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SSB

(Single-Sideband)

EQUIPMENT

OPERATING MANUAL
PRICE \$2.50
PHASEMASTER II B



MANITOWOC, WISCONSIN

MANUFACTURERS OF PRECISION ELECTRONIC EQUIPMENT

INSTRUCTION MANUAL.

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Theory of Operation:

The Phasemaster II A or B is a modern phasing type band-switching transmitter capable of transmitting all types of emissions -- AM, FM, CW, as well as DSB or SSB with or without carrier. Covers all bands 160 Meters thru 10 Meters. A modern design audio system, utilizing a 3500 cycle low pass audio filter gives a cut off at 3800 cycles of better than 40DB.

Audio is fed to an audio phase-shift network which produces two audio signals 90 degrees out of phase. These audio signals modulate two 9 MC R.F. signal, 90 degrees out of phase which are produced by an R.F. phase-shift network. The resultant signals are combined in a balanced modulator circuit which produces output emissions of AM, FM, CW, or SSB or SSB with or without carrier, depending upon the combination of AF and RF signals, and the amount of unbalance in the balanced modulator circuit,

The desired 9 MC signal is combined with a crystal or VFO signal in a mixer stage to provide output in the Amateur bands. The mixer stage is fed into a class A buffer amplifier which provides sufficient drive to operate the 6146 linear amplifier in class AB1 operation giving a usable output of 65 watts PEP. The 6146 amplifier is worked into a pinetwork giving a flexible output arrangement from below 50 ohms to over 300 ohms. The use of the pinetwork output circuit makes it possible to properly load the output amplifier to either antenna or an additional power amplifier. When used to drive a grounded grid type final where it is important to properly match the grounded grid input impedance for proper operation, the pinetwork of the "Phasemaster II - A or B" becomes extremely useful.

Voltage regulation of the 6146 screen and the 9 MC Oscillator and temperature compensating condensers in the critical 9 MC circuits are employed to give improved operating stability. An improved anti-trip voice control unit is completely built in allowing the operator to operate voice control on all types of voice transmissions in addition to break-in CW operation. The improved voice control circuit gives added performance and ease of operation not before available. An additional 2 sets of SPDT relay contacts are available from the rear chassis for controlling of antenna relays etc.

Added refinements such as an earphone jack for phone operation that is controlled with the voice control is panel mounted. A phone patch input is provided allowing patching directly into transmitter giving sufficient gain to operate most phone patch units. This input is filtered to prevent RF feedback.

General Description - Cont.

The Phasemaster II-A is a complete self contained transmitter less V.F.O. The Phasemaster II-B is complete with VFO built in.

Tube complement Phasemaster II-A: 12AX7 speech, 12AT7 modulator, 6U8 AF driver and 9 MC Xtal osc., 6BA7 mixer, 6CL6 buffer, 6L46 linear power amplifier, 1-5Y3GT L.V. Rect, and 1-5U4GB H.V. rect., 12AT7 anti-trip, 12AX7 voice control, 6AL5 bias rect, OA2 voltage regulator, -OB2 Voltage Regulator.

Phasemaster II-B same as above plus 6CB6 V.F. Oscillator, 6X4 VFO Rect. 6BA7 VFO Mixer, OB2 VFO Voltage Regulator, 6CL6 VFO Amplifier.

The VFO master oscillator operates on a 5.0 to 5.6 MC range on all bands. The 5.0 to 5.6 MC range is used for mixing against the 9 MC SSB exciter signal to provide operation on both 80 M and 20M bands. The 160 M band uses the 2nd harmonic of the 5.0 to 5.6 MC range and the 40M band uses the 3rd harmonic of the 5.0 to 5.6 MC range. The 15M band is heterodyned with the 5.0 to 5.6 MC and a 25 MC crystal controlled signal to provide a 30.0 to 30.45 output frequency. The 10M band is split into two (2) bands to provide maximum bandspread. The 10₁ band is heterodyned with the 5.0 to 5.6 MC and a 32.5 MC crystal controlled signal to provide a 37.5 to 38.1 output frequency. The 10₂ band is heterodyned with the 5.0 to 5.6 MC and a 33.1 MC crystal controlled signal to provide a 38.1 to 38.7 MC output frequency. Output is fed from the mixer stage into a bandpass isolation stage to provide from 3 to 8V RF. RF output is kept at the lowest usable level on the higher band to eliminate undesirable mixing products from overdriving the exciter mixer.

PHASEMASTER II-A-B
Printed in U.S.A.

LAKESHORE INDUSTRIES
Manitowoc, Wisconsin

INSTALLATION

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Unpack carefully and remove unit from its shipping carton. Inspect for any hidden damage. All claims for damage should be filed promptly with the transportation company. Be certain that all controls such as switches, dials, etc. work properly.

The rear chassis is clearly marked for ease of connecting into your station. Connect audio output of receiver to proper terminals at rear of transmitter. Note: Viewing chassis from the rear. The extreme left terminal connects to ground. If one side of the audio output of the receiver is grounded be sure that it is connected to this terminal. Connect speaker to speaker terminals. Two sets of terminal at rear of chassis are connected to contacts on the control relay for external switching requirements such as an antenna relay. Cut off Bias of - 100 volts is available for a final amplifier if desired. This bias is grounded on transmit. A Coax connector or screw terminals are available for connecting transmission line. The MM socket is connected internally to the RF rectifier circuit used in conjunction with the indicator eye and can be connected to an external meter if preferred.

If VFO operation is desired the Bandhopper VFO is available which plugs into the auxiliary power socket on the rear chassis. 6.3VAC @ 2A. and 300VDC @ 25 MA is available at the socket for other VFO's if needed. 4 to 8 volts RF Max VFO signal is required. See circuit diagram for connections.

Following is an explanation of the functions of the front panel controls.

1. CALIBRATE LEVEL

The CALIBRATE LEVEL control allows variable adjustment of signal level when the FUNCTION Switch is in CALIB or TOF (talk on frequency) positions for zero beating the transmitter signal to the receiver. This control may be left in the desired operating position at all times as it is automatically switched out when the FUNCTION Switch is removed from CALIB or TOF positions.

2. INDICATOR LEVEL

The INDICATOR LEVEL control adjusts the sensitivity of the Indicator eye when the Indicator switch is in position "1." Rectified R.F. is fed thru this control to the Indicator eye, for tuning for Maximum output or for adjusting carrier balance.

3. FUNCTION SWITCH

"MAN " - Manual Position allows receive to transmit operation to be controlled manually.

"STBY" - Standby

"CALIB" - Calibrate position. CALIBRATE LEVEL control is operative in this position and allows a controlled amount of carrier for Zero - beating output signal to the Receiver.

