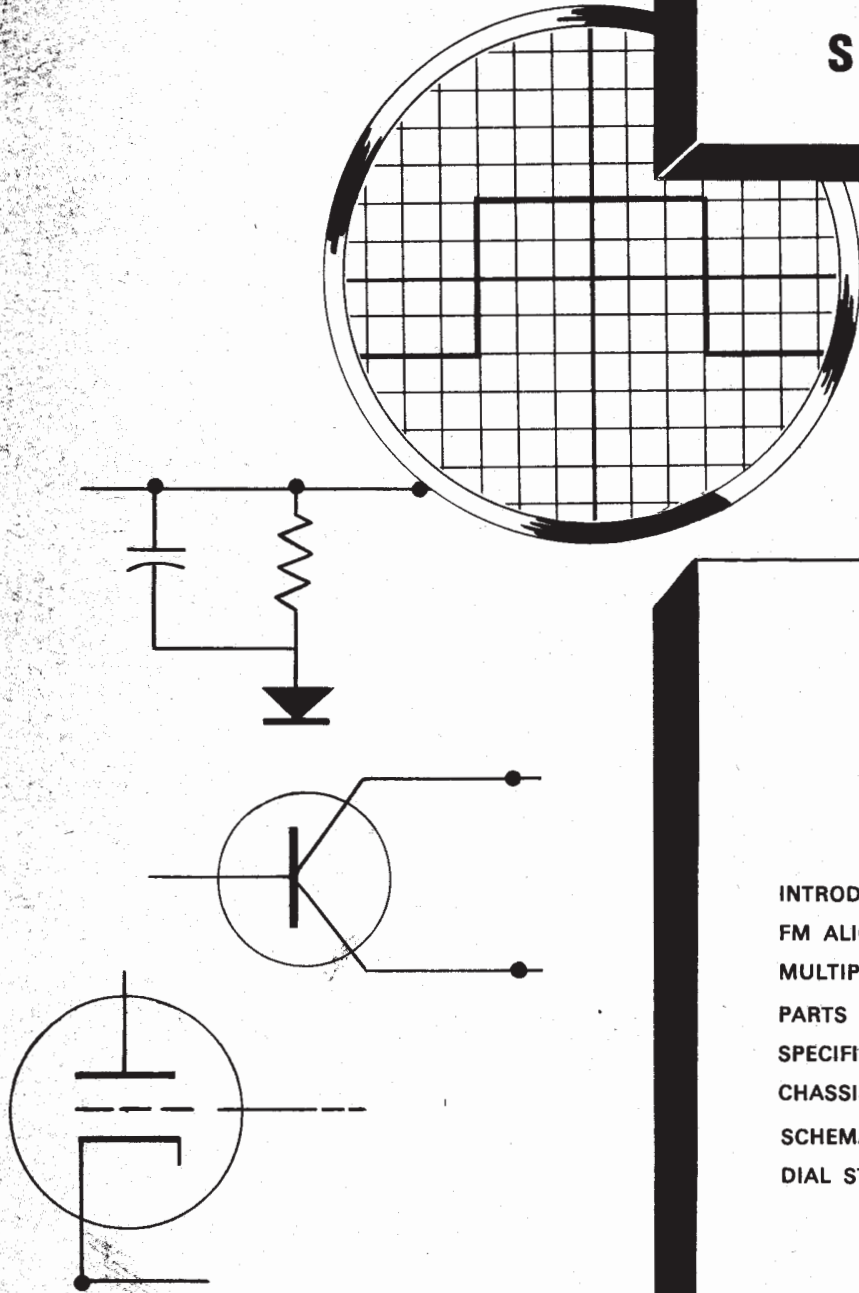


FM STEREO TUNER

WARRANTY STATION MR 67 SERVICE MANUAL



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SCHMATIC DIAL STRINGING	



2 CHAMBERS ST.
BINGHAMTON, N.Y.

McIntosh MR 67

INTRODUCTION

All McIntosh tuners are carefully aligned and tested at the factory using the finest available test equipment. All McIntosh tuners will meet their published specifications when shipped from the factory.

After extensive operation, especially when tubes have been replaced, it may be desirable to realign the tuner circuits for best performance. This manual gives complete information on the circuit realignment procedure for the MR 67 tuner.

The test equipment listed below (or its equivalent) is necessary to properly align an MR 67. The accuracy of the alignment will be directly related to the accuracy and calibration of the test equipment used.

FM Signal Generator (Measurements 210A or equivalent)

10.7 MC Generator (Preferably crystal controlled)

VTVM

Multiplex Generator (RCA WR-51A or equivalent)

Oscilloscope (Hewlett-Packard 120B or equivalent)

Harmonic Distortion Analyzer, desirable but not essential—(Hewlett-Packard 330B or equivalent)

If the necessary test equipment is not available, alignment should not be attempted. You may contact the McIntosh Customer Service Department for additional information.

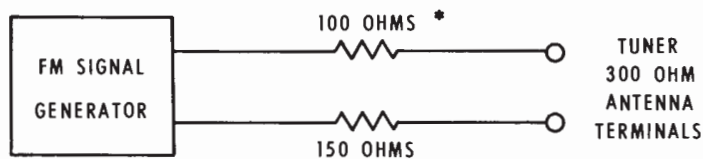
Customer Service
McIntosh Laboratory, Inc.
2 Chambers Street
Binghamton, New York

