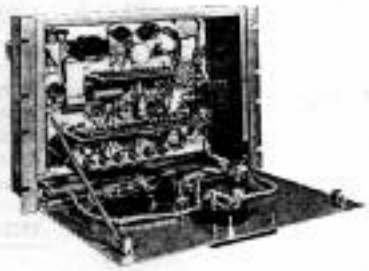
PEAK LIMITING AMPLIFIER

MODEL SA-39B

The SA-39B Limiting Amplifier is the trusted guardian of the audio signal in thousands of broadcast stations around the world. The unique circuitry developed by Gates engineers years ago and continually upgraded has been accepted as the world standard. By positive and smooth prevention of overmodulation with consistently louder audio signals, the SA-39B provides better station coverage, (a 3 decibel increase in over-all average audio signal is equivalent to doubling power). Usually installed near the transmitter it is an ideal replacement for older, slow acting limiters.

The very fast attack time, essentially instantaneous, is associated with six switch selectable release times. In this manner the engineer may adopt the mode of operation best suited for him. Limiting action is by full wave rectification of the output voltage with the resultant negative direct current fed to the second control grid of the push-pull input stage. Although action is extremely fast, no added distortion is introduced at compression levels as high as 20 db.

The circuit design provides separate input and output level controls and three push-pull stages. The regulated power supply assures limiter calibration over wide ranges of line voltage. A wide scale 4" meter is calibrated in decibels of compression for direct reading.



Note accessibility and logical design as shown (left) front open, and (right) rear views of this outstanding Limiting Amplifier.

SPECIFICATIONS

MODE:
Monaural.

CONTROLS:
Input and output level controls on front panel.

METER:
Reads directly in decibels of limiting.

IMPEDANCES AND LEVELS:
Input; 500/600, 150/250, 30/50 ohms.
Input level; from — 20 dbm. to + 20 dbm.
Output; 500/600 ohms.
Output level; up to + 19 dbm.

GAIN:
Maximum 50 db.

RESPONSE:
± 1½ db. 30-15,000 cycles.

DISTORTION:
1½% or less 30-15,000 cycles up to 15 db. compression. Only slightly higher up to 25 db. of compression.

NOISE:
65 db. or better below any adjustable output level.

LIMITER ACTION:
Attack time, essentially instantaneous. Release time: six positions from 0.2 to 1.2 seconds.

SERVICING:
Front panel drops down. Tubes in rear.

POWER:
117 volts, 50/60 cycles, 90 watts.

MECHANICAL:
Size, 19" x 14" x 9½" deep. Weight packed: 74 lbs. domestic, 96 lbs. export. Cubage: 9 cu. ft. Finish: Medium gloss gray with escutcheons in black.

TUBES:
(3) 6SJ7, (2) 1612, (2) 6V6GT, and (1 each) 6H6, 6X5GT, 6L6G, and 5V4G.

ORDERING INFORMATION

SA-39B Peak Limiting Amplifier with tubes M-3529B
Spare 100% tube kit TK-150

HARRIS INTERTYPE CORPORATION GATES

INSTRUCTION BOOK

SA-39B Limiting Amplifier (M3529B)

No. IB-888 0032 001

Welcome to the family of over 2000 users of Gates Limiting Amplifiers. No device in all of broadcasting does so much for so little cost. When properly installed and used, it will increase your audio signal at the point of reception which is generally equivalent to twice the RF modulated signal as compared to a straight amplifier.

As Limiters do require a different understanding of their functions, may we suggest your careful reading of the following pages.

The SA-39B Limiter may be used for all modes of broadcasting, AM, FM or TV and is designed for very low distortion, wide audio response and as an aid to fine programming.

GENERAL INFORMATION

Three audio stages, all push-pull, employ highly shielded transformers and carefully selected components to assure good balance and low distortion. —— Limiting action is derived by application of a portion of the output voltage through full wave rectification to the main and second control grids of the first audio stage. As output increases, the grid becomes more negative, lowering the gain of the amplifier. Curve A3984 illustrates the limiting action.

To further assure constant performance under varying line voltages, an electronically regulated power supply maintains constant voltage to the first two audio stages.

