

INSTRUCTIONS  
FOR  
GATES MODEL M5381A  
STUDIOETTE CONSOLE

IB #888 0777 001  
3/2/62

Gates Radio Company  
Quincy, Illinois

M5215A PRINTED CHASSIS PREAMPLIFIER

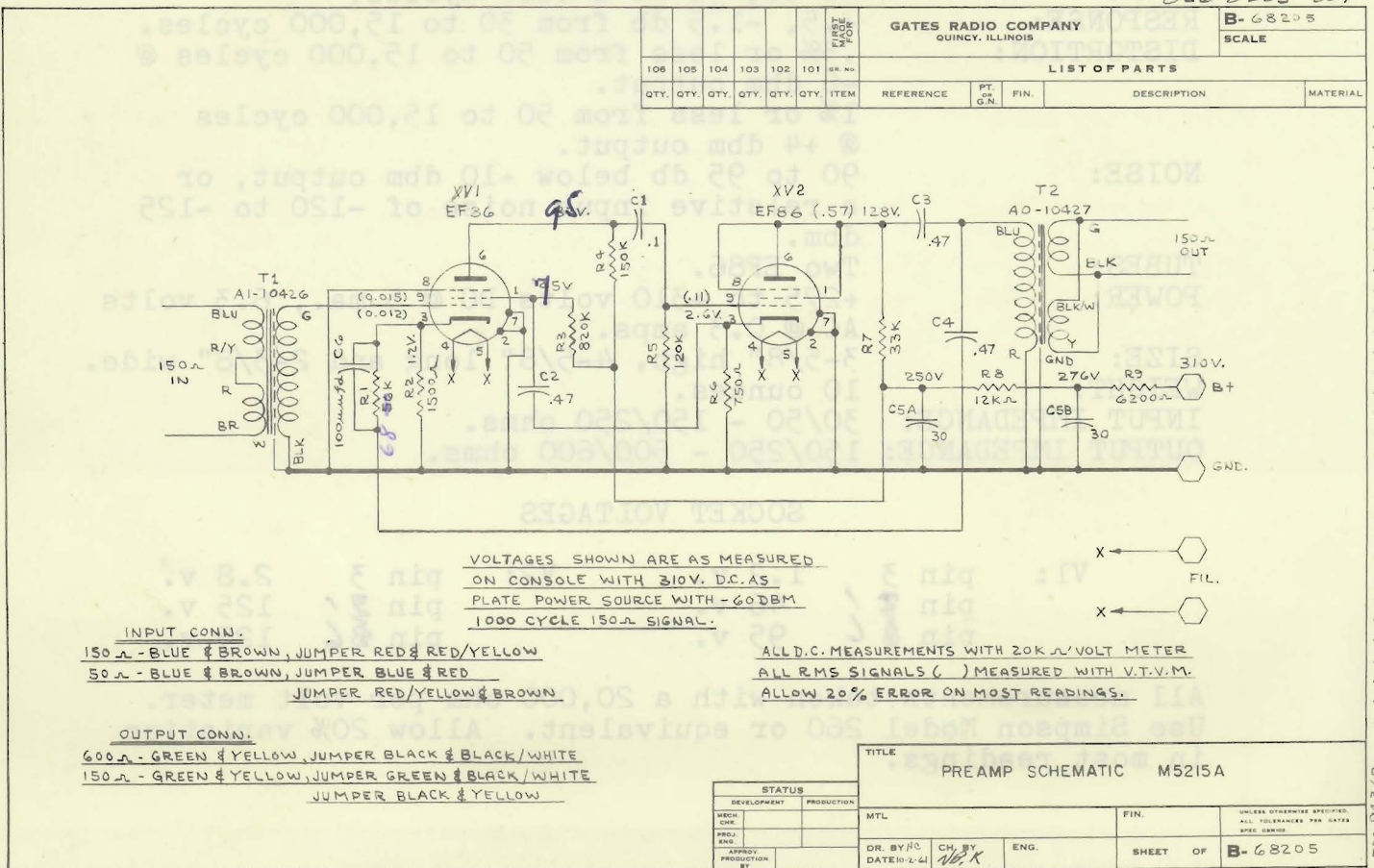
PARTS LIST

SYMBOL NO.	GATES PART NO.	DESCRIPTION
C1	506 0028 000	Capacitor, .1 mfd., 400 V.
C2, C3	506 0027 000	Capacitor, .47 mfd., 400 V.
C4	506 0026 000	Capacitor, .47 mfd., 200 V.
C5A/B	524 <del>0085</del> 000 0101	Capacitor, 30-30 mfd., 350-300 V. 350V
C6	500 0759 000	Capacitor, 100 mmfd., 500 V.
R1	540 0489 000	Resistor, 56K ohms, 1 W. 10%
R2	540 0470 000	Resistor, 1500 ohms, 1 W. 10%
R3	540 0503 000	Resistor, 820K ohms, 1W. 10%
R4	540 0494 000	Resistor, 150K ohms, 1 W. 10%
R5	540 0493 000	Resistor, 120K ohms, 1 W. 10%
R6	540 0329 000	Resistor, 750 ohms, 1 W. 5%
R7	540 0758 000	Resistor, 33K ohms, 2 W. 10%
R8	540 0481 000	Resistor, 12K ohms, 1 W. 10%
R9	540 0068 000	Resistor, 6200 ohms, 1/2 W. 5%
T1	478 0145 000	Input Transformer, AI-10426
T2	478 0118 000	Output Transformer, AO-10427
V1, V2	370 0144 000	Tube, EF86
XV1, XV2	404 0059 000	Socket

ORDERING REPLACEMENT PARTS

When ordering a replacement component, please refer to the parts list. Identify the component by its symbol number and if possible its Gates' part number. The type of equipment in which the part is used is also necessary. This procedure will insure the customer receiving the correct component and at the earliest possible date.

826 8205 001





## M5215A PRINTED CHASSIS PREAMPLIFIER

### INSTRUCTIONS

Gates' M5215A Printed Chassis Preamplifier was developed primarily for use in the new line of consoles. However, where the output levels permit, it may be used for an isolation amplifier or booster amplifier as well as a microphone preamplifier. Its small size and excellent electrical characteristics are due, to a great extent, to the use of the printed chassis wiring employed.

The schematic diagram, 826 8205 001 shows the circuit and external connections. It is a two stage amplifier, using a pentode connected EF86 tube in the first stage and a triode connected EF86 tube in the second stage. Negative feedback is taken from the plate of the second stage back to the cathode of the first stage. This compensates for differences in tube characteristics, reduces distortion and noise. The triode connected stage is shunt fed into the output transformer to allow small size and best operation of the transformer. The amplifier is connected 150 ohms in and out, in the factory. The schematic diagram shows the possible changes in impedances.

### SPECIFICATIONS

GAIN:	40 db, +1 db @ 1000 cycles.
RESPONSE:	+5, -1.5 db from 30 to 15,000 cycles.
DISTORTION:	.5% or less from 50 to 15,000 cycles @ -6 dbm output. 1% or less from 50 to 15,000 cycles @ +4 dbm output.
NOISE:	90 to 95 db below +10 dbm output, or a relative input noise of -120 to -125 dbm.
TUBES:	Two EF86.
POWER:	+275 to +310 volts DC @ 5 ma., 6.3 volts AC @ 0.3 amps.
SIZE:	3-5/8" high, 4-5/8" long and 2-3/8" wide.
WEIGHT:	10 ounces.
INPUT IMPEDANCE:	30/50 - 150/250 ohms.
OUTPUT IMPEDANCE:	150/250 - 500/600 ohms.

### SOCKET VOLTAGES

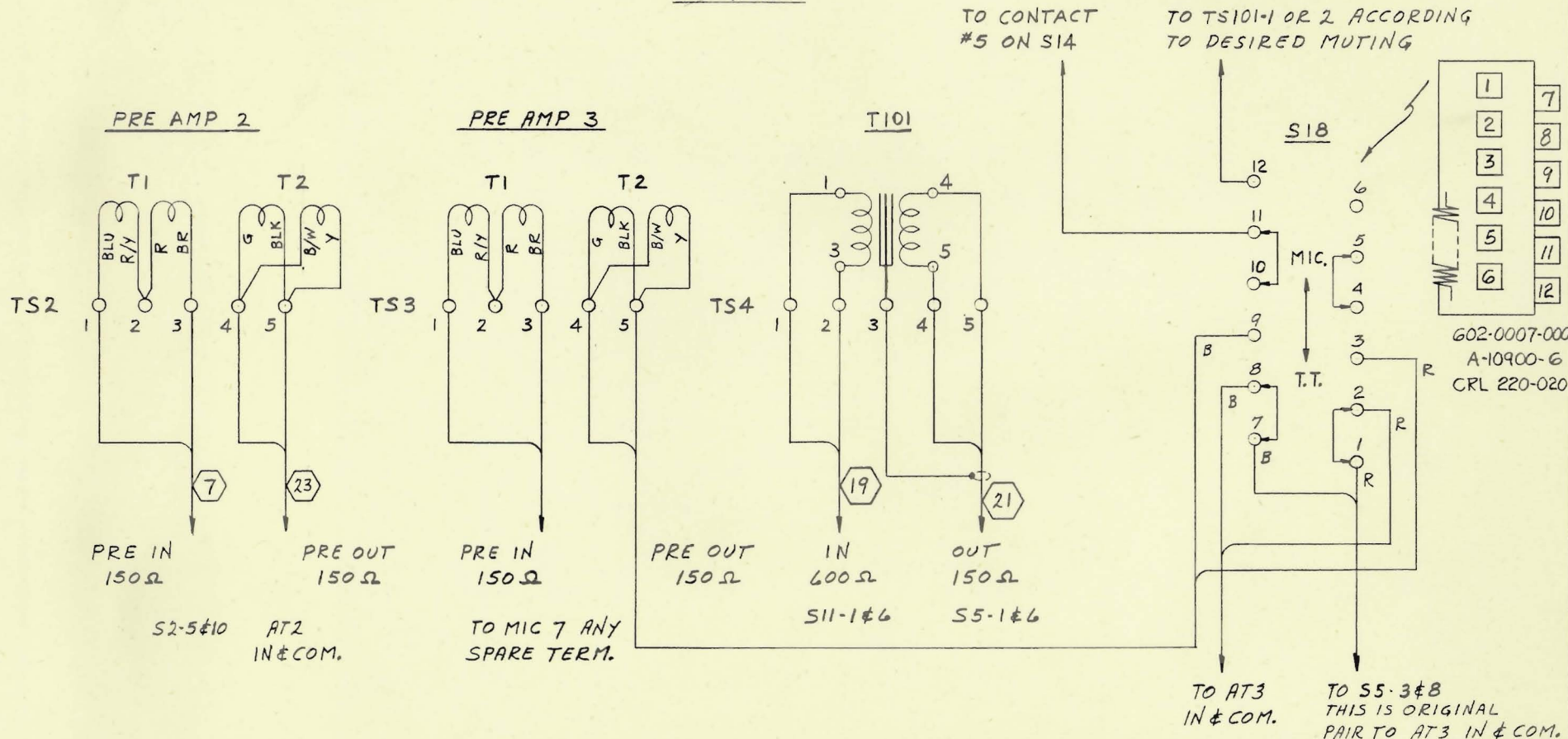
V1:	pin 3	1.2 v.	V2:	pin 3	2.8 v.
	pin 4	46 v.		pin 4	125 v.
	pin 6	95 v.		pin 6	125 v.

All measurements taken with a 20,000 ohm per volt meter. Use Simpson Model 260 or equivalent. Allow 20% variation in most readings.

