SANYO

8-TRANSISTOR PORTABLE RADIO/ PHONOGRAPH

MODEL G-1120

SERVICE MANUAL

SANYO ELECTRIC CO., LTD.
INTERNATIONAL DIVISION: SANYO ELECTRIC TRADING CO., LTD.
OSAKA, JAPAN

SPECIFICATIONS

FREQUENCY RANGE..... BC 530~1605 Kc
FM 88~108 Mc
INTERMEDIATE FREQUENCY ... BC 455 Kc FM 10.7 Mc
TRANSISTORS .....(1) 2SA440×1..... FM oscillator
(2) 2SA321×1..... AM oscillator
(3) 2SA321×2..... FM, IF amplifier
(4) 2SB186×2..... AF amplifier
(5) 2SB22 ×2..... Power amplifier
DIODES .....1S188 ×4..... Detector & AGC
RADIATION SENSITIVITY
50mW output.....BC 64 μV/m
FM 26 μV/m
DISTORTION .....50mW output at 5mV/m input (7%)
OUTPUT POWER...Undistorted .....600 mW
Maximum .....1000 mW

SIGNAL TO NOISE RATIO (50 mW output at 5mV/minput)
.....BC 35 dB FM 50 dB
CURRENT DRAIN No signal .....18 mA (Radio)
Maximum .....190 mA (Radio)
No signal .....50 mA (Phono)
Maximum ..... 210 mA (Phono)
BATTERY .....6×1½V size "D" flashlight batteries (UM-1)
TURN-TABLE .....5¾″ (142 mm) dia.
PICK-UP ..... Ceramic cartridge
PHONO SPEED .....33⅓, 45 rpm.
DIMENSIONS .....11¾″ wide×7⅛″ high×3½″ deep
WEIGHT .....4.6 lbs. (2.1 kg) approx.

ALIGNMENT PROCEDURES

In aligning this combined AM/FM receiver, the two alignment processes are substantially independent of each other but it should be mentioned that alignment of the AM section should precede that of the FM to avoid interference between closely located parts.

Alignment of the FM section

Excellent instruments are used to speed up and increase the efficiency of the process of aligning this FM set as well as to obtain the superior performance of our product.

Equipment required:

An oscilloscope
A sweep marker generator for FM IF alignment or a sweep type signal generator and a marker generator.
A tuning wand
A network (as in Fig. 2)
An FM signal generator covering 88 to 108 Mc/s
A vacuum tube voltmeter

The method of connecting the apparatus for visual alignment of FM receivers is illustrated in Fig. 1, It is common that, in order to assist with the alignment, a small "pip" can be produced on the displayed curve by injecting a marker signal from an accurately calibrated signal generator to the receiver together with a sweep generator signal.

In the case illustrated here we use the sweep marker signal generator. It has a built-in marker generator producing a signal of 10.7 Mc/s fixed and 10.7 Mc/s signal with the side marker signal of ±200 Kc/s separated from 10.7 Mc/s.
The marker signal with its output variable is injected in the sweep generator to the signal which has passed through the receiver and is picked up from the receiver.

FM IF alignment

1. Connect the "hot" lead from the sweep marker generator through 0.01μF to FM antenna terminal and the ground lead to the earth terminal. Before this connection the dial should be set at the position where no interference signal and as-large-as-possible capacitance of the tuning gang are obtained.
2. Connect the "Response from Receiver" cable from the generator in series with a network illustrated in Fig. 2 between test point "A" and "E" (earth). (Refer to main parts location and Fig. 3).
3. Adjust the output of the sweep marker generator to a level just high enough to provide a sufficient scope pattern.
4. Adjust T1, T2, T3, T4 and the primary of T6, viewing a scope pattern, to obtain a response curve indicated in Fig. 5.
5. This adjustment is accomplished as follows: First tune T4 and primary of T5 for maximum gain, simultaneously keeping the trace precisely centered on the 10.7 Mc/s. Next adjust