"TOF" - Talk on Frequency - calibrate level is also operative in this position and controls level of output to "Talk on Frequency."

"VOX" - Voice Control operation - "See anti-Trip Voice control operation section.)

4. VC GAIN (VOICE CONTROL GAIN)

The VC gain control allows adjustment of Voice control gain or volume settings. It should be set for proper voice control relay operating when speaking 3-4 inches from your mike. (See Anti-trip Voice Control Operation section.)

5. AT GAIN (Anti-trip Gain)

The AT GAIN control allows adjustment of the anti-trip gain, removing the condition of possible signal from your receiver's speaker reaching your mike and causing the transmitter to go on the air. This control should be set just high enough to remove the above condition.

5. (See Anti-trip Voice Control Operation section.)

6. MIKE Input

The "Phasemaster II A or B is designed to work with any good crystal or Dynamic hi impedance type mike used in amateur communications.

7. PATCH Input

A telephone patch input jack is provided to allow use of phone patching facilities. Either Voice Control or Manual operation may be used with phone patching operation.

8. AUDIO GAIN

The AUDIO GAIN control function is similar to all AM equipment. This control gives modulation control of signal on AM-PM. On SSB it also controls SSB power of transmitter (see section of Operating Instructions.)

9. Carrier Balance Controls (recessed between Audio Gain & Carrier Level)

The Carrier Balance controls are located behind the front panel because of the seldom need for adjustment after properly set. They are accessible from front panel with a screw driver for adjustment. (See Operating Instructions.)

10. CARRIER LEVEL Control

The CARRIER LEVEL control allows variable reinsertion of carrier for any level between zero and full. This provides for inserting carrier for AM-PM and CW operation. On SSB operation this control should be turned fully counter-clockwise to zero.

11. INDICATOR Switch

Position #1 Rectified RF is fed to Indicator eye Grid for adjusting for maximum output, or for adjusting carrier suppression. INDICATOR LEVEL control allows adjustable sensitivity in this position.

Position #2 Tuning eye indicates when 6146 is being over-driven and when flat topping occurs. (See operating instructions under INDICATOR)

12. EMISSION Switch

The EMISSION Switch allows all types of transmission, AM-DSB-PM-CW as well as switchable SSB.

12. EMISSION Switch - Cont.

Set the EMISSION Switch for the desired type of transmission and follow operating instructions. For Single Sideband see chart for sideband position that gives desired sideband (either upper or lower.)

13. ~~ADJUSTABLE~~ TRIM

This control allows peaking of the broadband mixer coils for maximum output at band extremities. Set at 3 for initial tune up on any band.

14. BAND Switch

The "Phasemaster-II" is completely bandswitched. All band operation is simple by setting the BAND switch to the desired band marking, providing the proper crystal or VFO signal and tuning the mixer, buffer and P.A. controls.

15. BUFFER TUNING

The BUFFER TUNING control is marked with the approximate band locations. This arrangement enables the operator to preset the tuning and only requires fine adjustment for proper operation.

16. P.A. TUNING

The P.A. TUNING control is the plate tuning of the 6146 linear amplifier stage. Follow instructions outlined in step 15 above. It is possible to tune in some band cases to either the VFO frequency or the master 9 MC frequency. However, traps are provided to remove the error and these points will be far removed from normal band markings. This remote condition will be noticed if it is impossible to remove carrier.

17. ANTENNA LOADING

The 6146 output stage of the "Phasemaster-II A or B is a pinetwork. The antenna loading is adjustable and will match load impedances from below 50 to over 300 ohms. Adjust this control for max output or proper loading for good linearity on SSB.

18. POWER Switch

The Power switch turns on the main power (115V AC 60C)

19. PHONE Jack

A phone jack is provided to allow earphone operation. This jack automatically silences the phones thru the Voice Control Relay in transmit position.

Front Panel Operating Control - Cont.

19. PHONE Jack Cont.

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This allows either voice control or break in CW operation for those who desire to use earphones.

20. KEY Jack

A Key Jack is provided to allow keying for CW operation. Simply tune the transmitter as outlined above, then insert key into KEY jack and turn FUNCTION switch to Manual. When the "Thesemaster - II A or B" is properly connected to your station equipment it is possible to operate break in CW.

21. XTAL

For plugging in an appropriate crystal when mixing with the 9 MC signal or for direct frequency crystal operation as outlined under "Novice CW operation."

22. XTAL - VFO Switch

Selects desired method of frequency injection. VFO signal should be fed into auxiliary socket at rear of chassis. See wiring diagram for proper connections. The "Bandhopper VFO" comes complete with plug to match this socket.

PRELIMINARY TUNE - UP INSTRUCTIONS

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AUDIO GAIN - 0.

CARRIER LEVEL - 0.

FUNCTION Switch STBY.

EMISSION Switch - any position.

INDICATOR Switch - Position #1.

VFO STANDBY Switch - on.

Connect proper antenna or load to R.F. Output Connector.

Connect Power cord to 115 VAC 60 CYCLE Source.

Turn on VFO and EXCITER POWER Switches and allow TRANSMITTER to warm up.

Insert crystal or set VFO at appropriate frequency.

Set VFO-XTAL Switch to corresponding position.

Set BAND Switches, P.A. TUNING, BUFFER TUNING to desired band.

Set MIXER TRIM control to 3.

Set INDICATOR LEVEL to 6.

Turn FUNCTION Switch to "man."

Increase CARRIER LEVEL until eye just starts to show indication.

Tune MIXER TRIM and BUFFER TUNING control for Maximum reducing CARRIER LEVEL as required to give usable indication.

Turn indicator switch to Position #2.

Advance CARRIER LEVEL until eye just starts to show indication.

Turn indicator switch back to position 1.

Reduce INDICATOR LEVEL as required while alternately adjusting PA TUNING AND ANTENNA LOADING for maximum indication.

Turn FUNCTION Switch to STBY.

PHASEMASTER II-B
Printed in U.S.A.

LAKESHORE INDUSTRIES
Manitowoc, Wisconsin

SSB Operation:

Tune transmitter as above to desired band. Set emission switch to desired sideband. Turn carrier level to "0". Set indicator switch to #2 position. With mike connected to mike input, set function switch to manual or voice operate (VOX) and while talking normally into the mike, advance audio gain control until audio peaks start to give an indication on the eye tube. This is the point beyond which "Flat-topping" will occur.