ADD .1 MFD 200V  
PAPER CONDENSER  
BETWEEN CONTACTS  
5 & 11 ON SWITCH S14

						FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS		826-8710-001		
									SCALE -		
106	105	104	103	102	101	GR. NO.	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL

TOP REAR

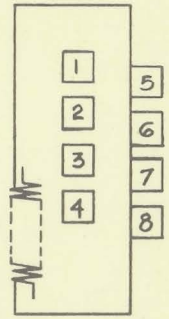
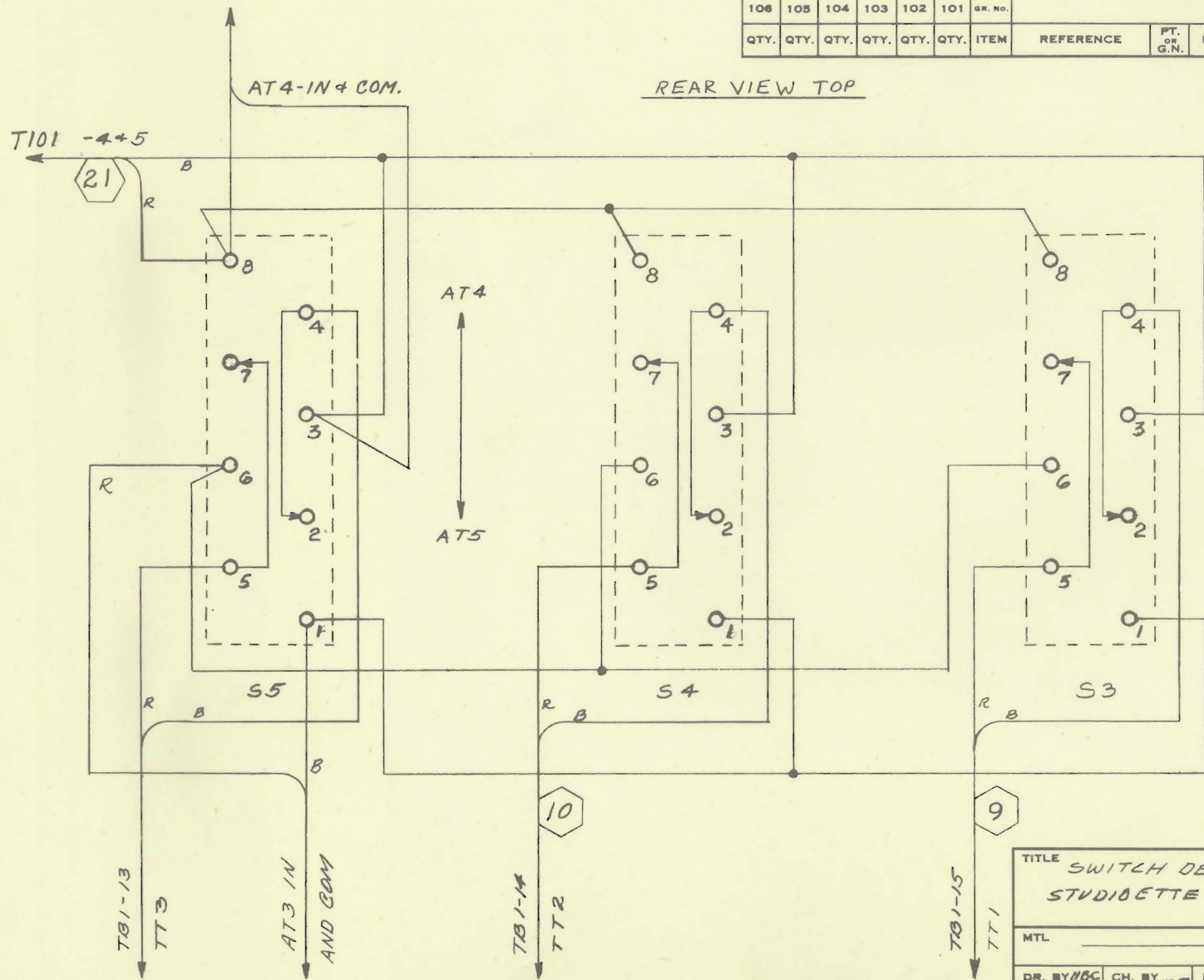


TITLE				SUGGESTED WIRING - FOR ADDING PRE AMP-3 TO CHANNEL 3 - USING UTILITY SW-S18 TO CONTROL CHANNEL 3 INPUT & MUTING M-5381A			
MTL				FIN.		UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC QSM102.	
DR. BY HBC	CH. BY	ENG. CWR					
DATE 5-9-62	DATE V.P.K.	DATE 5-19-62					
						826-8710-001	





							FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS		826-8706-001			
							GR. No.	LIST OF PARTS					SCALE
106	105	104	103	102	101	GR. No.	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL		
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM							



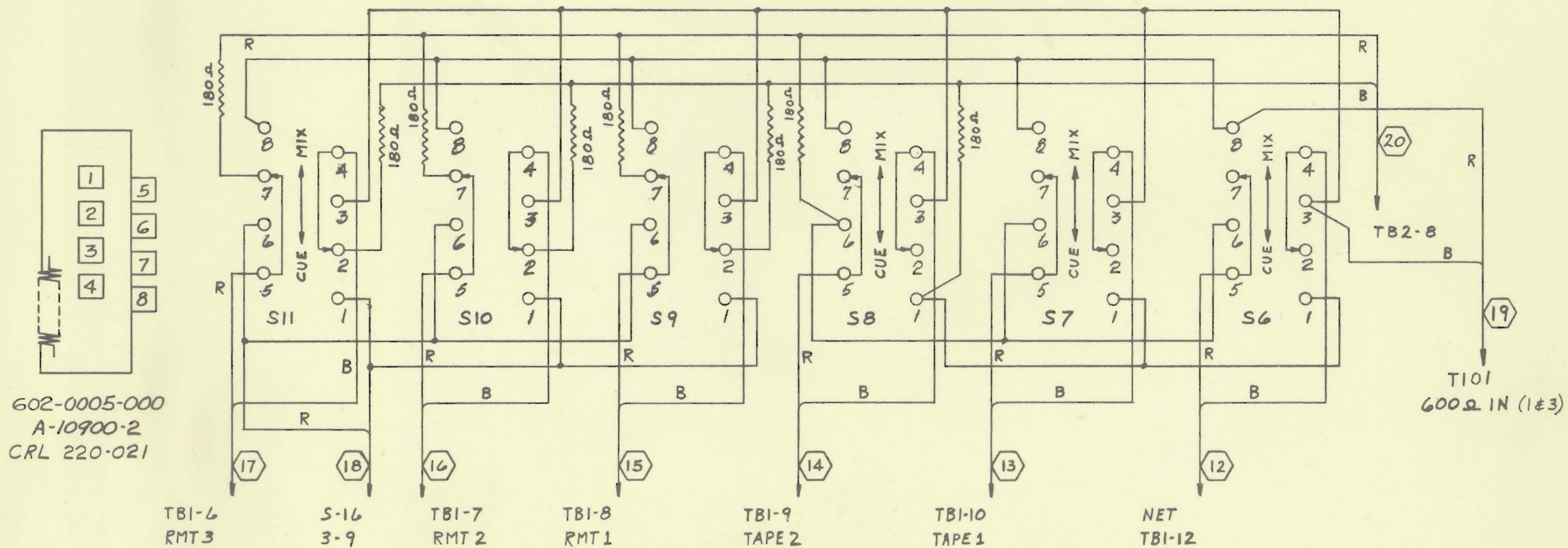
602-0005-000  
A-10900-2  
CRL 220-021

TITLE SWITCH DETAILS OF S3, S4 AND S5 FOR STUDIOETTE M538/A			
MTL		FIN.	
UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC 681016.		826-8706-001	
DR. BY NBC	CH. BY	ENG. CURT	
DATE 5-9-62	DATE V.P.K.	DATE 5-19-62	



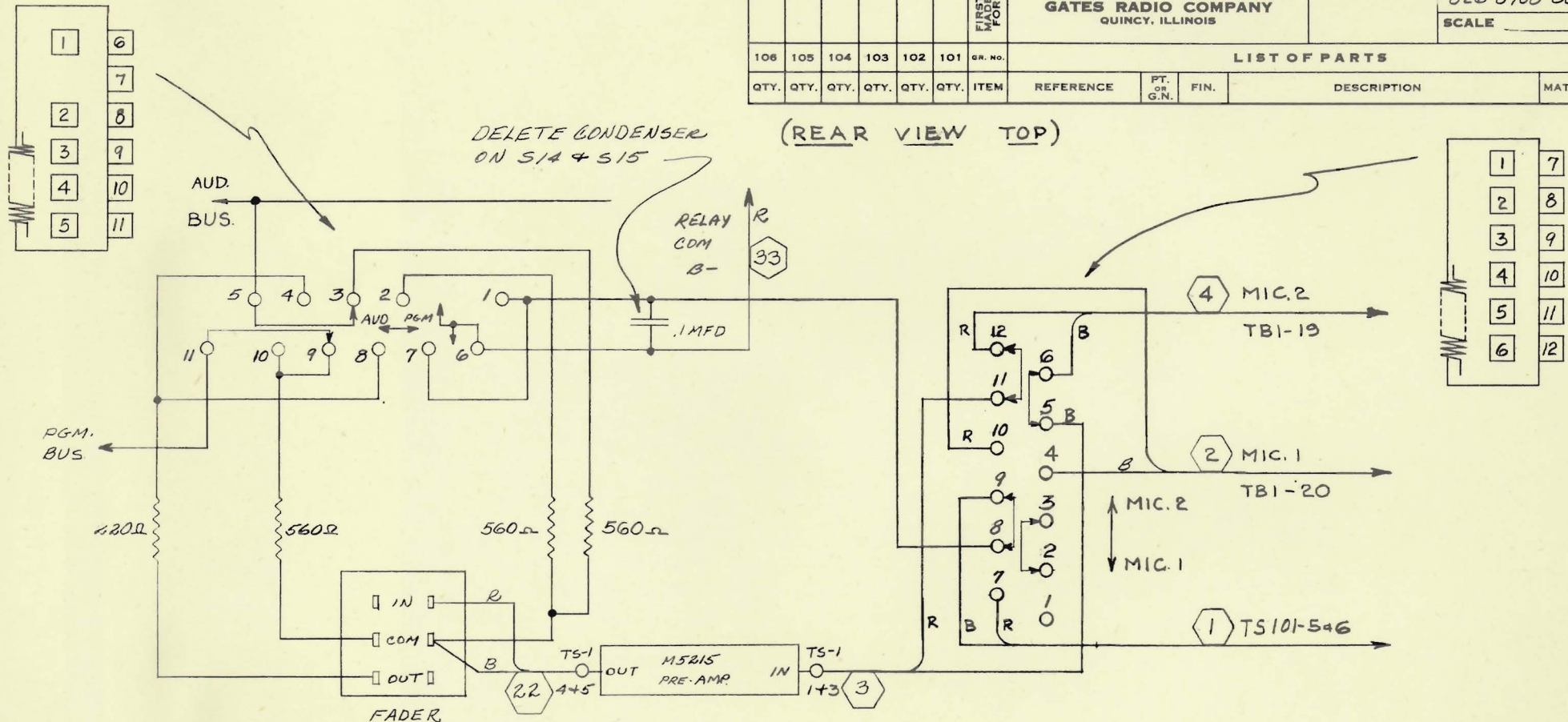
						GATES RADIO COMPANY QUINCY, ILLINOIS			826-8707-001 SCALE		
106	105	104	103	102	101	GR. NO.	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL

REAR TOP VIEW



TITLE				WIRING DETAIL - S6-7-8-9-10-11	
				STUDIOETTE	
				M-5381A	
MTL		FIN.		UNLESS OTHERWISE SPECIFIED: ALL TOLERANCES PER GATES SPEC 081010.	
DR. BY HBC	CH. BY	ENG. CWR			
DATE 5-9-62	DATE	DATE 5-14-62			
				826-8707-001	

							FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS			826-8708-001	
								SCALE _____				
106	105	104	103	102	101	GR. No.	LIST OF PARTS					
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL	



CHAN. SWITCH  
S 12, +13 (S12 SHOWN).