PARTS LIST

Stock No.	Description	Q'ty
(Cabinet)		
R-315176	Cabinet	1
R-245141	Insert nut	1
R-245211	〃	4
R-385006	Dial cover	2
R-265538	Control point out panel	1
R-435047	Speaker net	1
R-265495	Badge of cabinet	1
R-355097	Clip of adapter	1
R-426271	Spacer	1
R-115265	Speaker retaining clip metal	1
R-115248e	Lever	1
R-12080	Back cover fix nut	2
R-245255	Special screw	1
R-115247	EXT. socket fix metal	1
R-365058	Back plate (FM-AM)	1
R-365059	〃 (Radio-Phone)	1
R-475346	Battery sheet	2
R-475415	Specification sheet	1
R-395055	Top cover	1
R-395133	Bottom cover	1
R-395057	Battery compartment cover	1
R-445049	Turn table cover	1
R-265530	Badge (Top cover)	1
R-325062	Adapter	1
R-115308	Rod antenna fix metal	1
(Chassis)		
R-115292	Chassis	1
R-415184	Printed circuit board	1
R-395080	Tuning knob	1
R-385008	Volume knob	1
R-335081	Base decoration metal	1
R-395082	Drum of VC.	1
R-395083	Drum	1
R-245256	Pulley shaft	2
R-115300	Speaker retaining clip metal	1
R-265367	Decoration metal of knob	2
R-265460	Motor cover	1
R-115268	Motor cover band	1
R-265214	Antenna holder	1
R-445057	Cushion (VC.)	1
R-15096a	Coil spring	1
R-	Cushion (Antenna coil)	1
R-	Tuning rope (0.4ϕ L=600)	1

Stock No.	Description	Symbol No.	Q'ty
(Electrical)			
R-R116533	Variable resistor	VR-1	1
R-C1120	Variable capacitor	VC-1, 2, 3, 4	1
R-W2583	Antenna coil	L-5, 6	1
R-W9004a	VHF. coil	L-4	1
R-W2233	Antenna coil	L-1, 2	1
R-W9018	Choke coil	L-3	1
R-W8198	OSC. coil	L-7, 8	1
R-W5T174	IF trans.	T-2	1
R-W5T168	〃	T-3	1
R-W5T169	〃	T-4	1
R-W5T170	〃	T-5	1
R-W5T214	〃	T-6	1
R-W5T172	〃	T-7	1
R-W5T165	〃	T-8	1
R-S6583a	Pickup		1
R-S6576	Speaker		1
R-C9098	Electrolytic capacitor (5μF/6V)	C26, 28, 29, 31, 33	5
R-C9080	〃 (30μF/3V)	C16, 30, 32	3
R-C9091	〃 (120μF/10V)	C27, 37, 38, 40	4
R-W6577	Input trans.	T-9	1
R-S5608a	Motor		1
R-W5T565	IF trans.	T-1	1
R-S1555	Rod antenna		1
R-S4558	Slide switch (FM-AM)		1
R-S4303	〃 (Phono-Radio)		1
R-25239a	Spring		1
R-24372	Tip		1
R-S2115	Socket of tip		1
R-255059	Coil spring of battery terminal (−)		2
R-S4550	Rest switch		1
R-12011	Lug		1
R-235010	Lug board		2
R-235072a	Battery terminal (+)		2
R-S3008	Lug		1
R-12011	〃		1
2SA440	Transistor	Tr-1	1
2SA321	〃	Tr-2	1
2SA321	〃	Tr-3	1
2SA321	〃	Tr-4	1
2SB186	〃	Tr-5	1
2SB186	〃	Tr-6	1
2SB22	〃	Tr-7, 8	2
1S188	Diode (FM)		2
1S188 or 1N60	〃 (FM or AM)		2

Symbol No.	Description				Q'ty
(Resistors)					
R39, 40	2.2 ohms	±10%	¼W	Carbon or Solid	2
R42	10 ohms	〃	½W	〃	1
R5, 9, 35, 38	100 ohms	〃	¼W	〃	4
R15	150 ohms	〃	〃	〃	1
R13, 19, 34	220 ohms	〃	〃	〃	3
R22	270 ohms	〃	〃	〃	1
R11, 33	330 ohms	〃	〃	〃	2
R14	820 ohms	〃	〃	〃	1
R18, 29, 24	1 k ohms	〃	〃	〃	1
R20	1.2 k ohms	〃	〃	〃	1
R1	1.5 k ohms	±5%	⅛W	〃	1
R3, 10	2.2 k ohms	〃	¼W	〃	2
R36, 37	2.2 k ohms	±10%	〃	〃	2
R7	4.7 k ohms	〃	〃	〃	1
R12, 21, 27, 30	5.6 k ohms	〃	〃	〃	4
R4	6.8 k ohms	±5%	〃	〃	1
R23	8.2 k ohms	±10%	〃	〃	1
R2	10 k ohms	±5%	〃	〃	1
R16, 26	10 k ohms	±10%	〃	〃	2
R31	18 k ohms	〃	〃	〃	1
R8	39 k ohms	〃	〃	〃	1
R6, 32, 41	68 k ohms	〃	〃	〃	3
R28	100 k ohms	〃	〃	〃	1
R17	220 k ohms	〃	〃	〃	1
R25	820 k ohms	〃	〃	〃	1
R42	180 k ohms	〃	〃	〃	1
(Capacitors)					
C5	3 pF	±0.25pF	25-50WV	Ceramic	1
C20	4 pF	〃	〃	〃	1
C2, 43	6 pF	±0.5pF	〃	〃	2
C15	7 pF	〃	〃	〃	1
C7	8 pF	〃	〃	〃	1
C19	10 pF	〃	〃	〃	1
C14	11 pF	〃	〃	〃	1
C22, 1	30 pF	〃	〃	〃	2
C6	40 pF	〃	〃	〃	1
C4	500 pF	±20%	〃	〃	1
C3	0.001 μF	$+100\%$ -0	〃	〃	1
C8	0.01 μF	〃	〃	〃	1
C13, 18, 21, 44	0.01 μF	$+80\%$ -20%	〃	〃	4
C23, 17, 11, 45	0.04 μF	〃	〃	〃	4
C10	200 pF	±10%	125WV	Styrol	1
C39, 45	330 pF	〃	〃	〃	2
C34, 35	0.001 μF	$+30\%$ -20%	50WV	Mylar	2
C41, 42	0.002 μF	〃	〃	〃	2
C9	0.003 μF	〃	〃	〃	1
C12	0.005 μF	〃	〃	〃	1
C36	0.01 μF	〃	〃	〃	1
C24	0.02 μF	〃	〃	〃	1
C25	0.04 μF	〃	〃	〃	1

