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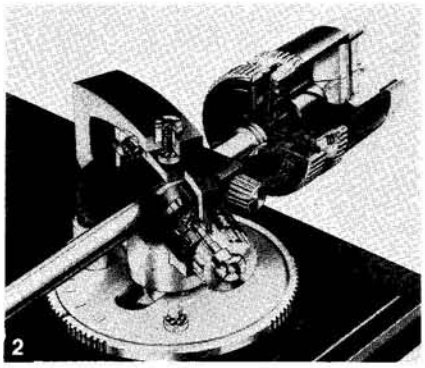
Dual Model 606 Turntable and Ortofon ULM 55E Cartridge

RADIO-ELECTRONICS AUDIO LAB

R.E.A.L. SOUND RATES

DUAL 606 TURNTABLE
AND ULM 55E CARTRIDGE

EXCELLENT



"Both in terms of lab measurement and extensive listening tests, the Dual *model 606* performed in a most exemplary manner. If you own, or plan to own, some of the new direct-to-disc or digitally-mastered records, turntables such as this new *Dual 606* come not a moment too soon, for such records are more demanding of a turntable/cartridge system than anything you have previously played. We were unable to find any records of either type which posed problems for this combination of turntable and cartridge. Considering its price, performance and sound quality, we would therefore assign a R.E.A.L. rating of Excellent bordering on superb, to this moderately priced combination."

R.E.A.L. SOUND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Dual Model 606 Turntable and Ortofon ULM 55E Cartridge

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CONTRIBUTING HI-FI EDITOR

IN RECENT YEARS, MANY AUDIO EXPERTS AS well as audio enthusiasts have begun to realize the importance of a proper interface between a phono cartridge and the pickup arm in which it is installed. Yet, traditionally, most turntable systems are supplied without a cartridge, leaving it pretty much up to the purchaser or the audio salesperson to recommend suitable cartridges for use with a given system. Often, the turntable/pickup arm combination ends up unable to provide its optimum performance because of an improper selection of the phono cartridge.

While Dual's *model 606* turntable (as well as their other models) can, of course, be purchased without a cartridge, the company makes this model available with an installed Ortofon *model ULM 55E* phono cartridge. ULM stands for *U*ltra-*L*ow-*M*ass, and is the abbreviation that is used to describe this ultra-lightweight cartridge as well as Dual's completely redesigned pickup arm.

The *model 606* shown in Fig. 1, is a single-play turntable system with semi-automatic features. Movement of the arm away from its rest post and towards the outer diameter of the turntable platter turns on the direct-drive motor and illuminates the strobe light that shines upon a series of metal dots located on the vertical rim of the platter. Alongside the front of the pickup arm is a cueing lever that, when activated, gently lowers the arm into playing position. Although movement of the arm to the correct position must be done manually, a set-down location aid in the form of an easily felt detent is provided for correct positioning of the arm for 12-inch and 7-inch records. If that feature is not desired (as, for example, when seeking other pionts in a record), the detent feature can be turned off by means of a knurled knob located immediately behind the cueing lever. Farther towards the rear of the unit, near the pickup-arm pivot assembly but mounted on the baseplate of the system, is an anti-skate adjustment control, calibrated separately for use with either conical- or elliptically-shaped styli.

At the front left corner of the turntable are a speed selector knob and a pitch control knob. Since the direct-drive motor of the *model 606* is electronically driven, speed change and adjustment are also purely electronic and involve no mechanical linkages. The direct-drive motor used in this turntable is a high-torque DC servo type. The speed-monitoring system uses a CMOS regulator circuit and an integral frequency generafor that, in effect, checks speed consistency 120 times during each revolution of the platter.

As for the ULM pickup-arm of the *model 606*, it is a refined and redesigned version of Dual's highly respected straight-line tubular arm with four-point gyroscopic gimbal suspension. Its vernier-adjustable counterweight establishes zero-balance first, and then a tempered flat-wound spring applies tracking force directly at the pivot point without altering effective mass of the arm/cartridge combination. A cross-sectional view of the pivot system is shown in Fig. 2.

