DIAGNOSIS OF FAULTS AND SUGGESTED REMEDIES

XI.
GENERAL INFORMATION

Apart from faults arising directly from the Pickup, the satisfactory reproduction of gramophone records is basically dependent upon the maintenance of correct and uniform speed. In order to achieve this, it is obviously necessary to maintain correct and uniform speed of the Turntable itself, but it is important to remember that uneven speed of the record track as it passes the stylus may arise from other causes such as:—

1. Enlarged centre holes in records resulting in eccentric rotation, causing excessive sideways swing of the Pickup Head.
2. Warping of records causing excessive up and down movement of the Pickup Head.
3. High spots on records or distortion, resulting in failure of the records to drive each other when used more than one at a time on Record Changers.

Before proceeding to investigate any faults on the basis of the information which follows, it is essential to eliminate the above three possible sources. For this purpose the Service Engineer is recommended to select and carefully preserve a set of test records in which he knows these defects to be wholly absent. It is also important to make sure that the drive to the Turntable is not slipping, due to the presence of grease or oil on the driving surfaces of the Pulleys or the inside rim of the Turntable. (See instructions for cleaning in Section IX).

It will be of great assistance to the Service Engineer when tracing the source of " Wow " to remember that defects in the Turntable itself will, in general, cause " Wow " to occur regularly at Turntable speed, whilst defects in the Idler Wheel will generally cause it to occur at approximately four times Turntable speed. These are not invariable rules; for example, the Turntable bearing may have tight spots in two diametrically opposite positions, thus causing " Wow " at twice Turntable speed.

CONDITIONS ESSENTIAL FOR SATISFACTORY OPERATION OF MOTOR UNIT

The information given in the following Table is based on the tolerances and precautions actually observed in manufacture and assembly. While the Service Engineer may not always have means at his disposal for checking all the tolerances quoted, the information will, nevertheless, give a useful indication of the degree of accuracy considered necessary to ensure satisfactory reproduction of records, and so help him in the diagnosis of any faults encountered.

Condition	Defect Produced by Non-compliance with Condition	Probable Causes of Defect
MOTOR		
1. Motor must spin freely.	Slow running. Uneven Speed.	Bearings out of alignment. (Tap Motor lightly on all sides whilst running to line up bearings).
2. Motor must run quietly.	Noisy running. Background Rumble.	Rotor not central in tunnel of Stator. (To centralise (I) loosen 6 Clamp Bolts (heads on underside of Motor Frame); (II) insert 2 shims 1" wide × .010" thick between Stator and Rotor; (III) tighten 6 Clamp Bolts; (IV) withdraw shims.).
TURNTABLE		
3. Inside of rim must run concentric within .006", and be free from all irregularities.	Wow.	(I) Distorted Turntable. (II) Foreign matter adhering to inside of rim.
4. Face (near rim) must run true within .010". (Test with truly flat disc 10" dia. on Turntable.).	Wow.	(I) Distorted Turntable. (II) Displacement of Rubber Mat.
5. Turntable bearing, with Circlip in place, must have small amount of end play (.015" max.)	Slow running. Noisy running. Wow.	Extra steel or neoprene washers, or incorrect washers, fitted under turntable bearing. (If from this cause, fault will disappear if wire circlip is removed from centre of Turntable.)
6. Turntable must spin freely without any trace of a tight spot (a tight spot is indicated by a tendency to come to rest predominantly in one position—to test mark edge of Turntable with chalk or gummed paper.)	Background Rumble. Wow. Slow running. Noisy running.	(I) Dirty or dry bearing. (II) Damaged steel thrust washer. 3894 (III) Damaged ball in thrust race. (IV) Ball binding in Thrust Cage (2884.) (V) Damaged ball cage contacting thrust washer or binding on spigot. (VI) No end play in bearing (See Condition 5.).
7. Bearing must run silently and smoothly.	Rumble.	(I) Dirty or dry bearing. (II) Damaged steel thrust washer. (III) Damaged ball in thrust race. (IV) Ball binding in thrust cage. (V) Omission of neoprene cushion washer. (VI) Damaged ball cage, contacting thrust washer or binding on spigot. (VII) No end play in bearing (See condition 5).
MOTOR PULLEY		
8. Driving surfaces must run concentric within .002" and be free from flats or other irregularities.	Flutter. Cross modulation.	(I) Bent motor spindle. (II) Enlarged bore in pulley. (III) Burr on motor spindle.
9. Must be close sliding fit on Motor Spindle without perceptible play.	Noisy running. (Probably in form of intermittent light rattling.).	(I) Enlarged bore in pulley. (II) Undersize Motor Spindle.
10. Must be set at correct working level, (Level is controlled by position of Fan on Motor Spindle—See SECTION V) and must engage Idler Wheel correctly (See Condition 16).	Wow. Slow running	(I) Upper face of Idler Wheel 3199 overlapping step of Motor Pulley. (II) Lower face of Idler Wheel contacting flange of Motor Pulley.
IDLER WHEEL		
11. Rim must run concentric within .002" and be free from flats or other irregularities.	Wow. Noisy running. (Probably in form of regular low thumping.).	(I) Distorted Idler Wheel 3199. (II) Rubber damaged at rim. (III) Boss loosened in Idler Wheel. (IV) Foreign matter adhering to rim.
12. Face (near rim) must run true within .005".	Wow (caused by rim overriding edge of step of Motor Pulley, or intermittently touching face of next lower step	(I) Distorted Idler Wheel. (II) Boss loosened in Idler Wheel.