

FREQUENCY MODULATION MODEL 42-400, CODE 121

SPECIFICATIONS

Model 42-400, Code 121, is an eleven (11) tube A.C. operated superheterodyne radio designed for reception of standard, shortwave and frequency modulation broadcast stations and the sound of a television program tuned in by special Philco Television Radios. The radio incorporates ten (10) electric push buttons for automatically tuning five (5) stations in the standard broadcast band and selecting standard, shortwave and frequency modulation bands; the Philco built Super Aerial System for standard and shortwave reception; the Philco F. M. Dipole Aerial for frequency modulation reception; four (4) tuning bands; three (3) I. F. stages; two tone controls (treble and bass); push-pull pentode audio output stage driven by a phase inverter audio amplifier stage; Philco LOXTAL tubes and a fourteen (14) inch electro-dynamic speaker.

Power Supply: 115 Volt, 60 cycle A. C.

This model can also be operated on a 115 Volt, 25 cycle or 220 Volt, 60 cycle power supply. To do this it is necessary to change the power transformers as indicated in the replacement parts list.

Power Consumption: 110 Watts

Intermediate Frequencies: Standard and shortwave bands, 455 K. C.; Frequency Modulation band, 4.3 M. C.

Tuning Band Frequencies: 540 to 1720 K. C.

9 to 12 M. C.

14.4 to 18 M. C.

42 to 50 M. C.

Audio Output: 7 watts.

Philco Tubes Used: XXL, oscillator; XXL, converter; three (3) 7B7, I. F. amplifiers; 7A6, automatic volume control; XXFM, second detector, first audio; 7A4, audio phase inverter; two (2), 6F6G push-pull audio output, and a 5Y4G, rectifier.

Cabinet Dimensions: Height, 35½"; Width, 34½"; Depth, 14¾"

ELECTRIC PUSH-BUTTON TUNING ADJUSTMENTS

The Electric push-button tuning mechanism consists of ten (10) push-buttons. Five of the push-buttons are used for selecting standard broadcast stations, one for the power control (ON-OFF); and four for selecting standard tuning, shortwave and Frequency Modulation bands.

Viewing the front of the cabinet from left to right the first push-button is the power control (ON-OFF), the next five push-buttons for tuning standard broadcast stations, and the seventh, eighth, ninth and tenth for selecting the tuning ranges—standard, shortwave 1, shortwave 2, and F. M., respectively.

When setting up stations on the push-buttons the lowest frequency station is set up in the second push-button from the left and the remaining stations according to increasing frequency in the next four push-buttons. These push-buttons are adjusted by the padders located on the rear of the tuning unit. The second push-button from the left can also be adjusted for reception of the sound

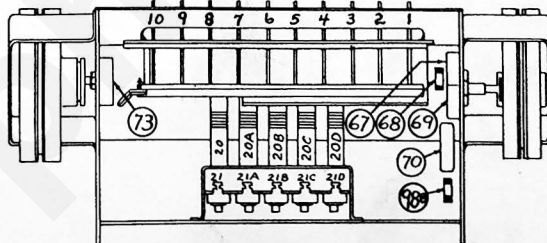


Fig. 1. Locations of Parts—Tuning Unit

EXTERNAL AERIAL CONNECTIONS

The built-in aerial system is designed to operate without an outside aerial or ground and to give exceptionally high receiving performance of stations in the standard, shortwave, or FM bands.

To operate the radio in steel reinforced buildings and other shielded locations where signal strength is weak, an external aerial is recommended. Three different types of aerial combinations are available, to improve reception on the standard, shortwave, or FM bands.

1—For Additional Sensitivity on Frequency Modulation only:

*Philco Dipole Outdoor Aerial, Part No. 45-2926.

The plug at the end of the transmission line is inserted in the socket at the back of the chassis in place of the plug connected to the F. M. loop in the cabinet.