(Screw, Nut & Washer)			
Oval countersunk head tapping screw	(3×10)	Bottom cover-Cabinet	2
Pan head screw	(3×12)	Motor cover	1
〃	(3×10)	Motor-Cabinet	2
〃	(3×8)	〃 - 〃	1
〃	(3×6)	Speaker-Cabinet	3
Round head screw	(2.6×6)	Lever-Pickup	1
〃	(2×10)	〃 - 〃	1
Pan head screw	(3×8)	Rod antenna	1
Pan head tapping screw	(3×8)	Rod antenna fix metal-Bottom cover	1
〃	(3×6)	Motor fix metal-Cabinet	1
Spring washer	(M3)	Speaker-Cabinet	3
〃	(M3)	Motor fix metal-Cabinet	3
〃	(M3)	Motor cover	1
〃	(M2.6)	Lever-Pickup	1
Washer	(M3)	Motor-Cabinet	2
〃	(M3)	Speaker-Cabinet	2
Hexagon nut	(M3)	Motor-Cabinet	2
〃	(M3)	Motor cover	1
〃	(M2)	Lever-Pickup	1
Pan head tapping screw	(3×8)	P.C. board fix metal-Cabinet	2
〃	(3×6)	P.C. board-Cabinet	3
〃	(3×6)	Rest switch-Cabinet	1
Pan head screw	(3×8)	Antenna holder-Cabinet	1
Round head screw	(2.6×6)	Drum-VC	1
〃	(2.6×4)	VC-P.C. board	2
〃	(2×6)	Slide switch-P.C. board	2
Countersunk head screw	(2×6)	EXT. socket-EXT. socket fix plastic board	2
〃	(2×4)	Slide switch-Chassis	2
Hexagon screw	(2×6)	Knob-VR	1
Washer	(M3)	Rod antenna fix metal-Cabinet	1
Spring washer	(M3)	P.C. board	1
〃	(M3)	Pulley shaft-P.C. board	1
〃	(M2)	VR-Chassis	2
〃	(M2)	Knob-VR	1
〃	(M2.6)	Drum-VC	1
Hexagon nut	(M3)	PC. board	1
〃	(M3)	Ant. holder-P.C. board	1
〃	(M3)	Pulley shaft-P.C. board	1
〃	(M2)	Slide switch-P.C. board	4
〃	(M2)	VR-Chassis	2

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T1 and T2 to make the on-10.7 Mc/s-centered pattern symmetric and to obtain maximum gain with simultaneous intent to locate the markers of plus and minus 200 Kc/s symmetrically as to the 10.7 Mc/s. This will complete the FM IF alignment.

6. In above procedures, the output of the sweep marker generator should be reduced to a level just high enough to provide a usable scope pattern in proportion to the gain increase of IF stages. It is necessary to avoid any limiting effect for precise alignment.

