

**OPERATION AND MAINTENANCE MANUAL**

**AM-2B**

**STEREO PHASE DISPLAY SCOPE**

Part Number 821602 Rev B

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## **I. GENERAL DESCRIPTION**

The AM-2B is a CRT based display system used to verify proper stereo audio phase, amplitude and separation.

The oscilloscope display shows the phase relationship between the left and right channels. Channel 1, or left, drives the scope Y-axis and channel 2, or right, drives the X-axis. The correct phase vector is marked on the graticule with a line and the words "IN PHASE" for operator convenience.

Measurement of amplitude is done with average reading true VU meters and peak reading LED meters. The VU meters, one each for left and right audio, meet all electrical and ballistic specifications established by Bell Laboratories and ANSI as required by broadcast and sound engineers. The LED peak reading meters, one each for left and right audio, are full wave rectified, reading both positive and negative peaks. They have a rise time response of approximately 250 microseconds and a fall time of 300 milliseconds.

Audio inputs are through 3-pin XLR connectors and are balanced and buffered with greater than 50K ohm input impedance. Inputs can be resistively terminated according to studio standards.

## II. OPERATING INSTRUCTIONS

Connect the AM-2B power cord into a grounded 3-pin AC mains power source. If there is any doubt as to which mains voltage the AM-2B is wired to accept, please refer to the power transformer wiring details on the AM-2B "Chassis Wiring" schematic and verify that the power transformer is wired correctly for the local mains voltage standard.

Audio left should be cabled to the rear panel connector labeled CH-1 and audio right to CH-2.

Proper connection can be verified by supplying a continuous tone of known correct left/right phase and amplitude to the AM-2B. This will produce a stationary line on the scope along the "IN PHASE" vector. The phase vector angle displayed is a result of phase and amplitude. So only a test tone, which has correct phase and equal amplitude left to right will produce an "IN PHASE" display vector. If in doubt about the phase accuracy of the test signal, it is best to fabricate a "Y" cable and drive both AM-2B input channels with the same test tone signal source momentarily to verify proper AM-2B phase display.

The test signal of known amplitude can also be used to verify that the AM-2B is still calibrated to studio standards on the VU and LED meters.

The AM-2B is useful to inspect the phase integrity of all studio equipment. Not only tape machines, but also other devices such as audio mixing boards introduce sometimes-surprising phase errors, for example.

## **WARNING**

Hazardous voltages are present at certain points within this product.

**SERVICE/MAINTENANCE TO BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY.**

Do not make adjustments or perform any internal service with power on unless another person capable of offering first aid or resuscitation is present.

### III. MAINTENANCE AND CALIBRATION

AM-2B units are aligned at the factory to operate at normal studio line levels. However, occasional transfer of units to another installation in which line level standards are different, or a "touch up" alignment to compensate for long time aging may require re-calibration procedures.

#### CHANGING TO A NEW LINE LEVEL STANDARD

The AM-2B uses precision resistors to correctly scale input buffer amplifiers to various line level ranges. These resistors, which are incorporated in the AM-2B signal printed circuit board, are selected by movable jumper plugs to preset the input amplifiers to the range of 0 dBm, +4 dBm and +8 dBm. Final, precise alignment is then set with 20 turn potentiometers listed on the potentiometer summary. The jumpers only preset to a range, so any jumper changes require final adjustment with the potentiometers.

#### CALIBRATION

An audio test set or a test oscillator and an AC voltmeter (preferable calibrated in dBm) are required to calibrate the AM-2B.

Set the test oscillator to output amplitude equal to the studio reference tone level (+4 dBm, +8 dBm, etc.). This should be cabled from the test oscillator to the AM-2B with a "Y" cable, as discussed in the section on operation.

All further adjustments are made with the potentiometer listed on the potentiometer summary page and the range selection jumpers.

1. Connect the test oscillator input to channel 1, left input, only. Adjust the front panel H and V position, intensity and focus controls so that a stationary, vertical line trace is obtained. Using the H position control, move the vertical line trace to the right or left-hand edge of the CRT.

#### CAUTION

#### **USE AN INSULATED ADJUSTMENT TOOL FOR THIS ADJUSTMENT AS CIRCUIT POINTS OF HIGH VOLTAGE ARE NEAR.**

1. Adjust R2, which is positioned facing up, mounted on a bracket directly behind the CRT socket, until the vertical line trace is vertical. This sets trace rotation.