2—For Additional Sensitivity on ALL ranges:

*Philco Dipole Outdoor Aerial, Part No. 45-2926.

Philco Aerial Coupler, Part No. 45-1361.

The coupler plugs into the socket at the back of the chassis in place of the plug connected to the F. M. loop. The aerial transmission line then connects to the terminals on the coupler marked "red" and "black." The local-distance switch on the coupler connects or disconnects the outdoor aerial from the standard broadcast and shortwave tuning ranges. The dipole remains connected to the F. M. band regardless of the position of the switch.

3—For Additional Sensitivity on Standard Broadcast or Shortwave only in Areas where F. M. reception is not available.

Philco Safety Aerial, Part No. 40-6370.

Philco Aerial Coupler, Part No. 45-1361.

Connect the single wire lead-in of the aerial to the "black" terminal on the aerial coupler.

*Accessories for this aerial are the Philco Aerial Mast Kit, the Philco Reflector Kit and Philco High Efficiency Transmission Line. See Service Bulletin No. 396 on Dipole Aerials.

NOTE: When installing the F. M. Philco Outdoor Dipole Aerial, it is very important that the aerial compensating condensers of the standard and shortwave band are repadded.

channel of a television program received by special Philco television radios. This push-button may also be used in conjunction with a Philco Wireless Record Player.

The frequency ranges covered by the station tuning push-buttons and procedure for adjusting is as follows:

Padders right to left from rear	Circuit	Buttons left to right from front	Frequency Range
..... 1		..... ON-OFF	
1	{ Ant. Osc. }	..... 2	..... 540 to 1000 KC
2	{ Ant. Osc. }	..... 3	..... 600 to 1200 KC
3	{ Ant. Osc. }	..... 4	..... 650 to 1300 KC
4	{ Ant. Osc. }	..... 5	..... 850 to 1500 KC
5	{ Ant. Osc. }	..... 6	..... 900 to 1600 KC
		7	..... Standard Band
		8	..... Shortwave Band 1
		9	..... Shortwave Band 2
		10	..... Frequency Modulation

