance is the tabulation of socket voltages with a particular test meter. We have the voltages tabulated but if the meter used in the field is not the same impedance or has considerable error, our voltages would not help much. Unless specifically requested, we do not feel it is best to issue these voltage readings.

After the unit has operated for a period long enough to stabilize (1/2 hour or more) take all the readings with your best meter. A vacuum tube meter is preferred to prevent circuit loading but a 20,000 ohm per volt or even 5,000 ohm per volt will suffice if used for future checking. It is best to record which meter scale was used for the various readings since the loading is a function of the switch position on low im pedance meters. Make one set of readings with no signal applied. Make another set with 15 db of compression. Readings with other degrees of compression would be valuable but not actually required.

Recording of signal levels throughout the amplifier will also help when trouble-shooting. It will point out tube difficulties that no tube tester can match. Always record all the pertinent data, such as input level, amount of compression, output level and line voltage.

With the data recorded as suggested above, maintenance is very easily accomplished. All the components are operated far below their maximum ratings thus will not fail due to circuit defects. A periodic check of the socket voltages and signal voltages against the tabulated chart will show any deterioration in ample time for correction before actual trouble occurs. Allow 20% variation on socket voltages with series resistors in the circuit. All tubes are not exactly alike and the circuit is designed to permit more than normal tolerances. Read the other descriptive sections when trouble-shooting. The answer you seek will probably be there.

PARTS LIST

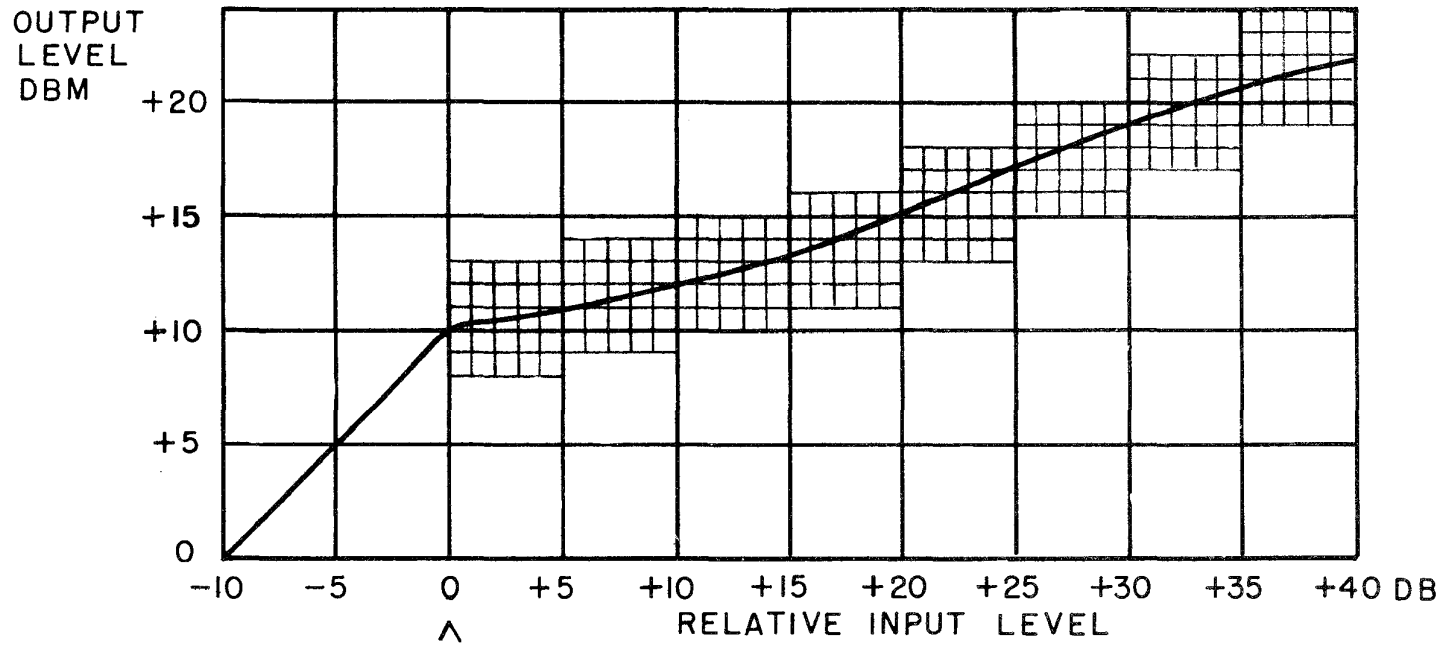
"STA-LEVEL" LIMITING AMPLIFIER

Symbol No.	Gates Part No.	Description
A1	396 0063 000	Neon Lamp
C1,C2,C5, C6,C8,C9	506 0014 000	Capacitor, .1 mfd., 400(W)V.
C3,C4	506 0011 000	Capacitor, .02 mfd., 400(W)V.
C7	524 0079 000	Capacitor, 15-15-10 mfd., 450V.
C10,C13	506 0007 000	Capacitor, .5 mfd., 200(W)V.
C11	506 0008 000	Capacitor, 1.0 mfd., 200(W)V.
C12	524 0062 000	Capacitor, 20-20 mfd., 450 V.
F1	398 0019 000	Fuse, 2 amp.
L1	476 0007 000	Filter Choke
M1	911 1308 001	Compression Meter
R1	550 0192 000	Dual Control, 100K ohm
R2,R3, R4,R5	540 0034 000	Resistor, 240 ohm, 1/2W. 5%
R6	540 0027 000	Resistor, 120 ohm, 1/2W. 5%
R7	540 0164 000	Resistor, 68 ohm, 1/2W. 10%
R8,R9	540 0028 000	Resistor, 130 ohm, 1/2W. 5%
R10,R11	540 0480 000	Resistor, 10K ohm, 1W. 10%
R12	540 0642 000	Resistor, 20K ohm, 2W. 5%
R13,R14	540 0208 000	Resistor, 330K ohm, 1/2W. 10%
R19,R20, R21,R22	540 0204 000	Resistor, 150K ohm, 1/2W. 10%
R15,R16	540 0180 000	Resistor, 1500 ohm, 1/2W. 10%
R17,R18	540 0201 000	Resistor, 82K ohm, 1/2W. 10%
R23	542 0061 000	Resistor, 150 ohm, 10W.
R24	540 0753 000	Resistor, 12K ohm, 2W. 10%
R25,R26	540 0035 000	Resistor, 270 ohm, 1/2W. 5%
R29,R30	540 0030 000	Resistor, 160 ohm, 1/2W. 5%
R27	552 0546 000	Control, 1000 ohm
R28	540 0032 000	Resistor, 200 ohm, 1/2W. 5%
R31	540 0762 000	Resistor, 68K ohm, 2W. 10%
R32	540 0365 000	Resistor, 24K ohm, 1W. 5%
R33,R34	540 0207 000	Resistor, 270K ohm, 1/2W. 10%
R35	540 0199 000	Resistor, 56K ohm, 1/2W. 10%
R36	540 0222 000	Resistor, 4.7 megohm, 1/2W. 10%
R37	540 0226 000	Resistor, 10 megohm, 1/2W. 10%
R38	550 0159 000	Control, 10K ohm
R39	540 0377 000	Resistor, 75K ohm, 1W. 5%
R40	540 0051 000	Resistor, 1200 ohm, 1/2W. 5%
R41	552 0541 000	Control, 100 ohm
R42	540 0759 000	Resistor, 39K ohm, 2W. 10%
R43	540 0104 000	Resistor, 200K ohm, 1/2W. 5%

