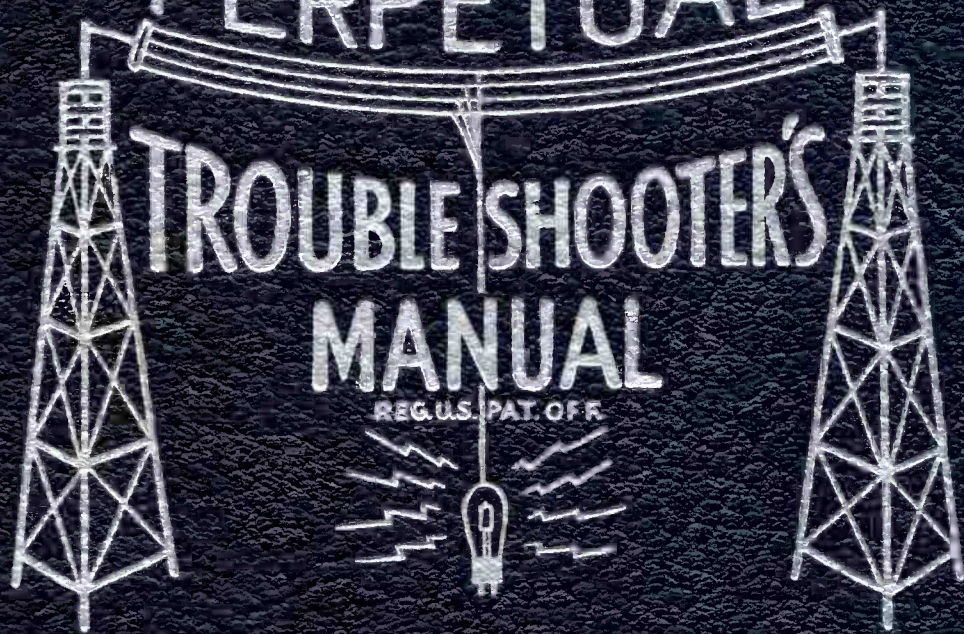


VOLUME XXI

PERPETUAL



TROUBLE SHOOTER'S
MANUAL

REG. U.S. PAT. OFF.

JOHN F. RIDER

MODEL 150

HOW TO OPERATE THE RADIO:

This radio is equipped with four controls, the left hand control is the combined off-on switch and volume control. The second knob from the left is the phono-radio switch, the third knob is the tone control, the fourth control is used for tuning the desired station. To place the set in operation, rotate on-off volume control knob to right and allow 30 seconds for set to warm up. Rotate tuning control to desired station. Adjust volume control to desired volume, set tone control to treble or base response. To use phonograph follow above steps, except turn phono-radio switch, to phono position. Place records on changer in sequence desired, push reject button, and allow changer to cycle.

ALIGNMENT PROCEDURE

Feed a 455 K.C. modulated signal from grid to ground (pin #7 12 BE6). Connect A output meter across the voice coil. Tune trimmers on first and second IF transformers for maximum indication on meter. Set signal generator to 1600 K.C. Modulated signal and couple loosely to loop antenna. Set dial to 1600 K.C. and tune oscillator trimmer for maximum indication on meter.

Set signal generator and dial to 1400 K.C. and tune R.F. trimmer, for maximum indication on meter. Check tracking at 600 K.C., knife gang if necessary. Repeat these adjustments until the receiver tracks correctly

