L MULTIPLEX TERMINALS

MMX-1

RECEIVING MASTERGROUP BANK

GAIN TESTS

A fully equipped MMX-1 terminal (1860 voice channels) contains three receiving mastergroup banks which are designated MG1, MG2, and MG3. Each mastergroup bank receives a multimastergroup signal spectrum from an L3 line connecting circuit or wire line entrance link via a trunk circuit and a combining hybrid circuit.

The basic mastergroup signals are recovered from the multimastergroup spectrum by the receiving mastergroup bank circuits shown in Fig. 3. The mastergroup 1 bank circuit consists of a bandpass filter to select the basic mastergroup band, a variable attenuator, and amplifier(s). In the mastergroup 2 and 3 bank circuits, a bandpass filter selects the appropriate mastergroup signal. The signal is demodulated in two steps to deliver the basic mastergroup signal to the associated receiving submastergroup bank. Amplifiers provide required amplification and permit gain adjustment.

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

CHART **PAGE**

1—Gain Tests 2

2—Passband Tests 5

3—266G Amplifier Adjustments 8

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 −31.5 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 −14 dBm and −20 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

GAIN 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 at the send frequency and power in Table A for the mastergroup bank circuit under test.
3	Prepare the RTE for a 75-ohm terminated measurement of 1500 kHz at −14 dBm.
4	Connect the STE to the MG( ) IN jack [patch (1), Fig. 1].
	Note: Parentheses ( ) denote MG1, 2, or 3.
5	Connect the RTE to the MG( ) OUT A jack [patch (2), Fig. 1].
6	Insert a 75-ohm 368A plug in the MG( ) OUT B jack.
7	Measure and record the power of the signal at the MG( ) OUT A jack.
	Requirement: −14.0 dBm ±0.3 dB

TABLE A

GAIN TESTS

MG	SEND			RECEIVE			
						REQUIREMENT	
	JACK	FREQ (KHZ)	POWER (DBM)	JACK	FREQ (KHZ)	NOMINAL	DEVIATION FROM NOMINAL
1	MG 1 IN	1500	−31.5	MG 1 OUT A MG 1 OUT B	1500	−14 dBm	±0.3 dB
2	MG 2 IN	4100	−31.5	MG 2 OUT A MG 2 OUT B	1500	−14 dBm	±0.3 dB
3	MG 3 IN	6700	−31.5	MG 3 OUT A MG 3 OUT B	1500	−14 dBm	±0.3 dB

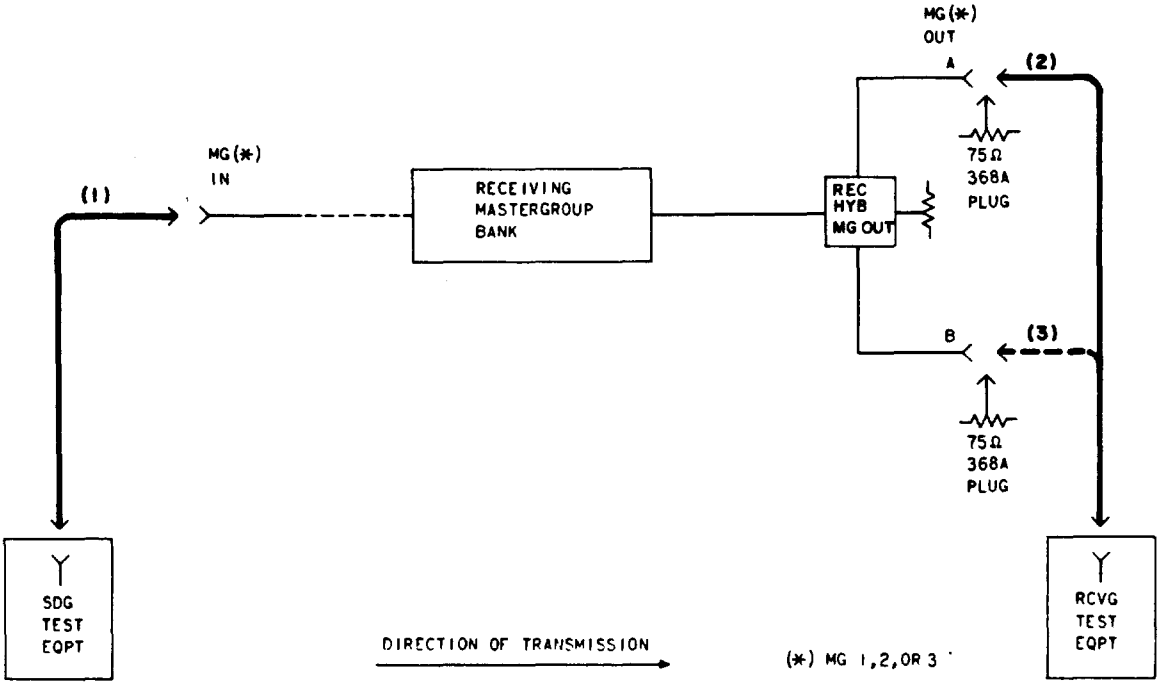


Fig. 1—Testing Arrangement

CHART 1 (Cont)

