



**C/PEK-2
Instruction Manual
for
Phonograph Evaluation Kit**

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I. INTRODUCTION

This test is designed to be used only with stereo phonograph cartridges. For customers with monaural cartridges, only stylus cleaning and turntable speed check can be performed.

CAUTION: Stereo records may be damaged if played with a monaural cartridge. Also, if the customer has a badly worn or damaged stereo stylus, it is not advisable to continue the test as this will drastically reduce the life of the test record. A small amount of stylus wear will not cause damage.

The tests are set up in a step by step sequence and the testing should be performed in the order stated below.

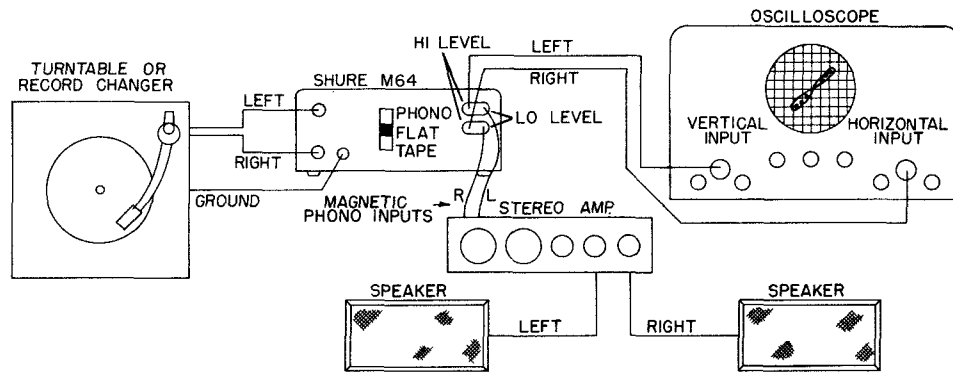
1. Cleaning the stylus assembly.
2. Equipment set-up.
3. Malfunctions of the record changer unit, such as:
 - a. Incorrect speed.
 - b. Dead signal channel.
 - c. Incorrect phasing.
4. Phono pickup functions, such as:
 - a. Output voltage levels.
 - b. Channel separation.
 - c. Anti-skating force adjustment.
 - d. Trackability.

II. CLEANING THE STYLUS

For the stylus to trace the groove accurately, it must be clean. To clean the stylus, use a camel's-hair brush (No. 2 size or smaller) dipped lightly in alcohol. The alcohol will remove any sludge deposits which may have coated the stylus tip. The brush bristles should be trimmed to a length no longer than 1/4 inch.

NOTE: Obtain manufacturer's procedure before cleaning a stylus with alcohol solution, as permanent damage may result. All SHURE styli may be cleaned in this way.

Always brush the stylus with a forward movement from the rear, or terminal end of the cartridge, to the front of the cartridge. Never brush or wipe the stylus from front to back or side to side.



EQUIPMENT WIRING DIAGRAM

III. ELECTRONIC EQUIPMENT SETUP

- A. Set up equipment as shown in block diagram above.
- B. Plug the left channel output from the turntable into channel 1 input of the SHURE M64 preamplifier.
- C. Plug the right channel output from the turntable into the channel 2 input of the SHURE M64 preamplifier.
- D. Set the control on the SHURE M64 preamplifier to the FLAT position so the test is performed without equalization. If a listening test is to be performed or if you wish to listen to the trackability test, plugging the LO level outputs of the M64 into the magnetic phono inputs on a stereo amplifier, in conjunction with a set of speakers (good quality), will provide this capability. The volume control of the stereo amplifier will control the listening volume, but will not affect the tests.
- E. If the turntable has a ground lead, connect it to the chassis of the M64.
- F. Connect the channel 1 output of the M64 to the vertical input of the oscilloscope.
- G. Connect the channel 2 output of the M64 to the horizontal input of the oscilloscope.
- H. On the oscilloscope:
 1. Set horizontal input to external.
 2. Set vertical and horizontal gain to the 10 mv/div range.