Our telephone number is 723-5491

The direct dial area code is 607

STEPS	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	
		FREQ	COUPLING	MODULATION	TYPE	CONNECTED TO
1	Point of no interference or signal	10.7MC	Through external .01MF cap to pin 7 of 12AT7 mixer	CW	VTVM	TP #1
2	SAME	SAME	SAME	SAME	MX 110 tuning eye	
3	SAME	SAME	SAME	SAME	VTVM	TP #2
4	SAME	SAME	SAME	SAME	SAME	Pin 6 of discriminator transformer
5	105MC	105MC	300 ohm antenna terminals with * matching network	400 cycles 75KC deviation (100% modulation)	VTVM connected to TP1 and scope connected to L or R audio output	
6	90MC	90MC	SAME	SAME		SAME
7	105MC	105MC	SAME	SAME		SAME
8	90MC	90MC	SAME	SAME		SAME
9	Point of no interference				Scope	L or R output
10	105MC	105MC	SAME	400 cycles 75KC deviation (100% modulation) attenuated to 2.5 microvolts output	VTVM connected to TP #1 and Scope connected to L or R audio output	

ANTENNA MATCHING NETWORK



2

* IF SIGNAL GENERATOR HAS OTHER THAN 50 OHM INTERNAL IMPEDANCE, USE A RESISTOR OF 150 OHMS, LESS INTERNAL GENERATOR IMPEDANCE.

ALIGNMENT

ADJUST	TEST LIMITS	REMARKS
Top (secondary) and bottom, (primary) of 1st, 2nd and 3rd IF transformers	Maximum possible negative voltage	Shunt to ground the winding not being adjusted with a .01MF capacitor in series with a 1K resistor. Attenuate signal generator until output voltage at TP #1 is less than 1.5 volts with one IF transformer winding shunted. IF transformers have terminal #1 marked with a green dot and are numbered clockwise.
4th IF transformer, top and bottom.		Eye should close to approx. $\frac{1}{16}$ " with strong signal. Make additional adjustments of eye closure by varying the spacing of parallel conductors connected to pins 1 and 4 of the 4th IF transformer. (This changes the capacitive coupling between pins 1 and 4.)
Discriminator transformer top core (secondary)	Adjust for 0 volts	
Discriminator transformer bottom core (primary)	Maximum negative voltage	Repeat step 3 if a large change is made in the setting of the bottom core.
Oscillator trimmer cap.	Maximum negative voltage	As output increases, attenuate signal generator to keep maximum output at TP #1 to less than 2 volts.
Oscillator coil tuning slug	SAME	Repeat steps 5 and 6 until dial calibration is accurate.
Mixer trimmer and RF trimmer	SAME	
Mixer coil tuning slug and RF coil tuning slug	SAME	Repeat steps 7 and 8 until output is as high as possible.
Muting adj. control		Turn muting switch to "in" position. Adjust muting control until background noise just disappears.
	IHFM sensitivity 2.5 microvolt for less than 3% total noise and distortion	Step 10 is an overall sensitivity check, and requires a distortion analyzer and FM signal generator with attenuator. With 2.5 microvolts input at the 300 ohm antenna terminals, TP #1 voltage should be .6 volts or more.

MR 67 MULTIPLEX

STEPS	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR	
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO
1	Point of no interference or signal	Audio generator set to 67KC, 0.5 volts output or less	TP #2		Audio VTVM	Pin 6 of 38KC transformer (yellow wire connected at this pin)
2	SAME	MPX generator with 19KC pilot attenuated to approx. 5% level (5% level is 1/2 of normal 10% level) 19KC pilot <i>must</i> be attenuated for correct alignment	SAME		SAME	Pin 3 or 8 of 12AU7 MPX oscillator
3	100MC	100MC modulated by MPX generator, 19KC pilot at normal output	300 ohm antenna terminals with approx. 1000 microvolt signal	1KC 100% modulation (34KC deviation) modulating left or right only	SAME	Pin 1 or 2 of 38KC transformer
4	SAME	SAME	SAME	SAME	Audio VTVM and scope	L or R output jack
5	SAME	SAME	SAME	SAME	SAME	SAME
6	SAME	SAME	SAME	SAME	SAME	SAME
7	SAME	SAME	SAME	Turn off 1KC audio modulation	SAME	SAME
8	SAME	SAME	SAME	Same as step 3	SAME	SAME

DECODER ALIGNMENT

ADJUST	TEST LIMITS	REMARKS
67KC trap	Adjust for minimum voltage	
19KC phase coil and 19KC transformer		<ol style="list-style-type: none"> 1. Disable local 38KC oscillator by placing a jumper wire across 6.8K resistor connected to pins 1 and 6 of 12AU7 MPX oscillator. 2. Shunt pin 2 of 19KC transformer to ground with .01 capacitor in series with 1K resistor. 3. Adjust 19KC phase coil for maximum output. Proper adjustment places core approx. $\frac{1}{4}$" from bottom of coil form. 4. Adjust bottom core of 19KC transformer for maximum output. 5. Shunt pin 3 of 19KC transformer to ground with .01 capacitor in series with 1K resistor. 6. Adjust Top core of 19KC transformer for maximum output. 7. Remove jumper used in step 1 above.
38KC transformer bottom core	Adjust for maximum voltage	
38KC transformer top core	Adjust for stable scope display	<ol style="list-style-type: none"> 1. Turn off 19KC pilot on MPX generator. 2. Adjust top core of 38KC transformer to obtain a stable and uniform 1 KC signal scope display. This adjustment may be critical, so turn core very slowly. 3. Turn 19KC pilot back on.
19KC phase coil	30db separation or more	Modulate left channel and measure right channel output. Adjust 19KC phase coil for minimum right channel output (maximum separation). Remove all test leads from TP # 2 for separation checks.
	SAME	Modulate right channel and measure left channel output. Separation in steps 5 and 6 should be at least 30db
		This step checks the rejection of 19KC and 38KC frequencies. Residual output should be at least 40db below modulated output.
		Check for MPX indicator light <ol style="list-style-type: none"> 1. MPX light should turn on with MPX signal 2. Tuning slowly across dial, MPX light should turn on only with MPX signal.