OPERATIONAL GUIDES

Input Impedance: 500/600 ohms. Use shielded wire.*
Output Impedance: 500/600 ohms. Use shielded wire.
Input Audio Level: -20 to +20 dbm.
Output Level: Up to +19 dbm.
Maximum Gain: 50 db.
Power Input: 115 Volts 50/60 Cycles.

*Do not place input pair with output pair in the same cable.

INSTALLATION

Only the rectifier tube is removed for packing. Detach any padding or tape used in securing for shipment. Inspect thoroughly for any loosening during shipment. In case of damage, notify the delivering transportation company at once. They are obligated to pay any damages. Note that this equipment is shipped in a safety transit approved container.

Mounting on the rack should be at a point of eye level convenience to the operator as he will observe the meter on the Limiter. Do not mount the Limiter directly next to a field radiating device such as an FM oscillator, oscilloscope or TV monitor. As radio frequency current, if permitted to enter the Limiter, will destroy its action, take every precaution both in installing and wiring to assure good shielding of wiring and good grounding. In no case should audio wires run in the same cable or conduit as the AC cable. It is also desirable that the ungrounded side of the 115 volt AC line be connected to terminal 8. This will assure a dead front panel.

OPERATION

The instrument has been carefully checked in the Gates laboratory under actual operating conditions and should be ready for operation.

To place the SA-39B Limiting Amplifier in operation, set the front panel controls as follows:

1. Set input and output controls to "OFF" or full anti-clockwise.
2. Turn on amplifier with toggle switch above headset jack. Pilot light should illuminate.

   NOTE: Input level at audio terminals 1 and 2 should be between -10 dbm. and 0 dbm. for best results and proper control settings.

3. If the meter does not read 0 db. compression (input control still off), then drop down front panel and adjust knob (R3) in the lower left-hand corner.
4. Now increase the input control (clockwise) and with program material such as a record, until the meter just begins to indicate compression of a decibel or two. Never operate the Limiter below this point or no value will be obtained and the limiter will act as a straight program amplifier. Usual programming with compression peak up to 5 decibels permits a much higher audio level and thus greater signal coverage without any noticeable effect to the listener. Greater compression will often take place on momentary peaks and is expected.
5. Increase the output control (clockwise) until the transmitter modulates the desired percentage. Be sure the Limiter is compressing during this adjustment.

Use your Limiter always compressing from 2 to 5 db. on peaks. This will assure maximum coverage of your broadcasting station. Remember the distortion is just as low under normal compression as no compression.

If output level is too high, refer to Drawing D-22199. The output level may be reduced by inserting fixed pads AT-2 or AT-3. These pads are located near the output transformer T2 and are unconnected. The dotted lines indicate the method of connection.

OPERATING SUGGESTIONS

Actual operation of the Limiter will depend, to a large extent, upon the individual desires of the personnel involved. The principal reason for the use of a Limiter is to permit the transmitter to be operated at high modulation, with the Limiter being a safety valve to prevent sudden or sustained program increases from causing over-modulation. In FM and TV, the SA-39B Limiter is ideal; preventing excessive transmitter swing and resultant receiver distortion. Under normal operation, it is suggested that compression should not exceed 5 db. for average program level.

The recovery time of the limiter is set by switch S1 (on the rear of the chassis). A dial is calibrated for six positions: Position #1 gives a time recovery of approximately .2 sec. and each succeeding position increases this by .2 sec. Position #3, or .6 sec., gives a good average recovery time and is recommended. However, it may be desirable to increase or decrease the time constant, to suit your programming taste.

The jack, J7, (on the front door) may be used for aural monitoring by plugging in phones. A signal will be heard at this point regardless of the position of the output attenuator.

MAINTENANCE

The Gates SA-39B Limiting Amplifier is carefully tested in the laboratory before shipping and all controls and adjustments set as indicated in the preceding test. For the assistance to the engineer in servicing, the various operating voltages are indicated on the schematic drawing. These readings were taken with a 20,000 ohm/volt voltmeter. If a high impedance vacuum tube voltmeter is used, a slight discrepancy may be noted.

A current jack has been placed in each cathode of each amplifier tube. If a multi-range DC milliammeter is available, a standard two circuit phone plug may be inserted. The readings should approach those shown on the schematic. The polarity of the jack plug is, the tip is positive and the sleeve is negative.

The layout of the SA-39B Limiting Amplifier lends itself to rapid routine maintenance. With the front door lowered, the attenuators are readily available for occasional cleaning.

