L MULTIPLEX TERMINALS

MMX-1

TRANSMITTING MASTERGROUP BANK

LOSS TESTS

A fully equipped MMX-1 terminal (1860 voice channels) contains three transmitting mastergroup banks which are designated MG1, MG2 and MG3. Each bank receives a basic mastergroup signal from a transmitting multiplex terminal via the submastergroup bank panel.

The basic mastergroup signals are translated into the multimastergroup spectrum by the transmitting mastergroup bank circuits shown in Fig. 3. A low-pass filter at each modulator input eliminates unwanted high-frequency signals above the basic mastergroup band. There is no modulator for mastergroup 1 and loss is provided by the transmitting hybrid, fixed pad, and optional 210B slope equalizer. For mastergroups 2 and 3, the signal is modulated in two steps to place the basic mastergroup into the proper position in the multimastergroup spectrum. Amplifiers provide required amplification and permit level adjustment.

This section is reissued to include in Chart 1 instructions to test and replace tubes and to adjust the meter relays. Arrows indicate significant changes. ***Equipment Test Lists are not affected.***

CHART **PAGE**

APPARATUS

Transmission Test Equipment. Refer to Section 356-010-500 and select, from available equipment, sending and receiving units having the following capabilities:

Sending Test Equipment (STE) capable of delivering, into 75-ohm circuits, signals between 320 kHz and 10 MHz at powers between −21 dBm and −36 dBm.

Receiving Test Equipment (RTE) capable of detecting, from 75-ohm circuits, signals between 320 kHz and 10 MHz at powers between −20 dBm and −32.5 dBm.

Electron Tube Test Set (such as KS-15560) capable of testing 404A electron tubes

P2BJ Cords

APPARATUS (Cont):

368A Plugs (75 ohms)

Amplifier Test Cords (Fig. 2B)

CHART 1

LOSS TESTS

STEP	PROCEDURE
	Note: Refer to Fig. 3 for location of jacks and controls used in these tests.
1	Check that the equipment to be tested is out of service.
2	Prepare the STE to produce a signal of 1500 kHz at −21 dBm.
3	Prepare the RTE for a 75-ohm terminated measurement at the receive frequency and power listed in Table A for the mastergroup bank circuit under test.
4	Connect the RTE to the MG( ) OUT jack [patch (1), Fig. 1].

Note: Parentheses ( ) denote MG1, 2, or 3.