FM discriminator alignment

1. Connect the sweep marker generator in the same way as in IF alignment.
2. Connect the "Response from Receiver" cable directly to test point "B" (see Fig. 3), without the network of Fig. 2, and lower lead to earth.
3. Detune the secondary of detector transformer by turning its core to maximum counterclockwise position and then you will have the scope pattern which is similar to the pattern seen in IF alignment, except polarity is reversed.
4. This pattern should be symmetrical as to 10.7 Mc/s marker. If not symmetrical, readjust the primary of T5 a little for complete symmetry. When a slight turn of the slug is not effective, realignment of IF stages is necessary. Also check the symmetry of the $\pm$200 Kc/s markers.
5. If the symmetric curve is obtained, tune the slug of the secondary to set the 10.7 Mc/s marker at the O level and obtain an "S"-shaped curve illustrated in Fig. 9.
6. Adjustment of the detector stage is successfully completed if scope pattern as illustrated in Fig. 9, in which an "S" curve is is obtained and the location of the side markers of $\pm$200 Kc/s as symmetrical to the reference point of symmetry (10.7 Mc/s). In the case of an unsymmetrical pattern, turn the slug of primary of T5 a little bit to make it symmetric. When a slight turn of the slug is not effective, realignment of IF stages is required.

Alignment of FM RF stages

Preparation for alignment

An FM signal generator is used instead of a sweep marker generator and connected as in Fig. 4.

Use FM signal modulated at 400cps with deviation of $\pm$22.5 Kc/s, and the output cable from the generator should be terminated with a dummy antenna, impedance of which depends on signal generator used. The signal developed across the dummy is applied to receiver. Output power of receiver is consumed with dummy load equivalent to speaker.

The desirable voltage range of the vacuum tube volt meter is 1.5V, because alignment is conducted at a level of 50 mW output power.

FM RF alignment

1. Set the volume control at medium volume and set the tuner dial at 90 Mc/s.
2. Set the generator frequency at 90 Mc/s. Adjust oscillator coil for maximum deflection of meter. If it is difficult to obtain optimum gain, a slight adjustment of oscillator trimmer (Ct2) is necessary.
3. Set the generator frequency and tuner dial at 106 Mc/s, obtain maximum gain by adjustment of OSC. trimmer.
4. Again set tuner dial at 90Mc/s and vary the generator frequency around 90 Mc/s to be tuned by the tuner. When the tuning generator frequency is not 90 Mc/s adjust OSC. coil to obtain optimum gain at 90 Mc/s of the generator frequency.
5. Set tuner dial at 106 Mc/s and vary the generator frequency around 106 Mc/s to be tuned by the tuner. When the tuning generator frequency is not 106 Mc/s, adjust Ct2 to obtain optimum gain at 106 Mc/s of generator frequency.
6. Repeat the entire process until no further adjustment is required at either point of the dial.

Tracking

1. Set the generator frequency at 106 Mc/s and make the tuner tune in the 106 Mc/s signal.
2. Adjust trimmer Ct1 for maximum gain. If the gain increases when nearing the tuning wand to coil L1 and L2 for checking the tracking, readjust the trimmer for maximum meter reading.
3. Set the generator at 90Mc/s and make the tuner tune in the 90 Mc/s signal. Adjust the slug of oscillator coil L1 and L2, for maximum gain. If the gain increases when nearing the tuning wand to L1 and L2, readjust the slug of L1 and L2.
4. Arrange in the manner as in step 1 and near the wand to L1 and L2. If the gain increases readjust the slug.
5. Arrange in the manner as in step 3 and near the wand to L1 and L2. If the gain increases readjust the trimmer.
6. Repeat steps 4 and 5 until no further adjustment is required at either end of the dial. During this entire procedure, make certain that the generator output is kept at a level just high enough to produce usable meter deflection.

Overall checking of alignments

After adjustment of RF and IF stages is finished, apply a signal of 94 Mc/s to the antenna terminal of the tuner and have the receiver tune in the signal accurately. Observe the waveform of the output signal across the dummy load with 30 dB level of the signal modulated at 400 cps, 75 Kc deviation applied to the antenna. If the precise waveform of 400 cps sinewave appears on the scope, adjustment is successfully completed, but if a heavily distorted waveform appears, readjustment of IF and RF stages is required.

When the frequency of the signal generator is changed at the same distance away from the center tuning frequency of the tuner on either side, waveform and degree of distortion in both cases should be similar. If not, readjustment of IF stages and discriminator is necessary.

AM sections alignment procedures

Apply a volt-meter across the voice coil. Volume control should be at maximum. Output of signal generator should be no higher than necessary to obtain output reading in order to avoid AVC function.

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	ADJUST FOR MAXIMUM OUTPUT
* *IF ALIGNMENT*				
1	Radiate signal through the loop antenna, connected with signal generator output cable.	455 Kc/s	lower end	T-3 T-2 T-1
* *BROADCAST RF ALIGNMENT*				
2	Radiate signal through the loop antenna, connected with signal generator output cable.	520 Kc/s	lower end	BC osc. coil L-7, L-8
3		1605 Kc/s	upper end	BC osc. trim. Vct-4
4		Repeat steps 2 and 3.		
5		600 Kc/s	600 Kc/s	BC ant. coil L-5, L-6
6		1400 Kc/s	1400 Kc/s	BC ant. trim. Vct-2
7		Repeat steps 5 and 6.		