Modern tube design assures long life; however, it is well to occasionally check the cathode currents, watching for unbalance in the tubes. In changing tubes, care should be taken that the 1612 tubes are evenly matched. This may be checked by plugging a current meter into jacks J1 and J2. Unbalance may cause fluttering or thumping in the Limiter circuit on extreme low notes. It may also be a source of noise (hum) where extremely low level circuits are employed.

Removing the tubes for periodic checking has the further advantage of lowering contact potential between the pins and socket clips. The plug-in capacitor should also be removed and re-inserted to insure good contact. Good housekeeping also indicates that all equipment should be kept clean and dust-free.

The output of the regulated power supply is indicated at 275 volts. This voltage may be adjusted by varying R43, a screwdriver slot control (located on the rear of the chassis). The voltage will be found to be very constant over quite wide variations of load current and line voltage fluctuations.

As in all broadcasting equipment, good engineering practice in installation and regular maintenance as related to tube checking and cleanliness, will assure a fine operating equipment for many years.

IMPORTANT

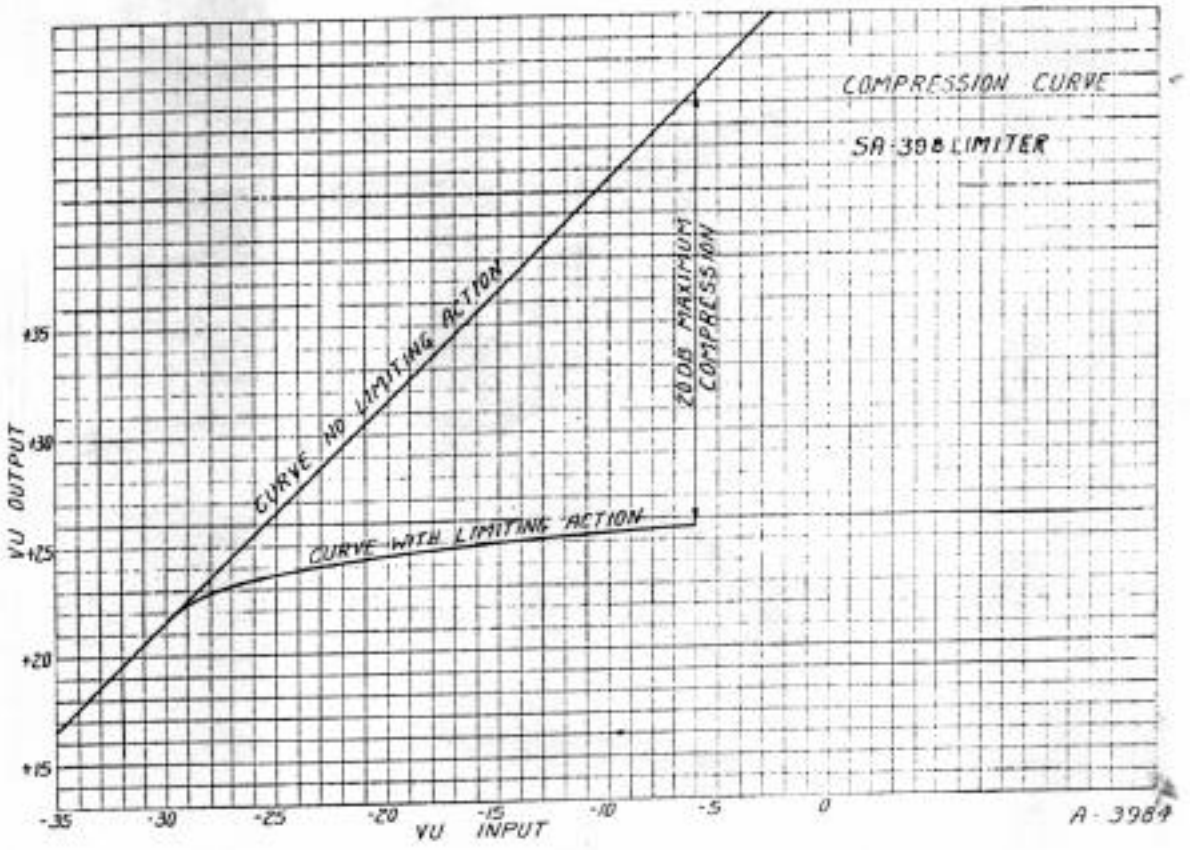
— In case of damage in transportation, notify the delivering carrier at once. After he has approved the damage report, which indicates he will accept your billing for the damage — order new part/s from Gates. Our billing for these parts, plus transportation expense, will be your claim to the transportation company.