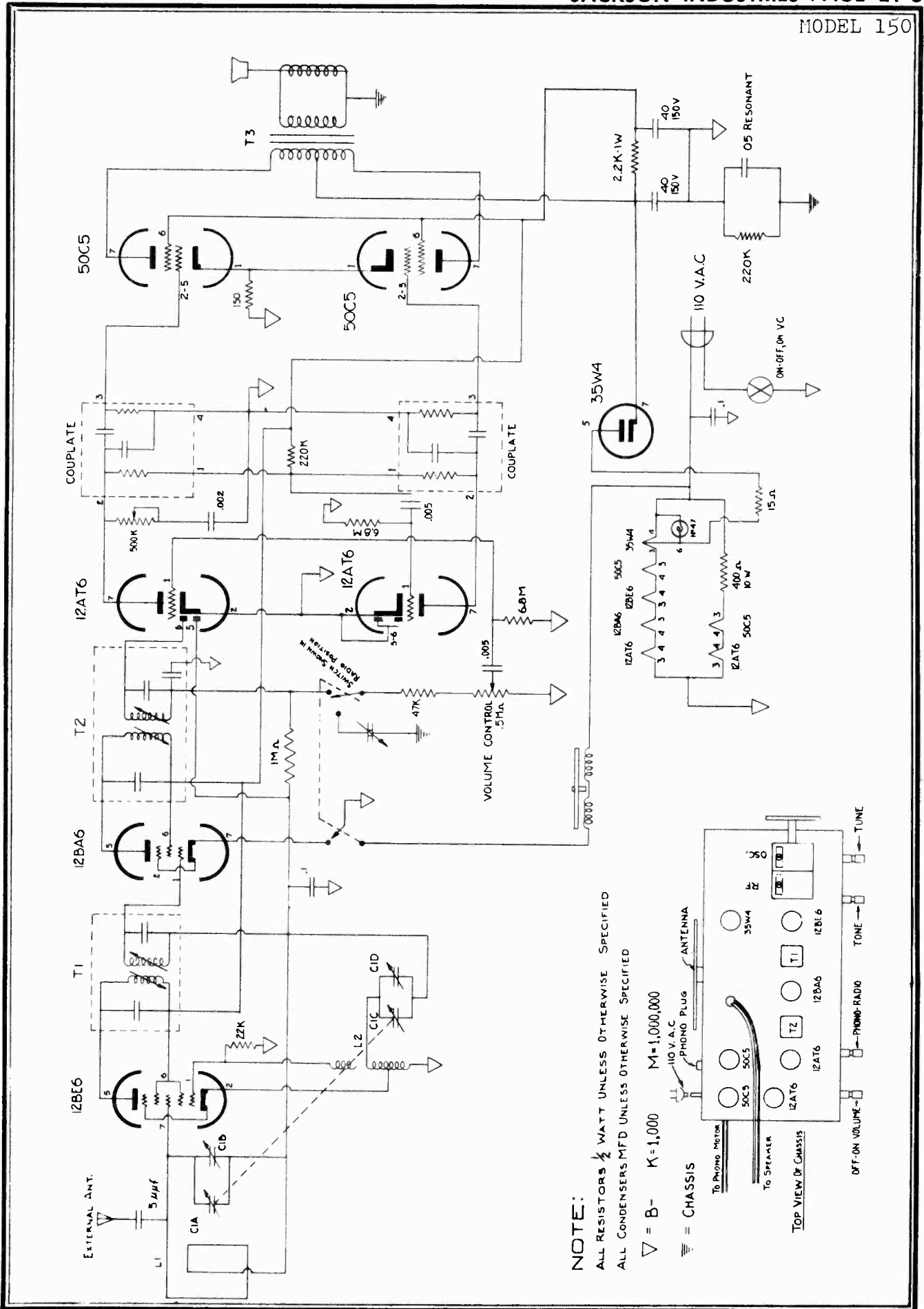
PIN	#1	#2	#3	#4	#5	#6	#7
12BE6	- 7.3	0	24 *	24 *	78	78	0
12BA6	- 8.	0	24 *	12 *	89	89	0
12AT6	- 1.8	0	0	8. *	- 8.	- 2.3	34
12AT6	- .45	0	0	12 *	0	0	45
50C5	- 7.2	0	60 *	12 *	0	89	120
50C5	- 7.2	0	80 *	36 *	0	89	120
35W4	- 0	0	86 *	120 *	115 *	115 *	120

Measured with V.T.V.M from

Pin to B- line.

Set in radio position.

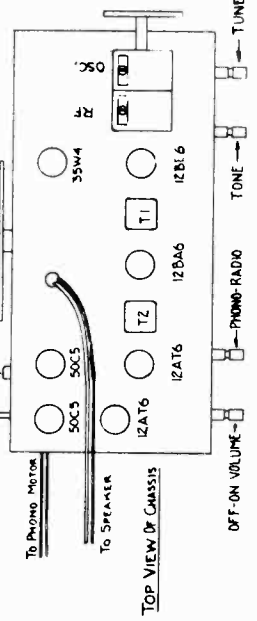
* A.C. Volts



NOTE:
 ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED
 ALL CONDENSERS MFD UNLESS OTHERWISE SPECIFIED

▽ = B- K=1,000 M=1,000,000

≡ = CHASSIS



MODELS 152,
153, 316

SPECIFICATIONS

Power Supply.....105-125 volts 60 cycle AC only.
 Power Consumption.....65 Watts.
 Frequency Range FM.....88 to 108 MC.
 Frequency Range AM.....540 to 1600 KC.
 I.F. Frequency FM.....10.7 MC.
 I.F. Frequency AM.....455 KC.
 Band width, FM, Ratio Detector.....330 KC.
 Band width, FM, 1st I.F.....280 KC.
 Band width, FM, Converter.....220 KC.