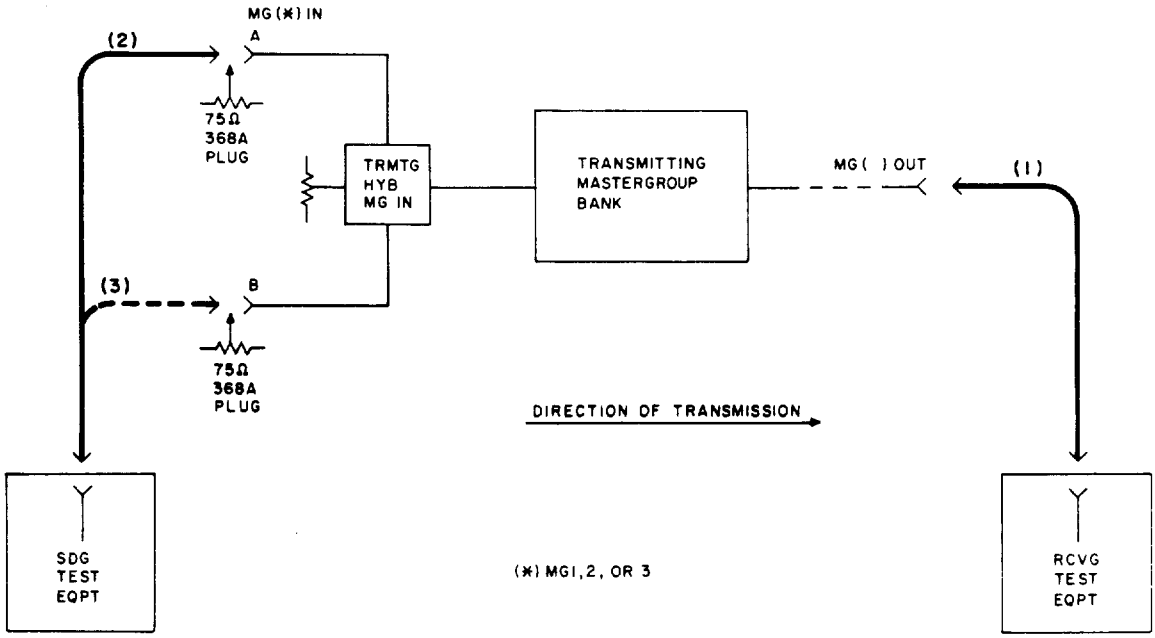


Fig. 1—Testing Arrangement

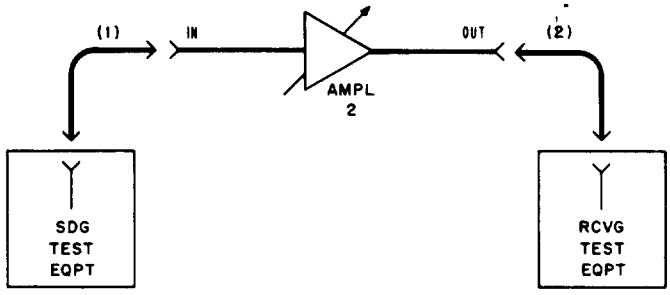
TABLE A

LOSS TESTS

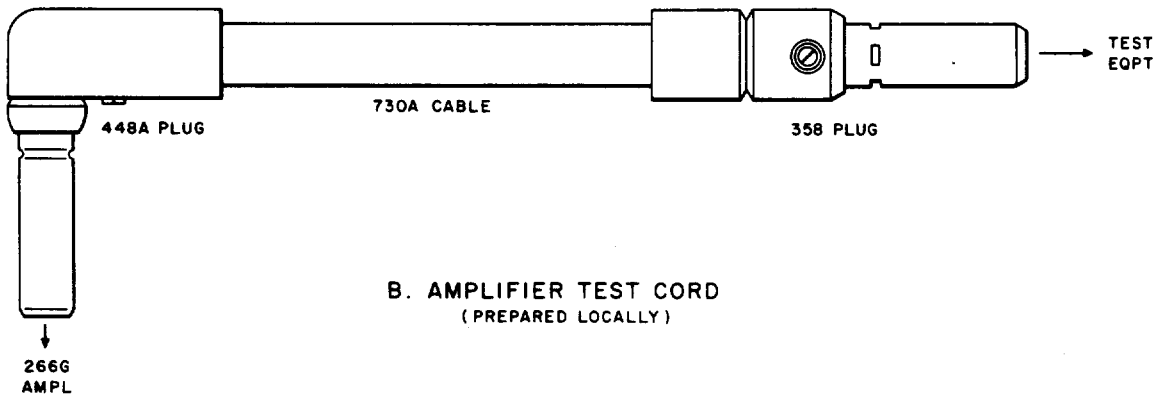
MG	SEND			RECEIVE			
	JACK	FREQ (KHZ)	POWER (DBM)	JACK	FREQ (KHZ)	REQUIREMENT	
						NOMINAL	DEVIATION FROM NOMINAL
1	MG 1A IN MG 1B IN	1500	−21	MG 1 OUT	1500	−32.5 dBm	±0.5 dB
2	MG 2A IN MG 2B IN	1500	21	MG 2 OUT	4100	32.5 dBm	±0.3 dB
3	MG 3A IN MG 3B IN	1500	21	MG 3 OUT	6700	−32.5 dBm	±0.3 dB

CHART 1 (Cont)

