

FREQUENCY MODULATION

Models 42-355, code 121; 42-390, code 121

SPECIFICATIONS

MODEL 42-355

Circuit Description: Models 42-355 and 42-390 are eight (8) tube superheterodyne radios 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 nine electric push-buttons for automatically tuning five stations in the standard broadcast band, and selects the standard, shortwave and frequency modulation tuning bands; Philco built-in low impedance loop aerials for standard, S. W. and F. M. reception; three tuning ranges; two intermediate frequency stages; two tone controls (treble and bass); audio bass frequency compensation in the volume control circuit, push-pull pentode audio output with screen phase inversion.

In general, these models are similar in design with the exception of the cabinets and loop aerials. Model 42-355 is assembled in a table model cabinet, and Model 42-390 is assembled in a console cabinet. The differences between the two models are indicated in the schematic diagram and replacement parts list.

Power Supply: 115 volts, 60 cycles A. C.

This model can also be operated on 25-cycle current. To do this it is necessary to replace the power transformer as indicated in the parts list for 25-cycle operation.

Power Consumption: 70 watts.

Intermediate Frequency: Standard Tuning, 455 KC; F. M. Channel, 4.3 MC.

Frequency Tuning Ranges: 540 to 1720 KC; 9 to 15 MC, and 42 to 50 MC (F. M.).

Audio Output: 3 watts.

Philco Tubes Used: XXL, oscillator; XXL, converter; 7V7, 1st I. F.; 7V7, 2nd I. F.; XXFM, 2nd detector-1st audio; two 41 audio output, and an 84 rectifier.

Cabinet Dimensions:	Height	Width	Depth
Model 42-355	11 $\frac{3}{8}$ "	20"	13"
Model 42-390	39 $\frac{3}{4}$ "	30"	12 $\frac{3}{4}$ "

ELECTRIC PUSH-BUTTON TUNING ADJUSTMENTS

The automatic tuning mechanism consists of nine (9) push-buttons. Five of the push-buttons are used for selecting standard broadcast stations, one for the power control (ON-OFF); and three for selecting standard tuning, shortwave and F. M. (Frequency Modulation).

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 and ninth for selecting the tuning ranges—standard, shortwave 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 chassis. The second push-button from the left can also be adjusted for reception of the sound 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.

EXTERNAL AERIAL CONNECTIONS

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

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 various tuning ranges as follows:

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 and Shortwave Only:

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 re-padded.

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
		9	Frequency Modulation

ALIGNING R. F. AND I. F. COMPENSATORS

The following procedure is the same for both models:

EQUIPMENT REQUIRED

1. SIGNAL GENERATOR
2. ALIGNING INDICATOR:
3. TOOLS

Covering the frequency of the receiver, such as the Philco Model 070.
Audio Output Meter. Philco Models 027 and 028. Circuit testers contain a sensitive output meter and are recommended.
Philco Fiber 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 are shown on the schematic diagram. 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		
	Output Connections	Dial Setting	Dial Setting	Control Settings	Adjust Compensators in Order	Special Instructions
1	High side to No. 4 terminal loop panel	455 KC	580 KC	Vol. max. push-button Bdst. "IN"	55A, 43C, 33B, 33A	
2	Use loop on generator	1500 KC	1500 KC	"	6E, 6	Note A
3	Use loop on generator	580 KC	580 KC	"	6F	Roll Tuning Condensers Note B
4	Use loop on generator	Readjust as given in Operation 2				
5	Use loop on generator	15 MC	15 MC	Push-button S. W. "IN"	6D, 6A	Note C

FREQUENCY MODULATION ALIGNING PROCEDURE

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

CRITICAL WIRING LOCATIONS

The following items on these sets are critical for location and position. See Fig. 3 for locations of wires and parts.