The tubes used are as follows:

12AT7 FM RF Amplifier, Converter
 6BE6 FM Osc, Am Osc, Converter
 6BA6 FM-AM, 1st I.F. Amplifier
 6BA6 FM, 2nd I.F. Amplifier
 6AL5 FM Detector
 6AT6 AM Detector, AVC, Audio
 6AQ5 Power Output
 6X4 Power Rectifier
 No. 44 Pilot Lights (2)

SERVICE NOTES

GENERAL

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5.

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

VOLTAGE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
6BE6 FM & AM OSC AM CONV	0	0	0	6 AC	155	125	0		
12AT7 FM RF AMP & CONV	170	0	1.5	0	0	155	0	1	6 AC
6BA6 1st IF AM & FM	0	0	6 AC	0 AC	150	100	0		
6BA6 2nd IF FM	0	0	6 AC	0 AC	155	110	1		
6AL5 FM DETECTOR	0	0	6 AC	0 AC		0	0		
6AT6 AM DETECTOR, AVC, AUDIO	-.5	0	6 AC	0 AC	0	0	60		
6AQ5 POWER OUTPUT	0	7.5	6 AC	0 AC	215	170	0		
6x4 POWER RECTIFIER	230 AC		6 AC	0 AC	235	230	235 AC		

Band Switch on AM position. Dial 1600 KC. No Signal.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and oscilloscopes. All R.F. and I.F. circuits have been accurately adjusted at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

EQUIPMENT USED FOR ALIGNMENT

- Vacuum tube voltmeter.
- AM Signal generator
- FM Sweep generator.
- Oscilloscope.
- Insulated screw driver.
- Dummy antenna:
 - .1 MFD condenser
 - .00025 MFD mica condenser
 - 150 ohm resistor (2)
- Output meter.