Carrier balance can be checked and adjusted by setting indicator switch to #1, Indicator level to about 6, and turn function switch to Manual. Alternately adjust with a screw driver the carrier balance controls, accessible from the front panel between the audio gain and carrier level controls, for Minimum indication (Maximum opening of eye.) Continue adjustments until no further improvement is noted. These adjustments should not be required over lengthy periods of time, except for periddical checking as above.

NOTE: Allow a 15 to 20 minute warm-up period before making carrier balance adjustments.

DSB Operation

Same as SSB except set EMISSION switch to AM-DSB position.

AM Operation

Set the EMISSION switch to AM-DSB position. INDICATOR switch to position 1. Set CARRIER LEVEL to desired level (between 1 and 8). Adjust AUDIO GAIN until modulation peaks just reach maximum output level used. This will be indicated by observing the eye INDICATOR and adjusting the AUDIO GAIN to keep audio level just below the point that causes eye shadow to move. Voice control or manual operation is available by proper setting of the FUNCTION switch.

PM Operation

Set the EMISSION switch to PM position. INDICATOR switch to position 1. Set CARRIER LEVEL to desired level (between 1 and 8). Adjust AUDIO GAIN so modulation peaks do not exceed the carrier level. This will be indicated by observing the eye INDICATOR AND ADJUSTING the AUDIO GAIN to just below the point that causes eye shadow to move. Voice control or manual operation is available by proper setting of the FUNCTION switch.

CW Operation

CW Operation (break~~ing~~-in) is available by placing the emission switch to CW, plugging your key into the key jack located on the front panel and setting the carrier level control to desired output. Set function switch to manual and key/

Novice CW Operation

Novice direct frequency crystal controlled CW operation is available on the 160, 80, and 40 meter bands by simply inserting the desired frequency crystal into the front panel crystal socket and tuning the buffer and P.A. amp controls to the frequency. This arrangement allows crystal controlled operation for novice operation with fundamental frequency crystals. The same "break-in" features are available as outlined in the CW operation section above. See ALL Band Operation chart.

NOTE: When using direct frequency crystals, keep carrier level control at "0".

ANTI TRIP VOICE CONTROL OPERATION (VOX)

With audio output of receiver and speaker properly connected at rear of chassis, and with mike connected, turn FUNCTION switch to VOX. Set AT GAIN to "0" speaking normally into the mike. Adjust VC GAIN for proper relay operation. Now tune in a fairly strong station that causes the voice control relay to kick in from the speaker level. Adjust the AT LEVEL just high enough to correct this condition.

NOTE: Too much AT gain will make it difficult to get proper voice control operation. A screwdriver relay set control is located on the rear chassis. This is factory adjusted, but if trouble is experienced with the relay not releasing or improper pulling in, adjust this control as follows: Set AT GAIN at "0", VC GAIN at "5". While speaking normally into the mike, adjust relay set control for proper relay operation.

INDICATOR

With the INDICATOR switch in position #2, the EYE will indicate when the 6146 is being overdriven. If the 6146 is driven beyond class AB₁ the voltage developed by the grid current flow is fed to the eye grid causing it to start to close.

Set the point at which the eye starts to close as follows:

Set INDICATOR switch to "2"

Set CARRIER LEVEL at "0"

Turn FUNCTION switch to MANUAL

Adjust IND. #2 SET (See Figure 1) until eye is just at the point where it starts to close.

Note: This adjustment is seldom required, and for that reason has been mounted on the top of the chassis. It can however, be reached with a long slim screwdriver through the louvers on the top of the cabinet.

OPERATING INSTRUCTIONS Cont.VFO

Operation of the VFO is simple and straight forward. Two (2) slide switches are located on the front panel. The switch marked power turned on the AC power to the VFO. The switch marked STBY is provided for those who desire immediate stability from day to day. Both switches must be up for proper operation. If you desire immediate stability for operating at a latter time, switch the standby switch down when your present operation is concluded. Leave power switch on. This allows the master oscillator to operate and removes plate power from all other stages, still allowing normal temperature and stability to be maintained even when the VFO is not in normal use. The VFO Power supply is rated sufficiently that it may be left in Standby for long periods of time.

Select desired band with the bandswitch knob. Set desired frequency on the main dial. A logging scale is provided on the bottom scale of the main dial and a vernier scale at the tuning knob. This is provided for accurate reset to any frequency at a later date. The Band-Hopper is not intended as an accurate frequency standard, therefore when operation close to the bandedges is desired it is recommended that a sepearte calibrated frequency standard be utilized to eliminate illegal operation outside of the amateur band. Band calibration of the dial is 5 KC on 80,20,15,10 meters and 10KC on 160, 40 meters.

A Bandset adjustment is located thru a hollow shaft on the oscillator compartment shield cover directly behind the dial panel (see fig. 1). In case of frequency changes caused by circuit values changing or other causes, calibration may be corrected by this adjustment. Remove the Exciter from its cabinet far enough so access can be had to the Bandset adjustment.

Set all controls for 80 meter operation and VFO dial to 4MC. Turn Function switch to Calibrate. Using a calibrated source such as your receiver and a 100 KC Frequency Standard, set the Bandset adjustment for zero beat.

Replace exciter in it's cabinet.

ALL BAND OPERATION

The frequency conversion system used in the PHASEMASTER II A or B permits all band operation without affecting the sideband suppression adjustments.

The following chart shows the injection frequencies required for all band operation.

BAND	OUTPUT FREQUENCY	INJECTION FREQUENCY
160M	1800 kc. 2000 kc.	7200 kc.* or 10800 kc. 7000 kc.* or 11000 kc.
80M	3500 kc. 3800 kc. 4000 kc.	5500 kc.* or 12500 kc. 5200 kc.* or 12800 kc. 5000 kc.* or 13000 kc.
40M	7000 kc. 7200 kc. 7300 kc.	16000 kc. or 5333.3 kc.x3 16200 kc. or 5400 kc.x3 16300 kc. or 5433.3 kc.x3
20M	14000 kc. 14200 kc. 14300 kc.	5000 kc.* or 23000 kc. 5200 kc.* or 23200 kc. 5300 kc.* or 23300 kc.
15M	21000 kc. 21450 kc.	12000 kc. or 30000 kc. 12450 kc. or 30450 kc.
10M	28000 kc. 28500 kc. 29700 kc.	37000 kc. 37500 kc. 38700 kc.

* Injection at these frequencies may be obtained from crystals plugged into the front panel socket.

The "Bandhopper" VFO will give the necessary injection frequencies to permit all band operation.