STEP	PROCEDURE
5	Connect the STE to the MG( ) IN A jack [patch (2), Fig. 1].
6	Insert a 75-ohm 368A plug in the MG( ) IN B jack.
7	Measure and record the power of the signal at the MG( ) OUT jack. ***Requirement:*** See Table A.
8	If the requirement of Step 7 is met, proceed to Step 33. If it is ***not*** met, remove the front cover from the mastergroup bank panel under test and perform the applicable trouble clearing procedure as follows: (a) ***MG1:*** Check the loss of the individual components in the circuit under test. Repeat Step 7. (b) ***MG2 or 3 with solid-state amplifiers:*** Perform trouble clearing procedures in Steps 9 through 29. (c) ***MG2 or 3 with vacuum-tube amplifiers:*** Perform trouble clearing procedures in Steps 30 through 32.
	Solid-State Amplifiers
9	Disconnect the RTE from the MG( ) OUT jack [patch 1, Fig. 1].
10	Disconnect the STE from the MG( ) IN A jack [patch (2), Fig. 1].
11	Prepare the STE to produce a signal of 10 MHz at −36 dBm.
12	Prepare the RTE for a 75-ohm terminated measurement of 10 MHz at −20 dBm.
13	At the transmitting mastergroup bank panel under test, locate the ED-51510 amplifier shelf assembly containing the 266G amplifier units.
14	Remove the coaxial connecting plugs from the IN and OUT jacks of AMPL 2.
15	Connect the STE to the AMPL 2 IN jack [patch (1), Fig. 2].
16	Connect the RTE to the AMPL 2 OUT jack [patch (2), Fig. 2].
17	Measure the power of the 10-MHz signal at the AMPL 2 OUT jack. ***Requirement:*** −20 dBm ±0.1 dB
18	If the requirement of Step 17 is met, proceed to Step 19. If it is ***not*** met, adjust the AMPL 2 gain control for a power indication of −20 dBm.



A. TESTING CIRCUIT



B. AMPLIFIER TEST CORD
(PREPARED LOCALLY)

Fig. 2—Amplifier Test Circuit

CHART 1 (Cont)

STEP	PROCEDURE
19	Disconnect the STE from the AMPL 2 IN jack [patch (1), Fig. 2].
20	Disconnect the RTE from the AMPL 2 OUT jack [patch (2), Fig. 2].
21	Reinsert the coaxial connecting plugs, removed in Step 14, into the IN and OUT jacks of AMPL 2.
22	Turn the AMPL 1 gain control to the maximum counterclockwise position (minimum gain).
23	Prepare the STE to produce a signal of 1500 kHz at −21 dBm.

CHART 1 (Cont)

STEP	PROCEDURE
24	Prepare the RTE for a 75-ohm terminated measurement of the mastergroup bank output signal at a power of −32.5 dBm.
25	Connect the STE to the MG( ) IN A jack [patch (2), Fig. 1].
26	Connect the RTE to the MG( ) OUT jack [patch (1), Fig. 1.].
27	Measure and, if necessary, adjust attenuator AT for a power indication between −33.0 and −32.5 dBm at the MG( ) OUT jack.
28	Readjust the AMPL 1 GAIN control to obtain a power indication of −32.5 dBm at the MG ( ) OUT jack.
29	Proceed to Step 33 and complete the mastergroup bank loss test.
	Vacuum-Tube Amplifiers
30	Adjust the AT control to meet the requirement of Step 7.
31	◆If the requirement of Step 7 ***cannot*** be met, proceed as follows: (a) Test and replace vacuum tubes V( ) as necessary. (b) Adjust meter relay K( ) associated with each vacuum tube replaced. ***Requirement:*** 1.1 mA ***Caution: Adjust only those meter relays having associated tubes replaced. Do not adjust other meter relays.*** (c) Repeat Step 30. (d) If requirement of Step 7 ***cannot*** be met, replace the amplifier. (e) Repeat Step 30.◆
32	Proceed to Step 33 and complete the mastergroup bank loss test.
33	Disconnect the STE from the MG( ) IN A jack [patch (2), Fig. 1].
34	Remove the 75-ohm 368A plug from the MG( ) IN B jack.
35	Insert a 75-ohm 368A plug in the MG( ) IN A jack.
36	Connect the STE to the MG( ) IN B jack [patch (3), Fig. 1].
37	Measure the power of the signal at the MG( ) OUT jack. ***Requirement:*** See Table A.