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

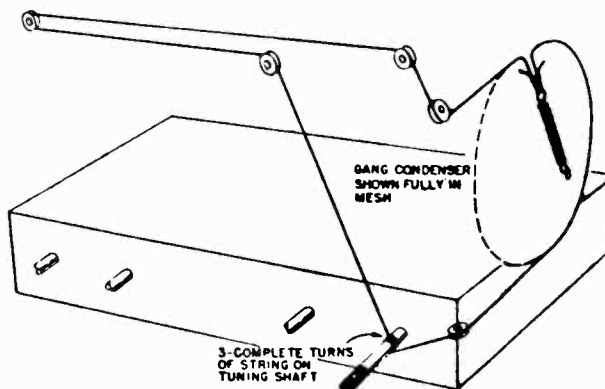


FIG. 4 DIAL CORD STRINGING

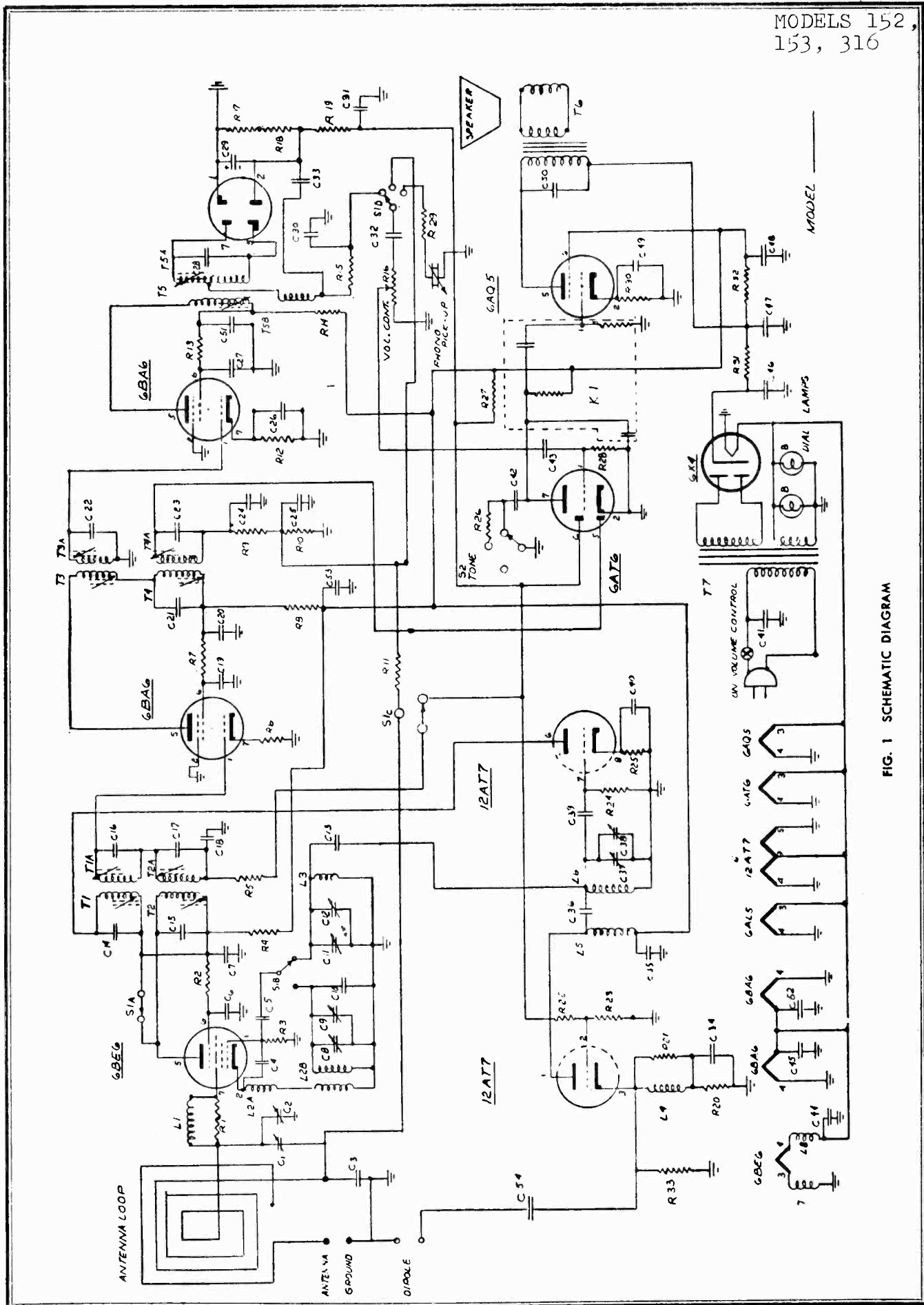


FIG. 1 SCHEMATIC DIAGRAM

MODELS 152,
153, 316

FIG. 3 TUBE AND TRIMMER LOCATIONS

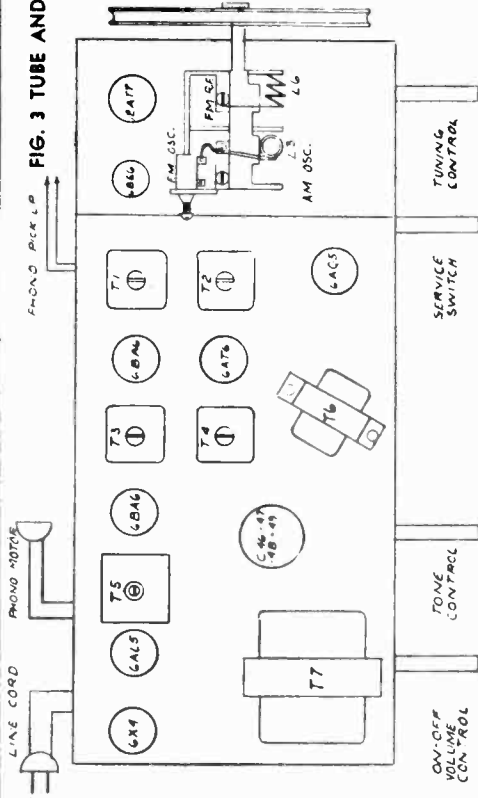


FIGURE 2

ALIGNMENT PROCEDURE

NOTE A: When aligning the FM I.F. circuits, keep the output from the signal generator as low as possible.

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—grid of AM converter tube (6BE6) Low side—chassis	Output Meter across voice coil	T2 & T4	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	"	"	"	AM OSC	AM Oscillator	"
3	1400 KC Any position where there is no station interference.	"	1400 KC 400 cycle AM	.00025 MFD	High side—One ant. terminal Low side—Other ant. terminal	"	Ant Loop	AM Antenna	"
4	"	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—grid of 2nd I.F. amplifier tube (6BA6) Low side—chassis	Connect V.T.V.M. to plate of Ratio Detector tube, pin 2 (6AL5)	Top T5	Ratio detector primary	Adjust for maximum negative voltage.
5	"	"	10.7 MC 400 cycle 250 KC Deviation	"	"	Connect scope to audio take-off point (across vol. cont.)	Bottom T5	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 2
6	"	"	10.7 MC 400 cycle 80 KC Deviation	"	High side—grid of 1st I.F. amplifier tube (6BA6) Low side—chassis	"	T3	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 2
7	"	"	"	"	High side—grid (pin 7) of FM converter tube (12AT7) Low side—chassis	"	T1	FM 1st I.F.	"
8	108.5 MC	"	108.5 MC 400 cycle 30% modulation (22.5 KC deviation)	300 ohms in high side	High side—ant. terminal Low side—chassis	Connect output meter across voice coil	FM OSC.	FM oscillator	Adjust for maximum output
9	105 MC	"	105 MC 400 cycle 30% modulation (22.5 KC deviation)	"	"	"	FM RF	FM R.F.	"