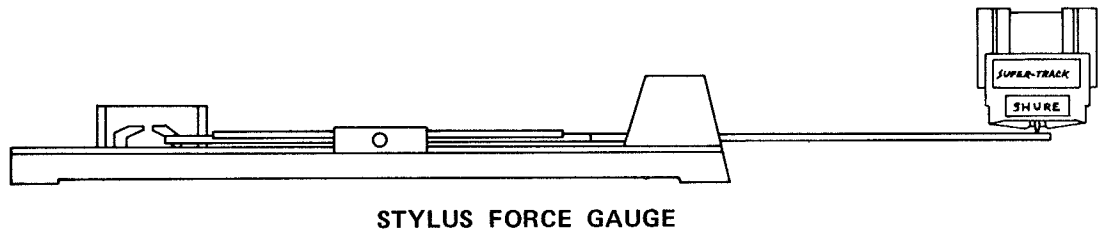
NOTE: If more gain is needed from the M64, see page 3 of the M64 data sheet for modification instructions to increase the gain.

IV. TURNTABLE SPEED

To check turntable speed, use an Audio Tex Stroboscope Disc, No. 30-230, or equivalent. See operating instructions on the disc.

V. TRACKING FORCE

- A. Set the stylus tracking force adjustment on the tone arm to zero.
- B. Balance the arm in accordance with instructions of the changer manufacturer.
- C. Set the tracking force at the middle of the tracking force range stated by the cartridge manufacturer. If the suggested range is 2 to 4 grams, set the tracking force to 3 grams.
- D. Check the actual tracking force with the SHURE SFG-2 Force Gauge. Place the gauge in position on the turntable or, if the turntable is not suitably flat, on a record on the turntable. Place the stylus tip into the appropriate groove on the force gauge lever arm for the desired range: "times 1" or "times 2". Move the rider weight to balance the gauge. The rider weight then indicates the actual tracking force at the stylus tip.



VI. CHANNEL PHASING AND BALANCE

To check equipment setup:

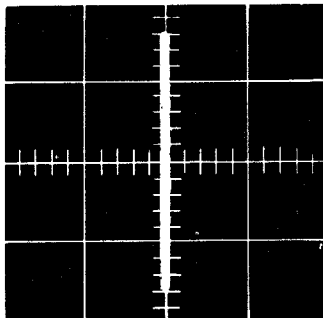


Figure A

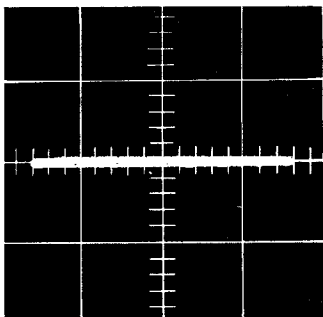


Figure B

Set up equipment as shown in SECTION III. Place the SHURE TTR 102 on the turntable. Set the cartridge playing conditions per SECTION V and play Band 1, left channel. You should observe a vertical line (Figure A) on scope. Using Band 4, right channel, you should observe a horizontal line (Figure B). If the results are reversed, the channels have been reversed. If necessary, reverse the leads from the changer so the proper lines are obtained. If either channel is dead, the wiring must be checked for continuity and wiring corrections made at this time.

Set the scope controls so that the lines cover about four large divisions on the screen. Adjust size using the scope vertical and horizontal gain controls. Play Band 10 (fourth from inside of record). If you observe a pattern as shown in Figure C, one channel is out of phase. Check the wiring of the system. The hot and ground wires of one channel are reversed. If all wiring still seems correct, reverse the hot and ground on one channel at the pickup. Choose a channel which has no ground clip or tab. If this malfunction is found, the customer should be advised to check the phasing of his entire stereo system by means of a test record such as the SHURE Audio Obstacle Course.

Figure D is the pattern observed, using Band 10, when all equipment is set up correctly and operating normally.

To observe channel balance, alternately connect the left and right channel turntable leads to one amplifier input and compare the size of the lines obtained on the scope. When observing the left channel, use Band 1. When observing the right channel use Band 4 of the SHURE TTR 102. The size of the lines should ideally be alike. When not alike, the shorter line should be no less than 4/5 the length of the longer.