MR 67 PARTS LIST

TUBES

ITEM NO.	USE	IDENTIFICATION NUMBER
V1	RF Amplifier 1	6DS4
V2	RF Amplifier 2; Mixer	12AT7
V3	Oscillator	6AB4
V4	IF Amplifier 1	6AU6
V5	IF Amplifier 2	6AU6
V6	IF Amplifier 3; Limiter 1	6AU6
V7	IF Amplifier 4; Limiter 2	6CS6
V8	Muting Amplifier; AGC Clamp	6AV6
V9	Tuning Indicator	EMM801
V10	Left Audio Amplifier	6BL8
V11	Right Audio Amplifier	6BL8
V12	MPX Amplifier & 19KC Separator—Indicator Control	6U8
V13	MPX 38KC Oscillator	12AU7

TRANSISTOR

Q1	Transistor (Switching)	Motorola #MA-113
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DIODES

D1	Muting and Tuning Eye Detector	Type 1N542 Germanium Diode
D2, D3	Discriminator (Matched Pair)	Type 1N542 Germanium Diode
D4, D5	Balanced Detector (Matched Pair) for Indicator	Type 1N542 Germanium Diode
D6, D7	Balanced MPX (Matched Pair) Detectors (Right Channel)	Type 1N542 Germanium Diode
D8, D9	Balanced MPX (Matched Pair) Detectors (Left Channel)	Type 1N542 Germanium Diode
SR1, SR2	High Voltage Supply Selenium Rectifiers	G.E. #6RS20PH6RGD1

CONTROLS

ITEM NO.	FUNCTION	RESISTANCE	IDENTIFICATION NUMBER
R1	Muting Adj. Pot.	500K	R50, 000-8G
R2	Volume Control	40K (dual)	R123-138

MR 67 PARTS LIST (Cont.)

SWITCHES

ITEM NO.	FUNCTION	DESCRIPTION	IDENTIFICATION NUMBER
S1	Power	2 Position Rotary	S123-134A
S2	Muting	2 Position Rotary	S123-137
S3	Mode Selector	2 Position Rotary	S123-135
S4	Panel Light Dim-Bright	SPST	Stackpole #SS-26 with ¹⁹ / ₃₂ Trigger Knob

TRANSFORMERS

ITEM NO.	FUNCTION	IDENTIFICATION NUMBER
T1	Balun	
T2	FM first IF	T107-134A
T3	FM second IF	T107-133A
T4	FM third IF	T107-133A
T5	FM fourth IF	T124-136A
T6	FM discriminator	T107-135B
T8	19KC amplifier	T129-101
T9	38KC oscillator	T129-102A
T10	Power	T123-133

CAPACITORS

ITEM NO.	DESCRIPTION	CAPACITANCE	VOLTAGE	TOLERANCE	IDENTIFICATION NUMBER
C1	Variable FM				C142-130
C2	Antenna Trimmer				Part of C-1
C3	Mixer Trimmer	1-8pf			
C4	Oscillator Trimmer	1-8pf			
C5	ceramic tubular	5pf		±.25pf N330	
C6	ceramic disc	.001mfd			
C7	ceramic disc	.001mfd			
C8	ceramic feed thru	1000pf			
C9	ceramic feed thru	1000pf			
C10	ceramic feed thru	1000pf			
C11	ceramic tubular	5pf		±.25pf N330	
C12	ceramic disc	.001mfd			

MR 67 PARTS LIST (Cont.)

CAPACITORS (Cont.)

ITEM NO.	DESCRIPTION	CAPACITANCE	VOLTAGE	TOLERANCE	IDENTIFICATION NUMBER
C13	ceramic tubular	3pf		±.25pf NPO	
C14	ceramic tubular	1.5pf		±.25pf NPO	
C15	ceramic disc	22pf		20%	
C16	ceramic tubular	5pf		±.25pf N330	
C17	ceramic tubular	5pf		±.25pf N220	
C18	ceramic feed thru	1000pf			
C19	ceramic disc	.005mfd		+80 - 20 %	
C20	phenolic	.39pf		10%	
C21	ceramic disc	10pf		20%	
C22	ceramic disc	.005mfd		+80 - 20 %	
C23	ceramic disc	.003mfd		20%	
C24	ceramic feed thru	1000pf			
C25	ceramic disc	.005mfd		+80 - 20 %	
C26	ceramic disc	.01mfd		+80 - 20 %	
C27	ceramic disc	.1mfd	200V	+80 - 20 %	
C28	phenolic	.18pf		10%	
C29	ceramic disc	12pf		20%	
C30	ceramic disc	.005mfd		+80 - 20 %	
C31	ceramic feed thru	1000pf			
C32	ceramic feed thru	1000pf			
C33	ceramic disc	.02mfd		+80 - 20 %	
C34	ceramic disc	.005mfd		+80 - 20 %	
C35	ceramic disc	.005mfd		+80 - 20 %	
C36	ceramic disc	3pf—10pf on some units		20%	
C37	ceramic disc	.005mfd		+80 - 20 %	
C38	paper	.1mfd	200V	20%	
C39	ceramic feed thru	1000pf			
C40	ceramic disc	.005mfd		+80 - 20 %	
C41	ceramic disc	.005mfd		+80 - 20 %	
C42	ceramic disc	.005mfd		+80 - 20 %	
C43	ceramic feed thru	1000pf			
C44	ceramic disc	6.8pf		20%	
C45	ceramic disc	12pf		20%	
C46	ceramic disc	47pf		20%	

MR 67 PARTS LIST (Cont.)

CAPACITORS (Cont.)