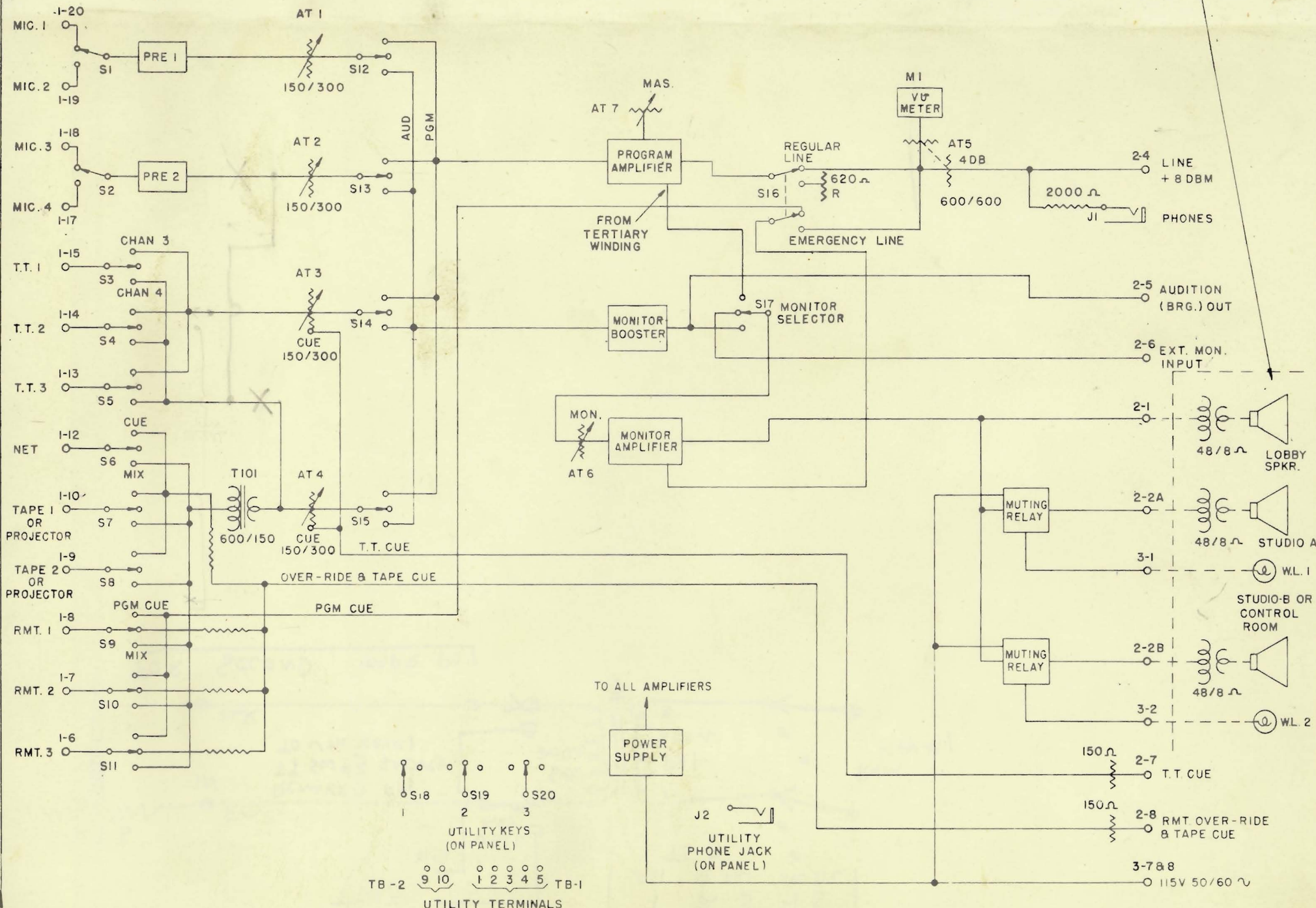
S14 + S15 SIMILAR  
EXCEPT INPUT CIRCUIT  
CONNECTS TO "IN" AND  
COMMON ON FADER  
602-0009-000  
A-10901-1  
CRL 1452

MIC. SELECTOR  
SWITCH S1, +S2  
(S1 SHOWN)

602-0007-000  
A-10900-6  
CRL 220-020

TITLE SWITCH DETAIL FOR STUDIOETTE				M538/A	
MTL _____		FIN. _____		UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC 68M102.	
DR. BY ABC DATE 5-7-62	CH. BY XYZ DATE 5-14-62	ENG. CLK DATE 5-14-62	826-8708-001		





CON 4-57  
 R/16-27-62 2  
 CORRECTED  
 8-7-62 1

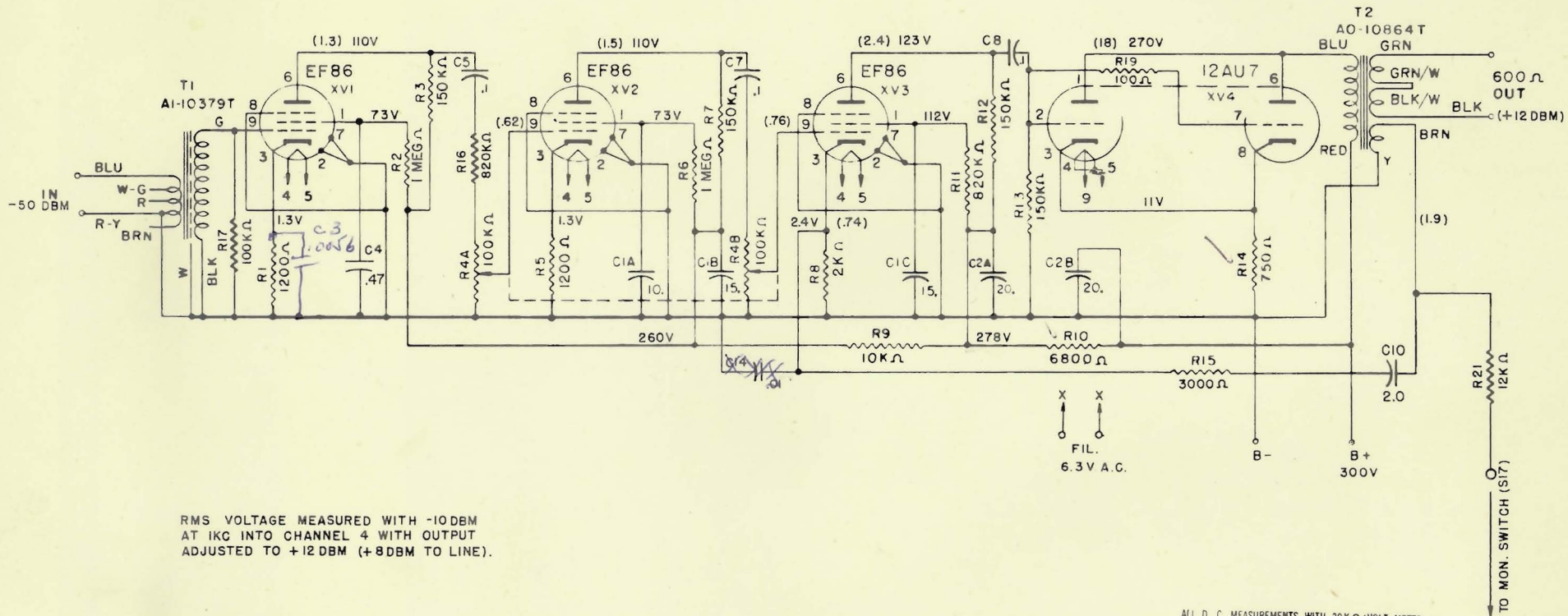
TB-2 9 10 1 2 3 4 5 TB-1  
 UTILITY TERMINALS

FUNCTIONAL DIAGRAM FOR  
 NEW STUDIOETTE CONSOLE M-5381A

						GATES RADIO COMPANY GURNEE, ILLINOIS		838-0009-012		
						SCALE		-		
108	109	104	103	102	101	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OF ASSEMBLY	DESCRIPTION	MATERIAL

NOTE:

R4A & R4B (EXTERNAL CONTROL)



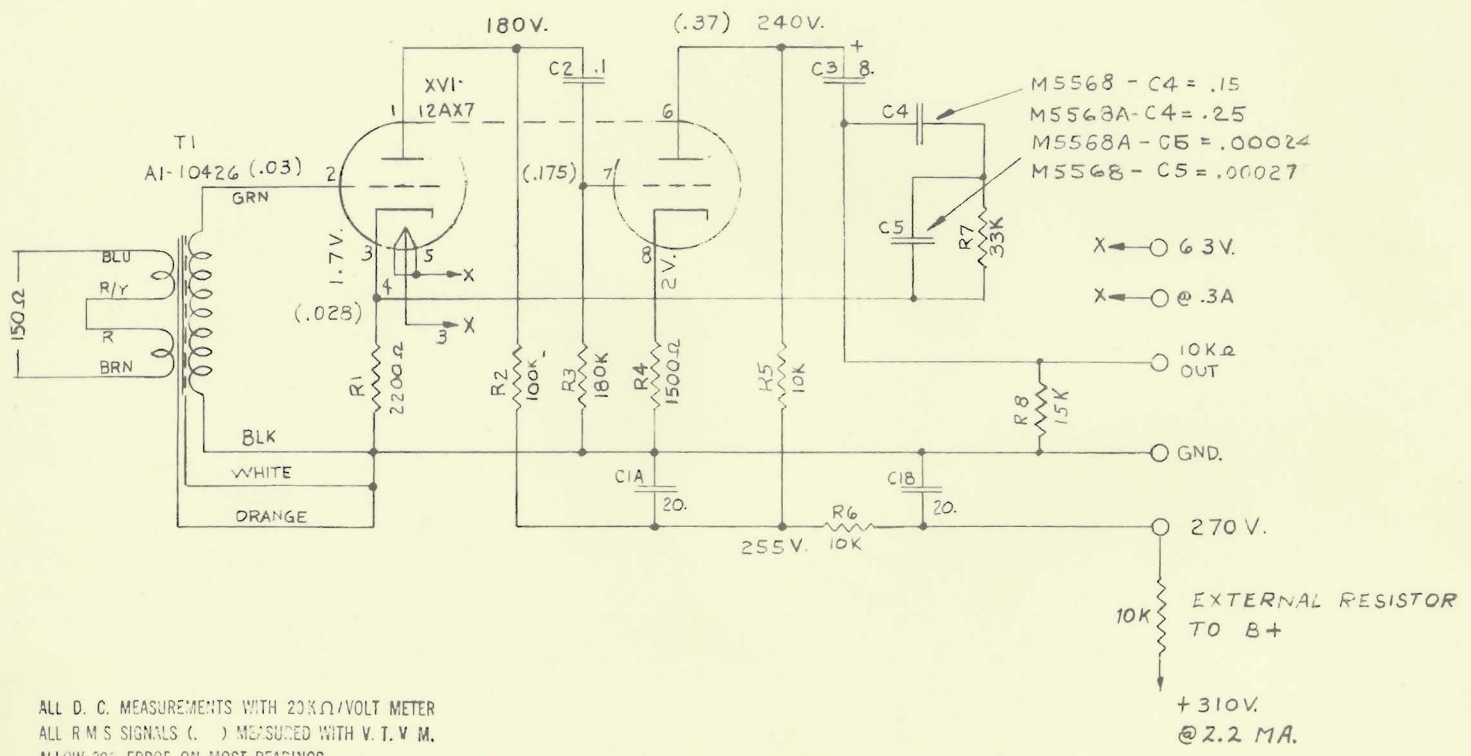
RMS VOLTAGE MEASURED WITH -10DBM  
AT 1KC INTO CHANNEL 4 WITH OUTPUT  
ADJUSTED TO +12 DBM (+8 DBM TO LINE).

ALL D. C. MEASUREMENTS WITH 20KΩ/VOLT METER  
ALL R.M.S. SIGNALS ( ) MEASURED WITH V. T. V. M.  
ALLOW 20% ERROR ON MOST READINGS.