REPLACEMENT PARTS—MODEL 42-400

Schematic No.	Description	Part No.	Schematic No.	Description	Part No.	Schematic No.	Description	Part No.
1	Loop Aerial (Standard & S.W. Bands)	28-3806FA3	31	Condenser (.03 mfd., 400 Volts)	30-4517	94	Power Transformer (115 Volts, 60 cycle)	32-8180
	Mtg. Sleeve	28-4189E7	35	Resistor (15,000 ohms)	33-315439		Power Transformer (115 Volts, 25 cycle)	32-8214
	Mtg. Sleeve	56-1545FA3	36	Condenser (.05 mfd., 200 Volts)	30-4519		Power Transformer (115/220 Volts, 60 cycle)	32-8087
	Spring Washer	W-280FE11	37	Resistor (220 ohms)	33-122336		Conversion Plug (115/220 Volts)	W-12773
	Screw	W-425FA3	38	Condenser (.01 mfd., 400 Volts)	30-4572		Mtg. Nut	W-317FA3
	Washer	W-648FA3	39	Resistor (100 ohms)	33-110339		Lockwasher	W-752FE7
	Washer		39	Resistor (100 ohms)	33-110339	95	Condenser (.01-.01 mfd.)	3903-0D6
1A	Terminal Panel (Loop Aerial)	36-9870	40	Resistor (100,000 ohms)	33-410330	96	Push-button Switch (Tuning Unit)	42-1703
			41	Second I.F. Transformer	32-3821		Washer (Mtg. Switch)	W-523FA3
2	F.M. Dipole Aerial (Mounted in Cabinet)	76-1394	41A	Primary Compensator			Rubber Grommet	W-151FA3
2A	Socket (F.M. Aerial)	27-6181	41B	Secondary Compensator			Mtg. Sleeve	28-3806
3	F.M. Aerial and Oscillator Transformer	28-3823	41C	Secondary Compensator		90A	Power Switch (Part of 96)	76-1343
	Mtg. Clip	28-5002FA3			W-1949FA3		Switch Cover	
4	Tuning Condenser (F.M. Section)	31-2600				97	Push-button Band Switch (Mounted Under Chassis)	42-1704
4A	Tuning Condenser (Standard & S.W. Section)		42	Condenser (.05 mfd., 200 Volts)	30-4519	97A	Push-button Band Switch (Part of 97)	28-4342FA3
	Part of 4		43	Resistor (330 ohms)	33-133336		Snapbuttons (Connecting Rods)	W-151FA3
	Coupling Assembly	31-2291	44	Third I.F. Transformer	32-3821		Mtg. Screw	W-523FA3
	Cable Drum Assembly	38-9716	44A	Primary Compensator			Rubber Grommet	27-4967
	Drive Cord (Pointer)	31-2316	44B	Secondary Compensator		98	Dial and Push-button Lamps	38-9685
	Drive Cord (Tuning)	31-2315	44C	Secondary Compensator			Socket Assembly (Dial Lights)	38-9685
	S. Ins.	28-8913	44C	Secondary Compensator			Socket Assembly (Push-button Lights)	76-1339
	Pointer	56-272FCP	45	Condenser (.05 mfd., 400 Volts)	30-4518		Socket Assembly (Cabinet Light)	76-1391
	Rubber Grommet	27-4771	46	Resistor (1000 ohms)	33-210339	98A	Cabinet Lamp	34-2210
	Screw (Mtg. Condenser)	W-1974FA3	47	Resistor (220,000 ohms)	33-422339	98B	Resistor (10 ohms)	33-010439
5	Compensator (F.M. Aerial)	31-6364	48	Condenser (.05 mfd., 200 Volts)	30-4519		MISCELLANEOUS PARTS	
5A	Compensator (F.M. Oscillator) Part of 5		49	Resistor (4700 ohms)	33-247339		Bezel	40-6685
6	Resistor (10 ohms)	33-010339	50	Resistor (100,000 ohms)	33-410339		Screw	W-2073FA3
7	Mica Condenser (250 mmfd.)	60-125157	51	Condenser (.02 mfd., 400 Volts)	30-4516		Cabinet	10589A
8	Resistor (10,000 ohms)	33-310339	51	Resistor (1 megohm)	33-510330		Cord (Power)	L-3199
9	Mica Condenser (250 mmfd.)	60-125157	52	Resistor (1 megohm)	33-510339		Control Drums (Bass and Treble)	54-4149
10	Resistor (47,000 ohms)	33-347339	53	Mica Condenser (100 mmfd.)	60-110157		Control Drum (Volume)	54-4150
11	Resistor (2200 ohms)	33-222339	54	Mica Condenser (100 mmfd.)	60-110157		Control Drum (Tuning)	54-4119
12	Mica Condenser (500 mmfd.)	30-1138	55	Resistor (68,000 ohms)	33-363330		Shaft Bearing (Control Drums)	56-1036
13	Mica Condenser (200 mmfd.)	30-1213	56	Condenser (.05 mfd., 400 Volts)	30-4518		Spring Washer (Bronze)	56-1385
14	S.W.-1 and S.W.-2 Oscillator Transformer	32-3827	57	Condenser (.05 mfd., 200 Volts)	30-4519		Spring Washer (Steel)	56-1639
15	Compensator (S.W.-2, Oscillator)	31-6448	58	Resistor (330 ohms)	33-133336		Keyed Washer	56-1029FA3
15A	Compensator (S.W.-2, Aerial) Part of 15		59	Fourth I.F. Transformer	32-3822		Washer (Steel)	28-3876
16	Broadcast Oscillator Transformer	32-3809	59A	Primary Compensator	Part of 59		Dial Scale	27-5760
	Mtg. Clip	28-5002	59B	Primary Compensator	Part of 59		Felt Gasket	34-2210