PARTS LIST

Schematic Diagram Reference	Description	R10, R23, R24 R11, R22 R16 R17, R18 R20 R25 R27 R28 R30 R31 R32 R33 K1 L1 L2A, B L3 L4 L5 L6	470K ohm Resistor 2.2M ohm Resistor .5M Vol. Cont. — SPST 12K Resistor 220 ohm Resistor 2.2K ohm 3.3M ohm 6.8M ohm 270 ohm — 1 Watt 100 ohm — 1 Watt 1000 ohm — 5 Watt 560 ohm CRL Triode couplate AM Grid Choke on R1 AM Osc. Coil FM Osc. Coil FM Cathode choke on R21 FM plate choke FM RF Coil
C1	Loop Trimmer		
C2	Variable Cond.		
C8, C9			
C11, C37			
C38	.05-200V Condenser		
C3			
C4	2.2 MMF Gimmick Cond.		
C5	33 MMF (Erie Style A N14004)		
C6, 18			
C19, 27			
C26	5000 MMFD GMV		
C42, C45, 51			
C50, C52			
C10	15 MMFD + or - 10% O° T.C. (Erie)		
C12	FM Osc Trimmer		
C13	1.5 MMFD (Erie Style "A")		
C14, 15, 16, 17 21, 22, 23, 24, 28	} Integral part of respective IF—XFMRs		
C31, 32, 53, 7, 20	} 10,000 MMFD GMV		
C25		D-1	Dial Scale
36, 39, 54	100 MMF ceramic cond.	L7, 8	Filament choke
C29	4 - 50V Lytic condenser	T1	1st FM IF
C30	2000 MMFD Condenser	T2	1st AM IF
C33	470 MMFD Condenser	T3	2nd FM IF
C34, 35 40, 44, 53	} 1000 MMFD GMV condenser	T4	2nd AM IF
C41	.1 - 400V condenser	T5	Ratio Detector
C43	.01 - 200V condenser	T6	Out Put XFMR
C46, 47 48, 49	} 40-350V, 30-300V FP Lytic Condenser. 30-300V, 10-25V	T7	Power XFMR
R2	4.7K ohm Resistor		Loop Ant.
R3, R15	22K ohm Resistor		No. 44 Pilot Light
R4, R8, R14	1K ohm Resistor	B	Line cord
R5, R19	100K ohm Resistor		300 ohm Line Di-Pole Ant.
R6, R12	68 ohm Resistor		
R7, R13	10K ohm Resistor		
R9, R26	47K ohm Resistor		

K=1000

M=1,000,000

All Resistors 1/2 Watt unless otherwise noted.

Values of Capacitors in MFD. unless otherwise stated.

Tolerance on Capacitors and Resistors + or - 20% unless otherwise stated.

MODELS 200,
300, 1250

SPECIFICATIONS

Power Supply.....105-125 volts 60 cycle AC only.
 Power Consumption.....65 Watts.
 Frequency Range FM.....88 to 108 MC.
 Frequency Range AM.....540 to 1600 KC.
 I.F. Frequency FM.....10.7 MC.
 I.F. Frequency AM.....455 KC.
 Band width, FM, Ratio Detector.....330 KC.
 Band width, FM, 1st I.F.....280 KC.
 Band width, FM, Converter.....220 KC.

The tubes used are as follows:
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 6BA6 FM-AM, 1st I.F. Amplifier
 6BA6 FM, 2nd I.F. Amplifier
 6AL5 FM Detector
 6AT6 AM Detector, AVC, Audio
 6AQ5 Power Output
 6X4 Power Rectifier
 No. 44 Pilot Lights (2)

SERVICE NOTES

GENERAL

CAUTION: If realignment is necessary be sure the proper test equipment is available, as listed below, before proceeding with the alignment procedure as given on page 5.

Due to the high frequencies at which FM signals are received the service man must use great care when servicing these sets. Extreme caution must be used regarding the moving of component parts in the R.F. and oscillator circuits of the receiver as those circuits can be detuned in this manner.