CHART 1 (Cont)

STEP	PROCEDURE
38	Disconnect the STE from the MG( ) IN B jack [patch (3), Fig. 1].
39	Remove the 75-ohm 368A plug from the MG( ) IN A jack.
40	Insert a 75-ohm 368A plug in the MG( ) IN B jack.
41	Proceed to Chart 2 if the passband tests are to be made. If the passband tests will ***not*** be made, disconnect the RTE from the mastergroup bank circuit under test [patch (1), Fig. 1].
42	Replace the panel cover if it was removed in Step 8.
43	Restore the equipment to normal service.

CHART 2

PASSBAND TESTS

STEP	PROCEDURE
	Note: Chart 1 is a prerequisite to this test.
1	Connect the STE to the MG( ) IN A jack [patch (2), Fig. 1].
	MASTERGROUP 1 (WITH SLOPE EQUALIZER)
2	The mastergroup 1 bank circuit can be equipped with an optional 210B slope equalizer. Determine from office records the wiring option for the circuit to be tested. Proceed to Step 3 if the circuit is equipped with a 210B equalizer; otherwise, proceed to Step 17.
3	Prepare the RTE for a 75-ohm terminating measurement of 320 kHz at −32.5 dBm.
4	Prepare the STE for an output of 320 kHz at −21 dBm.
5	Measure the power of the 320-kHz signal at the MG1 OUT jack.
	Requirement: Within ±0.3 dB of the power recorded in Step 7, Chart 1
6	Repeat Steps 3 and 4 at a frequency of 3080 kHz.
7	Measure the power of the 3080-kHz signal at the MG1 OUT jack.
	Requirement: Within ±0.3 dB of the power recorded in Step 7, Chart 1

CHART 2 (Cont)

STEP	PROCEDURE

8 If the requirements of Steps 5 and 7 are met, proceed to Step 15. If they are ***not*** met, determine the amount of slope correction to meet the requirements.

Example: Slope correction equals difference between the 320-kHz and 3080-kHz signal powers recorded in Steps 5 and 7.

Power of 3080-kHz signal: −33.6 dBm

Power of 320-kHz signal: −32.1 dBm

Difference: 1.5 dB (add slope correction)

Note: If the measured 3080-kHz signal power is less than the measured 320-kHz signal power, add slope correction. If the measured 3080-kHz signal power is greater than the 320-kHz signal power, subtract slope correction.

9 At the 210B cable equalizer, record the identifying numbers of the screw switches that are turned in.

10 Find in Table B and record the dB value of this screw switch setting corresponding to the settings recorded in Step 9.

11 Add or subtract the slope correction (dB value) determined in Step 8 (Note, Step 8) to the slope correction (dB value) recorded in Step 10.

12 Determine from Table B the screw switch setting required to give the slope correction computed in Step 11.

13 Change the 210B cable equalizer screw switches to the settings determined in Step 12.

14 Repeat Steps 8 and 9, Chart 1, and Steps 3 through 8, Chart 2, to verify slope correction.

15 Disconnect the STE and RTE from the mastergroup bank circuit under test [patches (1) and (2), Fig. 1].

16 Restore the equipment to normal service.

MASTERGROUP 1, 2, or 3 (NO SLOPE EQUALIZER)

17 Prepare the STE for a −21 dBm output at the send frequency listed in Table B for the mastergroup bank circuit under test.

18 Prepare the RTE for a 75-ohm terminated measurement at −32.5 dBm of the receive frequency listed in Table B for the mastergroup bank circuit under test.