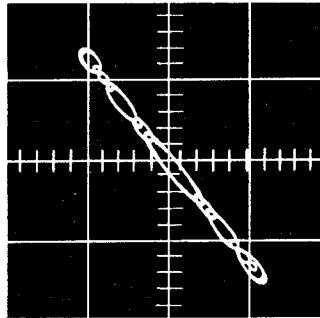


Figure C

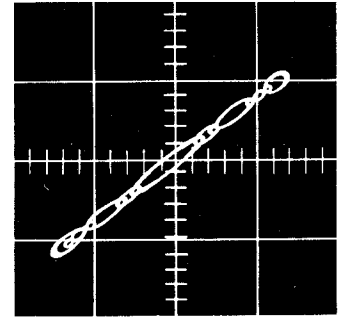


Figure D

The shorter line should be no less than 4/5 the length of the longer. This condition provides adequate channel balance for a phono pickup and is within 2 db.

VII. CHANNEL SEPARATION

To measure 1 KHz channel separation (left channel), remove the right channel turntable lead from the SHURE M64 input (Channel 2). Play Band 1 and increase the vertical gain of the scope until a minimum of 10 small divisions can be seen (Figure E). Then play Band 4 and count the number of divisions shown (Figure F). Convert the signals of Bands 1 and 4 to separation in db using the conversion scales below. Two conversion scales are shown. Use the one most convenient.

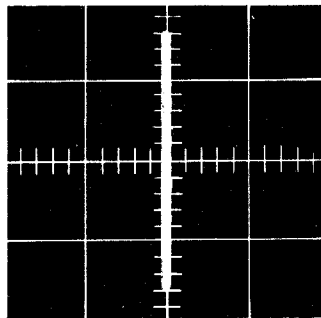


Figure E

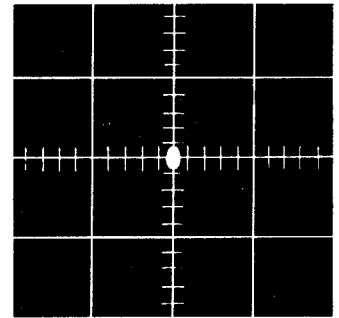


Figure F

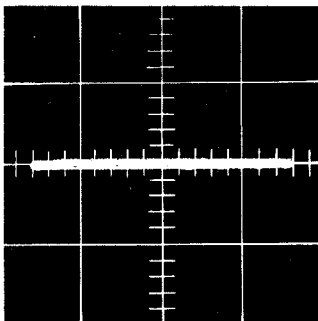


Figure G

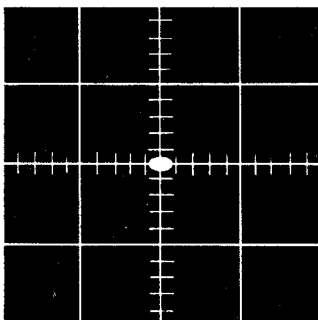
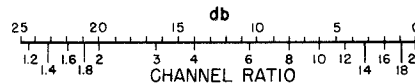
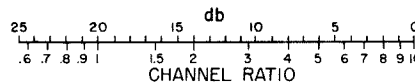


Figure H

EXAMPLE: If 20 divisions were shown on Band 1, and 2 divisions shown on Band 4, the ratio is 20 units to 2 units, or 10 to 1, and the separation is 20 db. A ratio greater than this is acceptable. Top quality pickups should have 25 db separation or better.



The separation at the right channel can be measured by reconnecting the right channel lead and then removing the left channel lead. The output of the right channel can then be compared using Bands 1 and 4 and the separation in db (Figure G and H) determined using the same method. The separation test can be made for both channels at 10KHz using Bands 2 and 5. When these tests are completed, reconnect the lead wire.

VIII. ANTI-SKATING FORCE ADJUSTMENT

NOTE: *Disregard the instructions of Section VIII if the record changer unit does not have an anti-skating compensation mechanism.*

When the stylus contacts the record groove, a certain amount of friction force is present at the stylus tip. As the stylus tracking force increases, this friction force increases. This force pulls along a line running through the length of the body of the pickup. Because of the offset angle, which is used on most tone arms to reduce the lateral tracking angle error, this force tends to pull the tone arm in toward the center of the record. This inward force, called skating force, unbalances the forces on the groove walls. By adding an outward pulling force, external to the tone arm, this skating force can be balanced. The stylus is able to exert equal forces on both groove walls. Since the skating force is always a fractional part of the tracking force, any increase in the tracking force will increase the skating force and will require a greater anti-skating force to balance it. At this time, the anti-skating force should be set to zero. The proper setting will be determined later, during the trackability test.