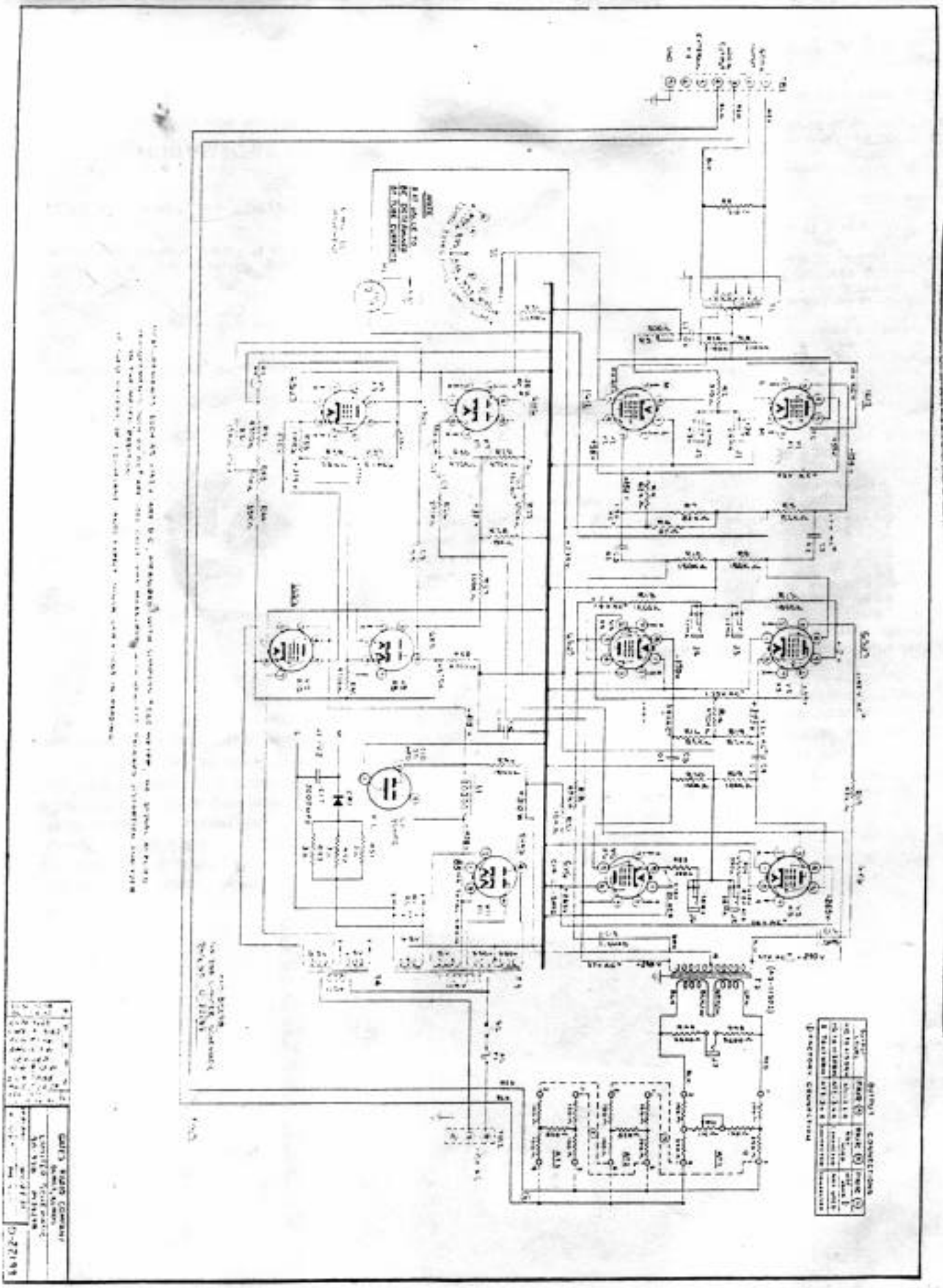
PARTS LIST

Symbol No.	Gates Part No.	Description
A1	406 0185 000	Pilot light assembly, red
A2	396 0053 000	Lamp
A3	406 0002 000	Lamp socket
A4	396 0070 000	Lamp, 1/4 W.
A5	402 0021 000	Fuseholder
AT1	991 2678 001	Attenuator assembly
AT2, AT3	991 2679 001	Attenuator assembly
C1, C2, C3, C4, C5	508 0085 000	Cap., .1 mfd., 400 V
C6, C7	506 0014 000	Cap., .1 mfd., 400 V.
C9, C12, C13, C14	506 0016 000	Cap., .5 mfd., 400 V.
C10, C11	524 0011 000	Cap., 20-20 mfd., 450 V.
C16	522 0133 000	Cap., 16 mfd., 450 V.
C17	524 0036 000	Cap., 3000 uf., 15 V.
CR1	384 0018 000	Diode, 1N2069
F1	398 0020 000	Fuse, 3 amp.

	Gates Part No.	Description
J6	612 0284 000	Jack
	612 0286 000	Jack
	476 0009 000	Filter Choke
M1	913 0720 001	0-1 MA. DC meter with special compression scale
R1	550 0192 000	Control, 100,000 ohm, dual
R2	540 0325 000	Resistor, 510 ohms, 1W.
R3	552 0543 000	Potentiometer, 500 ohms, wirewound, 3/4" shaft
R4	540 0375 000	Res., 62K ohms, 1W.
R5, R7, R15, R16	540 0491 000	Res., 82K ohms, 1W.
R6	540 0300 000	Res., 47 ohms, 1W.
R8	540 0325 000	Res., 510 ohms, 1W.
R9, R10	540 0494 000	Res., 150K ohms, 1W.
R11	552 0546 000	Control, 1000 ohms
R12, R13	540 0471 000	Res., 1800 ohms, 1W.
R14	540 0500 000	Res., 470K ohms, 1W.
R17, R18	540 0488 000	Res., 47K ohms, 1W.
R19, R20	540 0492 000	Res., 100K ohms, 1W.
R21	540 0480 000	Res., 10K ohms, 1W.
R23, R24	540 0322 000	Res., 390 ohms, 1W.
R25, R26	540 0497 000	Res., 270K ohms, 1W.