If it becomes necessary to replace components such as resistors and condensers they must be replaced with parts of the same size, type, voltage rating and tolerance as called for in the parts list.

When installing new parts they should be placed in the same position as the original, and the leads should be cut to the same length.

ALIGNMENT NOTES

This receiver has been thoroughly inspected and tested at the factory, using the most modern test equipment available, such as FM sweep generators and oscilloscopes. All R.F. and I.F. circuits have been accurately adjusted at the factory and no attempt should be made to realign these circuits unless it is absolutely necessary.

EQUIPMENT USED FOR ALIGNMENT

- Vacuum tube voltmeter.
- AM Signal generator
- FM Sweep generator.
- Oscilloscope.
- Insulated screw driver.
- Dummy antenna:
 - .1 MFD condenser
 - .00025 MFD mica condenser
 - 150 ohm resistor (2)
- Output meter.

VOLTAGE CHART

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
63E6 FM & AM OSC AM CONV	0	0	0	6 AC	155	125	0		
12AT7 FM RF AMP & CONV	170	0	1.5	0	0	155	0	1	6 AC
6BA6 1st IF AM & FM	0	0	6 AC	0 AC	150	100	0		
6BA6 2nd IF FM	0	0	6 AC	0 AC	155	110	1		
6AL5 FM DETECTOR	0	0	6 AC	0 AC		0	0		
6AT6 AM DETECTOR, AVC, AUDIO	-5	0	6 AC	0 AC	0	0	60		
6AQ5 POWER OUTPUT	0	7.5	6 AC	0 AC	215	170	0		
6x4 POWER RECTIFIER	200 AC		6 AC	0 AC	235	230	235 AC		

All voltage readings are taken from tube pin to chassis.

All measurements are made with no signal, using a 20,000 ohm per volt meter.

AC input voltage must be maintained at 117 volts for accurate readings.

AC voltages shown are at 1000 ohms per volt.

All voltages shown are approximate.

Band Switch on AM position. Dial 1600 KC. No Signal.