17	Resistor (33 ohms)	33-033336	59C	Secondary Compensator	Part of 59		Clamp	56-1034FA3
18	Compensator (Brdcat Oscillator)	31-6451	59D	Condenser (500 mmfd.)	Part of 59		Screw	W-2150FA3
18A	Compensator (Brdcat Oscillator 580 K.C.)	Part of 18		Mtg. Nut	W-1949FA3		Jewel (Cabinet Pilot Lamp)	27-4777
18B	Compensator (S.W. 1, Oscillator)	Part of 18	60	Resistor (330,000 ohms)	33-433339		Push-buttons	54-4138
18C	Compensator (Brdcat Aerial)	Part of 18	61	Resistor (330,000 ohms)	33-433339		Spring	76-1376
18D	Compensator (S.W. 1, Aerial)	Part of 18	62	Mica Condenser (150 mmfd.)	60-115137		Rubber Corner (Chassis)	54-4015
19	Mica Condenser (145 mmfd.)	20-014517	63	Mica Condenser (150 mmfd.)	60-115137		Rubber Grommet (Tuning Unit Mtg.)	3914
20	Push-button Oscillator Transformer (900 to 1600 K.C.)	32-3779	64	Resistor (223,000 ohms)	33-422339		Rubber Grommet (Chassis Mtg.)	3915
20A	Push-button Oscillator Transformer (850 to 1500 K.C.)	32-3779	65	Mica Condenser (100 mmfd.)	60-110157		Rubber Grommet (Tuning Unit Mtg.)	27-4571
20B	Push-button Oscillator Transformer (650 to 1300 K.C.)	32-3700	66	Condenser (.006 mfd., 400 Volts)	30-4591		Screw (Tuning Unit Mtg.)	W-752FA3
20C	Push-button Oscillator Transformer (600 to 1200 K.C.)	32-3780	67	Volume Control	33-528G		Screw (Chassis Mtg.)	W-1345FA3
20D	Push-button Oscillator Transformer (540 to 1000 K.C.)	32-3780	68	Resistor (58,000 ohms)	33-368339		Socket (Tuning Unit Mtg.)	28-2257FA3
	Iron Core	56-6100	69	Audio Bass Control	33-5472		Socket (Output and Rectifier)	27-6174
	Clip	56-2250	70	Condenser (.006 mfd.)	30-4591		Socket (LokTAL)	27-6177
	Cup	28-6536	71	Resistor (10 megohms)	33-610330		Mtg. Rivets	W-238FA3
21	Push-button Compensator (900 to 1600 K.C.)	31-6447	72	Condenser (.006 mfd., 400 Volts)	30-4591		Tab Kit (Station Letters)	40-6673
21A	Push-button Compensator (850 to 1500 K.C.)	Part of 21	73	Audio Treble Control	33-5476		Tab (Television)	27-5648
21B	Push-button Compensator (650 to 1300 K.C.)	Part of 21	74	Resistor (330,000 ohms)	W-2157FA3		Tab (Broadcast)	27-5763
21C	Push-button Compensator (600 to 1200 K.C.)	Part of 21	75	Condenser (.006 mfd., 400 Volts)	30-4591		Tab (F.M.)	27-5765
21D	Push-button Compensator (540 to 1000 K.C.)	Part of 21	76	Mica Condenser (250 mfd.)	60-125157		Tab (S.W. 1)	27-5766
			77	Condenser (.006 mfd., 400 Volts)	30-4591		Tab (S.W. 2)	27-5767
22	Condenser (1 mfd., consisting of Wire and Lug)	32-3780	78	Resistor (1 megohm)	33-510339		Tab (0/F)	27-5768
23	Mica Condenser (155 mmfd.)	20-015517	79	Resistor (4700 ohms)	33-247339		Tab Covers	27-5629
24	S.W. Aerial Transformer	32-3824	80	Resistor (47,000 ohms)	33-347339		Terminal Panel (3 Lugs)	38-8380
	Mtg. Clip	28-5002	81	Condenser (.006 mfd., 400 Volts)	30-4591		Terminal Panel (7 Lugs)	36-9100
25	Broadcast Aerial Transformer	32-3823	82	Resistor (470,000 ohms)	33-447339		Terminal Panel (4 Lugs)	38-9117
	Mtg. Clip	28-5002	83	Condenser (.003 mfd., 1,000 Volts)	30-4469			
26	Mica Condenser (250 mmfd.)	60-125157	84	Resistor (470,000 ohms)	33-447339			
27	Resistor (2.2 Megohms)	33-522339	85	Audio Output Transformer	32-8197			
28	Resistor (4700 ohms)	33-247339	88	Speaker	36-1515			
29	Condenser (.05 mfd., 400 Volts)	30-4518		Cone Assembly	36-4173			
30	Condenser (.01 mfd., 400 Volts)	30-4572		Cable	41-3430			
31	First I.F. Transformer	32-3820		Mtg. Fiber Washer	27-7467			
31A	Primary Compensator	32-3820		Mtg. Nut	W-124FA3			
31B	Secondary Compensator		89	Condenser (.003 mfd., 1,000 Volts)	30-4469			
31C	Secondary Compensator		90	Electrolytic Condenser (25 mfd., 250 Volts)	30-2531			
31D	Condenser (4000 mmfd.)			Mtg. Nut	W-2000			
	Mtg. Nut	W-1949FA3	91	Speaker Field Coil (Replace Speaker 36-1515)				
32	Resistor (15,000 ohms)	33-315339	92	Bias Resistor (10-165 ohms)	33-3416			
33	Electrolytic Condenser (8 mfd., 350 Volts)	30-2437	93	Electrolytic Condenser (18 mfd., 400 Volts)	30-2525			
				Mtg. Strap	56-1452FA3			