SIDEBANDS TRANSMITTED VS VFO INJECTION FREQS

BAND	SSB-1	SSB-2	MASTER XTAL	VFO or XTAL	INJECT FREQ	OUTPUT FREQ
160M	Upper	Lower	9MC	7MC to 7.2MC		2MC to 1.8MC
160M	Lower	Upper	9MC	10.8MC to 11.0MC		1.8MC to 2.0MC
80M	Upper	Lower	9MC	5.0MC to 5.5MC		4.0MC to 3.5MC
80M	Lower	Upper	9MC	12.5MC to 13.0MC		3.5MC to 4.0MC
40M	Lower	Upper	9MC	16.0MC to 16.3MC		7.0MC to 7.3MC
20M	Lower	Upper	9MC	5.0MC to 5.3MC		14.0MC to 14.3MC
20M	Lower	Upper	9MC	23.0MC to 23.3MC		14.0MC to 14.3MC
15M	Lower	Upper	9MC	12.0MC to 12.45MC		21.0MC to 21.45MC
15M	Lower	Upper	9MC	30.0MC to 30.45MC		21.0MC to 21.45MC
11M	Lower	Upper	9MC	35.96MC to 36.23MC		26.96MC to 27.23MC
10M	Lower	Upper	9MC	37.0MC to 38.7MC		28.0MC to 29.7MC

CAPACITORS

SCHMATIC DESIGNATION	DESCRIPTION
C1	150 mmf 500 V Ceramic Disc or Tubular
C2	25 mfd 25 V Electrolytic
C3	470 mmf 500 V Ceramic Disc or Tubular
C4	150 mmf 500 V Ceramic Disc or Tubular
C5	8 mfd 450 V Electrolytic
C6	.001 mfd 500 V Ceramic Disc
C7	.001 mfd 500 V Ceramic Disc
C8	150 mmf 500 V Zero TC Ceramic
C9	220 MMF 500 V Ceramic
C10	120 mmf 500 V Zero TC Ceramic
C10A	33 MMFD N-750
C11	.001 mfd 500 V Ceramic Disc
C12	.005 mfd 500 V Ceramic Disc
C13	.005 mfd 500 V Ceramic Disc
C14	.001 mfd 500 V Mica
C15	.001 mfd 500 V Mica
C16	150 mmf 500 V Silver Mica 5%
C17	150 mmf 500 V Silver Mica 5%
C18	.005 mfd 500 V Ceramic Disc
C19	.005 mfd 500 V Ceramic Disc
C20	3mmf 500 V Silver Mica 5%
C21	.005 mfd 500 V Ceramic Disc
C22	.005 mfd 500 V Ceramic Disc
C23	.005 500 V Ceramic Disc
C24	75 mmf 500 V Ceramic Disc or Tubular
C25	100 MMF 500 V Ceramic Disc. or Tubular
C26	150 MMF 500 V Ceramic Disc. or Tubular
C27	150 mmf 500 V Ceramic Disc or Tubular
C28	.005 mfd 500 V Ceramic Disc
C29	.005 mfd 500 V Ceramic Disc
C30	385 mmf Variable - Buffer Tuning
C31	.005 mfd 500 V Mica
C32	.005 mfd 500 V Ceramic Disc
C33	.001 mfd 500 V Ceramic Disc
C34	.02 mfd 500 V Ceramic Disc
C35 A-B-C	20-30-20 mfd 450 V Electrolytic
C36	.5 mfd 200 V Paper
C37	.02 mfd 500 V Ceramic Disc
C38	.1 mfd 200 V Paper
C39	.01 mfd 500 V Ceramic Disc
C40	.01 mfd 500 V Ceramic Disc
C41	40 mfd 150 V Electrolytic
C42	.001 mfd 500 V Ceramic Disc or Tubular
C43	.5 mfd 200 V Paper
C44	.005 mfd 500 V Ceramic Disc
C45	.005 mfd 500 V Ceramic Disc
C46	.005 mfd 500 V Ceramic Disc
C47	.005 mfd 500 V Mica
C48	385 mmfd Variable - P.A. Tuning

CAPACITORS CONT.

SCHEMATIC DESIGNATION	DESCRIPTION
C49	1400 mmfd Variable - Ant. Loading
C50	5mmf 500 V Ceramic Tubular
C51	.005 mfd 500 V Ceramic Disc
C52	.005 mfd 500 V Ceramic Disc
C53	.001 mfd 500 V Mica
C54	8 mfd 600 V Electrolytic
C55	39 mmf 500 V Silver Mica 5%
C56	.005 mfd 500 V Ceramic Disc
C57	.005 mfd 500 V Ceramic Disc
C58	.5 mfd 200 V Paper
C59	50 mmfd Variable
C60	.005 mfd - 500 Volt Mica
C61	.005 mfd - 500 Volt Mica
C62	15 Mmf 1.5KV
C63	10 mmf 500 V Ceramic
C64	.005 Mfd - 500 V Ceramic
C65	.005 Mfd - 500 V Ceramic

JACKS & FUSES

F1	3 Amp SB 3AG Type Fuse	J2	Earphone Jack
F2	¼ AMP SLOBLO	J3	Key Jack
J1	Phone Patch Jack		

COILS

L1	9MC Osc	L7-L13	Mixer Coils
L2	9MC Osc PS	L14	Buffer Coil
L3	9MC BM	L15	Final Coil
L4	9MC Coupling	L16	PC Trap
L5	9MC Output	L17	PC Trap
L6	15MC Trap	L18	5 MC Trap

RESISTORS

R1	4.7K ½W 10%	R20	470 Ohm ½W 10%
R2	1 Meg ½W 10%	R21	1K ½W 10%
R3	2.2K ½W 10%	R22	100 Ohm 1W 10%
R4	470K ½W 10%	R23	470 ohm ½W 10%
R5	220K ½W 10%	R24	100 ohm 1W 10%
R6	1K ½W 10%	R25	1K 1W 10%
R7	100K ½W 10%	R26	1 Meg Control-VC Gain
R8	1 Meg Control-Audio Gain	R27	10K ½W 10%
R9	1K ½W 10%	R28	470K ½W 10%
R10	1K 1 Watt 10%	R29	1K ½W 10%
R11	2K Control-Audio Balance	R30	4.7K 1W 10%
R12	47K Ohm 1W 10%	R31	150K ½W 10%
R13	100K ½W 10%	R32	100K ½W 10%
R14	68 ohms 1W 10%	R33	220K ½W 10%
R15	1K Control 2W-Carrier Bal.	R34	1 Meg ½W 10%
R16	1K Control 2W-Carrier Bal.	R35	100K ½W 10%
R16A	1K Control 2W-Carrier Level	R36	100K ½W 10%
R17	180 Ohm ½W 10%	R37	2.2 Meg ½W 10%
R18	22K ½W 10%	R38	470K ½W 10%
R19	33K 2W 10%	R39	6K Control-Relay Set

RESISTORS CONT.