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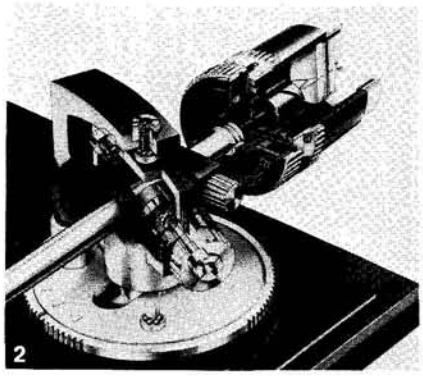
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MANUFACTURER'S PUBLISHED SPECIFICATIONS:

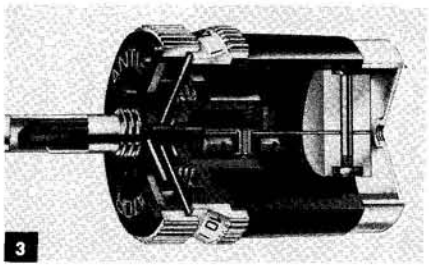
Turntable System:
Platter diameter: 12″. **Platter Weight:** 3.08 lbs. **Available Speeds:** 33⅓ and 45 rpm. **Time To Reach Rated Speed** (33⅓ rpm): 2 to 2.5 seconds. **Pitch Control Range:** 10%. **Strobe Sensitivity for 0.1% Speed Deviation** (at 60 Hz): 7.2 divisions per minute. **Wow-and-Flutter:** 0.05% unweighted; 0.03% WRMS. **Rumble:** (Din-A unweighted): 50 dB; (Din-B weighted): 75 dB. **Pickup Arm Length:** 8.7″. **Offset Angle:** 24.07 degrees. **Tangential Tracking Error:** 0.16 degrees/centimeter. **Pickup Arm Bearing Friction:** (vertical): 7 mg.; (horizontal): 15 gm. **Tracking Force Range:** 0 to 3 grams. **Overall Dimensions:** (base): 16½ wide × 3.5 high × 14½ inches deep; (with dust cover): 5.18 inches high.

ULM 55-E Cartridge (optionally supplied):
Weight: 2.5 grams (including bracket & hardware). **Stylus Shape:** biradial, 6 × 18 μm. **Tip Mass:** 0.35 mg. **Frequency Response:** 10 Hz to 25 kHz. **Output Voltage at 1 kHz per cm/sec:** 0.7 mV or greater. **Channel Separation at 1 kHz:** greater than 25 dB. **Channel Balance at 1 kHz:** less than 1.5 dB. **Static Vertical Compliance:** 30 μm/mN. **Dynamic Lateral Compliance:** 25 μm/mN. **Recommended Tracking Force:** 1.0 to 1.75 grams. **Vertical Tracking Angle:** 20 degrees. **Recommended Load Resistance:** 47,000 ohms. **Recommended Load Capacitance: 400 pF**

As we mentioned earlier, the combination of a low-mass pickup arm and an ultra-low weight cartridge adds up to a higher natural resonance point that lies above the region of maximum warp-frequency typically found on records—above 8 Hz and below 12 Hz. However, merely moving up the frequency of resonance does not in itself necessarily reduce the amplitude of that resonance.

Dual's solution to the problem is a mechanical anti-resonance filter housed in the pickup-arm counterweight. That filter is tuned broadly to the range of resonant frequencies that are to be damped. The owner's manual supplies a list of some popular cartridges and indicates the setting that should be selected on a movable calibrated knurled ring located at the front of the counterweight, based upon car-

tridge mass and compliance. In the case of the supplied Ortofon *ULM 55E* cartridge, that setting was 12.5. In use, the mechanical filter vibrates out-of-phase with the resonance, partially cancelling it out. According to Dual, addition of the filtering system typically reduces the amplitude of arm resonance by around 20%, while in the case of an arm equipped with a mating Ortofon ULM cartridge, amplitude of resonance ends up about 50% lower than it would be with a conventional cartridge and without the filter. A detailed partial cross-section view of the counterweight to illustrate the built-in mechanical anti-resonance filter, is shown in Fig. 3.