PARTS LIST

Symbol No.	Gates Part No.	Description
S1,S2	604 0005 000	Switch
T1	478 0144 000	Input Transformer, AI-10386T
T2	478 0121 000	Output Transformer, AO-11302T
T3	472 0255 000	Power Transformer, AP-11303T
TB1	614 0070 000	Terminal Board
TB2	614 0072 000	Terminal Board
V1	370 0213 000	Tube, GL6386
V2	370 0112 000	Tube, 12AT7
V3,V4	370 0102 000	Tube, 6V6GT
V5	370 0002 000	Tube, 0B2
V6	370 0030 000	Tube, 6AL5
V7	370 0020 000	Tube, 5Y3GT
XA1	406 0129 000	Pilot Light Assembly (Red)
XF1	402 0021 000	Fuseholder
XV1,XV2	404 0041 000	Socket
XV3,XV4, XV7	404 0016 000	Socket
XV5,XV6	404 0032 000	Socket

DRAWING NUMBER
A-11734

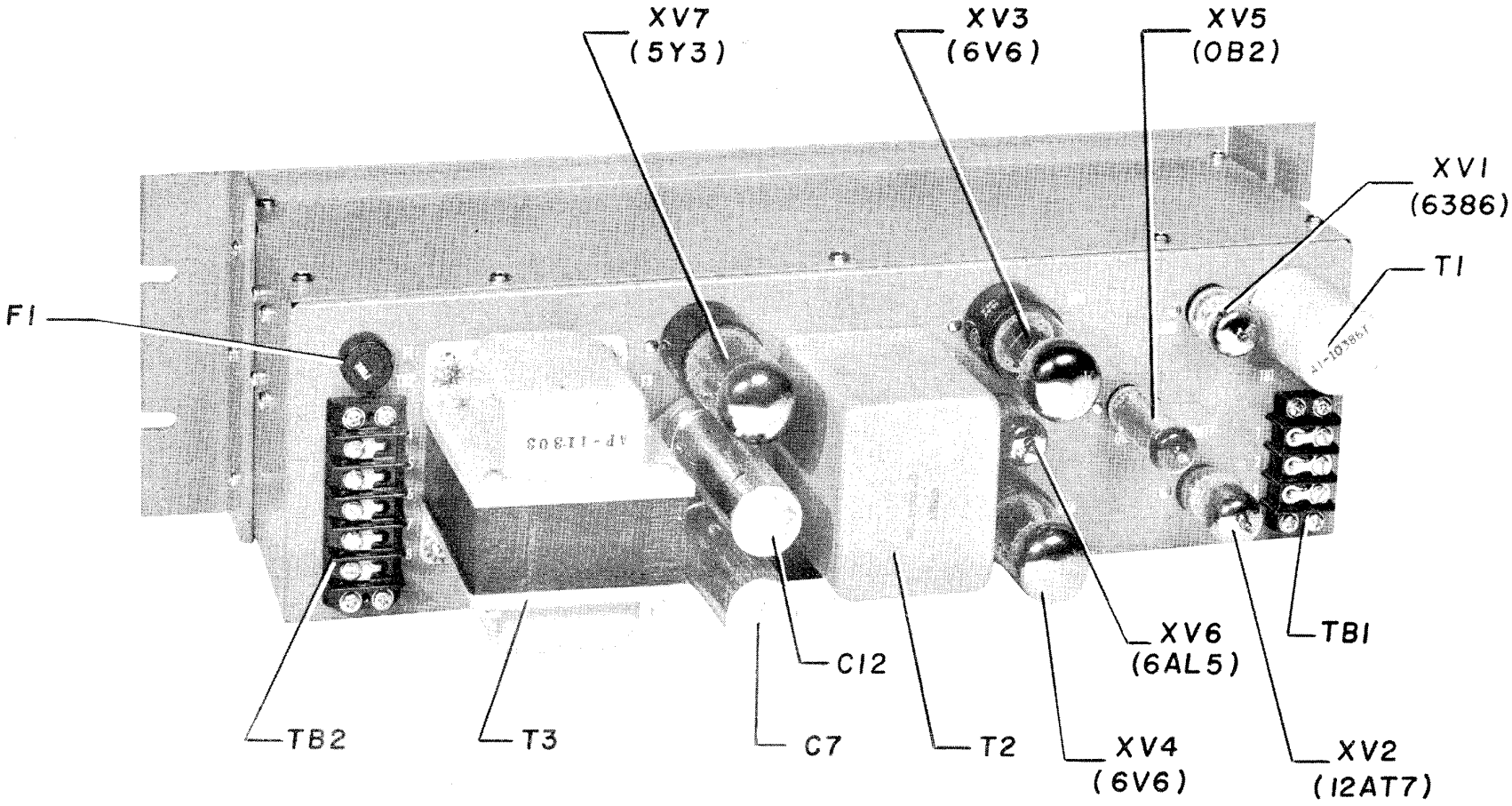


TYPICAL COMPRESSION CURVE ON M5167 STA-LEVEL AMPLIFIER

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC GSM102.
DR. BY D.L. DATE 4-4-56	CH. BY W.K. DATE 4-4-56	ENG. APR. DATE 4-4-56