STEP	PROCEDURE
8	If the requirement of Step 7 is met, proceed to Step 20. If it is not met and if the mastergroup bank circuit under test is equipped with solid-state amplifiers, proceed to Step 9. If the mastergroup bank circuit is equipped with vacuum-tube amplifiers, proceed to Step 16.
	SOLID-STATE AMPLIFIERS
9	Remove the front cover from the mastergroup bank panel under test.
10	Locate the amplifier shelf assembly containing the 231D and 231E amplifier units.
11	Set the 231D ADJ control to the maximum counterclockwise position (minimum gain).
12	Measure and, if necessary, adjust the AT control for a power indication between −15.8 and −15.3 dBm.
13	Readjust the 231D ADJ control to meet the requirement of Step 7.

CHART 1 (Cont)

STEP	PROCEDURE
14	If the requirement of Step 7 is met, proceed to Step 20. If it is ***not*** met, replace the 231D and 231E amplifier units in the circuit under test. Repeat Steps 11 through 13, as required.
15	If the requirement of Step 7 still ***cannot*** be met, proceed as follows: (a) ***MG1:*** Check the individual components in the circuit under test. Repeat Steps 11 through 13, as required. (b) ***MG2 or 3:*** Perform 266G amplifier adjustment procedures in Chart 3.
	VACUUM-TUBE AMPLIFIERS
16	Remove the front cover from the mastergroup bank panel under test.
17	Adjust the AT control to meet the requirement of Step 7.
18	If the requirement of Step 7 ***cannot be met, proceed as follows:*** (a) Test and replace vacuum tubes V( ) as necessary. (b) Adjust only meter relay K ( ) associated with each vaccum tube replaced. ***Requirement:*** 1.1 mA ***Note:*** This requirement applies only to newly replaced tubes. (c) Repeat Step 17. (d) If the requirement of Step 7 ***cannot*** be met, replace the amplifier. (e) Repeat Step 17.
19	Proceed to Step 20 and complete the mastergroup bank gain test.
20	Disconnect the RTE from the MG( ) A OUT jack [patch (2), Fig. 1].
21	Remove the 75-ohm 368A plug from the MG( ) OUT B jack.
22	Insert a 75-ohm 368A plug in the MG( ) OUT A jack.
23	Connect the RTE to the MG( ) OUT B jack [patch (3), Fig. 1].
24	Measure the power of the 1500-kHz signal at the MG( ) OUT B jack. ***Requirement:*** -14.0 dBm ± 0.3 dB

CHART 1 (Cont)

STEP	PROCEDURE
25	Disconnect the RTE from the MG( ) OUT B jack [patch (3), Fig. 1].
26	Remove the 75-ohm 368A plug from the MG( ) OUT A jack.
27	Insert a 75-ohm 368A plug in the MG( ) OUT B jack.
28	Proceed to Chart 2 if the passband tests are to be made. If the passband tests will not be made, disconnect the STE from the mastergroup bank circuit under test [patch (1), Fig. 1].
29	Replace the panel cover if removed in Step 9 or 16.
30	Restore the equipment to normal service.

CHART 2

PASSBAND TESTS

STEP	PROCEDURE
	Note: Chart 1 is a prerequisite to this test.
1	Connect the RTE to the MG ( ) OUT A jack [patch (2), Fig. 1].
	MASTERGROUP 1 (WITH SLOPE EQUALIZER)
2	The mastergroup 1 bank circuit may be equipped with an optional 210B slope equalizer. Determine from office records the wiring option for the circuit to be tested. Proceed to Step 2 if the circuit is equipped with a 210B equalizer; otherwise, proceed to Step 17.
3	Prepare the RTE for a 75-ohm terminated measurement of 320 kHz at −14 dBm.
4	Prepare the STE for an output of 320 at −31.5 dBm.
5	Measure the power of the 320-kHz signal at the MG( ) OUT A jack.
	Requirement: Within ±0.3 dB of 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 MG( ) OUT A 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: −15.2 dBm Power of 320-kHz signal: −13.7 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 C and record the dB value of the screw switch setting corresponding to the settings recorded in Step 9.
11	Add or subtract the slope correction (dB value) determined in Step 8 to the slope correction (dB value) recorded in Step 10. (See ***Note,*** Step 8.)
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 7 and 8, 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.
	MASTERGROUPS 1, 2, or 3 (NO SLOPE EQUALIZER)
17	Prepare the STE for a −31.5 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 −14 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 A jack of the mastergroup bank circuit under test. ***Requirement:*** See Table C. ***Note:*** Parentheses ( ) denote MG1, 2, or 3 as applicable.
20	If the requirements of Step 19 are met, proceed to Step 22. If they are ***not*** met, locate and correct the trouble in the circuit under test.
21	Verify that the trouble is cleared. Repeat Steps 18 through 20.
22	Disconnect the STE and RTE from the mastergroup bank circuit under test [patches (1) and (3), Fig. 1].
23	Restore the equipment to normal service.