1. Green lead and yellow lead from third I. F. coil must be short, direct, and symmetrically spaced from sub-base. Adding capacity to the green lead will narrow the discriminator curve, while adding capacity to the yellow lead will widen the discriminator curve.
2. The XXFM grid lead must be dressed away from the discriminator coil wiring in 42-355 and 42-390 with the lug provided for that purpose. Failure to do this will result in distortion at low volume control settings.
3. The black lead of the 1st I. F. coil must be dressed along the sub-base and away from the yellow and orange leads of the same coil. Proximity of these leads may result in decreased sensitivity at certain points of the broadcast band

because of oscillator harmonics feeding through the 4.3 MC I. F. channel to build up A. V. C. voltage.

4. The blue and white and the white leads from the loop terminal panel must have one complete twist. This is necessary to maintain the proper inductance for shortwave operation, and to prevent loose S. W. antenna padding.
5. Grounding must be maintained at all original points. Any change in grounding of the R. F. wiring will cause serious mistracking of the F. M. band.
6. The brass indicator tabs must not be allowed to touch the sub-base. Any accidental connection from the push-button shafts to ground will cause misalignment of the F. M. band.
7. All I. F. coil wires must be brought out of the designated sub-base holes and kept free from wires coming out other holes. This is necessary to maintain the proper 4.3 MC I. F. curves.
8. The leads from the small gang sections are part of the F. M. tuned circuits and must be maintained to specified lengths for proper F. M. tracking.

F. M. BAND ALIGNING PROCEDURE

Operations in Order	SIGNAL GENERATOR			RECEIVER		
	Output Connections	Dial Setting	Dial Setting	Control Settings	Adjust Compensators in Order	Special Instructions
1	2nd I. F., F. M. input connection	4.3 MC	580 KC	Vol. max. F. M. push-button "IN"	55C (Note D) 55B (Note E)	
2	1st I. F., F. M. input connection	4.3 MC	580 KC	F. M. push-button "IN"	43A, 43B (Note F)	
3	High side to No. 1 contact, F. M. socket. Ground to No. 2 contact	4.3 MC	580 KC	F. M. push-button "IN"	33C, 33B (Note F)	
4	Use test loop on generator; place near dipole aerial	49 MC	90 (Note G)	F. M. push-button "IN"	6C (Note G) 6B (Note H)	Roll tuning condenser when adjusting 6B. See Note B
5	"	49 MC	90	F. M. push-button "IN"	6C 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 compensator slightly to the right or left and again vary 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 compensator (6D) to the second signal peak from the closed position (maximum capacity).

The aerial compensator (6A) 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 (55C) 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 (55B) must be adjusted in the direction necessary to make both peaks equal. This is done by slightly turning padder and then turning 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 (55C) until zero reading is obtained on the meter. After this adjustment is made padder No. 55B should be reset for equal peaks as given above.
NOTE F.—Adjust padders 43A, 43B, 33C, and 33D for equal signal peaks and equal frequency spacing each side of 4.3 MC.

NOTE G.—The dial scale numbers are listed in tens of megacycles less the first digit: i. e., 49 MC is 90, 49.5 is 85. Set the tuning dial pointer to 90 on the F. M. scale. Adjust padder (6C) to the point where minimum signal indication is observed on the output meter.

NOTE H.—In order to adjust padder (6B) the signal generator should be set to either the signal peak approximately 125 KC below 49 MC (48.75 MC), or 125 KC above 49 MC (49.125 MC). Adjust padder (6B) to maximum output reading on either of these peak signals. As padder 6B is being adjusted roll the tuning condenser as given in Note B.