GATES RADIO COMPANY
QUINCY, ILLINOIS

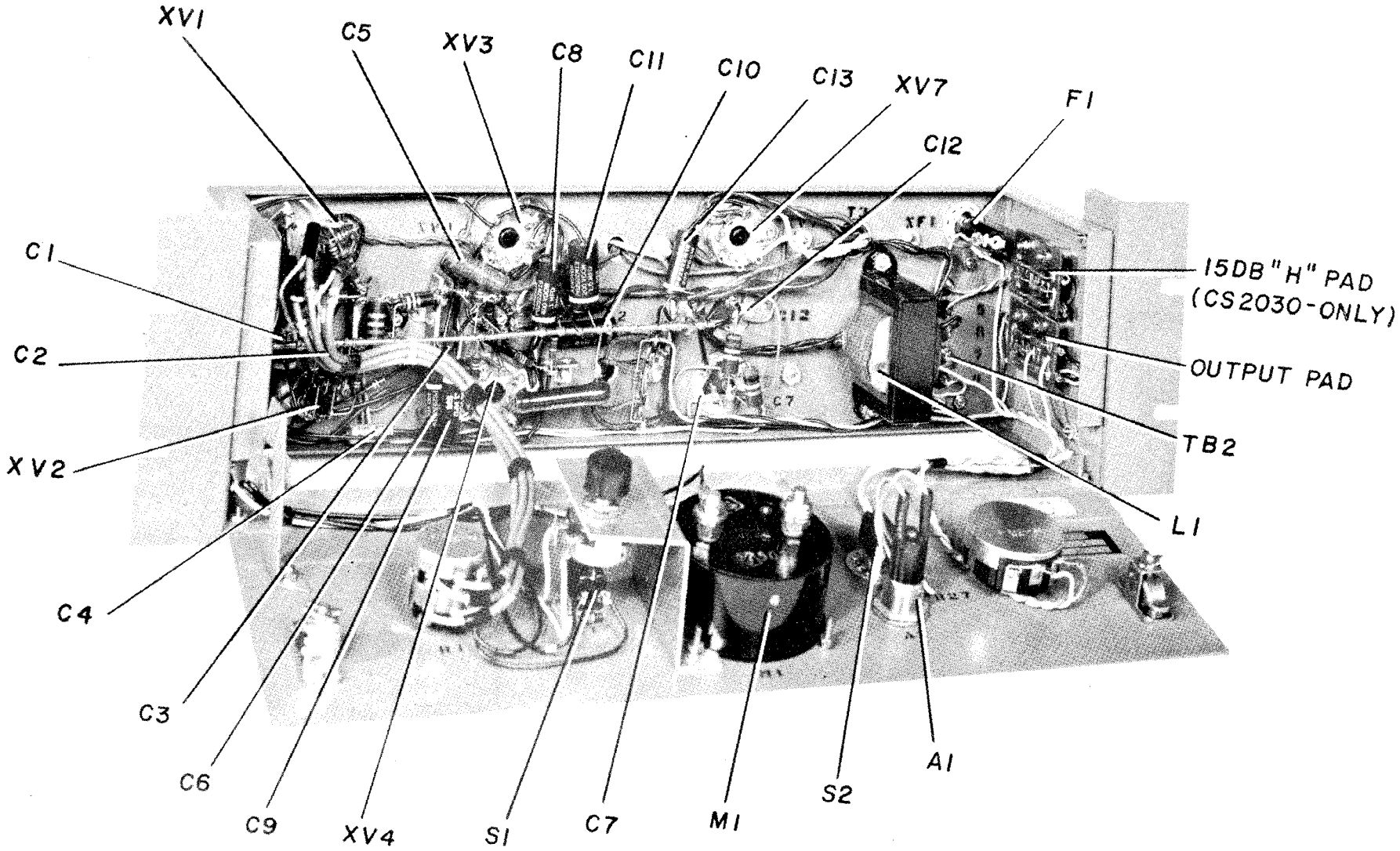
DRAWING NUMBER
A-11734



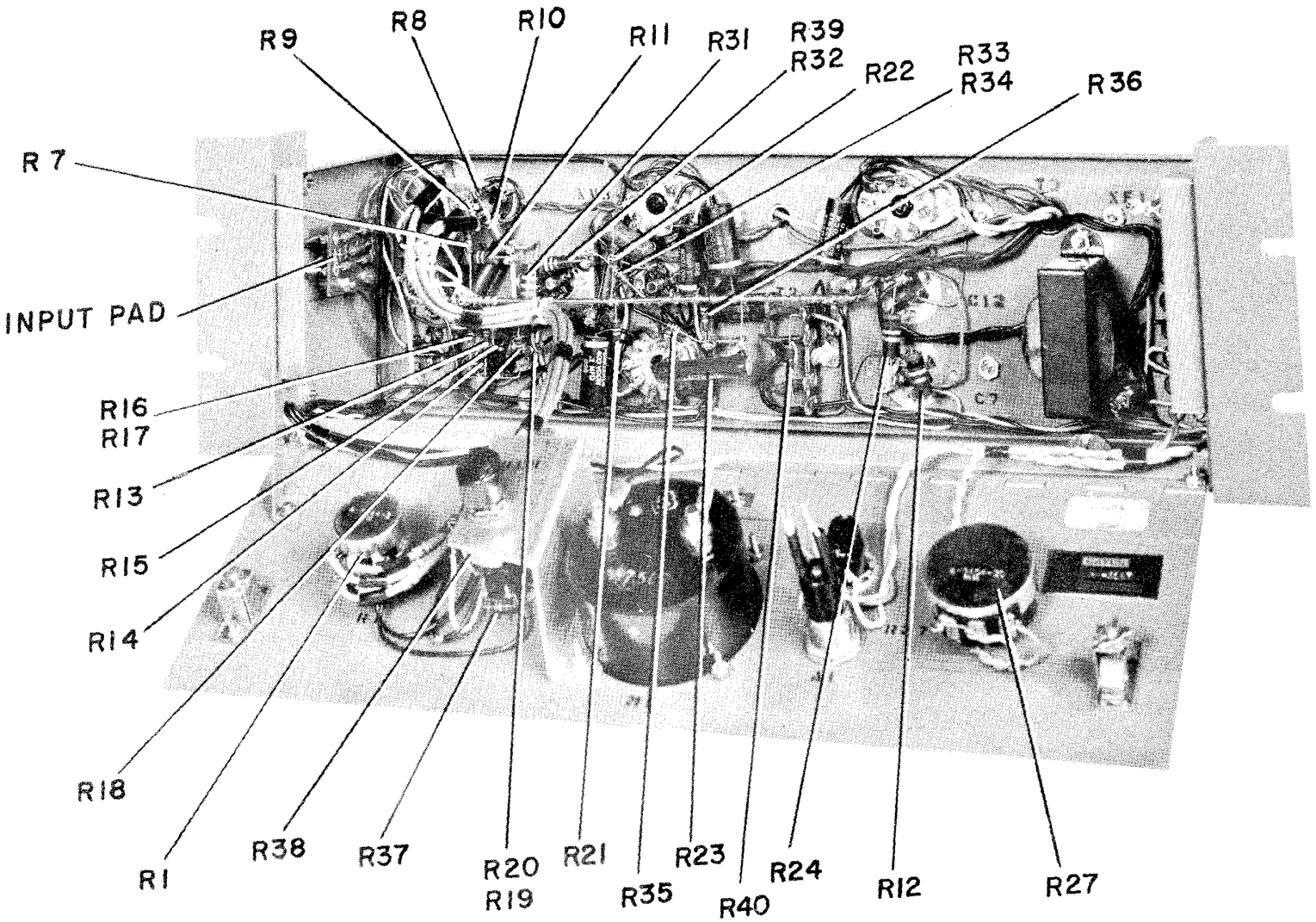
PARTS LOCATION

M5167 STA-LEVEL AMPLIFIER

A-34302

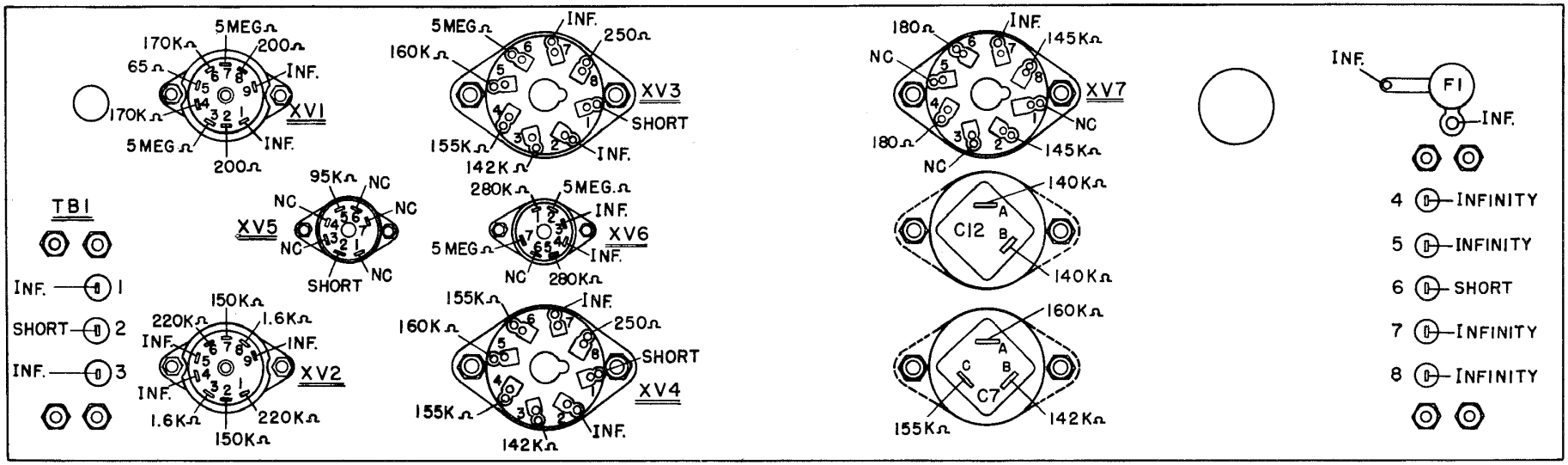


PARTS LOCATION
M5167 STA-LEVEL AMPLIFIER



RESISTOR LOCATION
M5167 STA-LEVEL AMPLIFIER

A-34311



ALL MEASUREMENTS MADE WITH SIMPSON "260" TEST METER

ALL READINGS ARE MADE WITH RESPECT TO COMMON "BUSS" GROUND

RI-R27-R38 SET AT MINIMUM (CCW)

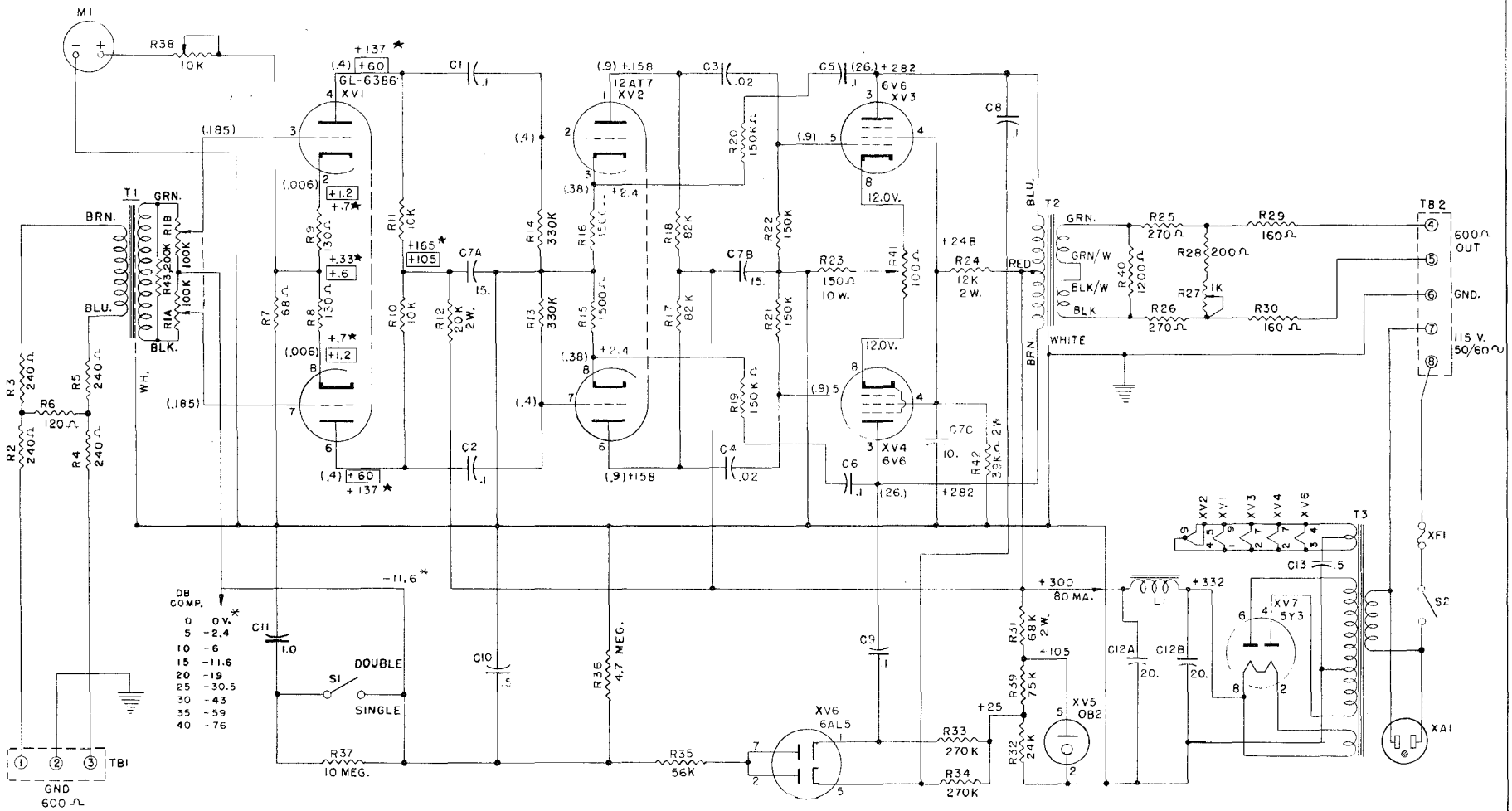
SI- "OFF" POSITION AND "AC" DISCONNECTED

S2- "SINGLE" POSITION

UNDER SIDE OF CHASSIS
STA-LEVEL M-5167
CS-2030

B-66945

C-19530



NOTE: D.C. MEASUREMENTS TAKEN WITH 20,000 Ω/VOLT METER +60, +332, ETC. SIGNAL VOLTAGES TAKEN WITH V.T.V.M., (185), (26.), ETC. (RMS VALUES) ALLOW AT LEAST 20% VARIATION. MOST IMPORTANT TO MAINTAIN GOOD PUSH-PULL BALANCE.
* TAKE WITH D.C. V.T.V.M.

NOTE: ALL MEASUREMENTS TAKEN WITH 15DB COMPRESSION, EXCEPT [+60] WHICH IS TAKEN WITH NO COMPRESSION. AT THESE POINTS THE "15DB COMP" READINGS ARE MARKED ★ OTHER D.C. READINGS DO NOT CHANGE.

ECN 8610 5-7-61 D.L. 2	ECN 8433 RAJ 11-16-62 1	SCHEMATIC DIAGRAM STA-LEVEL AMPLIFIER M5167	
		MTL	FIN.
		DR BY R.W. DATE 5-26-58	CH BY DATE
		ENG APR DATE	DRAWING NO
		GATES RADIO COMPANY QUINCY, ILLINOIS	C-19530

GATES ENGINEERING AND SALES BULLETIN 201-F

THE "STA-LEVEL" AUTOMATIC PROGRAM LEVEL AMPLIFIER

Perhaps no single equipment in all of broadcasting has done so much for so little cost as the Gates "Sta-Level." The basic function is to provide constant level output. "Sta-Level" brings up the low passages as well as holding down excessive output level. The result is always higher level of transmission, the equivalent of greater signal output.