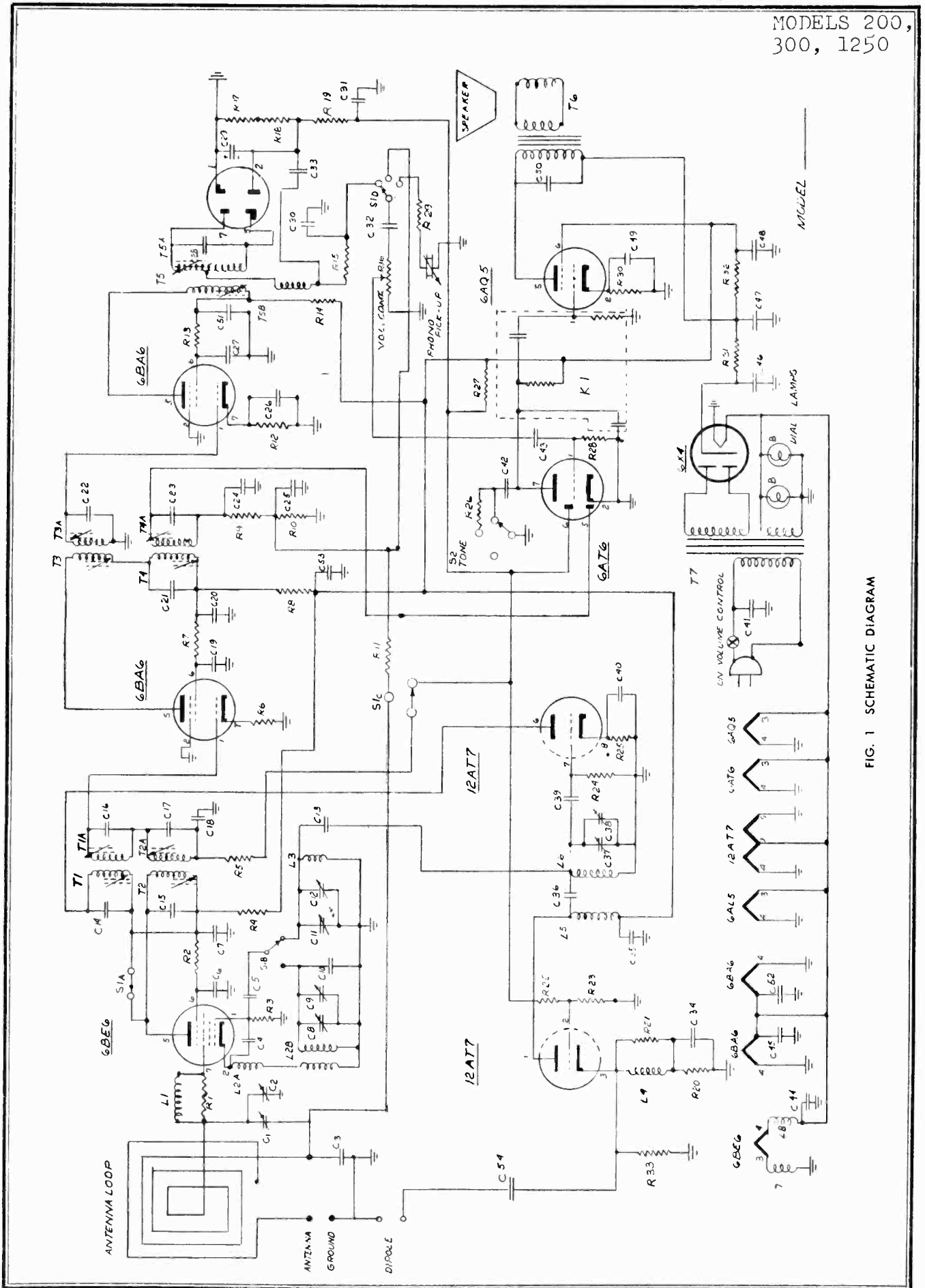
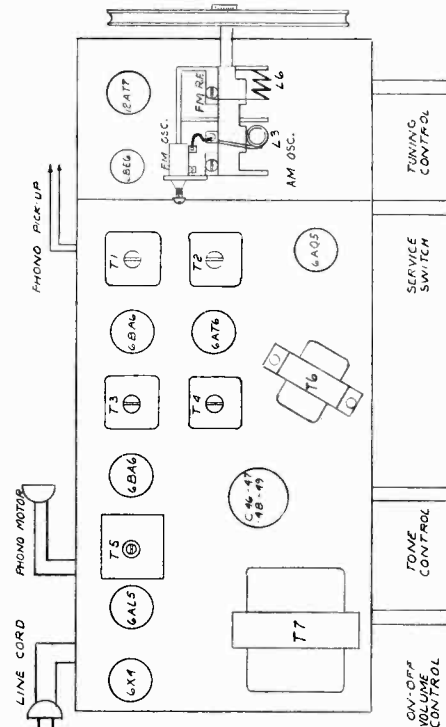
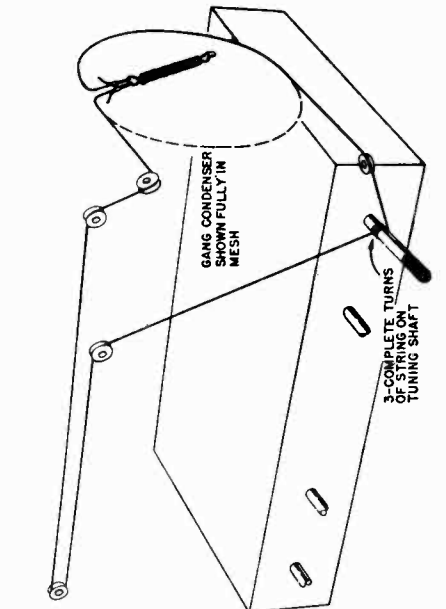


FIG. 1 SCHEMATIC DIAGRAM

MODELS 200,
300, 1250

ALIGNMENT PROCEDURE

STEPS	RECEIVER DIAL SETTING	BAND SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTIONS	OUTPUT INDICATOR	TRIMMER ADJUSTMENT	TRIMMER FUNCTION	REMARKS
1	Minimum capacity	AM	455 KC 400 cycle AM	.1 MFD	High side—grid of AM converter tube (6BE6) Low side—chassis	Output Meter across voice coil	T2 & T4	AM I.F.	Adjust for maximum output
2	"	"	1600 KC 400 cycle AM	"	"	"	AM OSC	AM Oscillator	"
3	1400 KC	"	1400 KC 400 cycle AM	.00025 MFD	High side—One ant. terminal Low side—Other ant. terminal	"	Ant Loop	AM Antenna	"
4	Any position where there is no station interference.	FM	10.7 MC unmodulated .1 volt output.	.1 MFD	High side—grid of 2nd I.F. amplifier tube (6BA6) Low side—chassis	Connect V.T.V.M. to plate of Ratio Detector tube, pin 2 (6AL5)	Top T5	Ratio detector primary	Adjust for maximum negative voltage.
5	"	"	10.7 MC 400 cycle 250 KC Deviation	"	"	Connect scope to audio take-off point (across vol. cont.)	Bottom T5	Ratio detector secondary	Adjust for a balanced pattern on scope. See Fig. 2
6	"	"	10.7 MC 400 cycle 80 KC Deviation	"	High side—grid of 1st I.F. amplifier tube (6BA6) Low side—chassis	"	T3	FM 2nd I.F.	Adjust for maximum gain and best pattern on scope. See Fig. 2
7	"	"	"	"	High side—grid (pin 7) of FM converter tube (12AT7) Low side—chassis	"	T1	FM 1st I.F.	"
8	108.5 MC	"	108.5 MC 400 cycle 30% modulation [22.5 KC deviation]	300 ohms in high side	High side—ant. terminal Low side—chassis	Connect output meter across voice coil	FM OSC	FM oscillator	Adjust for maximum output
9	105 MC	"	105 MC 400 cycle 30% modulation [22.5 KC deviation]	"	"	"	FM RF	FM R.F.	"