CHART 3

266G AMPLIFIER ADJUSTMENT

STEP	PROCEDURE
	Note: In Steps 1 through 12, the gain of the AMPL 2 unit is first checked, and then the test sequence is repeated for the AMPL 1 unit.
1	At the receiving mastergroup bank panel, locate the amplifier shelf assembly containing the 266G amplifier units.
2	Prepare the STE to produce a signal at the frequency and power listed in Table D for the 266G amplifier unit to be tested.
3	Prepare the RTE for a 75-ohm terminated measurement at the frequency and power listed in Table D for the 266G amplifier unit to be tested.
4	Remove the coaxial connecting plugs from the IN and OUT jacks of the amplifier to be tested.
5	Connect the STE to the AMPL ( ) IN jack [patch 1, Fig. 2]. ***Note:*** Parentheses ( ) denote amplifier 1 or 2.
6	Connect the RTE to the AMP ( ) OUT jack [patch 2, Fig. 2].

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

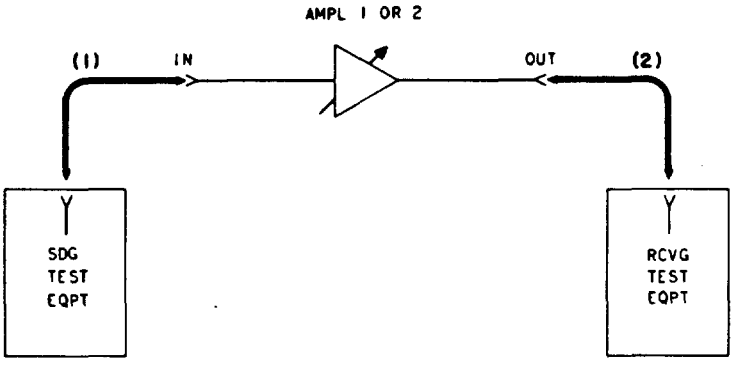
TABLE D

266G AMPLIFIER TESTS

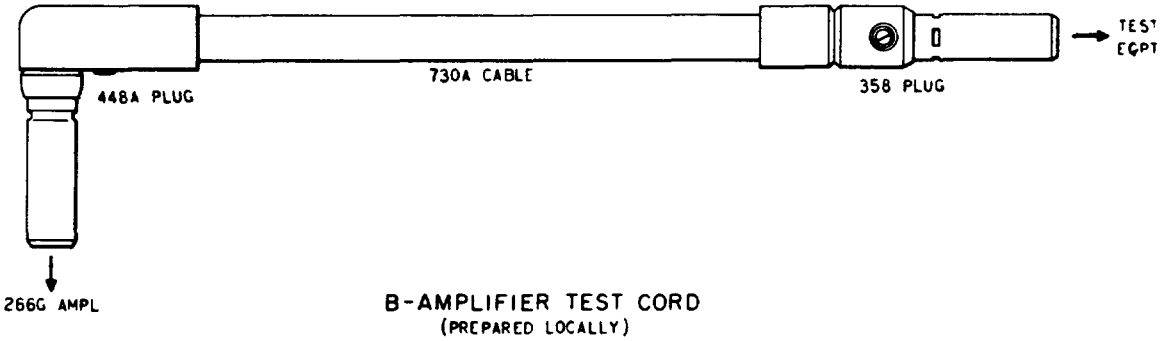
TEST SEQUENCE	MG	CIRCUIT DESIGNATION	SENDING TEST EQUIPMENT		RECEIVING TEST EQUIPMENT	
			FREQUENCY	POWER (DBM)	FREQUENCY	REQUIREMENT
1	2, 3	AMPL 2	10 MHz	−36	10 MHz	−20 dBm ±0.1 dB
2	2	AMPL 1	4100 kHz	−36	4100 kHz	−20 dBm ±0.1 dB
	3		6700 kHz		6700 kHz	

CHART 3 (Cont)

STEP	PROCEDURE
7	Measure the power of the signal at the amplifier OUT jack. ***Requirement:*** −20 dBm ±0.1 dB
8	If the requirement of Step 7 is met, proceed to Step 10. If it is ***not*** met, adjust the AMPL ( ) gain control for a power indication of −20 dBm.
9	If the requirement of Step 7 still ***cannot*** be met, replace the 266G amplifier unit under test. Repeat Steps 5 through 8 as required.
10	Disconnect the STE from the AMPL ( ) IN jack [patch 1, Fig. 2].
11	Disconnect the RTE from the AMPL ( ) OUT jack [patch 2, Fig. 2].
12	Reinsert the coaxial connecting plugs (removed in Step 4) into the IN and OUT jacks of the amplifier being tested.
13	Repeat Steps 2 through 12, as required, for the 266G AMPL 1 unit.
14	Proceed to Step 20 of Chart 1 and complete the mastergroup bank gain test.