REPLACEMENT PARTS—Models 42-355, 42-390

Sch. No.	Description	Part No.	Sch. No.	Description	Part No.	Sch. No.	Description	Part No.
1.	F. M. Loop Aerial (Model 42-355)	76-1354	24C.	Push-button Compensator (No. 4 Button) (Part of 24)		63.	Resistor (2.2 megohms)	33-522339
2.	F. M. Loop Aerial (Model 42-390)	76-1346	24D.	Push-button Compensator (No. 5 Button) (Part of 24)		64.	Tone Control (Bass)	33-4580
	Socket (on Chassis-F. M. Loop Aerial)	27-6181	25.	Push-button Oscillator oil (No. 1 P. B.)	32-3780	65.	Mica Condenser (100 mfmfd)	60-110157
3.	Terminal Panel (on Chassis, Loop Aerial)	W-207	25A.	Push-button Oscillator Coil (No. 2 P. B.)	32-3780	66.	Condenser (.01 mfd, 400 volts)	30-4212
	Mtg. Rivet	38-9870	25B.	Push-button Oscillator Coil (No. 3 P. B.)	32-3780	67.	Condenser (.006 mfmfd)	30-4591
4.	Loop Aerial (Brdcast—S. W.) (Model 42-355)	W-207	25C.	Push-button Oscillator Oil (No. 4 P. B.)	32-3779	68.	Resistor (68,000 ohms)	33-368339
	Mtg. Screw	76-1306	25D.	Push-button Oscillator Coil (No. 5 P. B.)	32-3779	69.	Mica Condenser (100 mfmfd)	33-5477
	Loop Aerial (Brdcast—S. W.) (Model 42-390)	W-2071		Coil Clip	56-1500	70.	Volume Control	33-5477
	Mtg. Sleeve	76-1307		Iron Core	56-2249	71.	Mtg. Nut	W-2157
	Mtg. Sleeve	28-3806		Iron Core Screw Clamp	42-1692	72.	Resistor (10 megohms)	33-510339
	Spring Washer	56-1545		Push-button Switch	42-1717	73.	Condenser (.150 mfmfd)	60-115137
	Screw	28-4156		(Part of 26)		74.	Mica Condenser (100 mfmfd)	33-447339
	Washer	W-258		Mtg. Grommet	27-4596	75.	Tone Control (Treble)	33-5461
	Washer	W-425		Mtg. Sleeve	56-1505	76.	Mtg. Nut	W-2157
	Screw	W-648		Mtg. Screw	33-227339	77.	Condenser (.01 mfd, 400 volts)	30-4572
5.	Aerial Transformer (Broadcast Band) (Model 42-385)	32-3511		Mtg. Grommet	27-4596	78.	Condenser (.01 mfd, 400 volts)	30-4572
	Aerial Transformer (Broadcast Band) (Model 42-390)	32-3790	27.	Mica Condenser (250 mfmfd)	60-125257	79.	Condenser (.01 mfd, 400 volts)	33-510339
	Mtg. Clip	28-5002	28.	Resistor (2.2 megohms)	33-522339	80.	Resistor (1 megohm)	33-447339
6.	Compensator (Broadcast Aerial)	31-6443	29.	Resistor (2700 ohms)	33-227339	81.	Mica Condenser (100 mfmfd)	30-4572
6A.	Compensator (S. W. Aerial) (Part of 6)	30-20	30.	Condenser (.05 mfd, 400 volts)	30-4518	82.	Resistor (47,000 ohms)	33-239339
6B.	Compensator (F. M. Aerial) (Part of 6)	31-31	31.	Resistor (100,000 ohms)	33-410339	83.	Resistor (3900 ohms)	30-4601
6C.	Compensator (F. M. Oscillator) (Part of 6)	33-33	32.	Condenser (.05 mfd, 400 volts) 1st I. F. Transformer	30-4518	84.	Condenser (.001 mfd)	30-4601
6D.	Compensator (S. W. Oscillator) (Part of 6)	33A.	33A.	Primary Compensator (455 KC) (Part of 33)	32-3787	85.	Output Transformer	33-473339
6E.	Compensator (Broadcast—Series) (Part of 6)	33B.	33B.	Secondary Compensator (455 KC) (Part of 33)		86.	Speaker (Model 42-355)	36-1519
6F.	Compensator (Broadcast—Oscillator) (Part of 6)	33C.	33C.	Primary Compensator (F. M. 4.3 MC) (Part of 33)		87.	Speaker (Model 42-390)	36-1552-4
7.	Aerial and Oscillator Transformer (F. M.)	32-3792	33D.	Secondary Compensator (F. M. 4.3 MC) (Part of 33)		88.	Cable (Model 42-355)	41-2541
	Mtg. Clip	28-5002	33E.	Condenser (4000 mfmfd) (Part of 33)		89.	Mtg. Washer	W-124
8.	Tuning Condenser (two sections—Standard & F. M.)	31-2592	33F.	Resistor (47,000 ohms) (Part of 33)		90.	Mtg. Nut	W-1949
	Drive Cord (Pointer)	31-2576		Mtg. Nut (I. F. Trans.)	33-247339	91.	Bias Resistor (12-175 ohms)	33-3416
	Spring (Pointer Drive)	28-8953	34.	Resistor (100 ohms)	30-4519	92.	Electrolytic Condenser (18 mfd)	30-2512
	Drive Cord (Tuning Cond.)	31-2577	35.	Resistor (68 ohms)	33-110336	93.	Clamp	33-068339