TITLE				SCHEMATIC, M6142L PROGRAM AMPLIFIER FOR	
				M5381A STUDIOETTE	
MTL		FIN	UNLESS OTHERWISE SPECIFIED BY ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED		
DR. B. G. A.	CH. BY 407	ENG. R. D. D.			
DATE 12-27-61	DATE 12-25-61		838-0009-012		



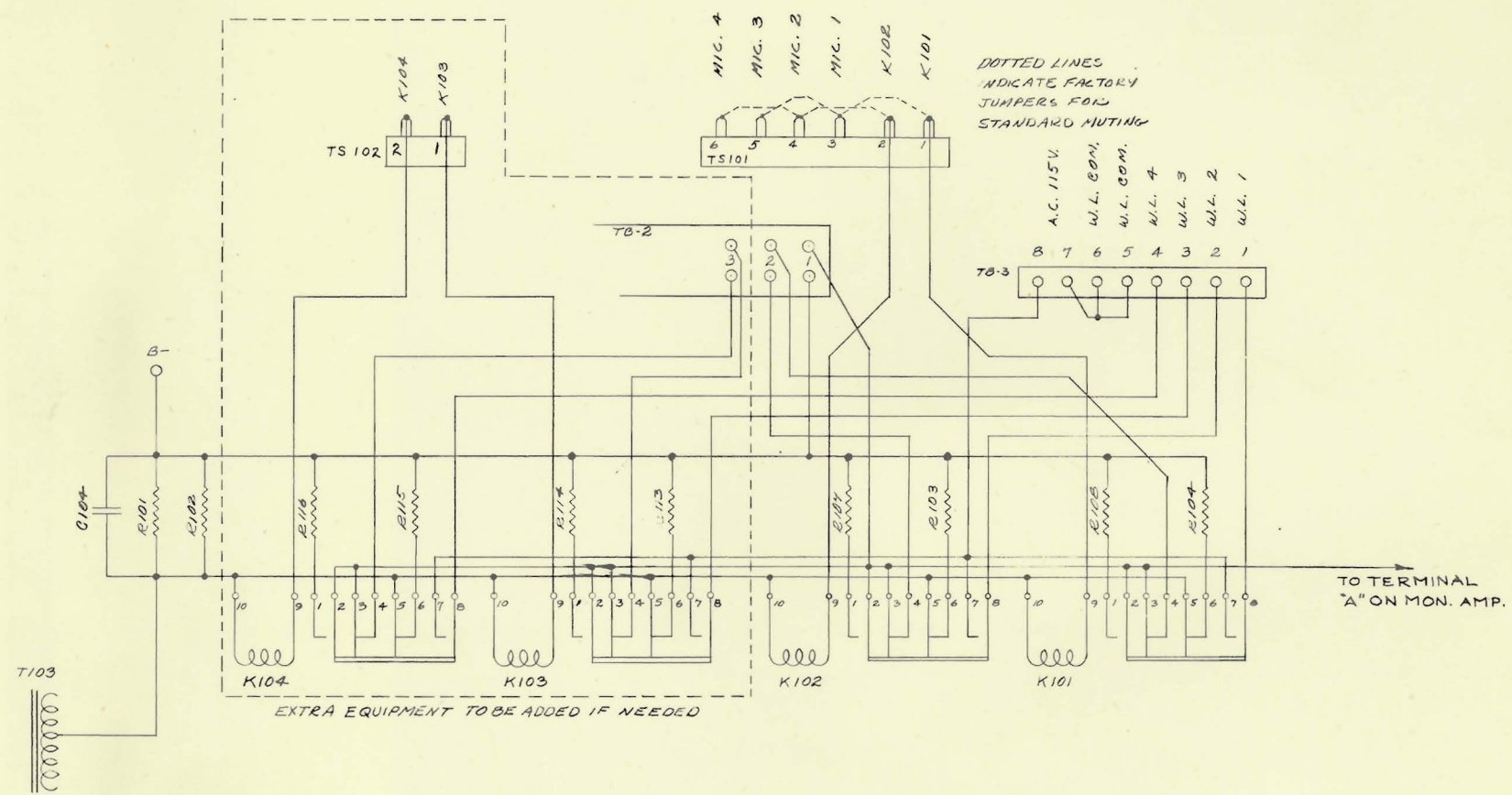
							FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS			B-65310
											SCALE
106	105	104	103	102	101	GR NO	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL



ALL D. C. MEASUREMENTS WITH 20KΩ/VOLT METER  
ALL R.M.S. SIGNALS ( ) MEASURED WITH V. T. V. M.  
ALLOW 20% ERROR ON MOST READINGS.

ECN 9018 3	RJ 2-26-62	ECN 7977 2	SA 11/2/59 1	TITLE	SCHEMATIC OF MONITOR BOOSTER AMPLIFIER M5568, M5568A		
				MTL	FIN.	UNLESS OTHERWISE SPECIFIED ALL TOLERANCES PER GATES SPEC. 65M102	
				DR. BY DATE	CH. BY DATE	ENG. V. W. DATE	B-65310

						GATES RADIO COMPANY QUINCY, ILLINOIS		C-77905 SCALE			
106	105	104	103	102	101	SR. NO.	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATERIAL



MODIFICATION DETAILS FOR ADDING RELAYS TO PROVIDE  
ADDITIONAL MUTING FOR M5381 CONSOLE

WITH 2 RELAYS AS FURNISHED (K101 + K102)  $R_{115} + R_{116} = 1200 \Omega$  2W  
 $R_{103} + R_{104} = 1000 \Omega$  2W

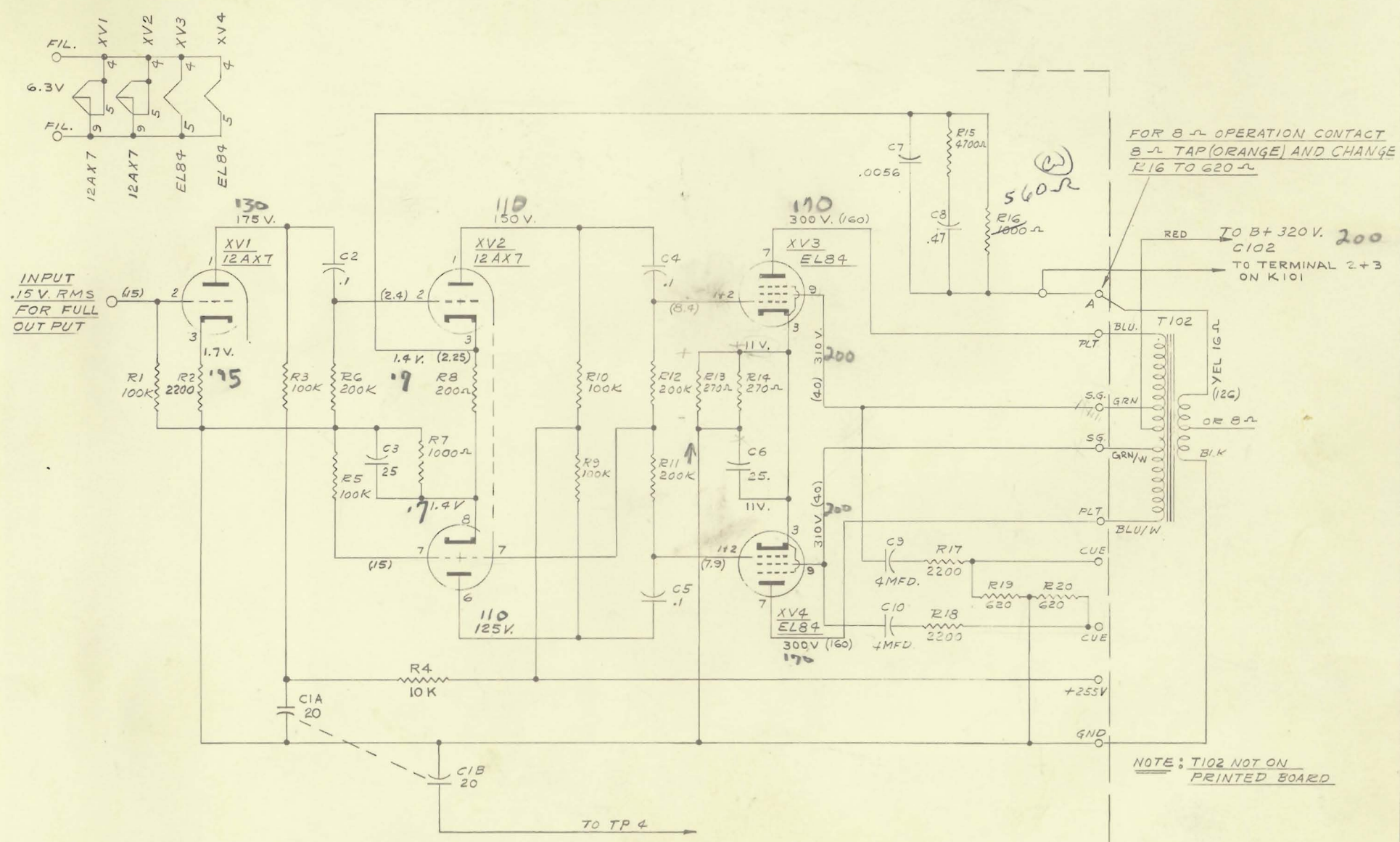
TO ADD 1 EXTRA RELAY (K103)  $R_{115}$  IS NOT USED  $R_{116} = 1500 \Omega$  2W  
 $R_{103}, R_{104} + R_{113} = 1000 \Omega$  2W

TO ADD 2 EXTRA RELAYS (K103 + K104)  $R_{115} + R_{116}$  ARE NOT USED  
 $R_{103}, R_{104}, R_{113} + R_{115} = 1000 \Omega$  2W  
 $R_{103}, R_{104}, R_{114} + R_{116} = 47 \Omega$  2W

1 APPROVED DATE 1/14/58	TITLE RELAY MODIFICATION WIRING INFORMATION FOR STUDIOETTE			M5381
	MTL		FIN.	UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS PER GATES SPEC. 80000
	DR. BY EJM	CH. BY	ENG. V.W.	C-77905
	DATE 1/14/58	DATE	DATE 5-58	



							GATES RADIO COMPANY QUINCY, ILLINOIS		C-77911		
							SCALE				
108	108	104	103	102	101	QTY.	QTY.	QTY.	QTY.	QTY.	
LIST OF PARTS							REFERENCE	PT. OR Q.N.	FIN.	DESCRIPTION	MATERIAL



NOTE:- VOLTAGES SHOWN ARE AS MEASURED ON M5381  
STUDIOETTE CONSOLE WITH 1000 CYCLE SIGNAL. GAIN  
IS SET FOR 10 WATT OUTPUT ACROSS 16 OHM LOAD

ALL D. C. MEASUREMENTS WITH 20KΩ/VOLT METER  
ALL R.M.S SIGNALS ( ) MEASURED WITH V. T. V. M.  
ALLOW 20% ERROR ON MOST READINGS.

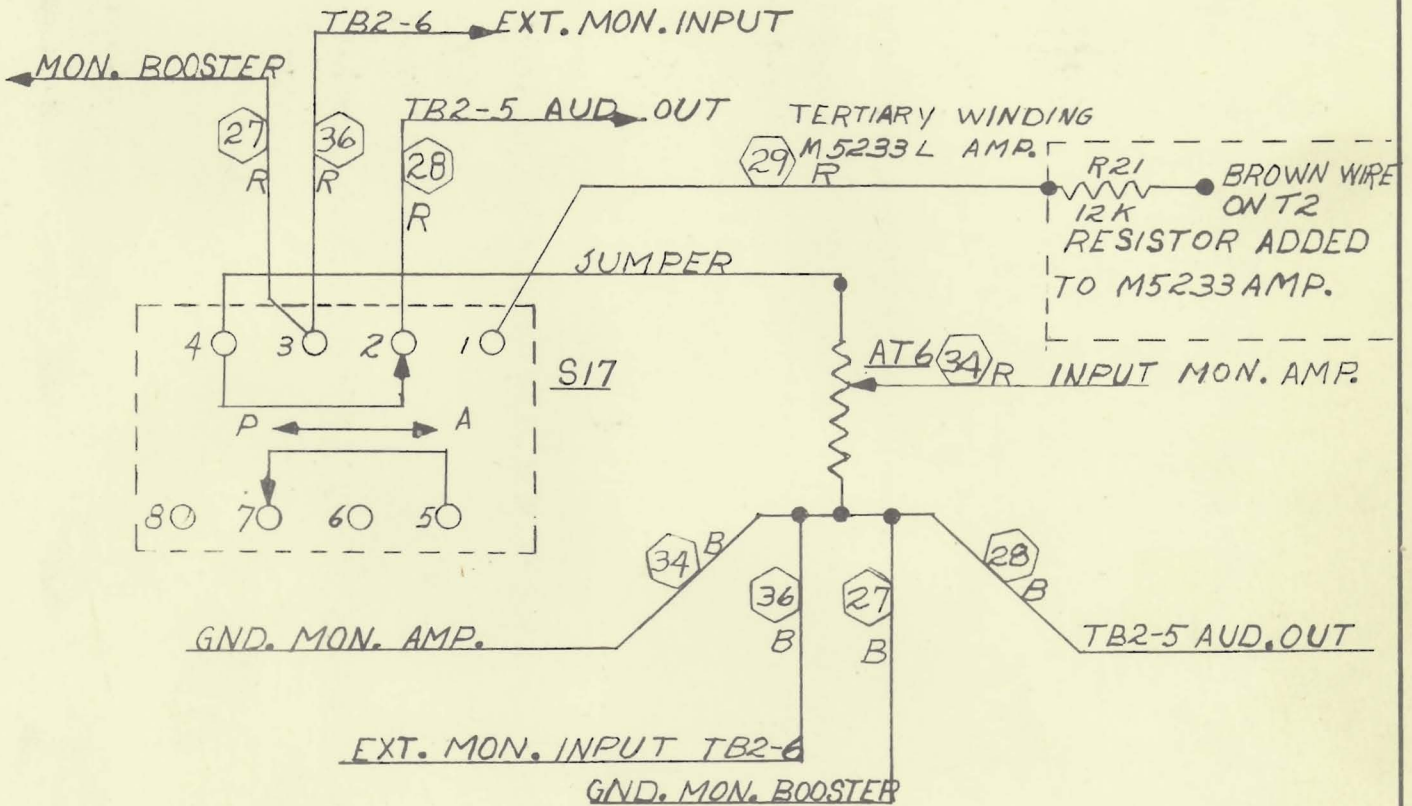
TITLE SCHEMATIC 10W. PRINTED BOARD AMPLIFIER FOR M5381		FIN.		UNLESS OTHERWISE SPECIFIED ALL TOLERANCES PER GATES SPEC. DRAWING
DR BY: WJC	CH BY:	ENG. V.W.	DATE: 1/1/58	DATE: 1/1/58
C-77911				