TABLE B

210B EQUALIZER ADJUSTMENT CHART

SLOPE (DB) (0.5 TO 3.0 MHZ)	• SCREWS TIGHTENED DOWN (ALL OTHERS WELL UP)																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0.0	•	•	•	•	•	•	•								•		•		•		•			
0.125		•	•	•	•	•	•		•						•		•		•		•			
0.250			•	•	•	•	•		•	•					•		•		•		•			
0.375				•	•	•	•		•	•	•				•		•		•		•			
0.50					•	•	•		•	•	•	•			•		•		•		•			
0.625						•	•		•	•	•	•	•		•		•		•		•			
0.75	•	•	•	•	•	•		•							•	•			•		•			
0.875		•	•	•	•	•		•	•						•	•			•		•			
1.0			•	•	•	•		•	•	•					•	•			•		•			
1.125				•	•	•		•	•	•	•				•	•			•		•			
1.25					•	•		•	•	•	•	•			•	•			•		•			
1.375						•		•	•	•	•	•	•		•	•			•		•			
1.50	•	•	•	•	•	•	•									•			•		•		•	
1.625		•	•	•	•	•	•		•							•			•		•		•	
1.75			•	•	•	•	•		•	•						•			•		•		•	
1.875				•	•	•	•		•	•	•					•			•		•		•	
2.0					•	•	•		•	•	•	•				•			•		•		•	
2.125						•	•		•	•	•	•	•			•			•		•		•	
2.25	•	•	•	•	•	•	•										•		•			•		•
2.375		•	•	•	•	•	•		•								•		•			•		•
2.50			•	•	•	•	•		•	•							•		•			•		•
2.625				•	•	•	•		•	•	•						•		•			•		•
2.75					•	•	•		•	•	•	•					•		•			•		•
2.875						•	•		•	•	•	•	•				•		•			•		•
3.0							•		•	•	•	•	•	•			•		•			•		•

CHART 2 (Cont)

STEP	PROCEDURE
19	Measure and record the power at each of the passband frequencies (Table C at the MG( ) OUT jack of the mastergroup bank circuit under test. ***Requirement:*** See Table C. ***Note:*** Parentheses ( ) denote MG1, 2, or 3.
20	If the requirements of Step 19 are met, proceed to Step 21. If they are ***not*** met, locate and correct the trouble in the circuit under test. Repeat Steps 19 and 20.
21	Verify that the trouble is cleared. Repeat Steps 19 and 20.
22	Disconnect the STE and RTE from the mastergroup bank circuit under test [patches (1) and (2), Fig. 1].
23	Restore the equipment to normal service.

TABLE C

PASSBAND TEST (NO SLOPE EQUALIZATION)

MG	SEND	RECEIVE		
	INPUT SIGNAL AT MG (*) IN JACK (KHZ)	OUTPUT SIGNAL AT MG (*) OUT JACK (KHZ)	POWER REQUIREMENT (DBM)	
			ELECTRON TUBE AMPLIFIER	SOLID STATE AMPLIFIER
1	320	320	Within —0.3 dB to +0.3 dB of the power recorded in Step 7, Chart 1	Within —0.3 dB to +0.3 dB of the power recorded in Step 7, Chart 1
	3080	3080	Within - 0.3 dB to +0.3 dB of the power recorded in Step 7, Chart 1	Within —0.3 dB to +0.3 dB of the power recorded in Step 7, Chart 1
2	570	3170	Within +0.2 dB to +1.2 dB of the power recorded in Step 7, Chart 1	Within - 0.4 dB to +0.4 dB of the power recorded in Step 7, Chart 1
	3080	5680	Within —0.9 dB to +0.5 dB of the power recorded in Step 7, Chart 1	Within 0.0 dB to +0.8 dB of the power recorded in Step 7, Chart 1
3	570	5770	Within —0.1 dB to +0.9 dB of the power recorded in Step 7, Chart 1	Within —0.4 dB to +0.4 dB of the power recorded in Step 7, Chart 1
	3080	8280	Within —0.2 dB to +0.8 dB of the power recorded in Step 7, Chart 1	Within +0.2 dB to +1.0 dB of the power recorded in Step 7, Chart 1