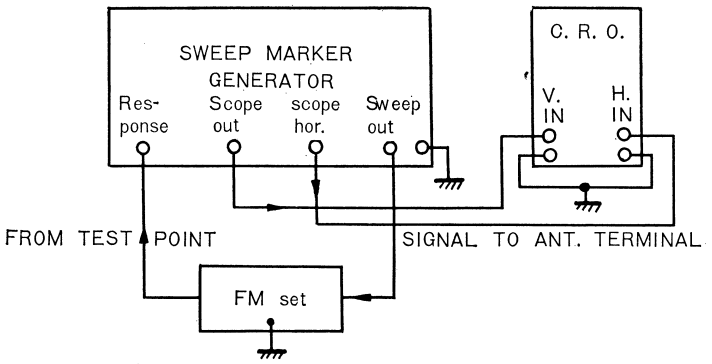


Fig. 1

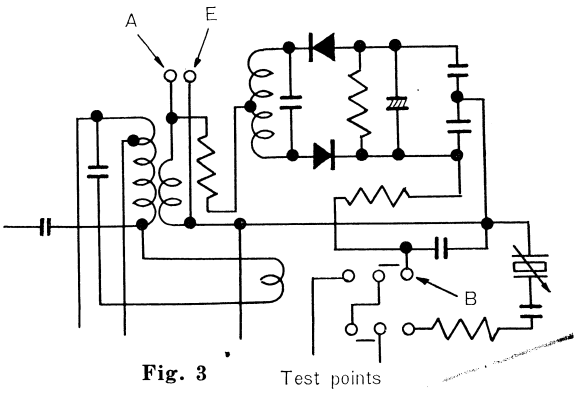


Fig. 3

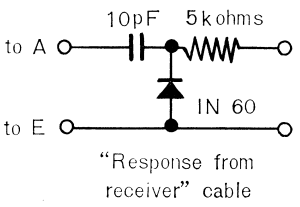


Fig. 2

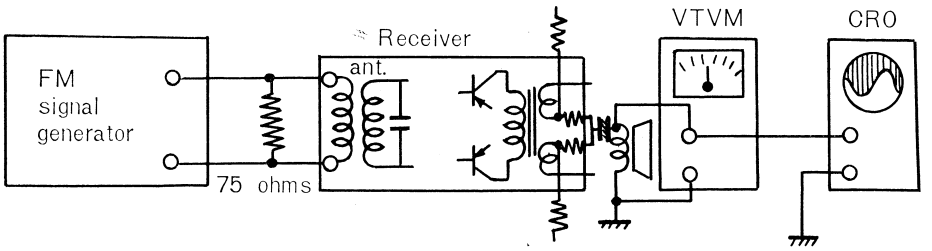
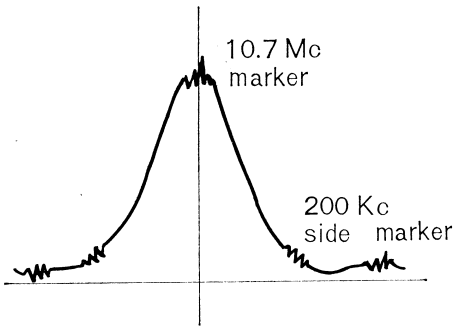
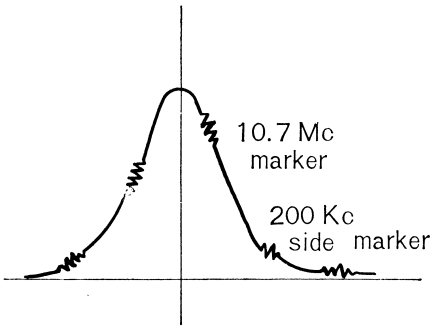


Fig. 4



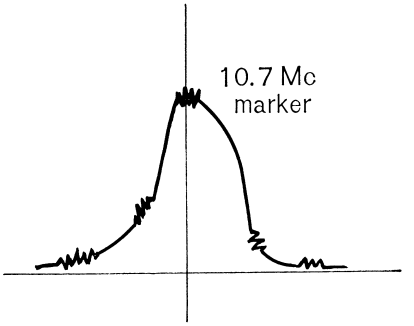
CHARACTERISTIC COMPLETE IF SCOPE PATTERN
Curve is symmetric. 10.7 Mc marker located at center of curve. Symmetrical location of side markers.