R40	1 Meg Control-AT Gain	R55	220K 1/2W 10% Calib
R41	10 Ohm 5W 10%	R56	100K Control-Calib level
R42	1K 1/2W 10%	R57	1K 1/2W 10%
R43	100K 1/2W 10%	R58	100 Ohm 2W 10%
R44	100K 1/2W 10%	R59	1 Meg Control-Ind Level
R45	1 Meg 1/2W 10%	R60	1 Meg 1/2W 10%
R46	1 Meg 1/2W 10%	R61	100 Ohm 1/2W 10%
R47	100K 1/2W 10%	R62	1 MEG Control IND.#2 Set
R48	220K 1/2W 10%	R63	5.6K 1/2W 10%
R49	5K 20W	R64	680K 1/2W
R50	100K 1/2W 10%-220K 1/2W	R65	1 Meg 1/2W
R51	10K 1/2W 10%	R66	1 MEG 1/2W
R52	47K 1/2W 10%	R67	47K 1/2W 10%
R53	22K 1/2W 10%	R68	470 Ohm 1/2W
R54	220K 1/2W 10%	R69	100K 2W

SWITCHES

S1	A-B-C-D Function switch		
S2	A-B Buffer & Mixer	S5	Power Switch
S3	Final Bandswitch	S6	A-B Modulation Switch
S4	XTAL-VFO Switch	S7	Indicator Switch

TRANSFORMERS & CHOKES

T1	AF Driver P-2651	T5	AT Input A-3329
T2	Modulation P-2652	T6	Low Pass Audio Filter P-2933
T3	Modulation P-2652	CH -1	Filter P-3022
T4	Power P-2984	CH -2	Filter 2P144

TUBES & DIODES

V1	12AX7-Audio Amplifier	V8	12AT7 - AT Amp-Rect.
V2	6U8-AF Driver 9MC Osc	V9	5Y3GT - LV Rect.
V3	12AT7-AF Modulator	V10	5U4GB - H V Rect.
V4	6BA7 - Mixer	V11	6E5 - Ind. Eye
V5	6CL6-Buffer	V12	6L46 - Linear Amp/
V6	12AX7 - VC Amp-Relay Cont.	V13	0A2 Voltage Regulator
V7	6AL5-Bias-VC Rect.	V14	0B2 Voltage Regulator

X-1 thru 5 - 1N 34A Diode

MISC. COMPONENTS

PS-Jr-Complete phase shift network on printed wiring board.

RY - 10K plate relay.

RFC 1 thru 7 - .5 MH RF Chokes

RFC 8 2.5 MH RF Choke

Chassis, shields, hardware, front panel & cabinet.

PHASEMASTER II - A
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LAKESHORE INDUSTRIES
Manitowoc, Wisconsin

ALIGNMENT

Your Phasemaster IIA or B has been completely aligned at the factory and realignment should not be required for a long period of time. However, if some or all adjustments have been inadvertently misadjusted, the following procedure may be followed in whole or in part as the case requires.

1. Set INDICATOR switch to position. INDICATOR LEVEL to 6
Connect Dummy load to RF connector. (a 50 watt light bulb will do)
2. Remove 9000 Kc Crystal from its socket
3. Insert crystal or VFO signal at about 5000 KC A Calibrated VFO, such as the "Bandhopper" will read 4 MC.
4. Set the MIXER TRIM control to 3, BUFFER and P.A. TUNING controls between 30 and 40 MTR markings.
5. Set L-8 so adjusting screw protrudes 5/8 inch.
6. Turn FUNCTION switch to MAN. Tune MIXER TRIM, BUFFER and P. A. TUNING for maximum indication. (Maximum closing of eye) Reduce INDICATOR LEVEL setting to give usable indication.
7. Adjust L-18 (5MC Trap) for Maximum opening of eye.
Turn FUNCTION switch to STBY.
8. Turn BANDSWITCH to 20 METERS. Insert crystal or VFO injection frequency at 5300 KC (14.3 MC Dial marking on VFO). Set L-10 so adjusting screw protrudes 5/8 inch. Set MIXER TRIM control to 3. BUFFER AND P.A. TUNING between 15M and 20M markings.
9. Turn FUNCTION switch to MAN and adjust MIXER, BUFFER, and P.A. controls for Maximum Closing of eye.
Adjust L-6 (15MC Trap for maximum opening of eye.
Turn FUNCTION switch to STBY.
10. Insert 9000 KC Crystal
11. Connect VTVM (250VDC scale) to Pin 3 of 6US socket.
Adjust L-1 for dip in reading. Adjust L-2 for slight increase. Repeat adjustment of L1 and L2. Set L-3, L-4, and L-5 so adjusting screws protrudes 7/8 inch.
12. Set carrier level to 5
Using the VFO or Xtal injection signal set BANDSWITCH to 80, FUNCTION switch to MAN and Tune MIXER TRIM, BUFFER AND PA TUNING controls for maximum indication on Indicator eye.
Adjust L-1, L-3, L-4 and L-5 for maximum closing of eye.
Turn CARRIER LEVEL to 0. Alternately adjust Carrier Balance controls (Screw driver adjustment accessible from front panel between AUDIO GAIN and CARRIER LEVEL controls), for maximum opening of eye, until no further improvement can be noted. Turn CARRIER LEVEL to 5. Repeak L-1, L-3, L-4, & L-5.
Connect VTVM (250VDC scale) to Pin 3 of 6US socket. Re-adjust L-2 for Maximum peak reading. This will be the approximate setting of the R F Tunesing coil, L-2, when making sidebands suppression adjustments.
13. With proper tune up on each band, and with MIXER TRIM control set at 3. Adjust Mixer coils, L-7 thru L-13 for maximum output on the following frequencies.

Note: Keep carrier level at point that gives about 1/2 max. output.

160 Meters	1800KC	15 Meters	21.2 MC
80 Meters	3750KC	11 Meters	27.1 MC
40 Meters	7150KC	10 Meters	28.85 MC
20 Meters	14.2 MC		

SIDEBAND SUPPRESSION ADJUSTMENTS

Equipment required:

1. Audio Oscillator with good sine wave output set at 1225 cycles.
2. Oscilloscope.

Refer to figures 1 and 3 for adjustments.

Connect output of Audio Oscillator to Mike input connector. Connect Horizontal and Vertical inputs of Scope to pins 3 and 8 of V-3 (12AT7-Modulator). Set A F Balance control to mid range. Advance AUDIO GAIN and adjust A F Phasing control to produce a circle on the Scope.

