

6190

The Harman Kardon Model TU920 ACTIVE TRACKING TUNER

Manual 117A

Technical Manual



The following marks found in the parts list of this manual identify the models as follows.

- JA : North America area model
- BK : North America area model Black version
- G : General model
- GB : General model Black version

harman/kardon

240 Crossways Park West, Woodbury, N. Y. 11797
1112-3152117A1 P-088709 1500 Printed in Japan

SPECIFICATIONS

	Nominal	Limit
FM SECTION		
Tuning range	87.5 ~ 108.0MHz	
	50dB Quieting Sensitivity	
Mono	14.2dBf \leq 19dBf	
Mono for active tracking	14.7dBf \leq 19dBf	
Stereo	38.2dBf \leq 41dBf	
Usable Sensitivity	11.7dBf \leq 15dBf	
Image Ratio	49dB \geq 40dB	
IF Rejection	92dB \geq 75dB	
Spurious Response Rejection	94dB	
Capture Ratio	1.5dB \leq 2dB	
Alternate Channel Sensitivity	60dB \geq 50dB	
for active tracking	75dB \geq 65dB	
AM Rejection	59dB \geq 49dB	
Signal to Noise Ratio		
Mono	80dB \geq 75dB	
Stereo	73dB \geq 68dB	
Total Harmonic Distortion		
Mono	0.09% \leq 0.3%	
Mono for active tracking	0.28% \leq 0.5%	
Stereo	0.13% \leq 0.4%	
Stereo for active tracking	0.3% \leq 0.8%	
Stereo Separation at 1 kHz	52dB \geq 40dB	
for active tracking	32dB \geq 28dB	
Output Level/Impedance (Stereo)	750mV/2.2k Ω	

	Nominal	Limit
AM SECTION		
Tuning range	520 ~ 1,710kHz	
Usable Sensitivity		
External Antenna	14 μ V \leq 20 μ V	
Loop Antenna	360 μ V/m \leq 700 μ V/m	
Selectivity	33dB \geq 26dB	
Signal to Noise Ratio	53dB \geq 48dB	
Image Rejection	40dB \geq 30dB	
IF Rejection	66dB \geq 50dB	

• DIMENSION 17-7/16" x 2-11/16" x 14-3/16"
(W x H x D) (443 x 68 x 360 mm)

• WEIGHT 7.3 lbs. (3.3 kg)

• POWER SUPPLIES
for North America area model AC 120V, 60Hz
for General modle AC 220/240V, 50/60Hz

• POWER CONSUMPTION 14W

This specification is the target of servicing. But, there is a care that the specification is not applicable to the measurement condition and instrument.

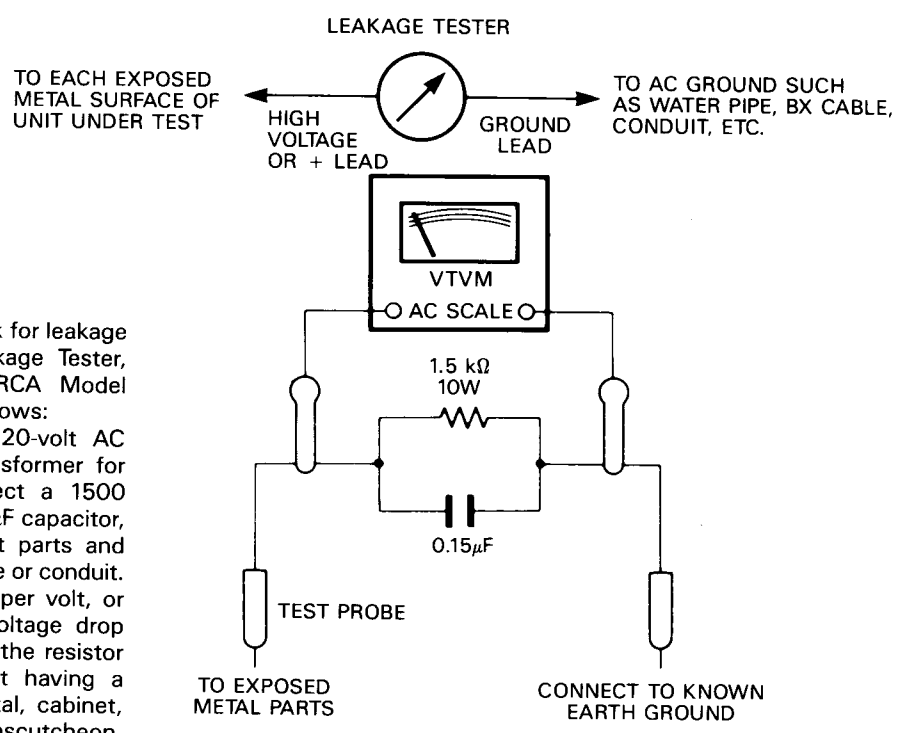
Specifications and components subject to change without notice. Overall performance will be maintained or improved.