A-AMPLIFIER TEST CIRCUIT



B-AMPLIFIER TEST CORD
(PREPARED LOCALLY)

Fig. 2—Amplifier Test Circuit

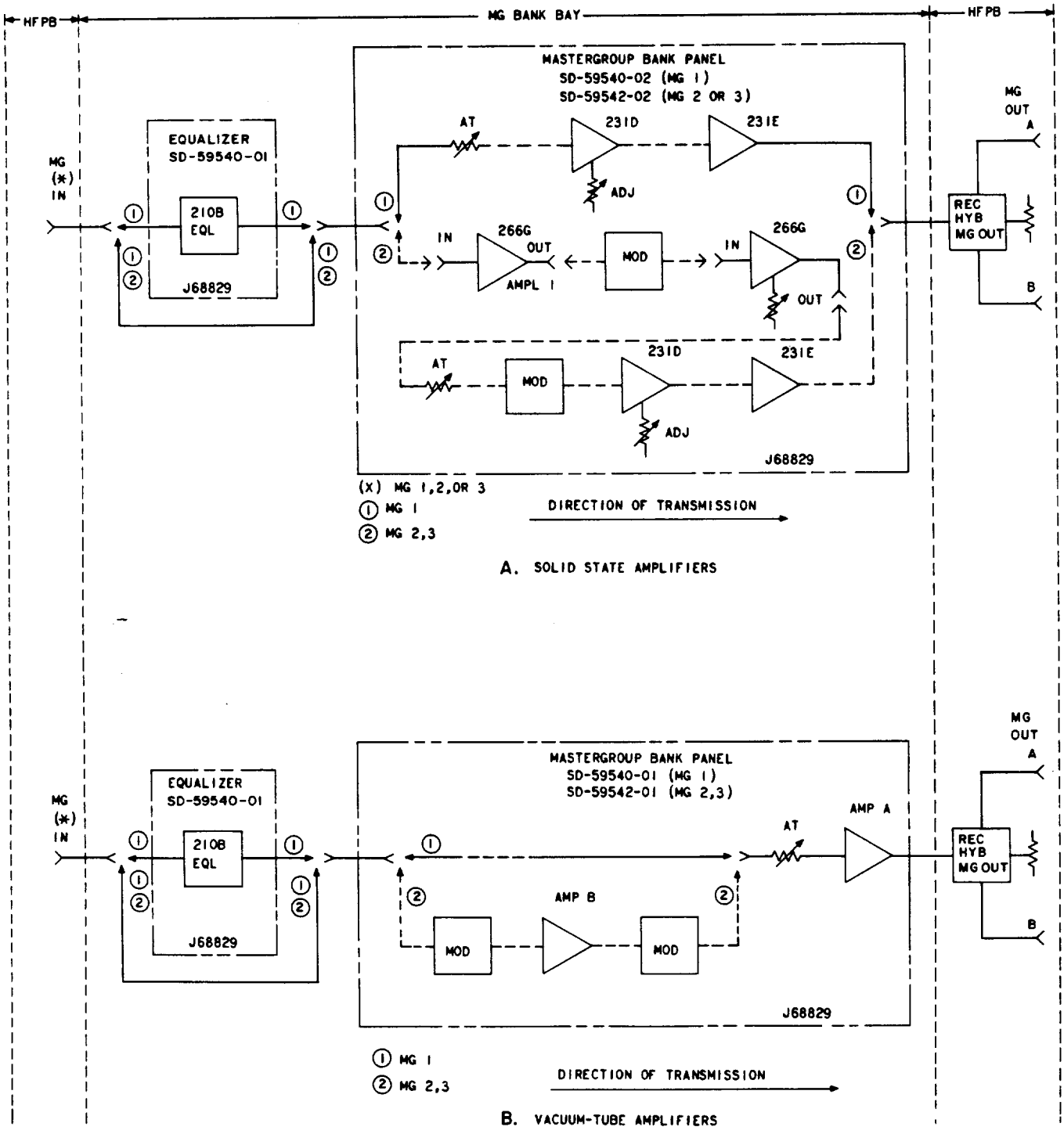


Fig. 3—Receiving Mastergroup Bank Circuit