Remove Scope connections from V-3 and couple to dummy load as shown in figure 4. Coupling is made directly into the Vertical plates.

Tune Transmitter as described in Preliminary tuneup instructions. Adjust I-O circuit in Scope coupling circuit for maximum deflection.

Set CARRIER LEVEL to "0"
AUDIO GAIN to "0"
EMISSION switch to SB-1
Turn FUNCTION switch to MANUAL.

Set AUDIO GAIN at about 4 and advance Audio oscillator gain to give about half maximum deflection on Scope. Alternately adjust R F Phasing control (I-2) and A F Balance and Phasing controls (see figure 3) until pattern on scope most closely resembles that of a pure RF signal. After each adjustment of I-2, turn AUDIO GAIN back to "0", and re-adjust Carrier Balance controls.

Turn EMISSION switch to SB-2 and check sideband suppression. If slight adjustment of I-2 improves sideband suppression, note position of adjusting screw for SB-1 and SB-2, and set midway between them. Make slight adjustments of the A F Phasing control until a position is found which gives good suppression on either sideband with no readjustment of I-2.
Reminder:

(Be sure to check Carrier balance after each adjustment of I-2)

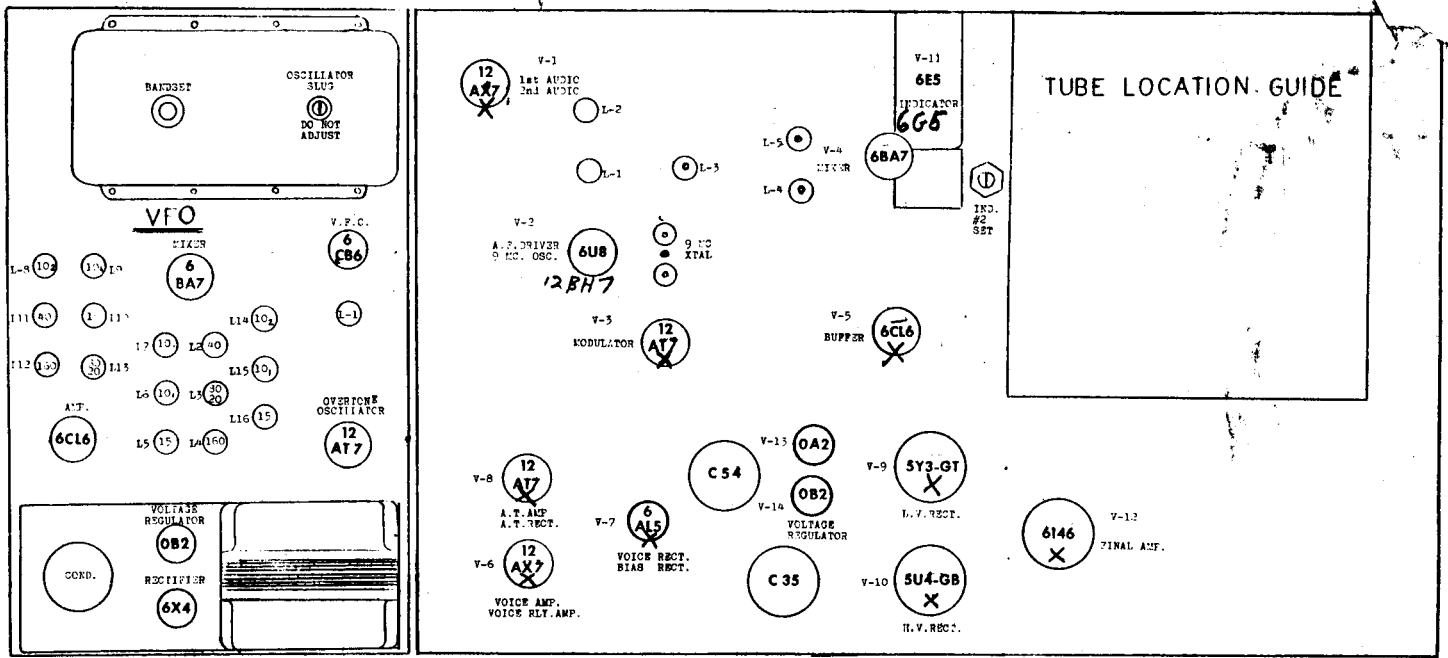


FIG. 1

VFO PART OF PHASEMASTER II-B ONLY

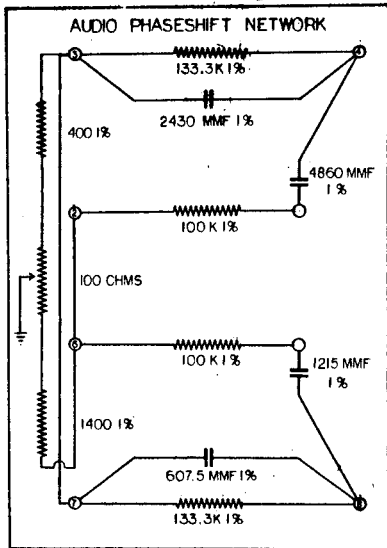


FIG. 2

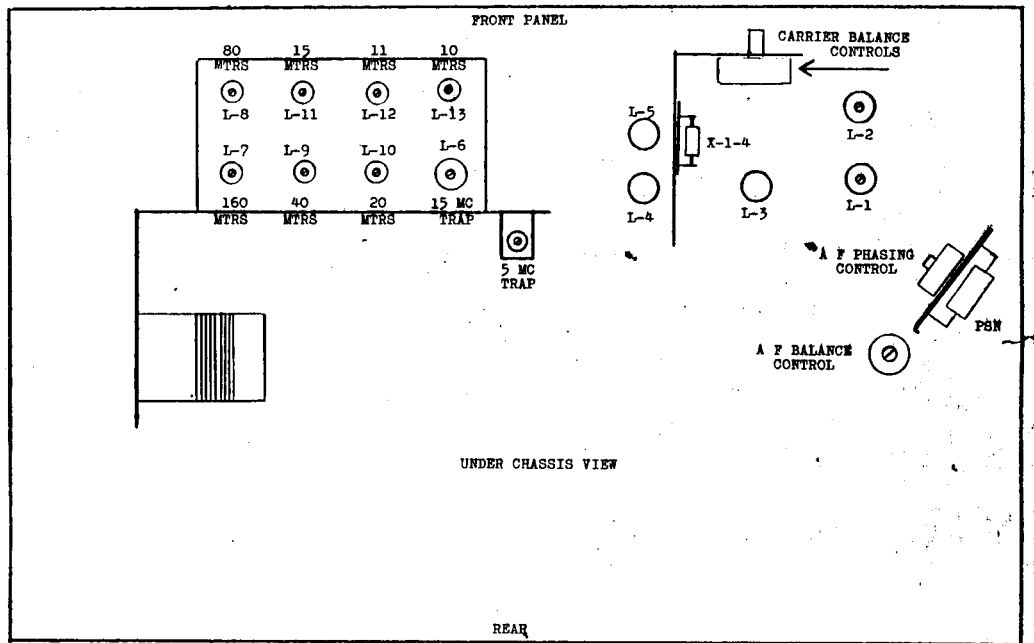
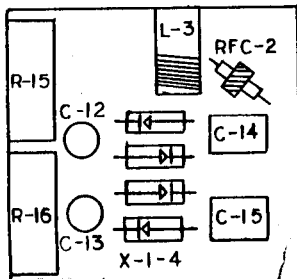