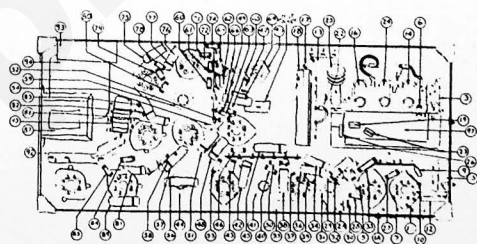


Fig. 4. Part Locations—Under Chassis

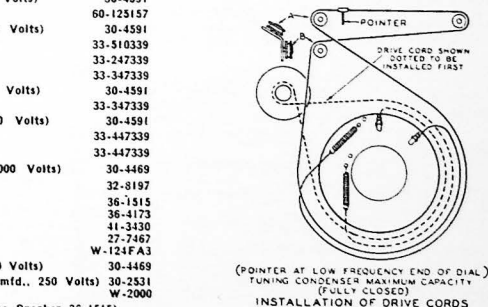


Fig. 3. Installation of Drive Cords

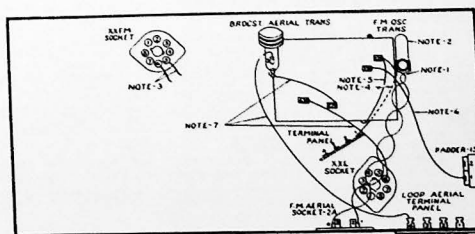


Fig. 5. Critical Wiring Locations—F.M. Aligning

ALIGNING R. F. AND I. F. COMPENSATORS

EQUIPMENT REQUIRED

1. SIGNAL GENERATOR: Covering the frequency of the receiver, such as the Philco Model 070.
2. ALIGNING INDICATOR: Audio Output Meter, Philco Models 027 and 028. Circuit testers contain a sensitive output meter and are recommended.
3. TOOLS: Philco Fibre Screw Driver, Part No. 45-2610.