	Spring (Drive Cord)	28-8751	36.	Condenser (.05 mfd, 200 volts)	30-4519	94.	Power Transformer (115 volts, 60 cycle) (Model 42-355)	32-8187
	Drive Drum (Tuning Cond.)	76-1293	37.	Resistor (100,000 ohms)	33-410339	95.	Power Transformer (115 volts, 60 cycle) (Model 42-390)	32-8177
	Mtg. Grommet	27-4596	38.	Condenser (.01 mfd, 400 volts)	30-4518		Shield	56-1538
	Mtg. Sleeve	56-1505	39.	Condenser (.01 mfd, 400 volts)	30-4518		Mtg. Screw	W-1874
	Mtg. Screw	W-2002	40.	2nd I. F. Transformer	32-3788	91.	Power Line Filter Condenser (.01 mfd)	3963-ODG
	Tuning Shaft	56-6152	41A.	Primary Compensator (F. M. 4.3 MC)		92.	Pilot Lamp	34-2064
	"C" Washer (Mtg. Shaft)	28-2043	43A.	Secondary Compensator (F. M. 4.3 MC)			Mtg. Clip	57-1404
9.	Silver Mica Condenser (230 mfmfd) (Model 42-355)	30-1214	43C.	Secondary Compensator (455 KC) (Part of 43)	33-347339		Socket Assembly (Dial Lights)	76-1295
	Silver Mica Condenser (190 mfmfd) (Model 42-390)	20-019017	43D.	Resistor (47,000 ohms) (Part of 43)	33-347339		Miscellaneous Parts	
10.	Condenser (Wire and Lug)	43C.	43D.	Mtg. Nut (I. F. Trans.)	W-1949		Bezel (Cabinet)	54-4099
11.	Silver Mica Condenser (200 mfmfd) (Model 42-355)	30-1213	44.	Resistor (3300 ohms)	33-233339		Mtg. Screw	W-2071
	Silver Mica Condenser (185 mfmfd) (Model 42-390)	20-018511	45.	Resistor (150 ohms)	33-115336		Cabinet (42-355)	10566A
12.	Resistor (10,000 ohms)	33-210339	46.	Resistor (1000 ohms)	33-210339		Cabinet (42-390)	10578A
13.	Mica Condenser (250 mfmfd)	60-125257	47.	Condenser (.05 mfd, 200 volts)	30-4519		Cord (Power)	27-5753
14.	Silver Mica Condenser (370 mfmfd)	30-1110	48.	Resistor (2.2 megohms)	33-522339		Dial	27-5903
15.	Resistor (10,000 ohms)	33-310339	49.	Electrolytic Condenser (8-8 mfd)	30-2513		Background Plate	27-5903
16.	Resistor (22,000 ohms)	33-322339	50.	Resistor (4700 ohms)	33-247339		Rubber Corner (Dial Mtg.)	54-4445
17.	Silver Mica Condenser (370 mfmfd)	30-1110	51.	Resistor (2.2 megohms)	33-522339		Spring (Background Plate)	28-8909
18.	Mica Condenser (500 mfmfd)	60-10157	52.	Condenser (.01 mfd, 400 volts)	30-4572		Mtg. Clamp (Dial)	56-1517
19.	Resistor (10 ohms)	33-010339	53.	Condenser (.05 mfd, 200 volts)	30-4519		Mtg. Screw	W-1874
20.	Resistor (47,000 ohms)	33-347339	54.	Condenser (.01 mfd, 400 volts)	30-4572		Pointer	56-2331
	Mtg. Clip	28-5002	55A.	3rd I. F. Transformer	32-3789		Knob (Push-Buttons)	54-4111
21.	S. W. Oscillator Transformer (Model 42-355)	32-3812	55B.	Primary Compensator (455 KC) (Part of 55)			Spring (P. B. Knobs)	76-1294
	S. W. Oscillator Transformer (Model 42-390)	32-3793	55C.	Secondary Compensator (F. M. 4.3 MC) (Part of 55)			Knob (Tuning, Volume, Tone)	54-4106
	Mtg. Clip	28-5002	55D.	Condenser (.125 mfmfd) (Part of 55)			Rubber Grommet (Chassis Mtg.)	27-4571
22.	Broadcast Oscillator Transformer	33-056339	55E.	Mtg. Nut (I. F. Mtg.)	W-1949		Screw (Chassis Mtg.)	W-1846
	Mtg. Clip	31-6439	56.	Mica Condenser (500 mfmfd)	60-150227		Socket (41 tube)	27-6168
23.	Push-button Compensator (No. 1 Button)	31-6439	57.	Condenser (.1 mfd, 200 volts)	30-4586		Socket (6 x 5 G)	27-6174
24.	Push-button Compensator (No. 2 Button) (Part of 24)	31-6439	58.	Condenser (.1 mfd, 200 volts)	33-447339		Socket (Lokalt Tubes)	27-6177
24A.	Push-button Compensator (No. 2 Button) (Part of 24)	31-6439	59.	Resistor (1 megohm)	33-510339		Socket (Single Prong-F. M. Test)	27-6180
24B.	Push-button Compensator (No. 3 Button) (Part of 24)	31-6439	60.	Mica Condenser (150 mfmfd)	60-115137		Rivets (Mtg. Sockets)	W-239
			61.	Resistor (220,000 ohms)	33-422339		Tab Kit	40-6663
			62.	Condenser (.01 mfd, 400 volts)	30-4572		Cover Tabs	27-5743
							Tab (Broadcast)	27-5739
							Tab (S. W.)	27-5740
							Tab (F. M.)	27-5741
							Tab (ON-OFF)	27-5742
							Tab (Television)	27-5749