ITEM NO.	DESCRIPTION	CAPACITANCE	VOLTAGE	TOLERANCE	IDENTIFICATION NUMBER
C47	ceramic feed thru	1000pf			
C48	ceramic disc	.02mfd		+80-20%	
C49	ceramic feed thru	100pf			
C50	ceramic disc	.02mfd		+80-20%	
C51	silver mica	470pf	100V	5%	
C52	ceramic disc	.01mfd	150V		
C53	electrolytic	1mfd			C124-129
C54	electrolytic	10mfd	3V		
C55	ceramic disc	.01mfd		+80-20%	
C56	electrolytic	1mfd			C124-129
C57	electrolytic	10mfd	3V		
C58	ceramic disc	100pf		N1500	
C59	ceramic disc	.05mfd	100V	+80-20%	
C60	silver mica	2700pf	100V	5%	
C61	ceramic disc	.001mfd		+80-20%	
C62	ceramic disc	100pf		N1500	
C63	ceramic disc	.001mfd		+80-20%	
C64	ceramic disc	.02mfd		+80-20%	
C65	ceramic disc	.1mfd	100V	+80-20%	
C66	ceramic disc	220pf		20%	
C67	silver mica	1200pf	100V	5%	
C68	silver mica	1200pf	100V	5%	
C69	silver mica	4700pf	100V	5%	
C70	silver mica	4700pf	100V	5%	
C71	ceramic disc	.005mfd	100V	+80-20%	
C72	ceramic disc	.005mfd	100V	+80-20%	
C73	ceramic disc	.005mfd	100V	+80-20%	
C74	ceramic disc	.005mfd	100V	+80-20%	
C75	ceramic disc	330pf		10%	
C76	ceramic disc	330pf		10%	
C77	ceramic disc	.001mfd			
C78	ceramic disc	.001mfd			
C79	ceramic disc	.02mfd		+80-20%	
C80	ceramic disc	.02mfd		+80-20%	

MR 67 PARTS LIST (Cont.)

CAPACITORS (Cont.)

ITEM NO.	DESCRIPTION	CAPACITANCE	VOLTAGE	TOLERANCE	IDENTIFICATION NUMBER
C81	electrolytic	40mfd	200V		BR40-200
C82	electrolytic	50/50/50mfd	200V		
C83	ceramic feed thru	1000pf			
C84	ceramic feed thru	1000pf			
C85	ceramic disc	.01mfd		+80-20%	
C86	ceramic feed thru	1000pf			
C87	ceramic disc	.01mfd		+80-20%	
C88	ceramic disc	.01mfd		+80-20%	

COILS

ITEM NO.	DESCRIPTION	VALUE	IDENTIFICATION NUMBER
L1	Antenna		L124-227
L2	Mixer		L124-247
L3	Oscillator		L107-206A
L4	19KC Trap		L129-123
L5	67KC Trap		L129-110
L6	RF Choke	1.2 micro H	Wilco 206-11
L7	RF Choke	2.2 micro H	Wilco 209-11
L8	RF Choke	1.2 micro H	Wilco 206-11
L9	RF Choke		SP10,004
L11	RF Choke	75 micro H	Wilco 1075-15
L12	Peaking	38MH	L129-103
L13	Filter, Lo Pass		L129-109
L14	Filter, Lo Pass		L129-109
L15	RF Choke	2.2 micro H	Wilco 209-11
L16	RF Choke	2.2 micro H	Wilco 209-11
L17	RF Choke	1.2 micro H	Wilco 206-11
L18	RF Choke	1.2 micro H	Wilco M187261.2
L19	RF Choke	1.2 micro H	Wilco 206-11
L20	RF Choke	.47 micro H	Wilco 201-11

MISCELLANEOUS

1 1/8" Knob with index E103-207B
 1 1/4" Knob without index E103-208B
 Lamp, Festoon: 7 volts, 2 watts 7 x 43mm
 Lamp, Incandescent: No. 1850 for MPX Indicator Light
 Dial Glass: N123B120

SPECIFICATIONS

Useable Sensitivity

Better than 2.5 microvolts at 100% modulation (+75KC deviation) for less than 3% total noise and distortion in accordance with IHFM standards.

Audio Frequency Response

Less than ½ db 20 to 20,000 cycles, including 75 microsecond de-emphasis.

Distortion

Less than 0.5% at 100% modulation, ±75KC deviation.

Capture Ratio

1.7 db at 100% modulation.

Muting

IF injected; at least 60 db quieting between stations.

Drift

Less than 25KC.

Image Rejection

Better than 60 db.

Hum

Better than 70 db below 100% modulation.

Output

Approximately 2.5 volts, low-source impedance.

Antenna Inputs

300 ohms balanced, 75 ohms unbalanced.

RF Amplifier

Cascode with 6DS4 Nuvistor in first stage.

IF Amplifiers

Four stages; AGC used to insure that limiting occurs only in the limiter stages.

Tuning Indicators

Dual electron ray tube; lower section for precise tuning indication; upper section for signal strength presentation (can be switched to indicate multipath distortion).

FM Multipath Distortion Indicator

An exclusive new McIntosh development; the upper section of the dual electron-ray tube can be switched to indicate multipath distortion or signal strength.

Multiplex Channel Separation

Better than 30 db at 1000 cycles.

Multiplex Filter

Greater than 40 db suppression below 100% modulation of 19KC pilot and 38KC carrier.

Multiplex Indicator

MPX stereo light activated by 19KC carrier.

Multiplex Type

Peak-detecting, self-matrixing circuit.

IF Bandwidth

200KC flat top response, down 3 db at 200KC.

Limiters

Two stages.

Radiation

Substantially below FCC requirements.

Tube and Semiconductor Complement

1—6DS4 Nuvistor 1st RF amplifier.

1—12AT7 2nd RF amplifier and mixer.

1—6AB4 Oscillator.

1—6AU6 1st IF.

1—6AU6 2nd IF.

1—6AU6 3rd IF; 1st limiter.