"Sta-Level" automatically adjusts for different input levels, or it differs from a peak limiting amplifier by raising level, if it is too low, and reducing level if too high. Practical and very realistic results become obvious. A few are:

(1) Psychologically, to prevent excess level, the operator will very naturally maintain lower levels. This makes the softer passages very low indeed. When "Sta-Level" is in the circuit, two important things happen: (a) output levels may be higher as they are automatically protected, and (b) the low, soft passages are automatically raised in level.

(2) The effect of (1) above is identical to turning up the volume control of all the receiving sets, or — raising power. If you increase your average program level 3 db, you have the same effect as doubling transmitter power. The nice part is that "Sta-Level" in many instances has gone far beyond the minimum of 3 db increase.

(3) "Sta-Level" will automatically adjust for different levels. We all are acquainted with the varied output levels of records, tapes and transcriptions. Furthermore, in these busy music-news days of broadcasting, the operator cannot keep his eyes glued to the VU meter. "Sta-Level" automatically brings up the low turntable and holds down the high one without operator attention.

(4) Here is a use many are finding for "Sta-Level": In disc jockey shows, by setting the microphone level higher than music level an automatic fade of music during the voice transmission is possible and excellently done. For example, if the microphone fader on the speech equipment is set 15 db above the turntable fader, when using the microphone, the music will fade 15 db. Music will return to normal level when microphone is no longer used. Recovery time is smooth, quite like a normal up fade.

GENERAL INFORMATION

RECOVERY SPEED: As supplied, "Sta-Level" recovers 2/3 level in 7 seconds and 90% level in about 28 seconds. This is considered typical. However, a kit of small fixed resistors is supplied. If the operator feels this is too slow or too fast, he may, by changing two resistors, increase recovery to as fast as 2¼ seconds for 2/3 level and 10 seconds for 90% level, or as slow as 11¼ second for 2/3 level and 45 seconds for 90% level.

ACCESSORIES: None needed. "Sta-Level" is a complete one-chassis unit, regulated power supply and all self-contained.

GAIN: As "Sta-Level" has up to 62 db gain, if your present system is short of gain, "Sta-Level" will pick it up. Both input and output level controls are on the front panel to adjust for any gain you wish right down to unity or up to the full 62 db.

ENGINEERING-SALES BULLETIN 201-F

THE "STA-LEVEL" AUTOMATIC PROGRAM LEVEL AMPLIFIER

SPECIFICATIONS

POWER SUPPLY: Regulated type, self-contained.

POWER INPUT: 105/115 volts, 50/60 cycles at 50 watts.

RECOVERY: Switch selects average or dual recovery time to accommodate operational mode best suited to engineering preference. Chart provided as guide.

COMPRESSION: Special regulator circuit holds threshold of compression constant. Rated 0-30 db but excellent performance to 40 db.

DISTORTION: 1% or less 50-15,000 cycles 0-30 db of compression when using +20 dbm output threshold level.

RESPONSE: ±1 db 30-15,000 cycles, 0-30 db compression.

NOISE: 65 db below output 0-30 db compression at +20 dbm threshold level.

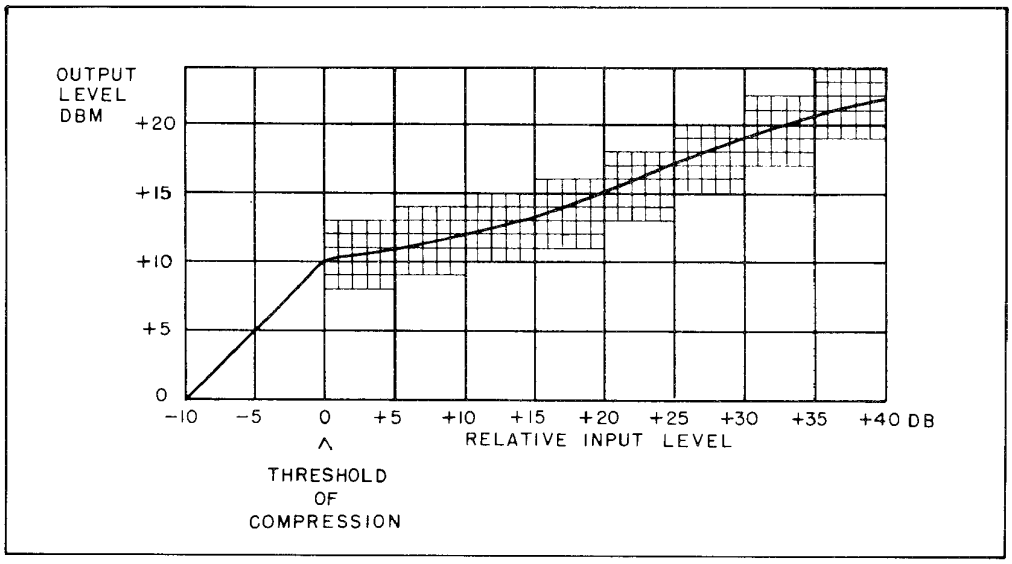
GAIN: 62 db ±2 db.

IMPEDANCES: 600 ohms input and output.

SIZE AND CONSTRUCTION: 19" x 5¼" panel. 7" deep. Front panel drops down to service all internal parts.

TUBES: Two 6V6, one each 6386, 12AT7, 6AL5, OB2, 5Y3GT.

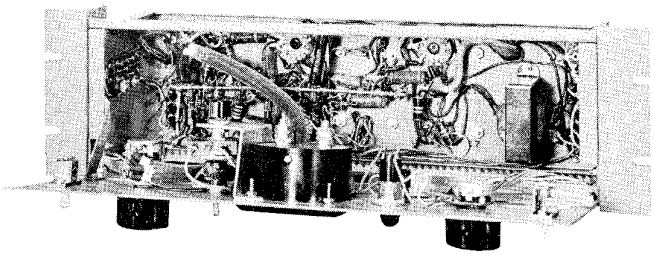
FINISH: Medium gloss gray with lettering in white.



ORDERING INFORMATION

"Sta-Level" complete with tubes and ready to operate	M-5167
Spare 100% tube kit for above	TK-243

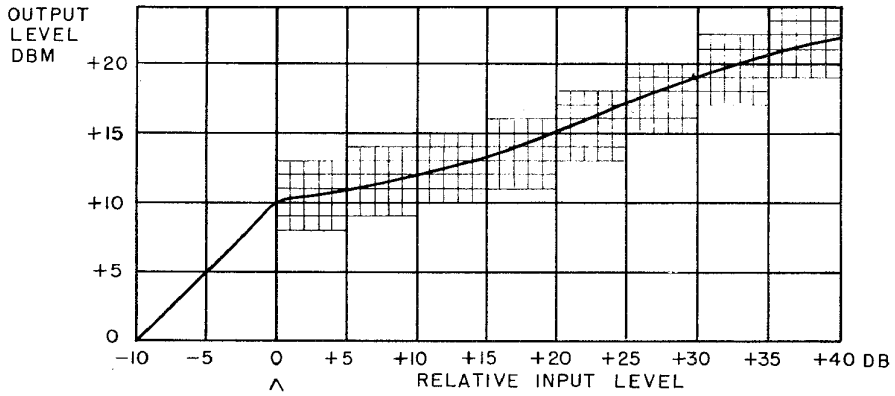
Front panel drops down for complete inner servicing. Big advantage of this type of construction is ability to keep important inner workings clean by means of bellows or small suction type cleaner.