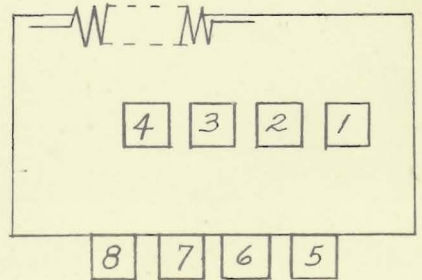


813 0934 001

					FIRST MADE FOR	GATES RADIO COMPANY QUINCY, ILLINOIS	A-30934		
							SCALE _____		
104	103	102	101	GR. NO.	LIST OF PARTS				
QTY.	QTY.	QTY.	QTY.	ITEM	REFERENCE	PT. OR G.N.	FIN.	DESCRIPTION	MATL.



602-0005-000  
A-10900-2  
CRL 220-021



REVISED + REDRAWN 6-5-62 RFH		1
STATUS		
DEVELOPMENT	PRODUCTION	
MECH. CHK.		
PROJ. ENG.	CWR CWR	
APPROV. PRODUCTION BY		

CH. BY	MTL.	TITLE	UNLESS OTHERWISE SPECIFIED, ALL TOLERANCES PER GATES SPEC GSM102.
DATE		WIRING DETAIL S17 SWITCH + AT6 ATTENUATOR - STUDIOETTE M5381	A-30934
DR. BY C.J.M.	ENG. KING	FIN.	
DATE 1-13-58			

813 0934 001

<u>Symbol No.</u>	<u>Gates Stock No.</u>	<u>Description</u>
R5,R6	540 0073 000	Res., 10K ohm, 1/2 W, 5%
R7	540 0196 000	Res., 33K ohm, 1/2 W, 10%
R8	540 0192 000	Res., 15K ohm, 1/2W. 10%
T1	478 0145 000	Transformer, Input
V1	370 0116 000	Tube, 12AX7
XV1	404 0059 000	Socket, 9 pin



PAD ASSEMBLY FOR STUDIOETTE

<u>Symbol No.</u>	<u>Gates Stock No.</u>	<u>Description</u>
R1	540 0021 000	Res., 68 ohm, 1/2 W. 5%
R2	540 0044 000	Res., 620 ohm, 1/2 W. 5%
R3	540 0066 000	Res., 5100 ohm, 1/2 W. 5%
R4	540 0055 000	Res., 1800 ohm, 1/2 W. 5%
R5	540 0062 000	Res., 3600 ohm, 1/2 W. 5%

BASIC PROGRAM AMPLIFIER, M6142L

C1	524 0079 000	Cap., 15-15-10 mfd., 450 V.
C2	524 0062 000	Cap., 20-20 mfd., 450 V.
C4	506 0026 000	Cap., .47 mfd., 200 V.
C5, C7, C8	506 0028 000	Cap., .1 mfd., 400 V.
C6		Cap., (Det. by Freq. Response)
C10	506 0009 000	Cap., 2.0 mfd., 200 V.
C3	516 0076 000	Cap., .0056 uf., 1 KV.
R1, R5	540 0179 000	Res., 1200 ohm, 1/2 W. 10%
R2, R6	540 0214 000	Res., 1 megohm, 1/2 W. 10%
R3, R7, R12, R13	540 0204 000	Res., 150K ohm, 1/2 W. 10%
R4	550 0198 000	Master Gain Control, Console R1
R8	540 0056 000	Res., 2000 ohm, 1/2 W. 5%
R9	540 0190 000	Res., 10K ohm, 1/2 W. 10%
R10	540 0188 000	Res., 6800 ohm, 1/2 W. 10%
R11	540 0213 000	Res., 820K ohm, 1/2 W. 10%
R14	540 0046 000	Res., 750 ohm, 1/2 W. 5%
R15	540 0060 000	Res., 3000 ohm, 1/2 W. 5%
R16	540 0119 000	Res., 820K ohm, 1/2 W. 5%
R17	540 0202 000	Res., 100K ohm, 1/2 W. 10%
R22	540 0049 000	Res., 1000 ohm, 1/2 W. 5%
T1	478 0143 000	Input Transformer
T2	478 0120 000	Output Transformer
V1, V2, V3	370 0144 000	Tube, EF86/6267
V4	370 0195 000	Tube, 12AU7A
XV1, XV2, XV3, XV4	404 0059 000	Socket

PRINTED WIRING, MON-BOOSTER AMPLIFIER

992 1292 001

C1A, C1B	524 0062 000	Cap., 20-20 mfd., 450 V.
C2	506 0028 000	Cap., .1 mfd., 400 V.
C3	522 0120 000	Cap., 8 mfd., 350 V.
C4	508 0033 000	Cap., .15 mfd., 200 V.
C5	500 0035 000	Cap., .00027 mfd., 500 V.
R1	540 0182 000	Res., 2200 ohm, 1/2 W. 10%
R2	540 0097 000	Res., 100K ohm, 1/2 W. 5%
R3	540 0205 000	Res., 180K ohm, 1/2 W. 10%
R4	540 0053 000	Res., 1500 ohm, 1/2 W. 5%

<u>Symbol No.</u>	<u>Gates Stock No.</u>	<u>Description</u>
S1,S2,S16,S18	602 0007 000	Lever Switch
S3,S4,S5, S6,S7,S8, S9,S10,S11, S17,S19,S20	602 0005 000	Lever Switch
S12,S13, S14,S15	602 0009 000	Lever Switch
T101	478 0009 000	Transformer
T102	478 0110 000	Output Transformer
T103	472 0056 000	Power Transformer
TB1	614 0376 000	Terminal Board
TB2	614 0377 000	Terminal Board
TB3	614 0075 000	Terminal Board
V101	370 0133 000	Tube, GZ34
V102	370 0001 000	Tube, OA2
V103	370 0002 000	Tube, OB2
XF101	402 0022 000	Fuseholder
XV101	404 0016 000	Socket, MIP-8T
XV102,XV103	404 0037 000	Socket, 7 pin. min.

10 WATT MONITOR AMPLIFIER, PRINTED BOARD ASS'Y.

C1A,C1B	524 0062 000	Cap., 20-20 mfd., 450 V.
C2,C4,C5	506 0028 000	Cap., .1 mfd., 400 V. (min. lead length 1/4")
C3,C6	522 0289 000	Cap., 25 mfd., 25 V. (min. lead length 1/4")
C7	508 0143 000	Cap., .0056 mfd., 400 V. (min. lead length 1/4")
C8	506 0026 000	Cap., .47 mfd., 200 V. (min. lead length 1/4")
C9,C10	522 0129 000	Cap., 4 mfd., 450 V.
R4	540 0190 000	Res., 10K ohm, 1/2W, 10%
R1,R3,R5, R9,R10	540 0202 000	Res., 100K ohm, 1/2 W, 10%
R2,R17,R18	540 0182 000	Res., 2200 ohm, 1/2 W, 10%
R6,R11,R12	540 0104 000	Res., 200K ohm, 1/2 W, 5%
R7,R16	540 0178 000	Res., 1000 ohm, 1/2 W, 10%
R8	540 0032 000	Res., 200 ohm, 1/2 W, 5%
R13,R14	540 0733 000	Res., 270 ohm, 2 W, 10%
R15	540 0186 000	Res., 4700 ohm, 1/2 W, 10%
R19,R20	540 0044 000	Res., 620 ohm, 1/2 W, 5%
T102		Output Transformer (Part of overall assembly)
V1,V2	370 0116 000	Tube, 12AX7
V3,V4	370 0143 000	Tube, EL84
XV1,XV2, XV3,XV4	404 0059 000	Socket, 9 pin



PARTS LIST

<u>Symbol No.</u>	<u>Gates Stock No.</u>	<u>Description</u>
AP1,AP2	994 5215 001	Preamplifier, printed wiring
AT1,AT2	554 0234 000	Attenuator, 150/300 ohms
AT3,AT4	554 0235 000	Attenuator, 150/300 ohms w/Cue pos.
AT5	937 7942 002	VU Matching & Isolation Pad
AT6	550 0160 000	Control, 10K ohm
AT7	550 0198 000	Dual Control, 100K ohm
C101,C102, C103	524 0062 000	Cap., 20-20 mfd., 450 V.
C104	522 0299 000	Cap., 250 mfd., 50 V.
C105	506 0007 000	Cap., .5 mfd., 200 V.
	506 0005 000	Cap., .1 mfd., 200 V. (used on S12 & S13) (S1 & S2)
F101	398 0020 000	Fuse, 3 amp., 3 AG
J1,J2	612 0284 000	Phone Jack
K101,K102	572 0072 000	Relay
L101,L102	476 0012 000	Filter Reactor
M1	630 0072 000	VU meter, B Scale, Model 142, illuminated, (Cal. for non- mag. panel)
R101,R102	540 0613 000	Res., 1200 ohm, 2 W, 5%
R103,R104	540 0611 000	Res., 1000 ohm, 2 W, 5%
R105	540 0073 000	Res., 10K ohm, 1/2 W, 5%
R106	540 0104 000	Res., 200K ohm, 1/2 W, 5%
R107,R108	540 0724 000	Res., 27 ohm, 2 W, 10%
R109	552 0541 000	Balance Control, 100 ohm, 3 W, Wirewound
R110	540 0628 000	Res., 5100 ohm, 2 W, 5%
R111	552 0013 000	Res., 150 ohm, 10 W, Adj.
R112	540 0468 000	Res., 1000 ohm, 1 W, 10%
	540 0043 000	Res., 560 ohm, 1/2 W, 5% (Used on S12,S13,S14,S15)
	540 0033 000	Res., 220 ohm, 1/2 W, 5% (Used on S12,S13,S14,S15)
	540 0031 000	Res., 180 ohm, 1/2 W, 5% (Used on S8,S9,S10,S11)
	540 0056 000	Res., 2000 ohm, 1/2 W, 5% (Used on S16 Wiring Diagram)
	540 0029 000	Res., 150 ohm, 1/2 W, 5%
	540 0190 000	Res., 10K ohm, 1/2 W, 10% (for Mon. Booster B+)
	540 0044 000	Res., 620 ohm, 1/2 W, 5% (Used on S16 Wiring Diagram)
R113	540 0210 000	Res., 470K ohm, 1/2W, 10%
R114	540 0043 000	Res., 560 ohm, 1/2W, 5%

cuits of the console. The Gates #572 0001 000 relay may be used as a slave relay for this operation. It has a low current 115 volt, 60 cycle coil and has one set of A (normally open) contacts. The contacts may be used to parallel the normal turntable or tape machine contacts. The machines may be cued in advance, then switched on from the console. Most tape machines have full remote control facilities available in the form of a small remote control box or switches. Investigate these before modifying the console.

We would like to emphasize that all modifications be carefully studied for possible sources of operational or technical trouble before starting the job. Sufficient time must be allowed to permit the modification to be installed and thoroughly checked before it is used. Make a permanent record of the modification by making drawings (or marking existing drawings) and any written description that will help you remember all of the details. The record should be sufficient to enable other members of your staff to understand it also. Explain the new operation to the operators so that they will not make mistakes. Include all necessary parts on your maintenance schedule.