1—6CS6 4th IF; 2nd limiter.

1—6AV6 Muting amplifier; AGC clamp.

1—EMM801 Tuning indicator, signal strength indicator, Multipath distortion indicator.

1—6U8 MPX amplifier and 19KC separator-Indicator control.

1—12AU7 MPX 38KC oscillator.

2—6BL8 left and right audio amplifiers.

1—MA113 Transistor (multiplex indicator lamp switch).

2—1N542 Diodes, wide band discriminator.

4—1N542 Diodes, balanced MPX detector.

2—1N542 Diodes, balanced detector for MPX indicator.

1—1N541 Diode, muting and tuning indicator detector.

2—Selenium rectifiers, high-voltage supply.

1—1850 pilot lamp, MPX indicator.

Power Consumption

50 watts, 105 to 125 volts, 50 to 60 cycles.

Dimensions

Front panel; 16 inches wide by 5⁷/₁₆ inches high; chassis (including PANLOC shelf) 15 inches wide by 5¹/₈ inches high by 13 inches deep, including connectors; clearance in front of mounting panel including knobs, 1¹/₂ inches.

Weight

Tuner only, 24¹/₂ pounds.

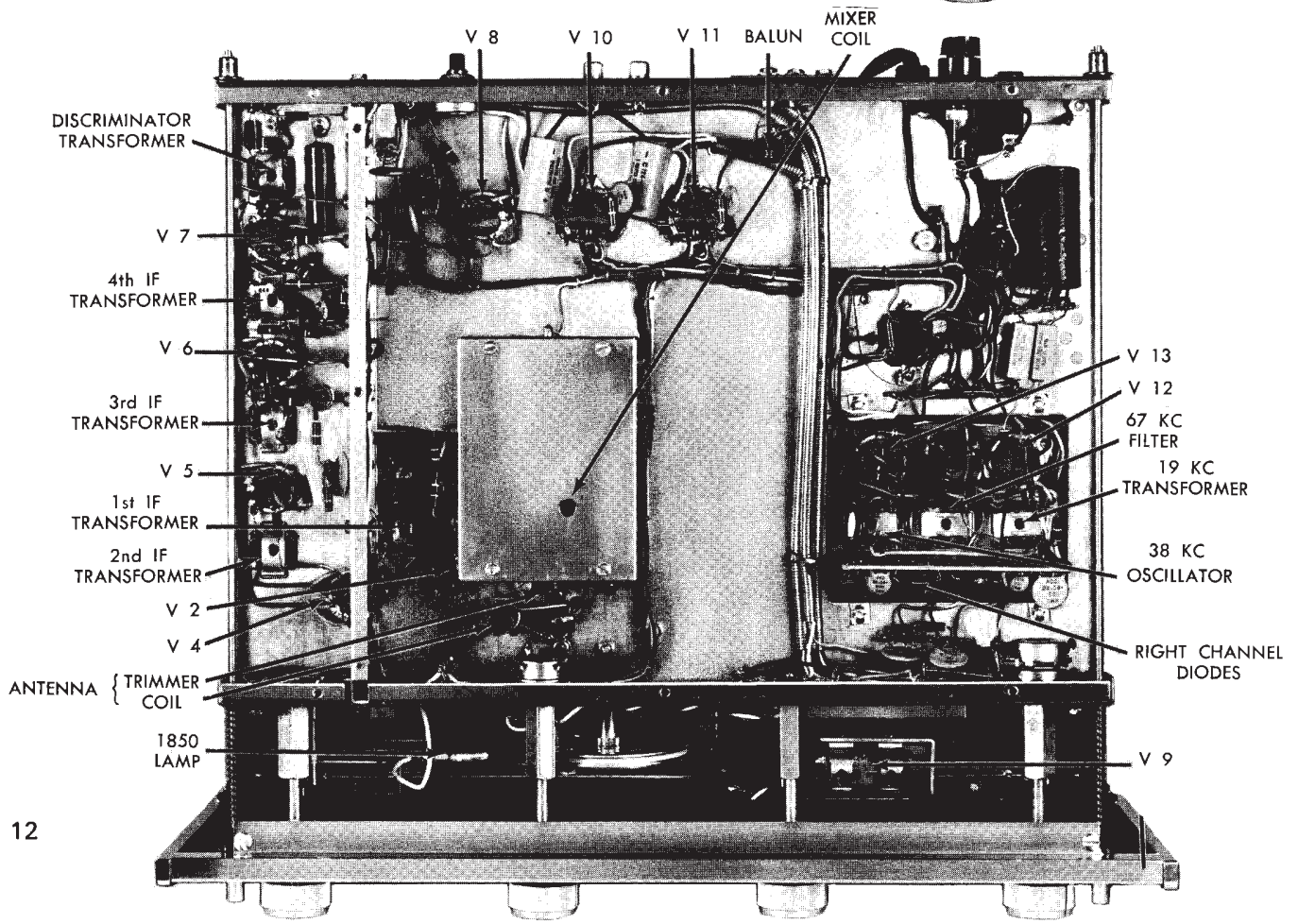
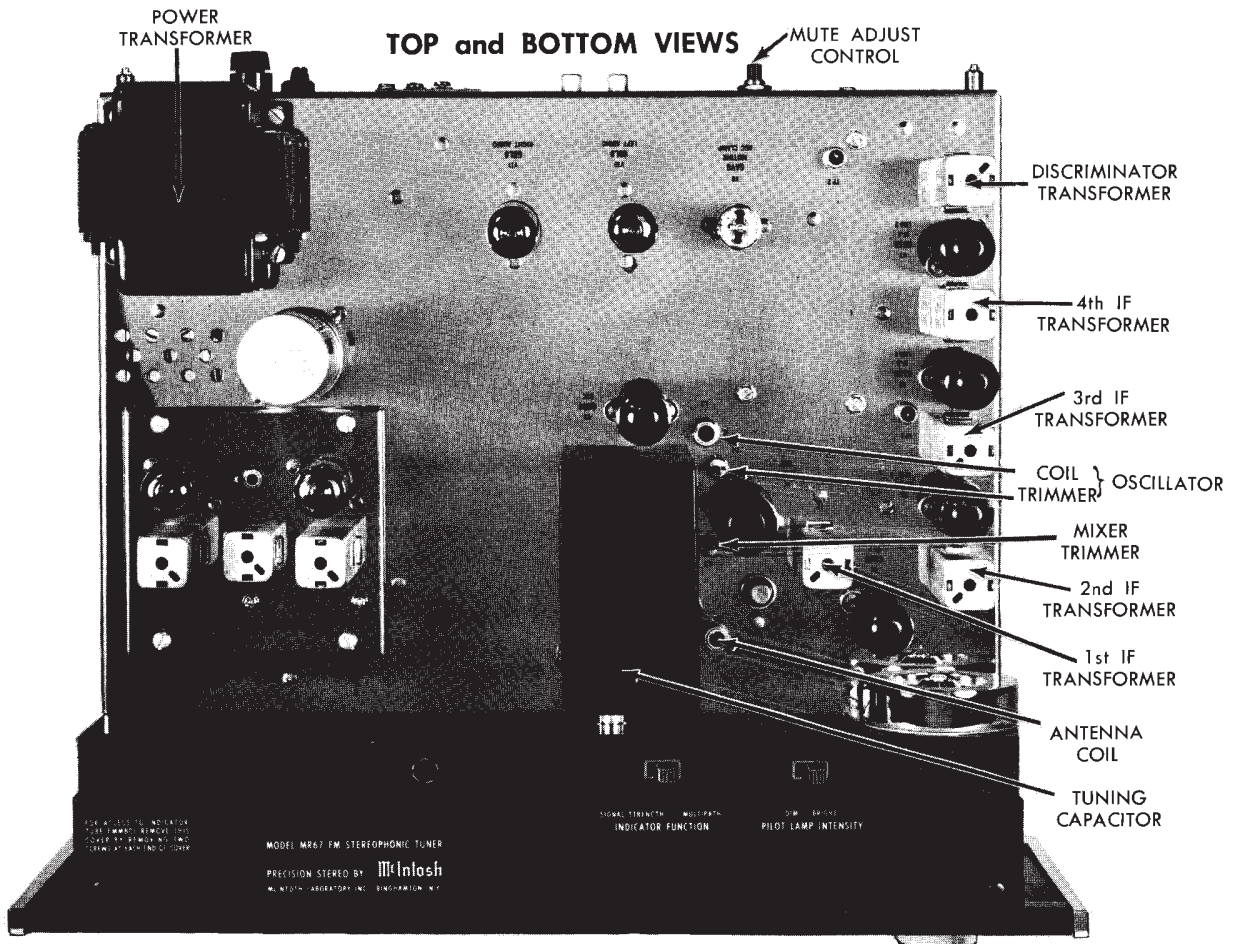
In shipping carton, 33 pounds.