2. Adjust the front panel H position control so that the vertical line trace is in the center of the CRT. Simultaneously adjust the front panel V position control and the scope Y calibration pot, R66, until the vertical line trace extends from the bottom of the CRT to the diagonal "IN PHASE" graticule line.
3. Reconnect the test oscillator input to channel 2, right input. Simultaneously adjust the front panel V position control and the scope X calibration potentiometer, R90, until the line trace is perfectly parallel with the "IN PHASE" graticule line.
4. Adjust R62 and R86 to set the left and right VU meters to 0 VU.
5. Set the test oscillator output amplitude equal to the line level, which is considered to be the studio "clip" or distortion level (+18 dBm, +24 dBm, etc.). Adjust R65 and R89 so that the top red LED's on the left and right columns are just lighted.

NOTE: Steps 6 and 7 are to adjust LED column linearity and are not required for "touch up" or when changing to a new line level standard.

6. Reduce the test oscillator output amplitude by 24 dB. Adjust R114 and R142 so that the 24 dB LED on the left and right LED columns is just lighted.
7. Increase the test oscillator output level by 3 dB. Adjust R113 and R141 so that the 21 dB LED on the left and right LED columns is just lighted. Repeat steps 5, 6 and 7 until no further improvement in calibration accuracy can be obtained.

## **MODEL AM-2B POTENTIOMETER SUMMARY**

### **SIGNAL P.C. BOARD**

R56	Scope astigmatism adjust
R62	Left VU meter cal.
R65	Left LED column cal.
R66	Scope "Y" cal.
R86	Right VU meter cal.
R89	Right LED column cal.
R90	Scope "X" cal.
R113	21 dB LED adjust, left
R114	24 dB LED adjust, left
R141	21 dB LED adjust, right
R142	24 dB LED adjust, right

### **CHASSIS**

R2	Scope trace rotation
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#### IV. SPECIFICATIONS

##### PHYSICAL:

Height	3-1/2 inches
Width	19 inches
Depth	15 inches
Weight	15 lbs.

The AM-2B is intended to be installed in an EIA standard 19" rack space and occupies 2 standard rack units.

##### TECHNICAL:

CH-1/CH-2: 3-pin XLR, female, 50K ohm, balanced: Pin 1, chassis ground. Pin 2, audio high. Pin 3, audio low.

NOTE: Inputs can be resistively terminated to studio standards.

Power: 115, 230, 240, 250 or 260 VAC, 50 watts

In the interest of product improvement, Wohler Technologies, Inc. reserves the right to change specifications at any time.



**VI. PARTS LIST****SIGNAL BOARD AM-2B**

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
R1,R28,R61,R85	1K, 1/4W	6-0010
R3-R5,R30-R32	47K, 1/4W	6-0011
R9,R12,R17,R36,R39,R44	100 OHM, 1/4W	6-0012
R10,R18,R19,R37,R45,R46, R67,R70,R75,R91,R94,R99	10K, 1/4W	6-0013
R11,R16,R107,R135	1.82K, 1/4W	6-0131
R13,R40	200 OHM, 1/4W	6-0007
R14,R15,R41,R42	6.8K, 1/4W	6-0015
R20,R21,R47,R48	12K, 5W	6-0017
R22,R49,R55	A.O.T.	
R23,R50	270 OHM, 1/4W	6-0016
R24,R25,R51,R52	3K, 1/4W	6-0021
R26,R27,R53,R54	150K, 1/4W	6-0033
R38,R43,R109,R137	909 Ohm, 1/4W	6-0095
R56	200K POT	6-0181
R57,R58,R81,R82	100K, 1/4W	6-0005
R62,R86,R114,R142	5K POT	6-0046
R63,R69,R73,R74,R87, R93,R97,R98	4.75K, 1/4W	6-0105
R64,R88	3.6K, 1/4W	6-0062