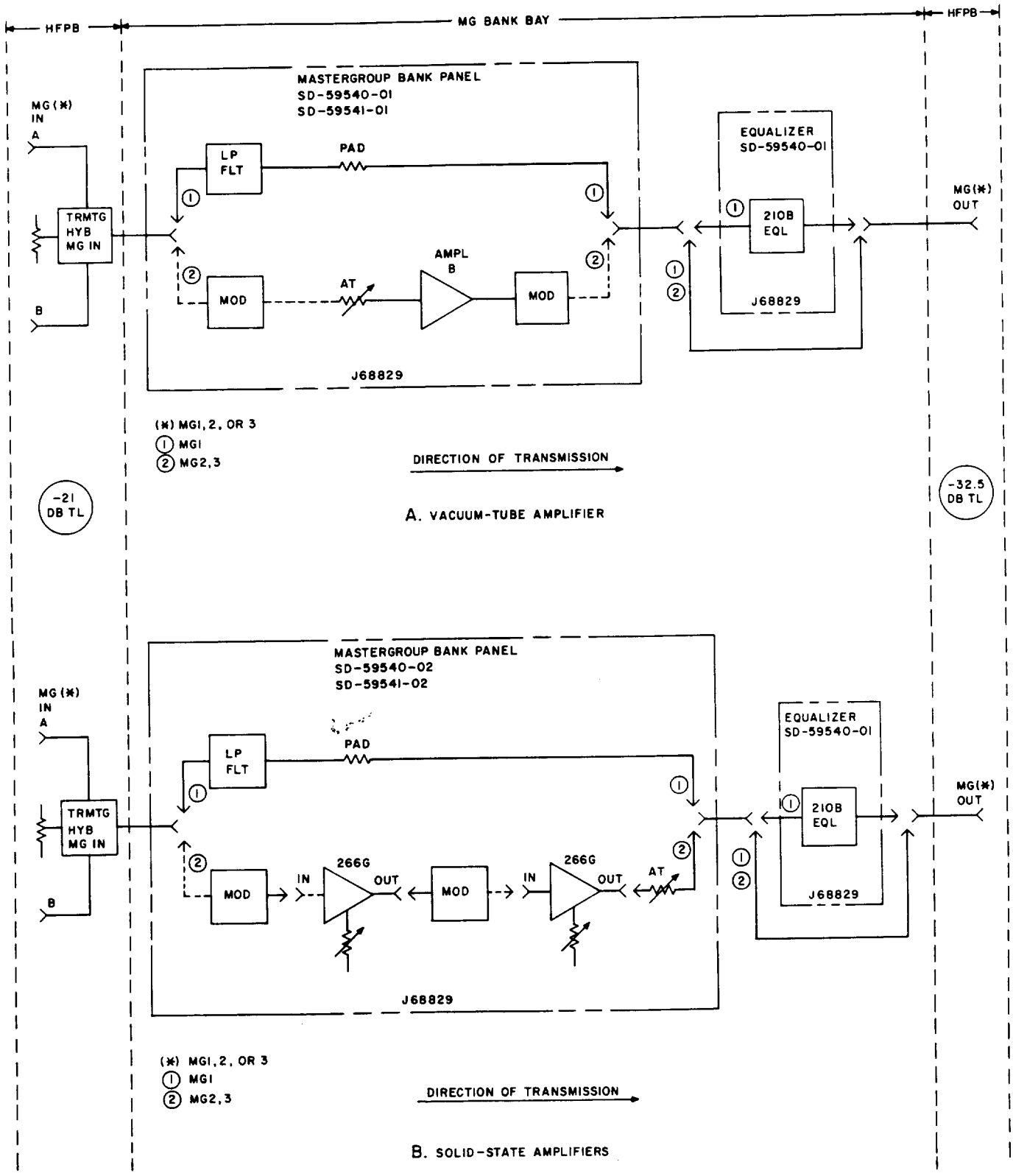


Fig. 3—Transmitting Mastergroup Bank Circuit