GATES

Leader in Creative Engineering

DRAWING NUMBER
A-11734



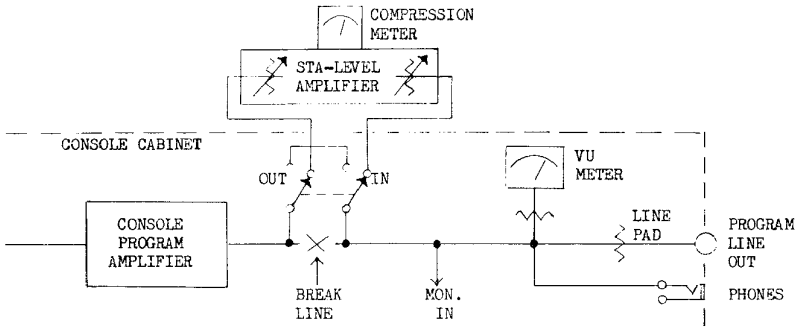
TYPICAL COMPRESSION CURVE ON
M5167 STA-LEVEL AMPLIFIER

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC GSM102.
DR. BY D.L. DATE 4-4-56	CH. BY W.K. DATE 4-7-56	ENG. APR. DATE 4-4-56

GATES RADIO COMPANY
QUINCY, ILLINOIS

DRAWING NUMBER
A-11734

DRAWING NUMBER
A-11361



Almost any console is easily modified for use with Gates' STA-LEVEL Amplifier as shown above. Simply remove the output from the console program amplifier, as shown by the break, and connect to the input terminals of the STA-LEVEL Amplifier. Connect the output of the STA-LEVEL Amplifier to the output circuit of the console. The use of a console utility switch, or an external switch, will allow the STA-LEVEL Amplifier to be switched in or out of the circuit as desired.

With the STA-LEVEL Amplifier connected as shown, it will keep a controlled level into the telephone line, monitoring amplifier input, monitoring phones and all other circuits bridging the output of the console. The variable input and output attenuation of the STA-LEVEL Amplifier permits unity gain operation or reduction of the program amplifier level for higher over-load factor. The program amplifier level may be easily reduced with the master gain control on the console.

With the STA-LEVEL Amplifier operating normally at mid range, or 15 db compression, the input level may change $\pm$ 15 db with approximately $\pm$ 4 db change into the telephone line. This small change in the output level is easily handled by the telephone line and the peak limiting amplifier at the transmitter.

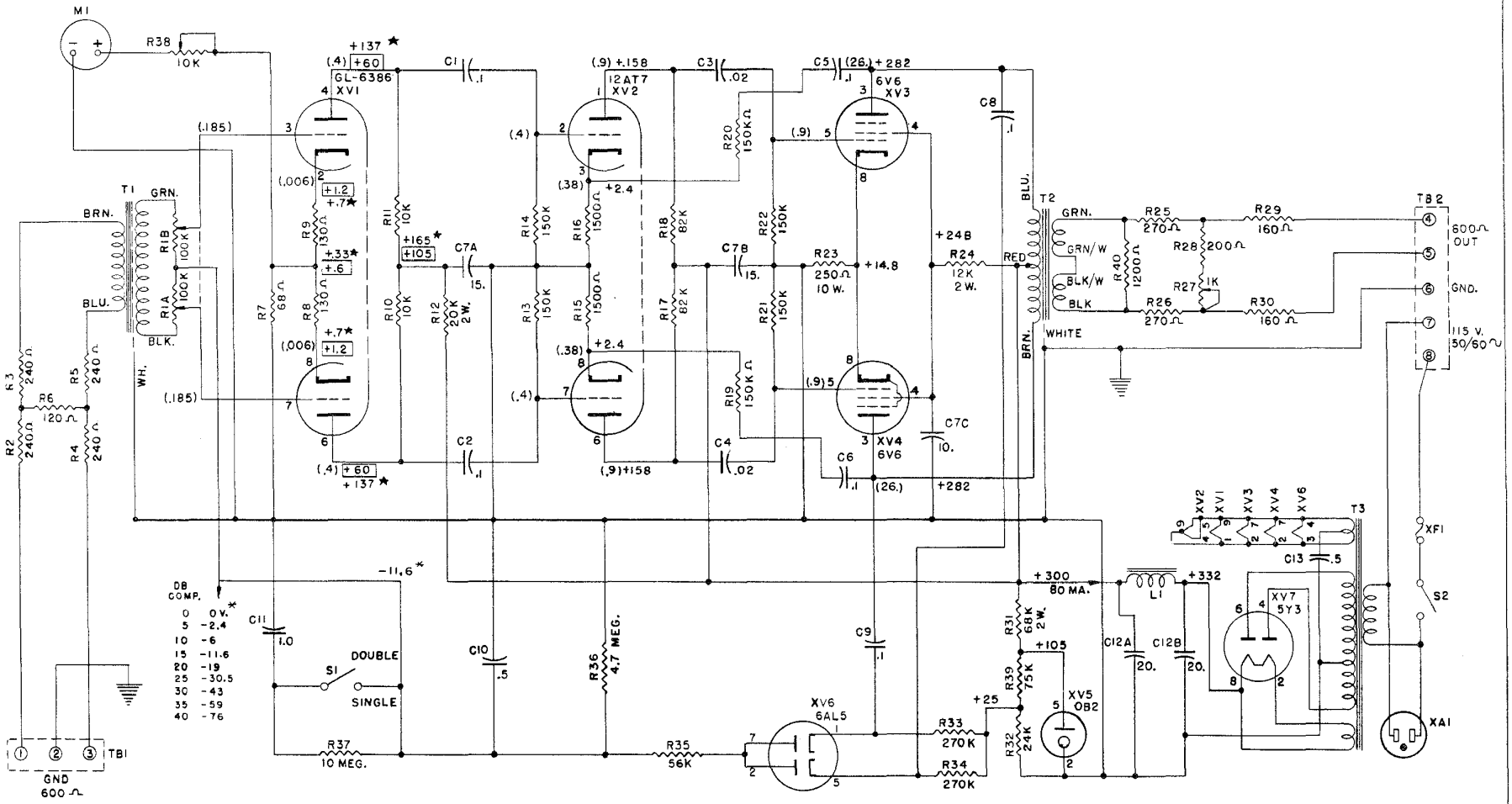
ONE SUGGESTED APPLICATION OF THE M5167
STA-LEVEL AMPLIFIER

MTL	FIN.	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC GSM102.
DR. BY WJK DATE 12-23-57	CH. BY WJK DATE	ENG. APR. DATE 12-23-57