R27	540 0492 000	Res., 100K ohms, 1W.
R28	540 0483 000	Res., 18K ohms, 1W.
R29, R30	540 0500 000	Res., 470K ohms, 1W.
R31, R32, R33, R34, R35, R36	540 0218 000	Res., 2.2 megohms, 1/2W.
R37	540 0421 000	Res., 5.1 megohms, 1W.
R38	540 0486 000	Res., 33K ohms, 1W.
R39	540 0504 000	Res., 1 megohm, 1W.
R40	540 0476 000	Res., 4700 ohms, 1W.

Symbol No.	Gates Part No.	Description
R41	540 0480 000	Res., 10K ohms, 1W.
R42	540 0748 000	Res., 4700 ohms, 2W.
R43	552 0255 000	Potentiometer, 10K ohms 4W., wirewound
R44	540 0758 000	Res., 33K ohms, 2W.
R46	542 0079 000	Res., 1500 ohms, 10W.
R47		Res., "X" value to be determined by tube current
R48, R49	540 0187 000	Res., 5600 ohms, 1/2W.
R50	540 0476 000	Res., 4700 ohms, 1W.
R51, R52, R53	540 0271 000	Res., 3 ohms, 1W.
S1	600 0355 000	Selector switch
S2	604 0005 000	Toggle switch, SPST
T1	478 0142 000	Input transformer
T2	478 0121 000	Output transformer
T3	472 0054 000	Power transformer
T4	472 0160 000	Filament transformer
TB1	614 0115 000	Terminal board
TB2	614 0111 000	Terminal board
V1, V2	370 0146 000	Tube, 1612
V3, V4, V9	370 0094 000	Tube, 6SJ7
V5, V6	370 0102 000	Tube, 6V6GT
V7	370 0080 000	Tube, 6H6
V8	370 0106 000	Tube, 6X5GT
V10	370 0086 000	Tube, 6L6G
V11	370 0018 000	Tube, 5V4G
X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12	404 0016 000	Socket





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GATES RADIO COMPANY

QUINCY ILLINOIS

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