Fig. 5



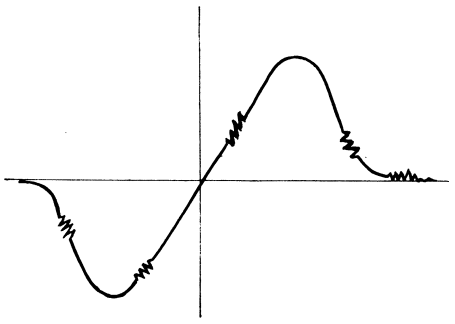
CHARACTERISTIC UNCOMPLETE IF SCOPE PATTERN
Symmetric curve, but offcentered 10.7 Mc marker.

Fig. 6



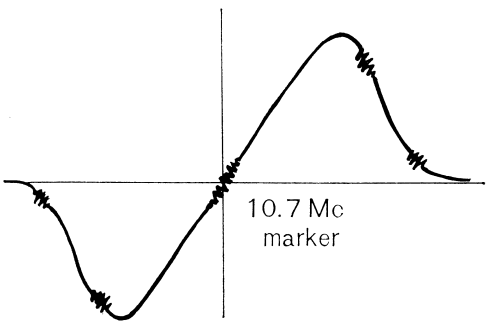
CHARACTERISTIC UNCOMPLETE IF SCOPE PATTERN
10.7 Mc marker on center of curve, but unsymmetric curve.

Fig. 7



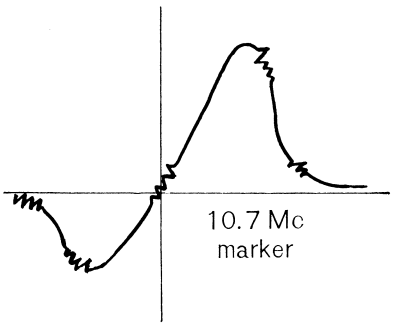
CHARACTERISTIC UNCOMPLETE DETECTOR SCOPE PATTERN
Symmetric curve, but bad location of markers.

Fig. 8



CHARACTERISTIC COMPLETE DETECTOR SCOPE PATTERN
"S" curve and location of markers is symmetric in reference to 10.7 Mc marker.