NOTE A: When aligning the FM I.F. circuits, keep the output from the signal generator as low as possible.

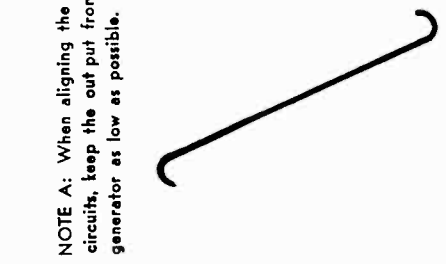


FIG. 4 DIAL CORD STRINGING

FIG. 3 TUBE AND TRIMMER LOCATIONS

FIGURE 2

PARTS LIST

Schematic Diagram Reference	Description	
C1	Loop Trimmer.....	R5, R19
C2	Variable Cond.....	R6, R12
C8, C9		R7, R13
C11, C37		R9, R26
C38		R10, R23, R24
C3	.05-200V Condenser.....	R11, R22
C4	2.2 MMF Gimmick Cond.....	R16
C5	33 MMF (Erie Style A N14004).....	R17, R18
C6, 18		R20
C19, 27		R25
C26	5000 MMFD GMV.....	R27
C42, C45, 51		R28
C50, C52		R30
C10	15 MMFD + or - 10% O° T.C. (Erie).....	R31
C12	FM Osc Trimmer.....	R32
C13	1.5 MMFD (Erie Style "A").....	R33
C14, 15, 16, 17	} Integral part of respective IF-XFMRS	K1
21, 22, 23, 24, 28		L1
C31, 32, 53, 7, 20	} 10,000 MMFD GMV.....	L2A, B
		L3
C25	100 MMF ceramic cond.....	L4
36, 39, 54		L5
C29	4 - 50V Lytic condenser.....	L6
C30	2000 MMFD Condenser.....	L7, 8
C33	470 MMFD Condenser.....	T1
C34, 35	} 100Q MMFD GMV condenser.....	T2
40, 44, 53		T3
C41	.1 - 400V condenser.....	T4
C43	.01 - 200V condenser.....	T5
C46, 47	} 40-350V, 30-300V FP Lytic Condenser.....	T6
48, 49		T7
R2	4.7K ohm Resistor.....	B
R3, R15	22K ohm Resistor.....	
R4, R8, R14	1K ohm Resistor.....	
		100K ohm Resistor.....
		68 ohm Resistor.....
		10K ohm Resistor.....
		47K ohm Resistor.....
		470K ohm Resistor.....
		2.2M ohm Resistor.....
		.5M Vol. Cont. - SPST.....
		12K Resistor.....
		220 ohm Resistor.....
		2.2K ohm.....
		3.3M ohm.....
		6.8M ohm.....
		270 ohm - 1 Watt.....
		100 ohm - 1 Watt.....
		1000 ohm - 5 Watt.....
		560 ohm.....
		CRL Triode couplate.....
		AM Grid Choke on R1.....
		AM Osc. Coil.....
		FM Osc. Coil.....
		FM Cathode choke on R21.....
		FM plate choke.....
		FM RF Coil.....
		Filament choke.....
		1st FM IF.....
		1st AM IF.....
		2nd FM IF.....
		2nd AM IF.....
		Ratio Detector.....
		Out Put XFMR.....
		Power XFMR.....
		Loop Ant.....
		No. 44 Pilot Light.....
		Line cord.....
		300 ohm Line Di-Pole Ant.....

K=1000
M=1,000,000

All Resistors 1/2 Watt unless otherwise noted.
Values of Capacitors in MFD. unless otherwise stated.
Tolerance on Capacitors and Resistors + or - 20% unless otherwise stated.