**SIGNAL BOARD AM-2B (continued)**

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
R65,R66,R89,R90	10K POT	6-0125
R68,R79,R92,R103,144, 147,150,153	46.4K, 1/4W	6-0106
R71,R76,R95,R100	267K, 1/4W	6-0103
R72,R77,R78,R96,R101, R102,R143,R146,R149,R152	22.1K, 1/4W	6-0104
R80,R104	180K, 1/4W	6-0100
R105,R133	4.22K, 1/4W	6-0090
R106,R134	2.21K, 1/4W	6-0091
R108,R136	806 OHM, 1/4W	6-0132
R110,R138	549 OHM, 1/4W	6-0133
R111,R139	348 OHM, 1/4W	6-0134
R112,R140	301 OHM, 1/4W	6-0097
R113,R141	500 OHM POT	6-0112
R115,R116	2.7K, 1/4W	6-0025
R117-R132	560 OHM, 1/4W	6-0030
R145,R148,R151,R154	60.4K, 1/4W	6-0128
R2,R6-R8,R29,R33-R35, R59,R60,R83,R84	NOT USED	
C1,C2,C5,C6	NOT USED	

**SIGNAL BOARD AM-2B (continued)**

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
C3,C7,C12-C16,C18,C21, C25-C29,C31,C35-C39	.1mF @ 63V	5-0040
C4,C8	A.O.T.	
C9	.015mF @ 600V	5-0020
C10,C11,C23,C24	10mF @ 35V	5-0003
C17,C19,C22,C30,C32,C34	.82mF @ 50V	5-0028
C20,C33	.022mF @ 50V	5-0010
Q1-Q6,Q9-Q14	2N4401	7-0002
Q7,Q8,Q15,Q16	2N3739	7-0005
U1,U2,U5,U6	MC1741CP1	9-0006
U3,U7	MC1747CP2	9-0019
U4	LM324	9-0021
U8,U9-U12	LM339	9-0022
U13,U14	LM3086N	9-0007
D1,D2	1N914	8-0003
J1	30 PIN HEADER	11-0033

## LED DISPLAY BOARD AM-2B

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
D1,D10	T1-3/4 RED LED	8-0008
D2-D9,D11-D18	T1-3/4 GREEN LED	8-0006
J1	30 PIN HEADER	11-0033

## HIGH VOLTAGE POWER SUPPLY BOARD AM-2B

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
R1	150K, 1/2W	6-0001
R2	3.3M, 1W	6-0002
R3-R5	470K, 1/2W	6-0003
R6	68K, 1/2W	6-0004
C1-C6	.1mF @ 2000V	5-0001
D1-D6	1N4007	8-0002

## CHASSIS AM-2B

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
R1	2K, 5W	6-0049
R2	500 OHM POT	6-0124
R3,R4	1000 OHM POT	6-0188
R5,R6	1M POT	6-0041
R7	270K, 1/2 W	6-0173
C1,C2	160mF @ 350V	5-0021
C4-C5	4100mF @ 25V	5-0022
C3	NOT USED	
U1	NOT USED	
U2	MC7812CK	9-0012
U3	MC7912CK	9-0013
Z1	BRIDGE, 600V	8-0017
Z2	BRIDGE, 100V	8-0016
Z3	NOT USED	
T1	TRANSFORMER	17-0014
J1	50/100 CARD EDGE	11-0002
J2,J3	3 PIN XLR	11-0005

**CHASSIS AM-2B (continued)**

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
J4-J8	3 PIN MOLEX	11-0007
P4-P8	3 PIN MOLEX	11-0008
S1	POWER SWITCH	14-0003

## MISCELLANEOUS PARTS AM-2B

<u>SYMBOL NO.</u>	<u>DESCRIPTION</u>	<u>B &amp; B PART NO.</u>
DS1,DS2	VU METER LAMPS	13-0004
M1,M2	VU METERS	4-0012
	CRT	21-0005
	FILTER/GRATICULE	19-0020
FS1	FUSE, 2 AMP (115-220 VAC OPERATION)	12-0001
	FUSE, 1 AMP (230-260 VAC OPERATION)	12-0002
	KNOBS	26-0008



## **WARRANTY**

THE COMPANY GUARANTEES THIS EQUIPMENT AGAINST ELECTRICAL AND MECHANICAL DEFECTS FOR A PERIOD OF ONE YEAR FROM DATE OF PURCHASE.

THIS WARRANTY APPLIES ONLY TO UNITS THAT HAVE NOT BEEN MODIFIED, ALTERED OR CHANGED IN ANY MANNER.

THE COMPANY'S LIABILITY IS EXPRESSLY LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS AT ITS FACTORY. ANY COMPANY REPRESENTATIVE MAY GIVE NO FURTHER WARRANTY, ORAL OR WRITTEN, EXPRESSED OR IMPLIED, TO THE BUYER.

IN THE EVENT INFORMATION CONCERNING SERVICE IS NEEDED, CONTACT:

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