LEAKAGE TEST (FOR SERVICE ENGINEERS IN THE U.S.A.)

Before returning the unit to the user, perform the following safety checks:

1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the unit.
2. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. which were removed for servicing are properly reinstalled.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item No. 21641, RCA Model WT540A or use alternate method as follows: Plug the power cord directly into a 120-volt AC receptacle (do not use an Isolation Transformer for this test). Using two clip leads, connect a 1500 Ohm, 10-watt resistor paralleled by a 0.15 μ F capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 Ohms per volt, or higher sensitivity to measure the AC voltage drop across the resistor. (See Diagram.) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal, cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the On and Off positions.)

A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.



FM ADJUSTMENT

- Conditions :
- Set the FM mode by pressing the "FM/AM" button.
 - Press the "mode" switch to the "mono" (button in) position.

	U.S.A. model	General model
FM Signal Generator	1kHz, 100% modulation	1kHz, 45% modulation
Stereo Modulator	L + R = 45.5%, L - R = 45.5%, 19kHz = 9%	L + R = 22.5%, L - R = 22.5%, 19kHz = 8%

Step	Alignment	Connection Equipments	Measurement Frequency	Station Display	Adjustment	For
1	Discriminator	<ul style="list-style-type: none"> ● Connect the FM Signal Generator to FM 300Ω BAL Antenna terminals through the 300Ω balanced dummy. [1mV(65dBf) input] ● Connect the Oscilloscope and Distortion meter to the OUTPUT jacks. 	98.1MHz ± 30 ~ 40kHz	98.1MHz	T201(A)	Adjust so that the TUNED indicator lights in the same range on both plus (+) and minus (-) sides of 98.1MHz.
2			98.1MHz	98.1MHz	T201(B)	Minimum distortion.
3			Repeat steps 1 and 2 for optimum sensitivity.			
4	Tuned indicator		98.1MHz	98.1MHz	VR351	Adjust so that the TUNED indicator lights at 22μV input. (32μV/75Ω input for General model)
5	Signal indicator		98.1MHz	98.1MHz	VR351	Adjust so that the five SIGNAL STRENGTH indicator lights at 450μV input. (500μV/75Ω input for General model)
6	Active tracking		98.1MHz	98.1MHz	L241 TC241	Adjust L203 so that the upper and lower parts of the waveform are symmetrical and TC241 so as to obtain the waveform immediately before clipping.
7	Tuned indicator		98.1MHz	98.1MHz	VR352	Adjust so that the TUNED indicator lights at 20μV input. (32μV/75Ω input for General model)
8	Signal indicator		98.1MHz	98.1MHz		Confirm the five SIGNAL STRENGTH indicator lights at 500μV input. (500μV/75Ω input for General model)
9	Separation	<ul style="list-style-type: none"> ● Connect the Stereo Modulator to FM Signal Generator. Connect FM Signal Generator to FM 300Ω BAL Antenna terminal through the 300Ω balanced dummy. ● Connect the VTVM and Oscilloscope to the OUTPUT jacks. ● Press the "mode" switch to the "stereo" (button out) position. 	98.1MHz	98.1MHz	VR301	Adjust so that the left channel output becomes minimum when only the right channel of the Stereo Modulator is modulated.
					VR301	Adjust so that the right channel output becomes minimum when only the left channel of the Stereo Modulator is modulated.
10	Normal AGC voltage	<ul style="list-style-type: none"> ● Contact the FM Signal Generator to FM 300Ω BAL Antenna terminals through the 300Ω balanced dummy. (1000μV/75Ω input) 	98.1MHz	98.1MHz	VR101	Adjust so that voltage becomes 1.7V.
11	Active tracking AGC voltage	<ul style="list-style-type: none"> ● Connect the VTVM to TP1(+) and ground(-). 	98.1MHz	98.1MHz	VR102	Adjust so that voltage becomes 1.7V.