#### ORDERING REPLACEMENT PARTS

When ordering a replacement component, please refer to the parts list in this instruction book. Identify the component by its symbol number and, if possible, its Gates part number. The type number (M5381A Studioette) of equipment in which the part is used is also necessary. This procedure will insure the customer of receiving the correct component and at the earliest possible date.



tables, install the preamplifier in Channel 1 as described under "Additional Microphone Channels". The inputs may be connected for 30/50 ohms or 150/200/250 ohms. The output must be connected for 150 ohms to match the input to the channel attenuator.

#### UTILITY SWITCHES

These switches may be used to expand any section of the console to fit your particular installation. Utility terminals are provided on the rear of the console that can be used with these switches. A maximum voltage of 310 volts D.C. or 230 volts A.C. may be applied to the switches. The maximum current on the switches should be limited to 100 ma., A.C. or D.C. All wires carrying A.C. should be twisted shielded pair and the wire should be physically isolated from program carrying lines as covered under "Installation". Switch contacts carrying voltages in excess of 25 volts (or connected to circuits that grounding would cause damage to components or the supply) should be insulated by the use of spaghetti, plastic tape or a suitable cover.

Utility switch 1 (S18) may be wired into Channel 3 to switch between the added preamplifier, for a third microphone channel and the regular turntable inputs. Muting can also be cut in for the mic. position. See action on "Adding Microphone Channels".

If it is desired to switch additional microphones into other channels, the three position utility switches may be used, if the muting is not switched.

Utility switches, used with bridging pads, may feed signal into one of several tape recorders from the program line. They may also be used to direct the output of the audition but to several recorders, as explained in section labeled "Input to Tape Recorders" (under the chapter "Theory of Operation"). They may also be used to expand the tape play back facilities, if the two standard switches are insufficient. They may be wired in the same manner as the standard switches, or they be used as three position selectors to feed one of the standard switches.

The utility switches may be used to expand the remote line facilities. They may be wired as three position selectors into a standard remote line switch and the talkback facilities retained when the proper line is selected. Perhaps a better method of handling more remote lines would be to bring them into a patch panel and patch them into the regular remote line input switches.

Control of turntable and tape machine motors may be accomplished with the utility switches if suitable slave relays are used for the actual control.

The motor currents should not be switched directly since the inductive surges would probably damage the switch contacts and the currents may induce hum in the program cir-



## MODIFICATIONS FOR EXTRA FACILITIES

Normal speech input facilities are included in the Studioette Console. Yet, some installations may require facilities that are not common. Thus, this chapter is devoted to a summary of the modifications available, and some of the suggested uses. Plan your modifications carefully. Allot sufficient time for completion so that it will be well executed and not be a source of trouble.

### ADDITIONAL MICROPHONE CHANNELS

Two microphone preamplifiers are standard on the Studioette Console. Channel 3 or Channel 4 can be converted to a microphone channel by the addition of a preamplifier in the space provided on the chassis.

Order a Gates M5304A Preamplifier Kit. Install the preamplifier and shield in the space provided, next to the other preamplifiers. Jumper the B+, B- and filament feed from the adjacent preamplifier. Complete the wiring exactly the way the other channels are wired.

It is suggested that switch S18 be wired to AT3 so that, with the lever down, Channel 3 becomes the extra microphone channel. This switch would also provide muting for the microphone when in this position. The actual muting however, would be controlled with channel switch, S14. With switch, S18, up Channel 3 would be used as a turntable channel in the regular way, or as originally furnished. In this position, no speaker muting would take place. See drawing 826 8710 001 for details on wiring.

Some of the wiring for the muting circuit has been made on the channel key switch, S14. A .1 mfd., 200 V. condenser will have to be connected between contacts 5 and 11. See drawing 826 8708 001. A shielded lead will have to be connected from the preamplifier input, to one of the spare terminals on the rear of the console, for connecting the microphone. The muting wire must be connected to TS101 (#1 or #2), according to which muting relay is to function with this new microphone channel. See drawing 826 8710 001.

### ADDITIONAL SPEAKER MUTING RELAYS

As many as two additional speaker muting relays can be installed in the Studioette. Mounting holes are provided for these relays on the chassis. Instructions for connecting these relays are furnished on drawing C-77905. Order Gates #572 0072 000 for the extra relays.

### TURNTABLE PREAMPLIFIERS

If the installation demands that the turntable preamplifiers be mounted in the console, and the two preamplifiers are not used for microphones, they may be used for turntables. If Channel 2 and 3 are to be used for turn-



Decoupling capacitors may be checked by testing the console at maximum gain as outlined in the specification section. If any decoupling capacitors are defective, oscillation or motor boating will occur. Parallel each section of the capacitors individually with the rated capacity (or close to rated capacity). Replace capacitors that need the additional capacity to prevent oscillation. Caution must be used when checking the monitor amplifier circuit, 100 db gain must not be exceeded or the test is not valid and oscillation may occur with all good components.

Filament Bias Voltage - +20 Volts D.C.  
 Line Power Consumption - 10 Watts  
 Power Supply Load - 124 MA - 1.6 MA Booster Amp.  
                           2.4 MA Mon(regulated)  
                           82 MA  
                           10 MA Preamplifiers (2)  
                           17 MA Program Amplifier  
                           11 MA VR Tubes  
  
                           124 MA

### OTHER COMPONENTS

The channel attenuators are low impedance attenuators. They require cleaning about four times a year in the average location. A well air-conditioned room would allow longer periods between cleaning then. A very dusty location would require more frequent cleaning. The attenuator contacts should be cleaned and lubricated by using Davenol (sometimes called Daven Oil). A soft lint-free cloth should be used to remove the dirty accumulation from the contact surfaces. Davenol is inexpensive and may be purchased from the Gates Radio Company.

Relays in the console are high quality telephone type. They are selected for long life and trouble-free service. The contacts are self-wiping and everyday use will keep these contacts burnished. Contacts on the relays that receive infrequent service can be cleaned by operating the relays several times. Periodic operation of unused equipment will keep the contacts clean. In case of stubborn trouble use a contact burnishing tool, Gates' TM-1, is listed in the general catalog. Abrasive papers, files, grease or oil, and grease solvents should never be used on these contacts. Grease or oil would cause them to collect dust, get gummy and cause contact burning and possible failure.

The Centralab lever keys have excellent wiping action and will probably not require any cleaning. If one of them is damaged, it is better to replace it than to attempt to repair it. Use the parts number for the description, if it is necessary to order a new one.

Electrolytic capacitors have been perfected to the point where they are subject to little maintenance. If one does become defective, it is better to catch it in routine maintenance than to let it cause loss of air time. The main filter condensers can be checked by shunting each of them in turn with a new one. If the power supply voltage increases 10 volts or more, the condenser under check should be considered unfit for service. C104, the 250 V. 50 mfd. capacitor, may also be checked by shunting it with a new capacitor. The voltage should be approximately 35 volts. If the new capacitor makes a change of 3 V. or more, replace C104.



to the monitor amplifier. This makes it possible to switch the monitor amplifier from "program" to "audition" without change in level.

B-65310 is the schematic diagram of this amplifier. The output is unbalanced. It is brought out to terminals TB2-5 and could be used to feed an external bridging monitor amplifier or a tape recorder. (See following paragraph)

#### INPUT TO TAPE RECORDER

The audition bus output can be used to feed a tape recorder. It is picked up on TB2-5. This bus can be fed with the input channels that are not being used on the program bus.

The level of this bus (through the Monitor Booster Amplifier) is the equivalent of 0 DBM and the impedance is 10,000 ohms. The recorder input impedance should be at least 20,000 ohms bridging, and must not be grounded, so that it will not destroy the one point ground system.

The recorder input should be bridged on the output of the program line for simultaneous broadcasting and recording. The recorder input must be at least 20,000 ohms bridging and balanced.

#### POWER SUPPLY

The power supply is built up on the right rear of the chassis. See schematic drawing C-77912.

The relay power is obtained from the voltage drop across the resistors and equipment (total resistance of 270 ohms) located electrically between center tap of the high voltage winding of the power transformer and ground.

Two relays are used for speaker muting. These relays have one set of B (normally closed) and one set of A (normally open) contacts connected to form a set of D (make before break) contacts. This set of D contacts is used to load the amplifier and break the speaker connection. An additional set of A contacts energize the warning lights when the speaker is muted. An additional set of B contacts substitute a resistance load for the relay coil when the relay is non-energized, keeping the relay load constant.

As many as four monitoring speakers, with 48 ohms to voice coil matching transformers, will match the amplifier loading without making any changes in the amplifier. More than four speakers will make it necessary to change the amplifier output to 8 ohms. There is an 8 ohm tap on the amplifier output transformer. R16, on the lower side of the amplifier board, will have to be changed from 1000 ohms to 620 ohms to maintain the amplifier characteristics. See drawing C-77911.



doubt be necessary to switch one of these inputs off temporarily to avoid confusion of two signals. The remote switches feed the cue amplifier whenever they are in the center position. This circuit can be disabled by throwing the switch to "Pgm. Cue" position. The "Tape cue circuit" is disabled when the tape switch is in the center. The "turntable cue" input can be disabled by turning the fader clockwise, just out of the "cue" position.

#### SWITCH DETAILS

Switch details are shown on Gates drawings 826 8706 001, 826 8707 001, 826 8708 001, 826 8709 001 and 826 8710 001. They show the physical location of the contacts, as viewed from the rear of the switch. The use of these prints, along with the functional diagram 838 0100 001 will explain most switching functions. Drawing C-77912 shows details of the relay switching along with the microphone channel switches.

#### MIXING SYSTEM

The mixing system consists of a four channel mixer utilizing ladder type controls connected in a parallel, minimum loss type of mixing circuit.

#### PREAMPLIFIER

(See separate instruction sheet in this book).

#### PROGRAM AMPLIFIER

The M6142L Printed Chassis Program Amplifier has four stages. The first three stages all use a pentode connected EF86/6267 tube. The output stage uses a parallel connected 12AU7. Negative feedback, from a separate winding on the output transformer, is applied to the cathode of V3. The master gain control is a tandem connected, high impedance interstage control (R4A-R4B). It is electrically connected between the first and second, and the second and third stages. The correct position of this control keeps the signal to noise ratio acceptable.

#### V.U. METER AND ISOLATION PAD

A four inch illuminated VU meter is compensated so that it indicates zero when an audio level of +8 VU is being fed into a 600 ohm program line. The V.U. meter is isolated from the external program circuit by a 4 db isolation pad. This pad isolates the meter from the various telephone line reactances that would cause erroneous readings at various audio frequencies.

#### MONITOR BOOSTER AMPLIFIER

In this console the monitor booster amplifier is used to bring the audition bus up to the level of the program input



## PRINCIPLES AND THEORY OF OPERATION

This section is presented to give the engineer more detail on any unusual operation of part of the console. It is hoped that it will give the engineer a complete understanding of all the circuits and enable him to maintain and troubleshoot the console.

### FREQUENCY DETERMINING COMPONENTS

The M5381A Studioette is a speech input system in itself, and as many as three amplifiers are cascaded in some operations. The frequency response of each would have to be nearly perfect to allow this cascading, yet keep the system within specifications, since any deviation will add. Slight deviations in response do occur in the production of the amplifiers so compensation must be employed to make each console meet specifications.

In some of the amplifiers this compensation is standard enough to give the normal value of the capacitor (small capacitors are generally used to compensate for response deviations). In some cases it will be given an X value, determined by frequency response. In rare cases a standard value will be deleted or changed, or a capacitor will be added where none is shown, on the schematic diagram. Also, in rare cases, the value of a resistor must be changed to bring the system within specifications. The console, as you receive it, will be within all specifications. Each one is given a complete test. The component deviations that you may encounter are to make it perform accurately. They are not errors. Do not change them unless you are compensating for abnormal conditions external to the console. If you need special compensation in your application, and do not know the best way to obtain it, contact the Engineering Department of Gates Radio Company. Have the complete details at hand and we will be happy to give assistance in solving it.

### CUE AMPLIFIER CONNECTIONS

Two connections are provided for an external cue amplifier. These connections are both loaded with 150 ohms. These circuits can not be combined because the "turntable cue" circuit is unbalanced, and the "over-ride and tape cue" circuit is balanced.

The M5377 Unique amplifier is ideal for use on these cue circuits. The input transformer to this amplifier has two isolated input windings, which make it possible to combine these circuits in the transformer and feed them into a common amplifier. The two 150 ohm load resistors on these cue circuits should be removed when such an amplifier is connected.