FIG. 3

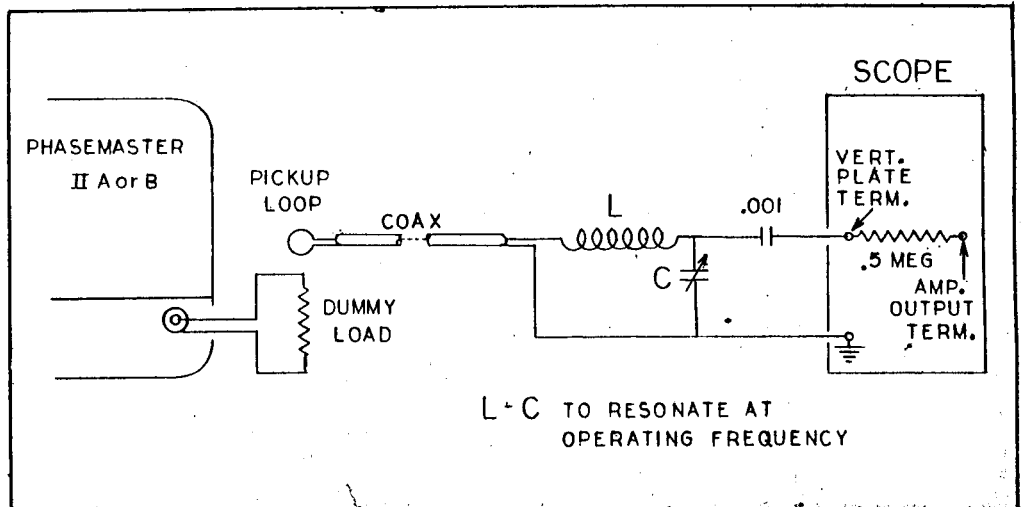


FIG. 4

VOLTAGE CHART

Test Conditions:

Ind. Level - 0
 Calib. Level-0
 AT Gain - 0

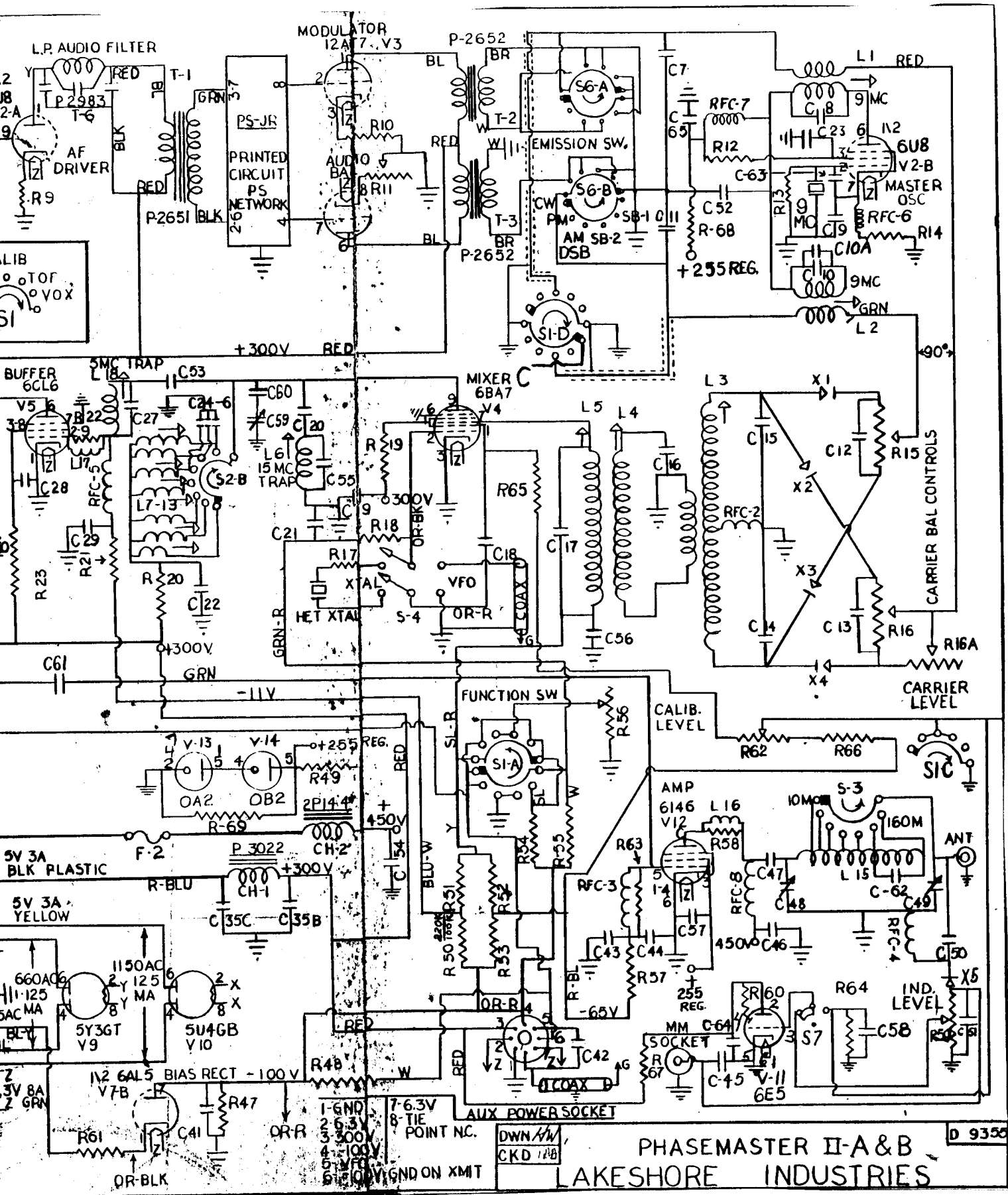
VC Gain - 0
 Audio Gain-0
 Carrier Level-0

Function Switch - Manual
 Indicator Switch- 1

Tuning - 4MC with Xtal inserted in front panel Xtal socket.