CIRCUIT DESCRIPTION

■ FM TUNER SECTION

The FM signal which has entered through the antenna is high-frequency amplified in the front end unit FE101, mixed with the output of the local oscillator and converted into the 10.7MHz intermediate-frequency.

The 10.7MHz signal is amplified in the intermediate-frequency amplifying section which consists of CF201, Q201 and CF202 and fed to 1 pin of IC201. In IC201, the signal is transmitted through the IF amplifier in two steps, and after being detected in the quadrature, it is transmitted through the post amplifier to 12 pin and then input to 2 pin of IC301. In IC301, the pilot signal is detected out of the signal which has been fed and 38kHz signal is produced. Then by this signal, stereo signal is demodulated, output from 4 pin for the left channel and from 7 pin for the right channel be fed to the amplifier.

■ ACTIVE TRACKING CIRCUIT

When FM reception is poor because the tuned frequency is interfered by some other strong FM signal nearby, turning ON the active tracking switch causes the signal from the tuned station to come out of IF AMP Q201 and pass through D202, CF203, IF AMP Q202 and CF204. Then it is fed to 1 pin of IC202 where its phase compared with the phase of the VCO output signal composed in Q204, D205 and L241, by the phase comparison device included in IC202. The output signal of the phase comparison device is sent out from 7 pin of IC202, transmitted through LPF consisting of Q203, R239 and C238 back to D205. As this forms the PLL circuit, the VCO output signal follows the signal within the PLL lock range only and that signal is sent through D204 to 1 pin of IC201.

■ AM TUNER SECTION

The AM signal which has entered through the antenna is transmitted through the tuning circuit consisting of L251 and TC251 to IC201. In IC201 it undergoes high-frequency amplification, intermediate-frequency amplification local oscillation, intermediate-frequency amplification and detection, and then output from 15 pin. This signal is turned ON and OFF at Q703 and Q704 according to the signal from the input selector and fed to 2 pin of IC301.

■ MUTING CIRCUIT

If FM is received out of tuning or in a very weak field intensity, 28 pin of IC702 becomes high level. This is fed to the base of Q351, whose collector then becomes low level and the collector of Q4 high level. As a result, Q301 (L ch) and (R ch) are conducted to mute the output.

■ SYNTHESIZER SECTION

● FM

The local oscillation output at the front end is fed to 5 pin of the prescaler IC701 and after being frequency divided into 30 or 32, it is fed to 37 pin of the PLL synthesizer IC702. In IC702, the standard frequency is oscillated by the crystal oscillator, compared with the divided local oscillation output signal and output to 34 pin. This voltage is level converted at Q701 and Q702, and fed to the varicap diode at the front end.

● AM

The local oscillation output is fed from 24 pin of IC201 to 39 pin of IC702. In IC702, the standard frequency is oscillated by the crystal oscillator, compared with the local oscillation output and output to 34 pin.

■ INDICATOR SECTION

● FREQUENCY DISPLAY

The serial data sent out of 27 pin of the PLL synthesizer IC702 is fed to 2 pin of the frequency indicating driver IC751, where the data is decoded to provide a signal which turns ON the indicator.

● SIGNAL STRENGTH

The voltage corresponding to the signal level is output from 16 pin of IC201 and input into 8 pin of the level comparator IC351. D361, D362, D363, D364 and D365 of the signal strength indicator turn ON according to the signal level.

● TUNING

8 pin of IC201 becomes low level when tuned and the tuned indicator D366 connected there turns ON.

BLOCK DIAGRAM