This amplifier uses a common volume control. It will no



Two signals would cause a mis-match in the circuit and individual control of the levels would not be possible.

The operator at the remote facility can call in and the control operator can talk back to him on the audition channel. This will be covered later in this section, under "Channel 1 through 4".

#### UTILITY SWITCHES

Three utility switches are provided. They are not factory wired and are for the customer's convenience for his special circuits. Their possibilities and limitations will be listed in the section "Modification for Extra Facilities", and their use will be determined and explained by the station engineer.

#### V.U. METER

The V.U. meter is calibrated to feed +8 VU into a 600 ohm line when the meter reads 0 VU or 100%. The station engineer should instruct the operator concerning the proper level desired as read on the meter. Normally, +8 VU is the proper level to feed into the telephone line.

#### CHANNEL 1 THROUGH 4

The four mixing channels are on the lower left of the Studioette panel. The channel switches connect the output of the channel mixer to the audition bus in position A, and to the program bus in position P. Throwing the key, to either A or P, operates the proper speaker muting relay to prevent acoustical feedback. Very rapid switching may connect the microphone before the speaker is cut off, because of the mechanical inertia of the muting relays. Both the audition and program mixing busses are compensated so that any number of channels may be mixed without inter-action between controls.

The controls are step type and calibrated in 2 db steps, tapered to infinity. They are normally adjusted to position 12 for best operation with normal input levels.

The channel attenuators, for Channels 3 and 4, have a "cue" position. This is one step counterclockwise from the "off" or infinite position. When rotated to the "cue" position, the signal from the turntable is connected to the turntable cue circuit. This circuit is applied to terminals on the rear of the console (TB2-7) to which an external speaker and amplifier, or phone jack can be connected. This allows a cue or preview of the signal when these mixers are set in the "cue" position.

At this point it might be well to point out that there are two circuits to which an external amplifier and speaker should be connected. The one for the turntable "cue" is



Since Channel 4 is used for network, tapes, and remotes (as well as a turntable position) plan ahead so that the last turntable preceeding a tape, remote or net is played on Channel 3.

If the turntable is followed by a live microphone this sequence planning is not required. The only reason for power sequencing is to allow fading out one program source and fading in the next one instead of abrupt switching.

#### NET AND TAPE SWITCHES

To the right of the turntable switches are the net and tape switches. The first switch in this group is for network. The other two are for tape 1 and 2.

These lever switches connect the equipment to the "external cue" terminals in the up position. A cueing amplifier may be connected to terminals (TB2-7) on the back of the Console. The cueing amplifier is extra optional equipment. See Gates "Unique" in the catalog. It was designed for use with this console.

The center position of these switches is "off", and the down position connects the equipment into the Channel 4 mixer.

#### REMOTE SWITCHES

There are three remote input switches. A remote line can be permanently connected to each of these switches. A more flexible practice would be to connect at least one of these remote circuits to jacks, so that various remote lines can be patched into them as required.

When these switches are in the center position, the remote line is connected to the "over-ride" and "Tape Cue" circuit. This is the same circuit mentioned in the section on the tape switches for "tape cue". It is a terminal to which an external amplifier and speaker may be connected, or it may be wired to a phone jack. This circuit makes it possible to listen to the remote circuit for preview purposes. It also gives the operator (at the remote end) facilities for calling in, when his equipment is set up and ready. This is possible only when the remote switch lever is in the center position.

Switching the remote switches to the up position will feed "program cue" to the remote line. When the switch lever is down, the remote program is fed into the mixer. The gain is then adjusted with the Channel 4 mixer.

Since there is more than one remote switch, it is possible to use one switch for a remote on the air, while a second remote is being set up. Although possible, it is not good practice to feed both remotes into the mixer at one time.



on the under side of the chassis. See drawing C-77912.

#### WIRE SIZE

#16 AWG is recommended for the 115 volt a.c. input line. All other wiring may be as small as #24 AWG with no bad effects. Adequate insulation must be provided for all wiring 600 volt insulation would suffice in all cases.

The warning lights are supplied with 115 volts a.c. out of the power deck. One side is switched with the muting relay, one side is common. It is recommended that lights of over 60 watts should not be used. This would cause excessive arcing in the relay contacts. Studio A: Warning light 1, connect one side only to TB3-1. Studio B (or control): Warning light 2, connect one side only to TB3-2. Connect the other side of both lights to TB3-5 or 6. The common side must not be grounded. See drawing C-77912.

#### OPERATION

The M5381A Studioette Console is very functional in design. This makes it simple to operate, once the various switching operations are understood.

#### MICROPHONE SELECTOR SWITCHES

The two microphone switches are at the upper left of the panel. These are two position switches. The first selects between microphone 1 and 2 for the Channel 1 input. The lever is up for microphone 1 and down for microphone 2. Similarly, the second switch selects between microphone 3 and 4 for the Channel 2 input.

The muting relays are interconnected, between the channel and the microphone switches, in such a manner that the proper speaker is muted whenever a microphone is switched on. As previously outlined, the speaker muting can be connected according to the location of the microphone. As factory wired: Microphones 1 and 3 are wired for muting the speaker in Studio A. Microphones 2 and 4 are wired for Studio B (or control room).

#### TURNTABLE SWITCHES

There are inputs for three turntables. A three position switch is provided for each of these inputs. With switch lever up, the turntable is connected into Channel 3. With the lever down, it connects the turntable into Channel 4. The center is the "off" position. Any of the three turntables can be operated into Channel 3 or Channel 4. Always plan ahead when using these channels for the turntables. A typical example would be: Turntable 1 is playing on Channel 3. TT2 will follow on Channel 4. TT3 follows TT2 on Channel 3. Then a taped announcement is fed into Channel 4.



separate cables.

Avoid running cables of a different level classification in the same conduit, if possible. If it is necessary to use cables of different levels in a common conduit, the difference between the lowest and the highest level in the two cables should not be greater than 40 db. Use high quality shielded twisted pair for all audio wiring, such as Gates catalog number 1261. All microphone, and long medium level runs should be made in insulated shielded pair with rubber, plastic, or cloth covering over the shielding. This eliminates the possibility of ground loops, and the noise problems that accompany such conditions. Number 8440 (Gates catalog number) microphone cable is recommended for all such conduit runs.

Physical isolation is the best way to avoid trouble between parallel cables. Six inches, or more, spacing is preferred. If space does not permit this isolation, at least keep the cables of different level classifications laced separately. Better isolation is achieved, even though the cables are in close proximity, if the circuits of different levels are laced separately. Deviations from these preferred methods must not be taken lightly. Deviations should be made only as a last resort, and not as a matter of convenience.

The terminal board placement is arranged to allow separation for various levels. The microphone cables connect to the right side (looking from rear) on TB1. The center of TB1 has the medium level terminals. The higher level circuits are on TB2. TB3 carries the A.C. connections. Utility terminals are located between the medium and high level circuits on TB1 and TB2. Ground studs are spaced below the terminal boards for connecting the shields of external cables.

The shielding of conduit is sufficiently effective that isolation of conduits carrying different levels is unnecessary. Conduits carrying microphone cables can be run adjacent to those containing speaker level cables without danger of crosstalk. If practical, however, it is advisable to maintain physical separation and add to the safety of the installation. Power circuits, especially those with high current, should not be in close proximity with program carrying conduit. This is because the electro-magnetic shielding in most conduit is poor.

#### GROUNDING CIRCUITS

Circuit grounding is unpredictable to a certain extent. No hard and fast rules apply 100% of the time. In this section it is attempted to cover the things to avoid. Certain general practices will be presented that will always give good results, or allow good results to be obtained with minor modifications. Entirely different approaches to this



program line. The other is a utility jack that can be wired to any circuit by the user.

Other utility equipment includes three key switches and eight spare terminal pairs, on the terminal board at the rear of the Console.

All connections to the Console are made through terminal strips, on the back of the Console.

Two speaker muting relays are provided. They can be connected to mute either of two speakers, probably the control room and studio speakers. Provision is made for installing two additional relays, if required.

This introduction has touched on some of the more important points of the Console to give general information without excessive details. Those concerned with daily operation should carefully study the section labeled "Operation". The installation crew should study their section before actually starting work. Each section is broken down to cover different phases so that unnecessary confusion is eliminated, and the answer to any particular question may be easily found. The engineering staff is urged to become acquainted with all sections, so they can advise other groups in the best performance, as well as being able to keep the Console in top operating condition.

### INSTALLATION

The following items will be enclosed in the packing box:

1. Console, with tubes installed.
2. A-31034 Kit for Cementing Knobs.
3. #888 0777 001 Instruction Book for M5381A Studioette Console.

The base of the cabinet has large dimples pressed to raise it from the desk surface. Each of these dimples have holes in them to permit the use of wood or sheet metal screws in fastening the cabinet to the desk. Before any drilling is done, cable routing and isolation must be planned. Keep in mind that the connections to the Console are made on the rear of the cabinet.

### CABLE AND CONDUIT LAYOUT

Cable and conduit layout is very important so it should be very carefully planned. An installation hastily made, with out thought, is a continuous source of trouble until it is rebuilt.

The matter of signal levels is of prime importance. A low level cable can include circuits from -60 dbm to -20 dbm. A medium level cable may include levels from -20 dbm to +14 dbm to +40 dbm. The 115 volt a.c. lines should be run in



## INTRODUCTION

The M5381A is an entirely self-contained speech input system. While it is not as elaborate as some Gates Consoles it does incorporate sufficient circuits to make it a very flexible speech input system. It fills the need of many program requirements: broadcasting, recording, or any installation requiring a fine quality speech input system. See functional drawing for facilities.

The entire unit is housed in a metal cabinet of modern design. The top cover is removable, and the front panel is hinged, to provide access to the equipment. The printed circuit amplifiers and various other components are mounted on a hinged chassis to provide accessibility to the underside of the chassis.

Facilities include two microphone channels (one additional microphone channel can be added). Each of these two channels has a switch for selecting two microphones. This provides input facilities for four microphones.

The Console has two high level channels. Channel 3 is 150 ohms unbalanced for turntables. Channel 4 provides another unbalanced 150 ohm input for turntables, plus a 600 ohm balanced input for net, tape recorders or remote lines. Both of these channels have cue type faders. The cue circuit is wired on terminals for connecting to an external amplifier and speaker, if desired.

Three turntable inputs are provided with switches connecting them to either Channel 3 or Channel 4. Switches are used on each of the six (600 ohm) balanced inputs to Channel 4. These provide one input for net, two inputs for tape recorders and three inputs for remote lines.

The remote over-ride, net and tape cue circuits are combined to feed an external amplifier and speaker, if desired. They may be connected to the utility phone jack for headphone operation.

The Console has an audition channel, so any of the input circuits can be previewed or checked independently of those used on the program channel. There is a three position monitor input switch on the panel to select program, audition, or an external monitoring source.

Provision is made for emergency program feed from the monitor amplifier. This feature disables the program cue circuit, to the remote switches, when it is used.

Other controls on the panel include the monitor gain and master program control.

There are two headphone jacks. One is for monitoring the



## MAINTENANCE

Without routine maintenance even the finest equipment soon becomes erratic or inoperative. The M5381A Studioette is no exception to this rule. The maintenance schedule is subject to conditions that vary with each installation. It must be planned by the station engineer. Most stations set up a schedule similar to automobile service schedules. Some sections receive maintenance on a basis of every week, other sections on a basis of every two weeks or a month. Proof of performance measurements are taken at least every six months. We strongly recommend that the station engineer plan a routine maintenance program and make every effort to follow it carefully.

Present day vacuum tubes are very reliable compared with those of a few years ago. Yet, some fail in a relative short time due to some defect in it or from rough handling. In the design of the console every effort was made to keep all components, including tubes, well below maximum ratings. Unless some component has suffered a major change, the circuitry will not cause tube failure. Routine dynamic or emission tube checking will spot tubes that are liable to give trouble. Substitution of new tubes in the console will show up old ones that have started to go bad. Gates TK444 tube kit should be ordered for a complete set of spares.

### TUBE SOCKET VOLTAGE

Typical tube voltages are shown on the schematic diagrams. These voltages are subject to tube characteristic variations and age. In most cases, a variation of 30% from these readings is permissible. When in doubt, try several tubes in the socket and measure the voltages of each to establish an average in your location and with your particular test meter. All measurements were taken with a 20,000 ohm per volt Simpson 260 meter. Vacuum tube meters will give higher readings since the meter will not load some of the high impedance circuits that the Model 260 loads. All D.C. readings were taken with no signal applied. RMS signal voltages are shown in parenthesis. They were measured with a vacuum tube voltmeter under the conditions outlined on the schematic diagrams.