All voltages measured from Ground with VTVM.

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-1 12AX7 Speech	100V DC	0	.8V DC	3.1V AC	3.1V AC	170V DC	0	1.1V DC	3.1V AC
V-2 6U8 9MC Osc. A F Driver	290V DC	0	160V DC	3.1V AC	3.1V AC	255V DC	1.5V DC	6V DC	0
V-3 12AT7 Modulator	300V DC	0	4.2V DC	3.1V AC	3.1V AC	300V DC	0	5V DC	3.1V AC
V-4 6BA7 Mixer	48V DC	17V DC	0	3.1V AC	3.1V AC	0	0	0	300V DC
V-5 6CL6 Buffer	0	-10V DC	300V DC	3.1V AC	3.1V AC	300V DC	0	300V DC	-10V DC
V-6 12AX7 Voice Control	250V DC	10V DC	10V DC	3.1V AC	3.1V AC	140V DC	0	1V DC	3.1V AC
V-7 6AL5 Rect Bias- VC	85V AC	-.1V DC	3.1V AC	3.1V AC	.25V DC	NC	-85V DC		
V-8 12AT7 Anti-Trip	115V DC	0	1.6V DC	3.1V AC	3.1V AC	.5V DC	.5V DC	1V DC	3.1V AC
V-9 5Y3GT L.V.Rect.	NC	310V DC	NC	290V AC	NC	290V AC	NC	310V DC	
V-10 5U4GB H.V.Rect.	NC	500V DC	NC	570V AC	NC	570V AC	NC	500V DC	
V-11 6E5 Eye Indicator	3.1V AC	285V DC	0	250V DC	0	3.1V AC			
V-12 6146 Amplifier	0	3.1V AC	255V DC	0	-65V DC	0	3.1V AC	0	
V-13 0A2 Volt. Reg.	150V DC	0	NC	0	150V DC	NC	0		
V-14 0B2 Volt. Reg	255V DC	150V DC	NC	150V DC	255V DC	NC	150V DC		



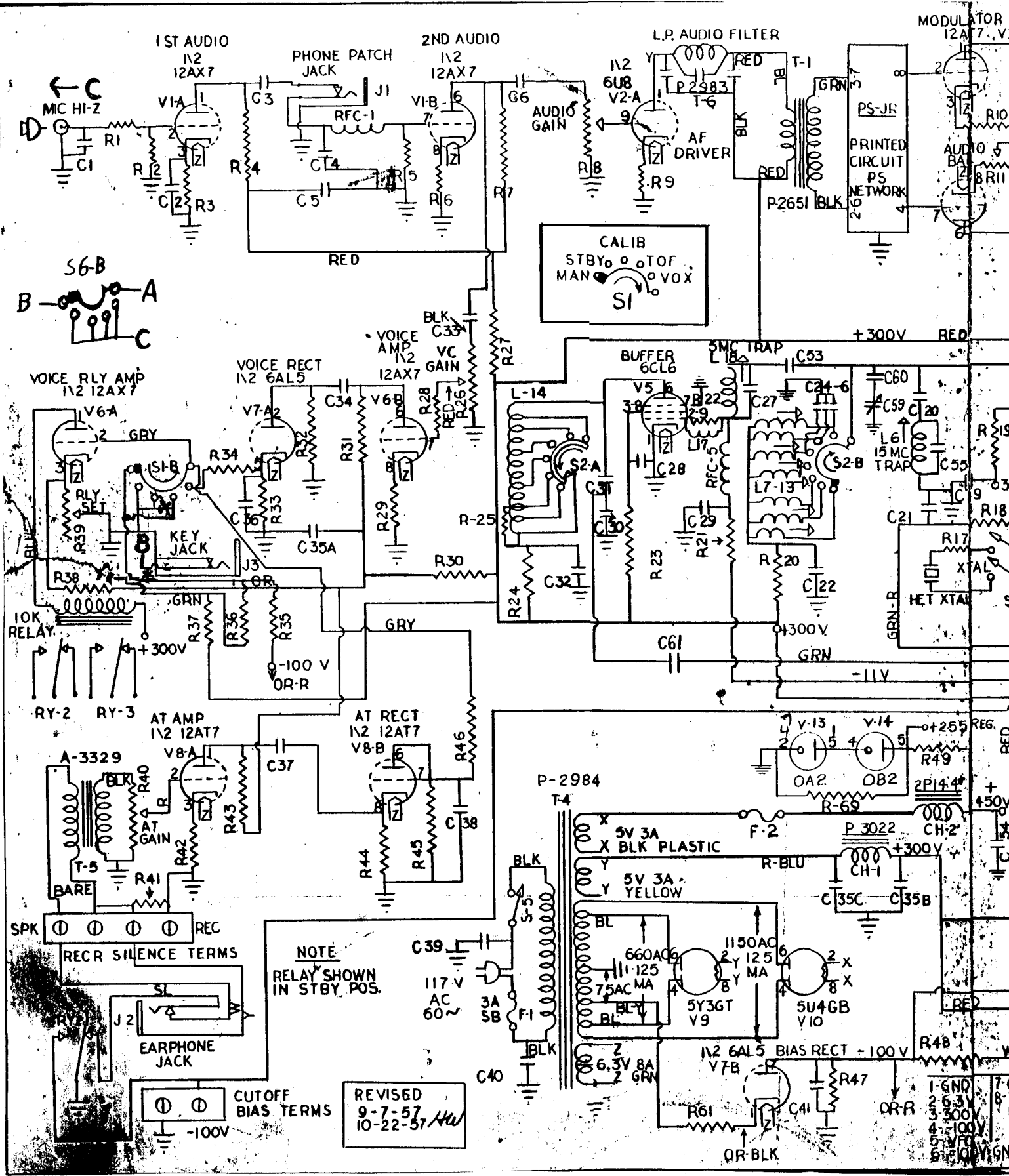
D 9350

PHASEMASTER II-A & B
LAKESHORE INDUSTRIES

- 1-GND
2-6.3V
3-300V
4-100V
5-VFO
6-100V GND ON XMT
- 7-6.3V
8-TIE POINT NC.

AUX POWER SOCKET

MM C-64
SOCKET
R-67
C-45
V-11
6E5



NOTE
RELAY SHOWN
IN STBY POS.

REVISED
9-7-57
10-22-57

1-GND
2-6.3V
3-300V
4-100V
5-100V
6-100V