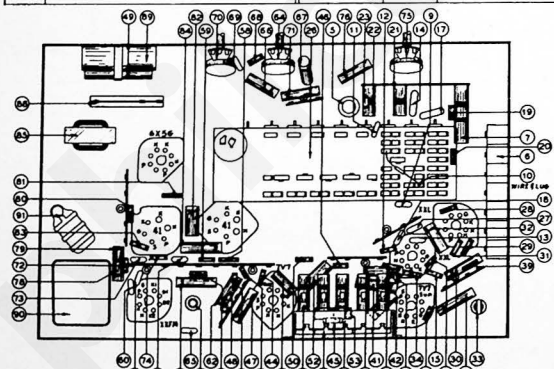


FIG. 2—PART LOCATIONS, UNDERSIDE OF CHASSIS

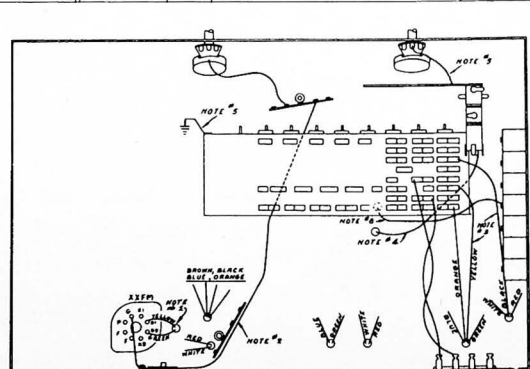


FIG. 3—CRITICAL WIRING LOCATIONS, F. M. ALIGNING