Maximum B+ Volts - 32 Volts D.C.

(See Power Supply drawing for B+ feed to the various amplifiers.)

All Filament Voltage - between 5.7 and 6.9 Volts A.C.

Input Line Voltage - 105/125 Volts, 50/60 cycles, single phase.

Relay Supply Voltage - 35 Volts D.C.

(This voltage should remain essentially the same with relays operated or non-operated.)



As many as two relays can be added if extra muting is necessary. See section under "Modification for Extra Facilities".

It is necessary to isolate the B+, to the monitor booster and low power stages of the monitor amplifier, from the output stage. VR tubes are used to regulate the power to these stages. Isolation for the other amplifiers is provided with R-C filter sections. R105 and R106 apply positive bias to R109, the hum balance control, and to all amplifier tube filaments to reduce hum caused by heater-cathode emission. The control should be adjusted for minimum noise of all amplifiers simultaneously.

#### MONITOR AMPLIFIER

Except for the output transformer, all of the components of the monitor amplifier are on a printed circuit board. The first stage is one half of a 12AX7 tube. The other half of this tube is not used. The second stage is another 12AX7. This tube is used in a phase inverter circuit to drive the output stage, two EL84's in push-pull. Negative feedback is used between the output transformer and the cathode of the first half of the phase inverter. This lowers the output impedance, gives good load regulation and reduces distortion in the output section.

The low level output from this amplifier, for program cue and the emergency program feed, is coupled to the screen grids of the output stage. This output is balanced to ground.

#### LINE VOLTAGE

The Studioette Console is designed to operate with an input line voltage of 105/125 volts, 50/60 cycles, single phase. The operation of the console is not guaranteed beyond these limits and damage may occur with voltages above 125 volts.

output of the monitor amplifier.

The levels will be set the same as for the program channel. The "master gain" level can be adjusted with the "monitor gain" control if required.

The remote "program cue" function will be disabled when the monitor amplifier is in emergency use. The house monitor speakers will not be affected. If a microphone channel is in use, the speaker is muted in emergency operation the same as in regular operation. It would be well to rehearse the changeover (to emergency operation) when permissible, so that it can be accomplished gracefully should the occasion demand it.



### PHONE JACKS

Two phone jacks, for headphone monitoring, are located on the panel just below the meter. The one labeled "Line" is connected across the output of the program amplifier. The one labeled "Util." is not factory wired and is provided for the convenience of the customer. It might be used for network monitor, audition, or any external circuit.

If headphone monitoring of the cue circuits is desired: Connect the utility phone jack to the "common" terminals of one of the utility switches. Connect "turntable cue" into one position, "remote (tape and net) cue" into the second position. The third position of the switch could be connected to the "line phone jack". This would allow line monitoring without constantly changing the phone plug from one jack to the other. Do not connect the line directly to the utility phone switch. Series isolation resistors are required to prevent accidental shorting or loading of the line.

### MASTER GAIN CONTROL

This control is located on the right side of the panel. It is a tandem connected, high impedance interstage control. It is located electrically between the first and second, and the second and third stages of the program amplifier.

### PROGRAM LINE SELECTOR SWITCH

This switch is located above the master gain control and is a two position switch labeled "Reg." and "Emg.". The "Reg." position connects the program amplifier to the VU meter and the line. The "Emg." position picks up a low level output from the monitor amplifier and connects this output to the VU meter and the line. (See the following section.)

### EMERGENCY MONITOR OPERATION

Normally the telephone line is fed from the program amplifier. The monitor amplifier is connected to the output of the program amplifier and feeds the house monitor speakers. In case the program amplifier should fail, the monitor amplifier could be substituted so that it feeds the line in addition to the house monitor circuit.

In normal operation the channels are switched to "P", the program bus. The monitor input selector is switched to "P", the output of the program amplifier. The line key is switched to "Reg.", the output of the program amplifier.

In emergency operation, the program material (or the channels in use) must be switched to "A", the audition bus. The monitor input must be switched to "A", the audition bus. The line selector key must be switched to "Emg.", the



unbalanced (TB2-7). The one for the remote "over-ride" and tape is balanced (TB2-8). It is recommended that the Gates M5377 Unique amplifier be used for this purpose. This amplifier has two isolated inputs, one for each of the cue circuits. For headphone monitoring of cue circuits, see the section under "Phone Jacks".

Program channel "P" is the channel feeding the regular program line. Audition Channel "A" is used for previewing or checking the channel, or feeding a recorder. To use the "A" Channel, set the lever switch to "A" and turn the monitor switch to "audition".

The "A" Channel can be used for talking on a remote, provided there is a microphone set-up in the control room. Switch control room mic. to the audition channel and turn the monitor switch to "Aud.". The remote can be heard in the "remote over-ride/cue" speaker. For listening, the remote switch should be in the center position. When the control room operator is talking, the remote switch must be in the "Pgm. Cue" position.

If no cue speaker amplifier or headphone connection is installed, and Channel 4 is not in use, the remote can be heard by switching Channel 4 to "A" and setting the remote switch lever to the Channel 4 mix position. For talkback to the remote throw the remote switch up to "Pgm Cue" and switch the control room mic. to "A". If this latter system of checking is used, extreme care must be exercised. Remember that this ties up two channels, and that two switches must be operated between the listening and talking modes.

After checking the remote, the monitor switch should be restored to the "Pgm" position and the remote switch left in "Pgm Cue" position. The latter switch should be left in this position until the remote operator has received his cue to go on the air. The console operator will then throw the remote switch to "Mix", and bring it in on Channel 8.

#### MONITOR GAIN

The monitor gain control is a medium impedance, unbalanced control located to the right of the channel faders. It is located electrically between the monitor selector switch and the input of the monitor amplifier.

#### MONITOR SELECTOR

The monitor selector switch is located just above the monitor gain control. It switches the input of the monitor amplifier to the audition bus, program bus, or an external circuit. The external circuit is connected to terminals on the back of the console (TB2-6). It could be used for "off the air" monitoring. The input to the control is unbalanced, so a transformer should be used to isolate any grounded external circuit.



generally results in poor noise, frequency response, or other poor operation.

#### CIRCUIT IMPEDANCES

The microphone inputs are factory connected for 150/250 ohms. This can be changed to 30/50 ohms by connecting the input transformer according to drawing B-68205. These are balanced inputs. (M5215A)

Turntable inputs are 150/250 ohms and cannot be changed in the console. Other impedances could be obtained by the use of a matching pad or isolation transformer. If a matching pad is used, it should be unbalanced and its common side connected to the common or grounded side of the inputs. The lower terminal on the terminal board is the grounded side. It would be well to check the incoming circuit for grounds with an ohmmeter prior to connecting them. The external ground, if any, should be removed.

The net, tape, and remote input is factory connected 600 ohms. The impedance of this input may be changed by changing taps on T101, the matching transformer for this channel. Terminals 1 & 3 are for 500/600 ohms, 1 & 2 for 150/250 ohms, and 2 & 3 for 30/50 ohms. Since this channel accommodates net, tape, and remote inputs; any change in the transformer impedance will effect all of these circuits.

#### POWER WIRING AND INTERCONNECTION

A five ampere circuit, 105/125 volts, 50/60 cycles, single phase, is sufficient to operate the console power supply. This connects to TB-3 - 7 & 8. This circuit should be completely isolated from other power circuits of the station so that a possible short will not shut down all the facilities. Proper a.c. wiring in the studio demands many branch circuits. If carefully planned, it will minimize down time.

The monitor amplifier is factory wired for 16 ohms output. The speakers should have (45/50 ohm to voice coil) transformers to match the speakers to the amplifier load. Use a Gates A-30601 transformer. The muting relays have back loading resistors across the lines when speakers are muted. Two muting relays are supplied. Provision is made for attaching a third unmuted speaker for an office or lobby. The output of the monitor amplifier can be changed to 8 ohms if more than 4 speakers are desired.

See instructions on drawing C-77911.

NOTE: The monitoring speakers and warning lights are set up to operate with certain microphone channels. Drawing C-77912 shows this coding. Microphone 1 and 3 operate relay 1. These microphones should go in Studio A. Microphone 2 and 4 operate relay 2. They should go in Studio B. To change this standard coding, change the jumpers on TS101,



problem have been used. Some of these have been used with good results but, unless you are an expert on the subject, most of them are risky.

The console grounding system is based on the one point ground. Different circuit grounds are insulated from the chassis and other grounds except at one point. At this point they all join together and go to earth ground. This system prevents multiple ground loops that result in hum pickup (from circulating currents and R.F. pickup) and regeneration.

External circuits connecting to the console should not destroy this system. Microphone circuits are balanced, so are not grounded in the console. They should not be grounded externally until noise checks have proven that better results can be obtained. The turntable and tape inputs are unbalanced, so they are grounded in the console and should not be grounded externally. The net and remote inputs are balanced and ungrounded. They should not be grounded externally. The program line output is balanced and not grounded in the console. It may be center-tap grounded at the telephone, if desirable.

A safe rule to follow is: Do not ground either side of an external circuit. Generally, the shields should be grounded at the console only. They may be connected to the ground terminals below the regular terminal board. There may be exceptions to this rule, especially on microphone input circuits. The shield grounds should be connected in such a way that they can be lifted at the console and grounded at the other end. This is part of the test procedure and should be used to obtain lowest noise.

#### BALANCED AND UNBALANCED LINES

If a circuit is ungrounded, it is considered balanced to ground. If one side is grounded it is unbalanced. If the circuit is center-tap grounded, with pad or coil, it is balanced to ground. Refer to the third paragraph under "Grounded Circuits" for determining the proper classification. Twisted shielded pairs should be used for all circuits, whether they are balanced or unbalanced. Cancellation of noise and crosstalk pickup is approximately the same for either when the one point ground system is used.

If it is necessary to connect a balanced circuit to an unbalanced circuit, or the opposite, an isolation transformer should be used between them. The transformer must have good balance, and electro-static shield and magnetic shielding sufficient to reduce the hum pickup at least 65 db below the signal level. Impedance taps on primary and secondary are important to properly match both circuits. Gates transformer #478 0009 000 is recommended for this use. Balanced lines require balanced pads and attenuators, unbalanced lines require that they be unbalanced. Mixing them



## SPECIFICATIONS

### MICROPHONE TO REGULAR PROGRAM LINE OUT.

GAIN: 103 db  $\pm$ 2 db @ 1000 cycles  
RESPONSE:  $\pm$ 1.5 db from 30 to 15,000 cycles  
DISTORTION: 1% or less from 30 to 15,000 cycles @ +8 dbm output. 1-1/2% or less @ +18 dbm output.  
NOISE: 60 db or better below +8 dbm output with -60 dbm input. The equivalent noise input is -120 dbm or better.  
CROSSTALK: Below noise level with normal levels and control positions.

### REMOTE, TAPE, NET AND TURNTABLE INPUTS TO REGULAR PROGRAM LINE OUT.

GAIN: 63 db  $\pm$ 2 db @ 1000 cycles  
RESPONSE:  $\pm$ 1.5 db from 30 to 15,000 cycles  
DISTORTION: 1% or less from 30 to 15,000 cycles @ +8 dbm output. 1-1/2% or less from 30 to 15,000 cycles @ +18 dbm output.  
NOISE: 60 db below +8 dbm output with -20 dbm input.

### MONITORING AMPLIFIER.

GAIN: 140 db maximum from microphone to monitor out. This can not be adjusted above 100 db gain without the possibility of oscillation.  
RESPONSE:  $\pm$ 2 db from 50 to 15,000 cycles  
DISTORTION: 1% or less from 50 to 15,000 cycles @ +40 dbm output (10 watts). NOTE: The above measured across 16 ohm load. The muting relays must be non-energized or blocked open to keep the back loading resistors from loading the output to a value less than 16 ohm when making this test.  
NOISE: 55 db or more below +40 dbm output with -10 dbm input to remote position.

### POWER REQUIREMENTS.

PRIMARY POWER: 105/125 volt, 50/60 cycles, 120 watts.

### MECHANICAL SPECIFICATIONS.

LENGTH - 24"                      HEIGHT - 8"                      DEPTH - 17"

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Instruction Book:

M-5215A Printed Chassis Preamplifier  
Replacing Components on Printed Chassis