IX. TRACKING

The ability of a cartridge to track properly at a minimum force is very desirable; the wear on the record and the stylus is kept to a minimum. However, a stylus tracking at a force too light to maintain contact with the groove wall (mistracking) can cause permanent damage to the recording. Therefore, the proper adjustment of the tracking force is very important in terms of both reducing mistracking distortion and insuring maximum stylus and record life.

A stereo pickup in good condition should be able to track Band 10 or 14 cm/sec at the median recommended force. A high trackability cartridge should be able to track properly on Band 7 or 8 at the *median* tracking force recommended by the manufacturer. If a cartridge is rated at 2 to 4 grams, the median force is 3 grams. The force should now be set to the required value.

X. TRACKABILITY TEST USING THE SHURE TTR 102

The Trackability Test portion of the SHURE TTR 102 is a two-frequency signal, 400 and 4000 Hz. The recorded velocity of the 400 Hz is 4 times higher than the 4000 Hz recorded velocity. This signal, at a number of different total recorded velocities occupies Bands 7 thru 13. The velocity stated for each band is the recorded velocity of the combined signal. The most difficult to track band is Band 7 or 27.1 cm/sec.

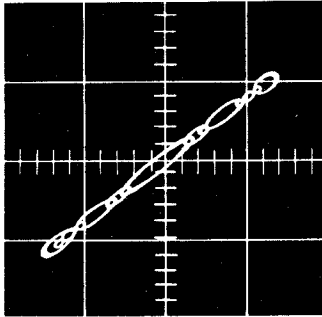


Figure J

Test by playing, in turn, Bands 13, 12, 11 and so on. The normal pattern observed on the scope when the cartridge is tracking correctly is Figure J. If mistracking occurs, it will be similar to Figures K and L. The exact shape of this pattern will depend on the pickup and the anti-skating force in use at that time.

NOTE: *If mistracking does occur, DO NOT go on to the next band. Corrections should be made to minimize or eliminate the condition at that time.*

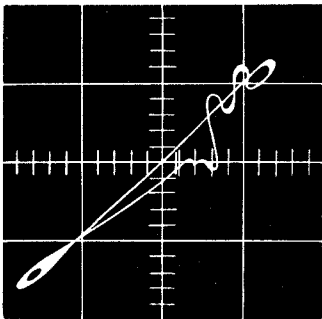


Figure K

CORRECTION METHODS:

If the anti-skating force adjustment is available, set this to the manufacturer's recommendations. If no recommendation is available, increase or decrease anti-skate adjustment until mistracking stops (Figure J) or appears to be balanced as shown in Figure M.

If the unit has no anti-skate mechanism, and will track Band 10, adjustment is satisfactory.

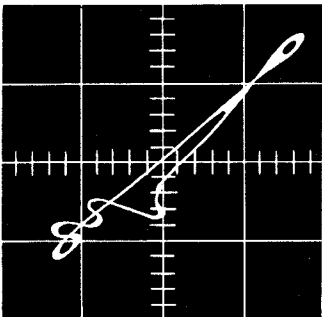


Figure L

If the unit has no anti-skate mechanism and will not track Band 10, increase tracking force until the pickup tracks properly on Band 10. **DO NOT EXCEED** the pickup manufacturer's suggested maximum value.

The highest velocity which the pickup will track is then the stated maximum trackability.

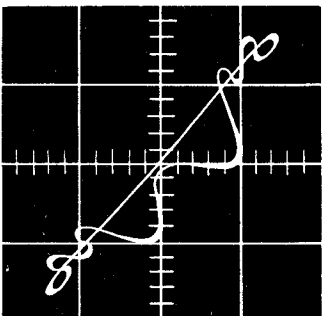


Figure M

XI. CHECKING WEAR OF THE SHURE TTR 102

A log of usage of the TTR 102 Record should be maintained since a record should be used for a limited period of time. After about 25 tests on one side, the record should be checked by using a cartridge of known trackability. Both sides of the record are identical, so the cartridge should exhibit the same tracking capabilities, and the same pattern should be observed on the oscilloscope for corresponding bands on the new and used sides of the record. When a difference is noted, a new TTR 102 should be ordered, and meanwhile the new side of the present record is used.

SUGGESTED LOG

DATE	RECORD SIDE NO.	NO. OF PLAYS	USER'S INITIALS