GATES RADIO COMPANY
QUINCY, ILLINOIS

DRAWING NUMBER
A-11361

C-19530

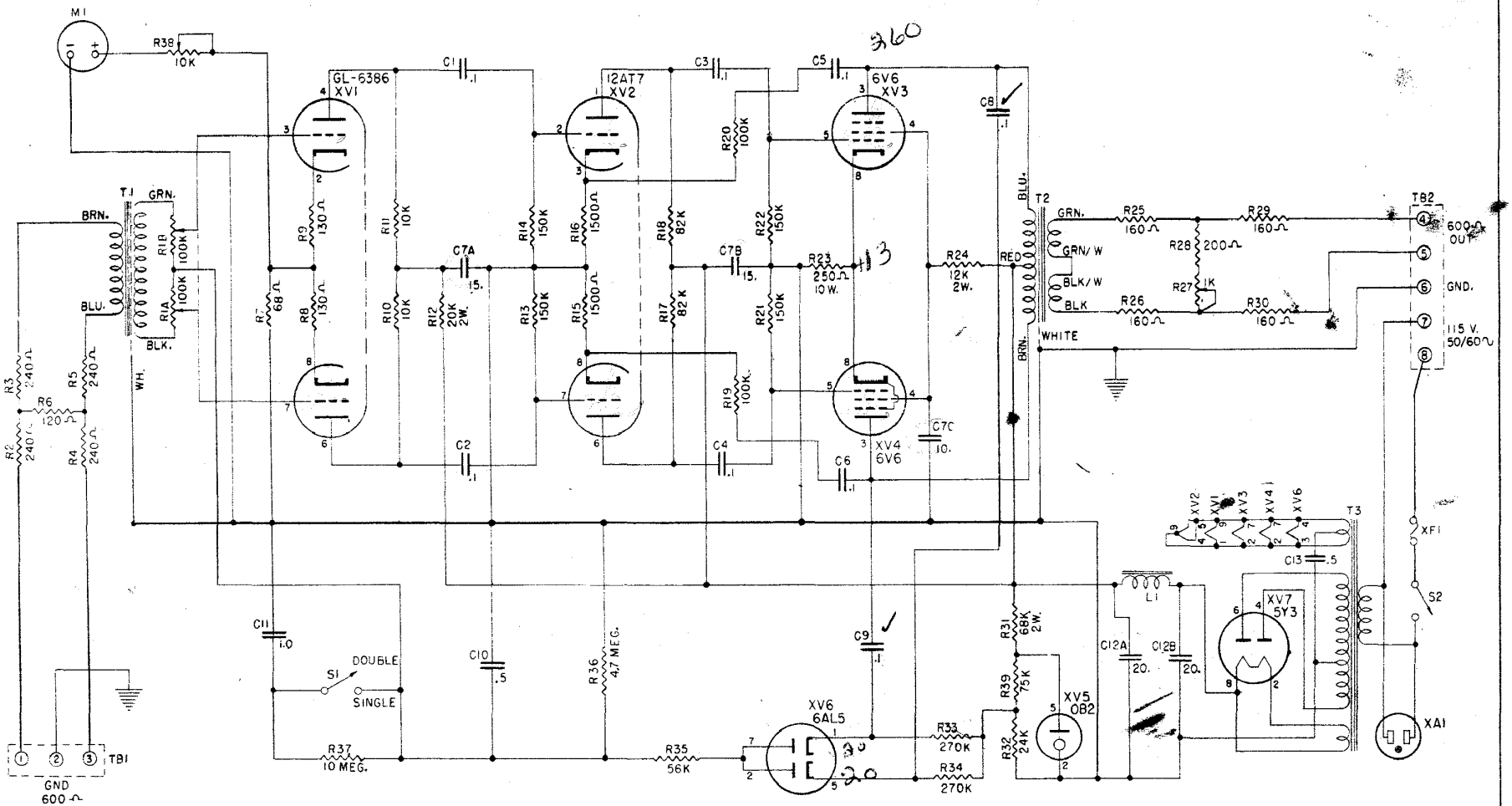


NOTE: D.C. MEASUREMENTS TAKEN WITH 20,000 Ω/VOLT METER +60, +332, ETC.
SIGNAL VOLTAGES TAKEN WITH V.T.V.M., (185), (26.), ETC. (RMS VALUES)
ALLOW AT LEAST 20% VARIATION. MOST IMPORTANT TO MAINTAIN
GOOD PUSH-PULL BALANCE.
* TAKE WITH D.C. V.T.V.M.

NOTE: ALL MEASUREMENTS TAKEN WITH 15DB COMPRESSION, EXCEPT
+60 WHICH IS TAKEN WITH NO COMPRESSION. AT THESE POINTS
THE "15DB COMP." READINGS ARE MARKED ★ OTHER D.C. READINGS
DO NOT CHANGE.

SCHEMATIC DIAGRAM
STA-LEVEL AMPLIFIER M5167

MTL	FIN.	
DR BY R.W. DATE 5-26-38	CH BY W.H.K. DATE 2-16-55	ENG APR. DATE 4-8-55
GATES RADIO COMPANY QUINCY, ILLINOIS		DRAWING NO C-19530



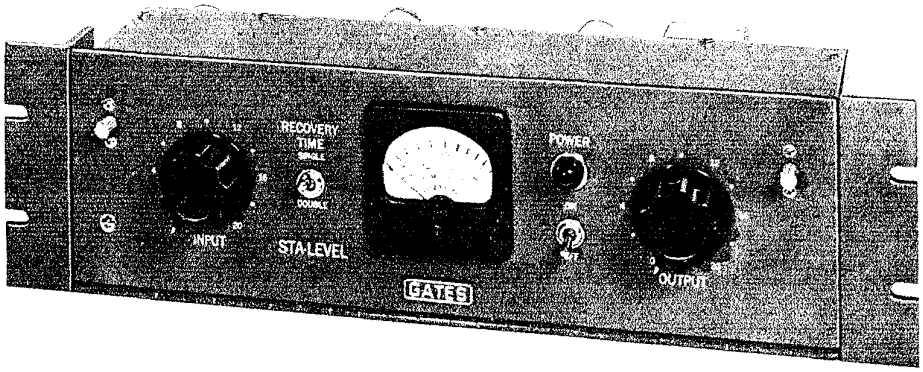
SCHEMATIC DIAGRAM
STA-LEVEL AMPLIFIER M5167

MTL.	FIN	
DR BY AWC DATE 11-19-58	CH BY WJK DATE 12-16-58	ENG APPR. DATE

GATES RADIO COMPANY
QUINCY, ILLINOIS

DRAWING C-1953

THE STA-LEVEL—AUTOMATIC PROGRAM LEVEL AMPLIFIER



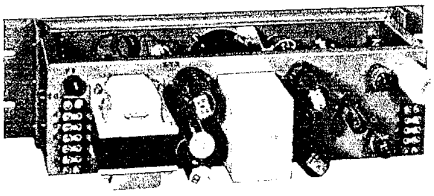
THE STA-LEVEL

Perhaps no single equipment in all of broadcasting has done so much for so little cost as the Gates *Sta-Level*. The basic function is to provide constant level output. *Sta-Level* might be likened to a gentle electronic hand on the master gain control. When the volume is too low, *Sta-Level* will raise it. If volume is too high, *Sta-Level* will automatically reduce it. This automatic adjustment for different input levels allows average output levels to be higher (for there is automatic protection)—while the low soft passages are automatically raised in level—resulting in a uniformly higher level of transmission and the equivalent of greater signal output.

RECOVERY SPEED: As supplied, *Sta-Level* recovers ⅔ level in 7 seconds and 90% level in about 28 seconds. This is considered typical. However, a kit of small fixed resistors is supplied. If the operator feels this is too slow or too fast, he may, by changing two resistors, increase recovery to as fast as 2¼ seconds for ⅔ level, and 10 seconds for 90% level; or as slow as 11¼ seconds for ⅔ level, and 45 seconds for 90% level.