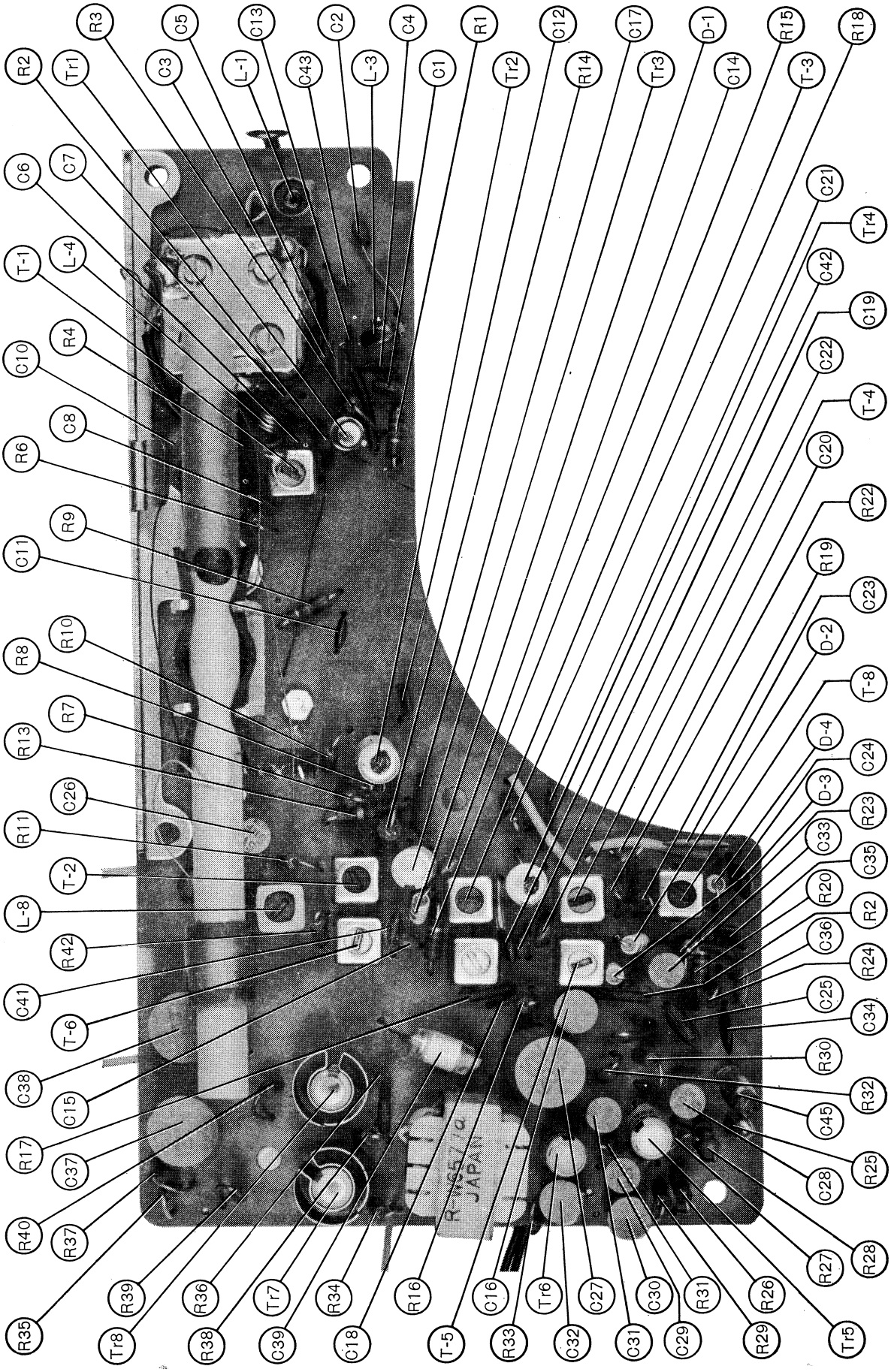
Fig. 9



CHARACTERISTIC UNCOMPLETE DETECTOR SCOPE PATTERN
"S" curve is unsymmetric viewed from reference point of 10.7 Mc marker.

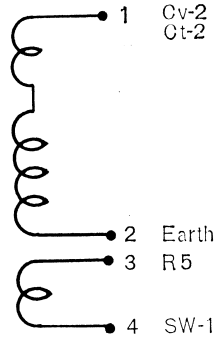
Fig. 10

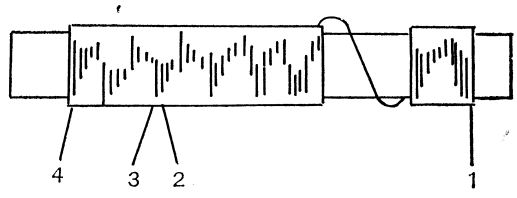
LOCATION OF MAIN PARTS



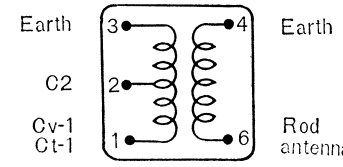
CONNECTIONS OF MAIN PARTS

1. Antenna coil (L-5,6)

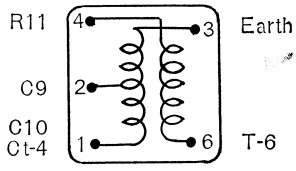




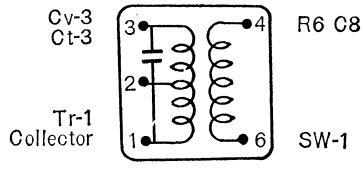
2. OSC. coil (L-1,2)



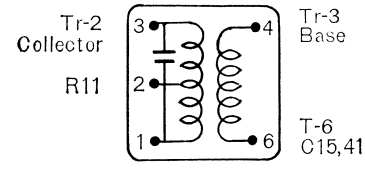
3. OSC. coil (L-7,8)