CONNECTING ALIGNING INSTRUMENTS

Audio Output Meter: Terminal No. 1 is provided on the loop aerial panel for connecting one lead of the audio output meter to the voice coil of the speaker. The other lead of the meter is connected to the chassis. When using these connections, the lowest A. C. scale of the meter must be used. (0 to 10 volts.) The audio output meter can also be connected between the plate of the output tube and the chassis.

Signal Generator: When adjusting the "I. F." padders, the high side of the signal generator is connected through a .1 mfd. condenser to the points indicated in signal generator column "output connections" to receiver in the tabulations below.

When aligning the R. F. padders a loop is made from a few turns of wire and connected to the signal generator output terminals; the loop is then placed two or three feet from the loop in the cabinet and dipole aerial lead. Do not remove the receiving loops from the cabinet. It is necessary when adjusting the padders, that the receiver be left in the cabinet.

After connecting the aligning instruments adjust the compensators in the order shown in the tabulation below. Location of the compensators is shown, Figure 6. If the output meter pointer, goes off scale when adjusting the compensators, reduce the strength of the signal from the generator.

STANDARD AND S. W. BANDS ALIGNING PROCEDURE

Operations In Order	SIGNAL GENERATOR		RECEIVER			Special Instructions	
	Output Connections	Dial Setting	Dial Setting	Control Settings	Adjust Compensators in Order		
1	High side to No. 4 terminal loop panel	455 KC	580 KC	Vol. max. push-button Bcst. "IN"	59B, 44C, 41C, 31B, 31E		
2	Use loop on generator	1500 KC	1500 KC	"	18, 18C	Note A	
3	Use loop on generator	580 KC	580 KC	"	18A	Roll Tuning Condensers Note B	
4	Use loop on generator	Readjust as given in Operation 2					
5	Use loop on generator	12 MC	12 MC	Push-button S. W. 1.	18B, 18D	Note C	
6	Use loop on generator	18 MC	18 MC	Push-button S. W. 2.	15, 15A	Roll Cond. Note C	

FREQUENCY MODULATION ALIGNING PROCEDURE

Note: The Frequency Modulation Circuits Must Be Adjusted With the Dipole Aerial Connected.

CRITICAL WIRING LOCATIONS

STANDARD SHORTWAVE AND F. M. ALIGNING

NOTE

- 1.—F. M. Aerial wires from F. M. aerial socket 2A to F. M. aerial transformer (3) must be twisted (for shielding). The twisted wires should also be dressed away from the switch and other wiring.
- 2.—All wires from F. M. Oscillator transformer (3A) (3A is a part of (3) F. M. aerial transformer) must be dressed away from the F. M. aerial transformer section.
- 3.—Dress yellow wire from 4th I. F. transformer (59) to the diode connection 5 of the XXFM socket down against chassis base. The green lead from the same transformer to connection 6 of the XXFM socket must be pulled away from the chassis base. (These lead dresses are necessary for proper peak separation when aligning F. M. circuits.)
- 4.—Dress wire from F. M. push-button contact (12) to terminal panel lug 1 around end of P. B. switch next to the underside of the chassis (this dress prevents frequency shift when chassis is mounted in the cabinet).

5.—Dress close to the push button switch the wire which connects from contact 12 of the lower switch wafer 97 to contact 64 of the upper switch wafer 97A.

6.—Wire from SW2 push-button contact No. 22 to padder 15 must be dressed close to the switch.