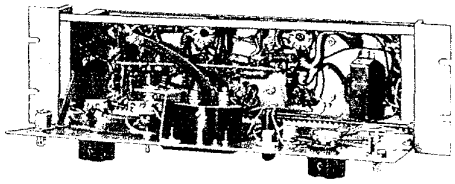
ACCESSORIES: None are needed for the *Sta-Level* is a self-contained one-chassis unit complete with regulated power supply.

GAIN: As *Sta-Level* has up to 62 db. gain, if your present system is short of gain, *Sta-Level* will pick it up. Both input and output level controls are on the front panel to adjust for any gain you wish right down to unity or up to the full 62 db.



Right: Front panel drops down for easy servicing of all inner parts.

Left: rear view shows terminations and tube locations.



SPECIFICATIONS

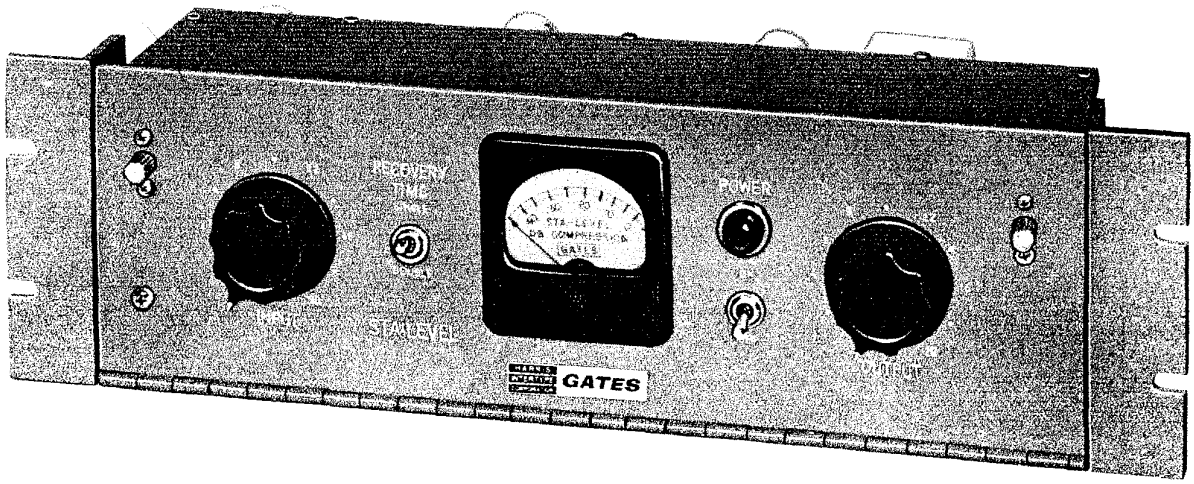
MODE:
Single channel monaural.
CONTROLS:
Input and output level controls.
METER:
Reads decibels of compression.
IMPEDANCES:
500/600 ohms input and output.
GAIN:
62 db. adjustable at both input and output.
RESPONSE:
± 1 db. 30-15,000 cycles.
DISTORTION:
1% or less 50-15,000 cycles at 30 db. compression or less and at + 20 dbm. output threshold level.
NOISE:
65 db. below 0-30 db. compression at + 20 dbm. threshold level.
MAXIMUM VOLUME EXPANSION:
Variable as set by input control.
EXPANSION RISE TIME:
Factory set at 7 seconds. Kit provided for faster or slower action as desired.
EXPANSION RECOVERY TIME:
Approximately 25 milliseconds.
MAXIMUM COMPRESSION:
30 db. at 1% distortion. 40 db. at slightly greater distortion.
COMPRESSION ATTACK TIME:
Approximately 25 milliseconds.
COMPRESSION RECOVERY TIME:
Normal 7 seconds for 63% recovery.
Faster as compression becomes greater.
SERVICING:
Drop down front panel. Tubes on rear.
POWER:
117 volts, 50/60 cycles, 45 watts.
MECHANICAL:
Size, 19" x 5¼" x 7" deep. Weight packed: 40 lbs. domestic; 50 lbs. export. Cubage: 2 cu. ft.
Finish: Medium gloss gray and black.
TUBES:
(2) 6V6, and (1 each) 6386, 12AT7, 6AL5, OB2, 5Y3GT.

ORDERING INFORMATION

Sta-Level with tubes ..... (Cat. No.) M-5167
Spare 100% tube kit TK-243

HARRIS INTERTYPE CORPORATION GATES

Automatic Program Level Amplifier



THE STA-LEVEL

The basic function of Gates Sta-Level is to provide constant level output. When the volume is too low, Sta-Level will raise it; if volume is too high, Sta-Level will automatically reduce it. This automatic adjustment for different input levels allows average output levels to be higher, since there is automatic protection. Soft passages are automatically raised in level—resulting in a uniformly higher level of transmission and the equivalent of greater signal output.

RECOVERY SPEED: Sta-Level recovers ⅔ level in 7 seconds and 90% level in about 28 seconds. This is considered typical. However, a kit of small fixed resistors is supplied. If the operator feels this is too slow or too fast, he may, by changing two resistors, increase recovery to as fast as 2¼ seconds for ⅔ level, and 10 seconds for 90% level; or as slow as 11¼ seconds for ⅔ level, and 45 seconds for 90% level.

ACCESSORIES: None are needed, as the Sta-Level is a self-contained, one-chassis unit complete with regulated power supply.

GAIN: Since Sta-Level has as much as 62 dB gain, if your present system is short of gain, Sta-Level will pick it up. Both input and output level controls are on the front panel to adjust for any gain you wish, down to unity or up to the full 62 dB.

SPECIFICATIONS

MODE: Single channel monaural.

CONTROLS: Input and output level controls.

METER: Reads decibels of compression.

IMPEDANCES: 500/600 ohms input and output.

GAIN: 62 dB adjustable at both input and output.

RESPONSE: ±1 dB 30-15,000 Hz.

DISTORTION: Less than 1%, 50-15,000 Hz at +20 dBm output level, 0-30 dB compression.

NOISE: 65 dB below +20 dBm output level, 0-30 dB compression.

MAXIMUM VOLUME EXPANSION: Variable as set by input control.

EXPANSION RISE TIME: Factory set at 7 seconds. Kit provided for faster or slower action as desired.

EXPANSION RECOVERY TIME: Approximately 25 milliseconds.

MAXIMUM COMPRESSION: 30 dB. 40 dB at slightly greater distortion.

COMPRESSION ATTACK TIME: Approximately 25 milliseconds.

COMPRESSION RECOVERY TIME: Normal 7 seconds for 63% recovery. Faster as compression becomes greater.

SERVICING: Drop down front panel. Tubes at rear.

POWER: 117 volts, 50/60 Hz, 45 watts.

MECHANICAL: Size, 19" x 5¼" x 7" deep. Weight packed: 40 lbs. domestic; 50 lbs. export. Cubage: 2 cubic feet. Finish: beige-gray.

TUBES: (2) 6V6, (1 each) 6386, 12AT7, 6AL5, OB2, 5Y3GT.

ORDERING INFORMATION

Sta-Level with tubes	**994-5167**
Spare 100% tube kit	**990-0243**

HARRIS INTERTYPE CORPORATION GATES