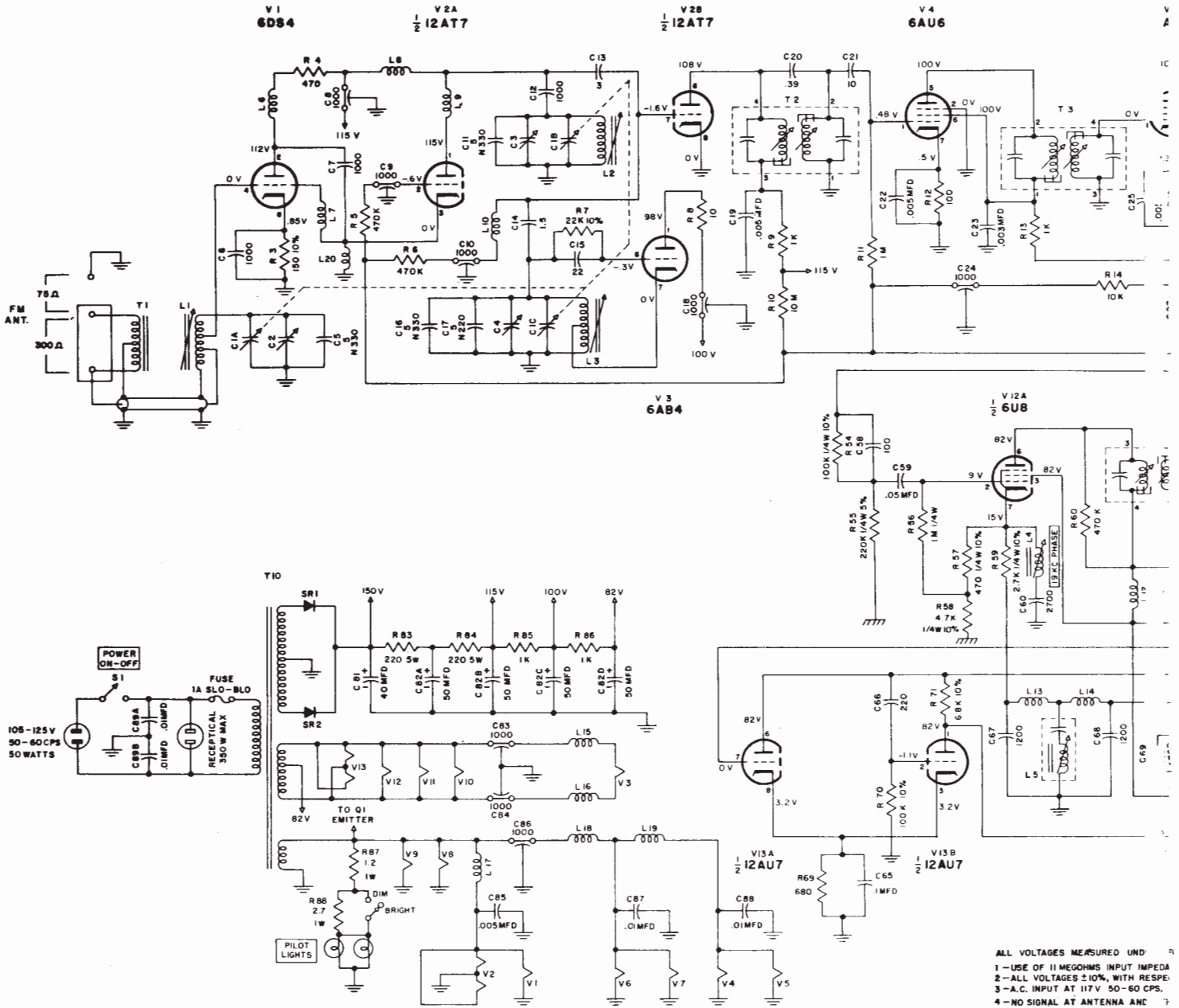
Finish

Anodized gold and black front panel; chrome chassis.

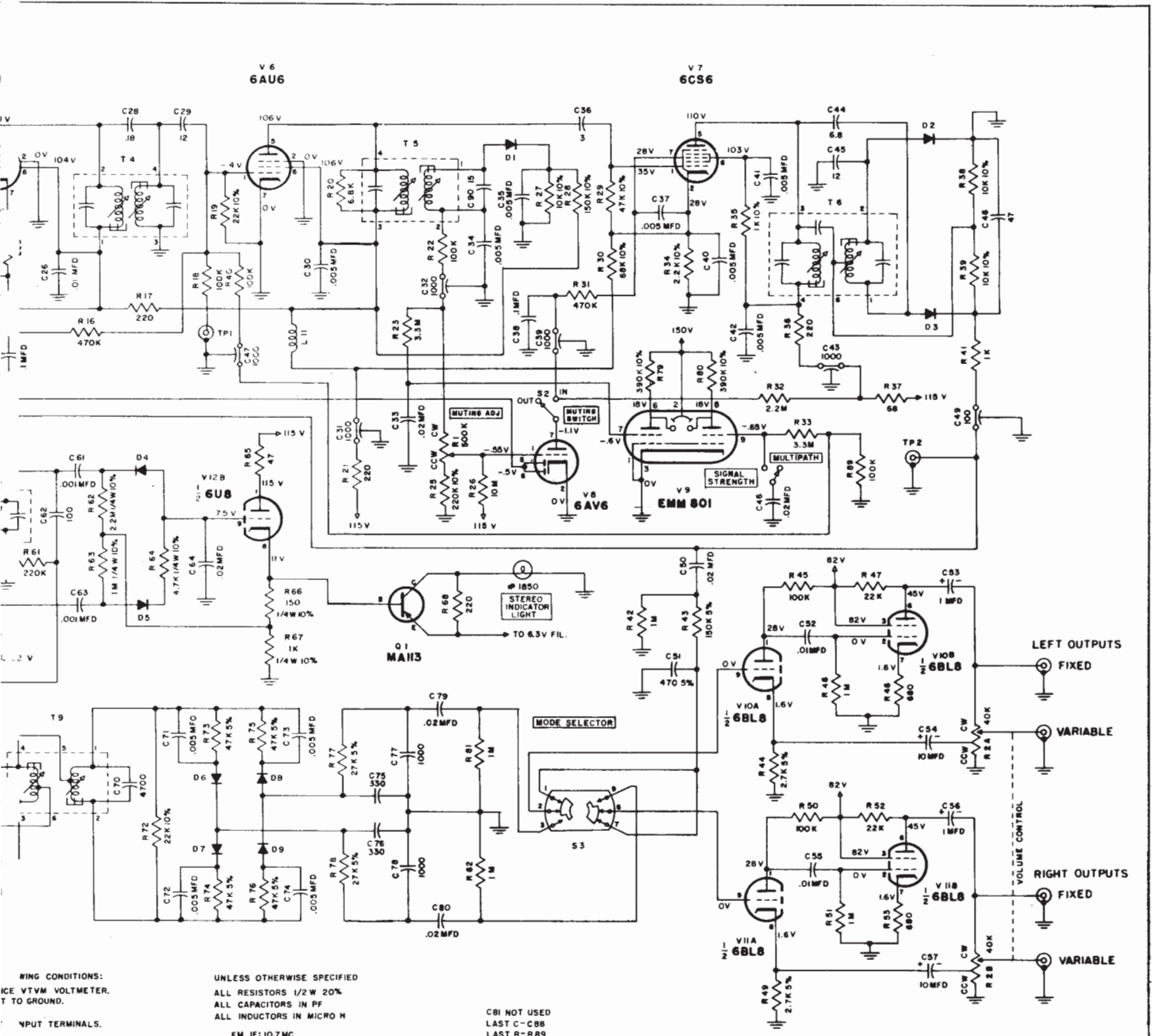
Installation

Convenient professional PANLOC, (see PANLOC Installation folder.)