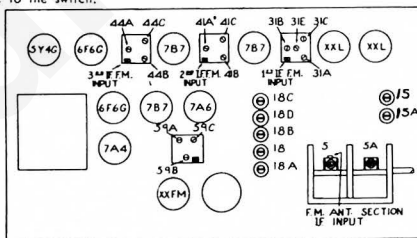


FIG. 6. LOCATION OF COMPENSATORS — TOP OF CHASSIS

F. M. BAND ALIGNING PROCEDURE

Operations In Order	SIGNAL GENERATOR		RECEIVER			Special Instructions
	Output Connections	Dial Setting	Dial Setting	Control Settings	Adjust Compensators in Order	
1	3rd I. F., F. M. input connection	4.3 MC	1400 KC	Vol. max. F. M. push-button "IN"	59C (Note D) 59A (Note E)	
2	2nd I. F., F. M. input connection	4.3 MC	1400 KC	F. M. push-button "IN"	44A, 44B. (Note F)	
6	1st I. F., F. M. input connection	4.3 MC	1400 KC	F. M. push-button "IN"	41A, 41B (Note F)	
3	Ant. Section of F. M. Tuning Cond. and Grd.	4.3 MC	1400 KC	F. M. push-button "IN"	31A, 31C (Note F)	
4	Use test loop on generator; place near dipole aerial	48.5 MC	85 (Note G)	F. M. push-button "IN"	5A (Note G) 5 (Note H)	Roll tuning condenser when adjusting 5B. See Note B.
5	"	48.5 MC	85	F. M. push-button "IN"	5A oscillator	

NOTE A.—DIAL CALIBRATION: In order to adjust the receiver correctly, the dial pointer must be aligned to track properly with the tuning condenser. To adjust the dial, proceed as follows: With the tuning condenser closed (maximum capacity) set the dial pointer on the extreme left index line at the low frequency end of the broadcast scale.

NOTE B.—When adjusting the low frequency compensator of the broadcast or the aerial padders of the high frequency tuning range; the receiver tuning condenser must be adjusted (rolled) as follows: First, tune the compensator for maximum output, then vary the tuning condenser of the receiver for maximum output. Now turn the receiver tuning condenser for maximum output. This procedure of first setting the compensator and then varying the tuning condenser is continued until maximum output reading is obtained.

NOTE C.—Adjust compensators (15 and 18B) to the second signal peak from the closed position (maximum

capacity). The aerial compensators (15A and 18D) must also be adjusted to maximum on the first signal peak by rolling the tuning condenser. (See Note B.)

NOTE D.—With the signal generator set to 4.3 MC, padder (59C) is adjusted to the point where minimum signal indication is observed on the output meter.

NOTE E.—Turn the signal generator first to approximately 125 KC below 4.3 MC (4.17 MC) and then 125 KC above 4.3 MC (4.42 MC). A signal peak should be observed on the output meter at approximately each of these points (4.17 and 4.42). The two peak signals should be of equal reading on the output meter and equally spaced in frequency each side of 4.3 MC. If the peaks are unequal in amplitude, padder (58A) must be adjusted in the direction necessary to make both peaks equal. This is done by slightly turning padder and then tuning signal generator above and below 4.3 to observe peaks. After equal peak readings are obtained, set the signal generator to 4.3 MC. The output meter should show zero reading at 4.3 MC. If a signal indication is observed readjust padder

(59C) until zero reading is obtained on the meter. After this adjustment is made padder No. 59A should be reset for equal peaks as given above.

NOTE F.—Adjust padders 44A, 44B, 41A, 41B, 31A, 31C for equal signal peaks and equal frequency spacing each side of 4.3 MC.

NOTE G.—The dial scale numbers are listed in tenths of megacycles less the first digit; i. e., 49 MC is 09, 48.5 is 85. Set the tuning dial pointer to 09 on the F. M. scale. Adjust padder (5A) to the point where minimum signal indication is observed on the output meter.

NOTE H.—In order to adjust padder (5) the signal generator should be set to either the signal peak approximately 125 KC below 48.5 MC (48.275 MC), or 125 KC above 48.5 MC (48.725 MC). Adjust padder (5) to maximum output reading on either of these peak signals. As padder 5 is being adjusted roll the tuning condenser as given in Note B.