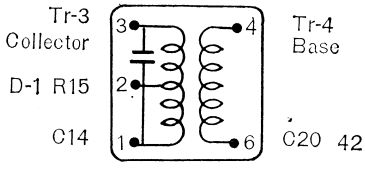
4. T-1



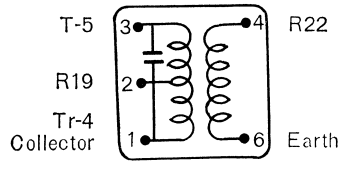
5. T-2



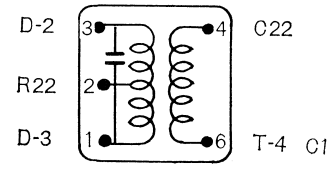
6. T-3



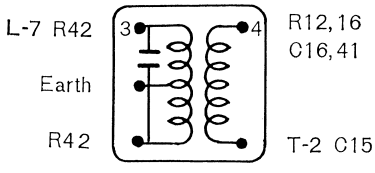
7. T-4



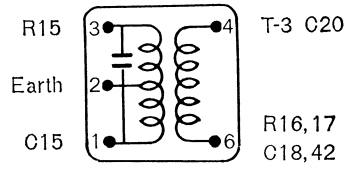
8. T-5



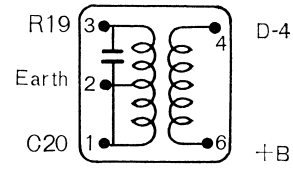
9. T-6



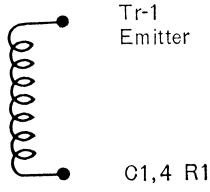
10. T-7



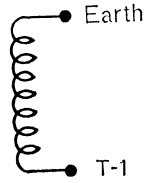
11. T-8



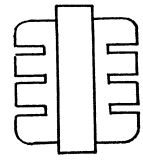
12. L-3

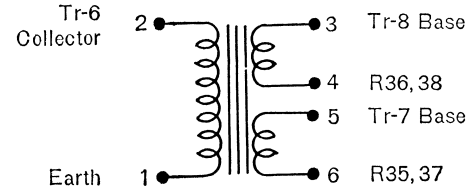


13. L-4

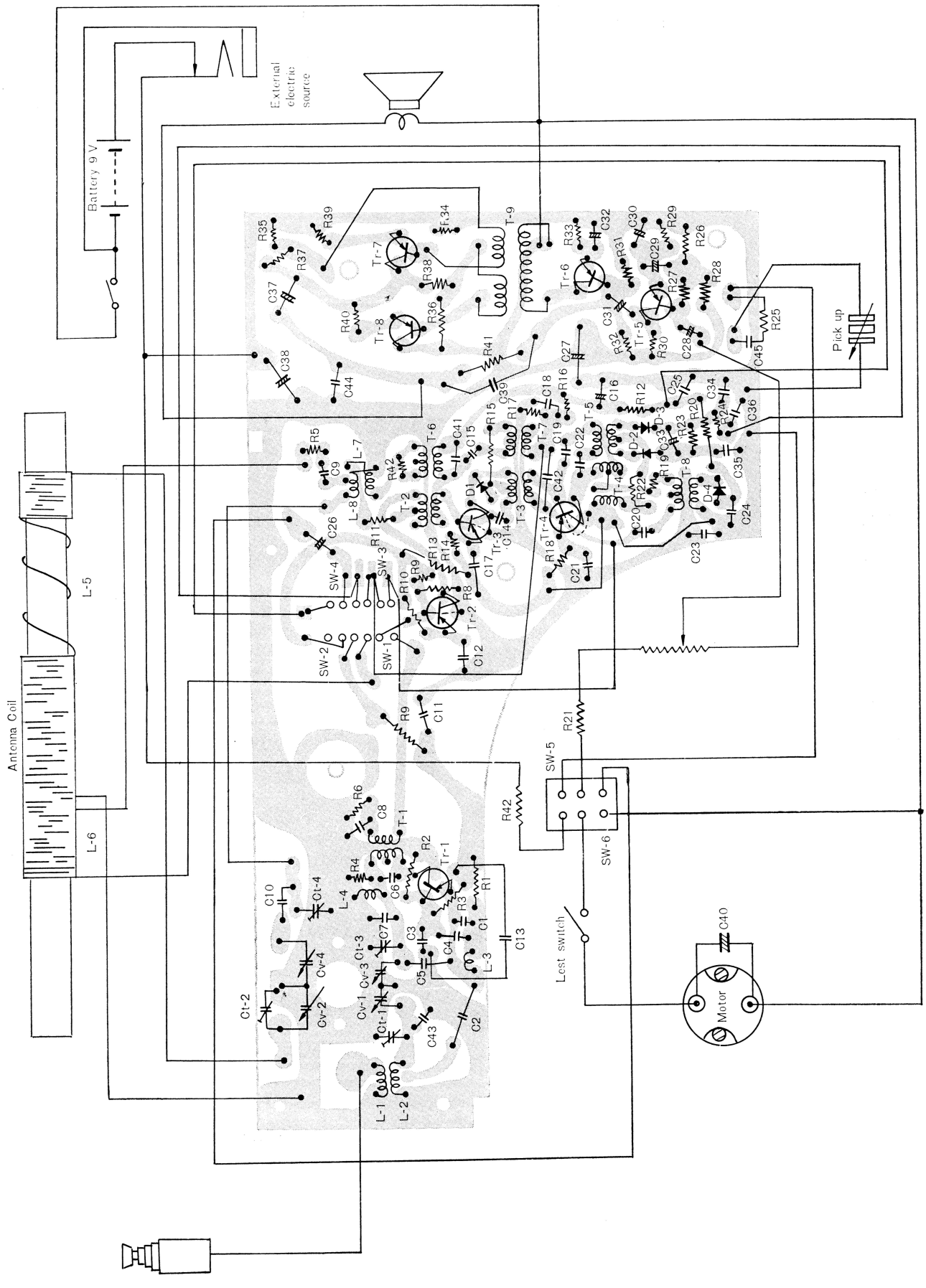


14. Input trans. (T-9)





INTER-PARTS WIRING ILLUSTRATION



CIRCUIT DIAGRAM