- ALL VOLTAGES MEASURED UNDER THE FOLLOWING CONDITIONS:
- 1 - USE OF 11 MEGOHMS INPUT IMPEDANCE
 - 2 - ALL VOLTAGES $\pm 10\%$, WITH RESPECT TO GROUND
 - 3 - A.C. INPUT AT 117 V 50-60 CPS.
 - 4 - NO SIGNAL AT ANTENNA AND TUNING
 - 5 - FRONT PANEL CONTROLS AT:
 - MODE SELECTOR - MPI
 - VOLUME CONTROL - MA
 - MUTING - OFF

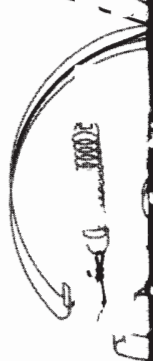
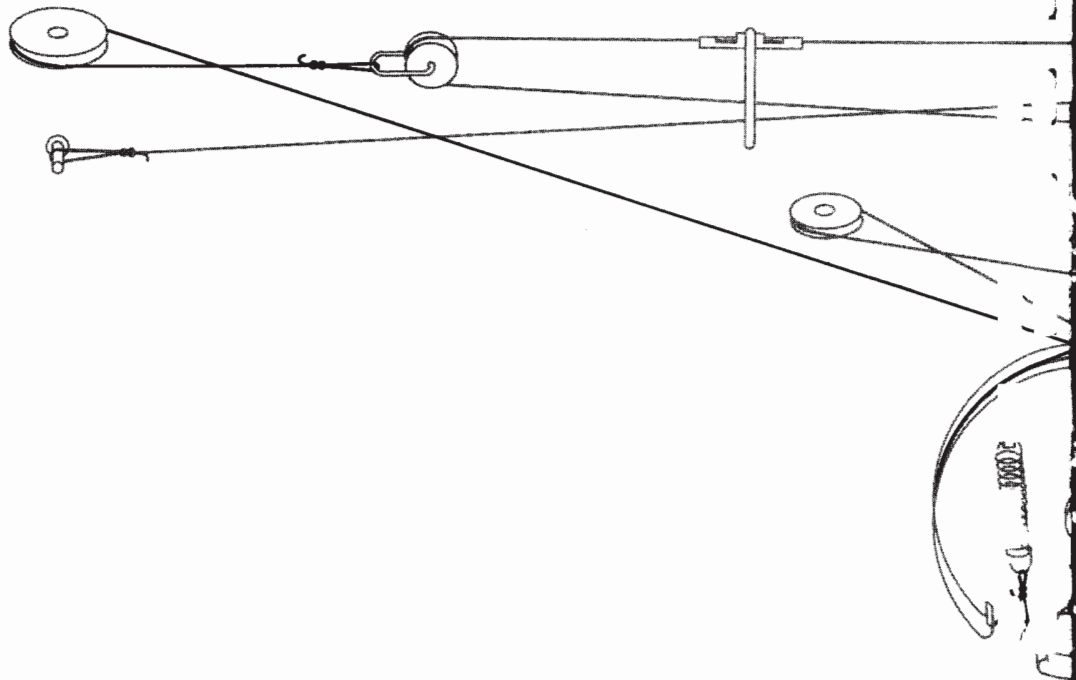


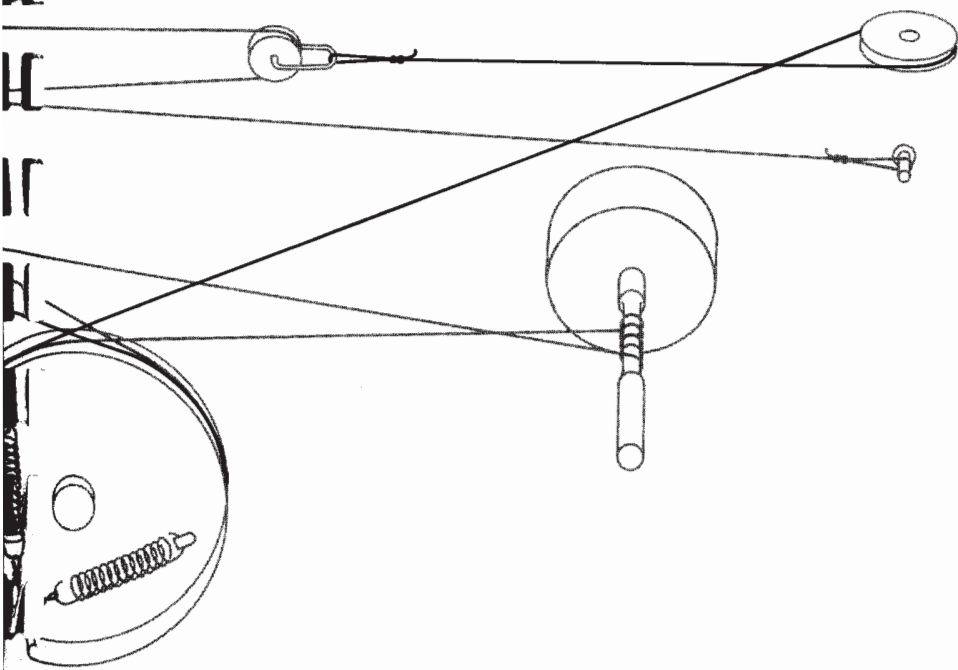
WING CONDITIONS:
 ICE VTVM VOLTMETER.
 T TO GROUND.
 INPUT TERMINALS.

UNLESS OTHERWISE SPECIFIED
 ALL RESISTORS 1/2 W 20%
 ALL CAPACITORS IN PF
 ALL INDUCTORS IN MICRO H
 FM. IF: 10.7 MC

CBI NOT USED
 LAST C - C88
 LAST R - R89

DATE	TITLE	PART NO.
	SCHEMATIC, MR 87	
	Inch LABORATORY INC.	
	7 Chambers St., Binghamton, N. Y.	
DESIGNED - <i>W. J. ...</i>	SCALE	DATE
DRAWN - <i>BB</i>		1, 4, 63
CHECKED - <i>SAC</i>		APP
		SC 123-140





McIntosh

LABORATORY INC.

2 Chambers St., Binghamton, N. Y.

Made in U.S.A.

Phone—Area Code 607-723-5491

Design subject to change without notice.