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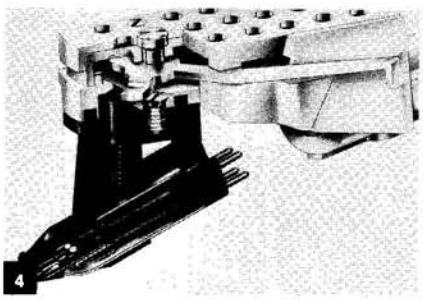
Since the unit we tested was supplied with the Ortofon ULM cartridge, a word is in order concerning this unusual pickup. Originally introduced by Ortofon as the *models LM-30* and *LM-20*, the new low-mass cartridge quickly became known as the *Concorde 30* and *Concorde 20* because of its distinctive appearance that resembles the tilted-down nose of that supersonic aircraft. In addition to its ultra-low mass of just 2.5 grams (which accounts for its improved low-frequency reproduction), the stylus tip mass has also been reduced, and the lower the mass of the stylus tip, the more accurately it can track transient signals in the treble range. The cantilever of the cartridge is constructed of a hardened aluminum alloy with an external diameter of 0.45 mm and a wall thickness of only 0.035 mm.

The cartridge itself is a moving-iron type, based upon the variable-magnetic-shunt principle (VMS) upon which Ortofon holds world patents. Ortofon claims to have improved the magnetic circuit of the design to provide sufficient output voltage to drive all modern amplifiers or preamplifiers despite the miniaturization of its coils and cantilever.



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A closeup view of the Ortofon ULM cartridge mounted in the lightweight headshell of the Dual *model 606* is shown in Fig. 4. While the headshell of the arm is permanently affixed to the arm itself, the cartridge can be easily removed and, if desired, other cartridges having standard ½-inch mounting centers can be used and mounted with the aid of the hardware supplied. In addition, a stylus-orientation gauge is supplied separately to precisely align the stylus tip of an alternate cartridge. If heavier cartridges than the Ortofon are used (and that means just about any other cartridge), it is necessary to add weights (which are supplied in the included bag of accessories) to the counterweight so that static zero-balancing of the pickup arm can still be accomplished.

TABLE 1

RADIO-ELECTRONICS PRODUCT TEST REPORT

Manufacturer: **Dual (United Audio)** Model: **606**

TURNTABLE SYSTEM MEASUREMENTS

	R-E Measurements	R-E Evaluation
PERFORMANCE CHARACTERISTICS		
Wow-and-flutter (% WRMS)	0.025	Superb
Rumble, unweighted (dB)	52	Excellent
Rumble, (Din weighted B) (dB)	75	Superb
Speed accuracy (%)	Strobe, adjustable	N/A
Speed adjustment range (±___%)	4.5	Excellent
Speed build-up time (rotations)	0.6	Excellent
COMPONENT MATCHING CHARACTERISTICS		
Tracking force range (___ to ___ grams)	0 to 3.0	
Anti-skating force range (___ to ___ grams)	0 to 3.0	
Available speeds (RPM)	33⅓, 45	
Drive system	Direct drive	
Motor type	DC Servo	
Power requirements	120V, 50/60Hz, 2 W	
MISCELLANEOUS EVALUATIONS		
Adequacy of controls		Excellent
Automatic Features, performance		Superb
Speed stability		Excellent
Vertical tone arm friction		Superb
Lateral tone arm friction		Excellent
Quality of construction		Superb
OVERALL TURNTABLE SYSTEM RATING		Excellent

TABLE 2

RADIO-ELECTRONICS PRODUCT TEST REPORT

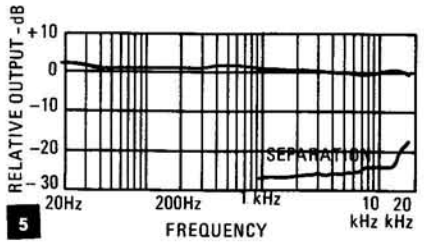
Manufacturer: **Ortofon** Model: **ULM-55E**

PHONOGRAPH CARTRIDGE MEASUREMENTS

	R-E Measurements	R-E Evaluation
FREQUENCY RESPONSE (H-kHz, ±___ dB)	10-20, 2.0 See Fig. 5	Excellent
STEREO SEPARATION		
Separation, 1 kHz (dB)	28.0	Very good
Separation, 10 kHz (dB)	24.0	Very good
Separation, 30 kHz (dB)	N/A	N/A
CHANNEL BALANCE, 1 kHz (dB)	0.5	Excellent
TRACKABILITY MEASUREMENTS		
Stylus velocity at 1 kHz (cm/sec)	Better than 40	Superb
Stylus velocity at 10 kHz (cm/sec)	Better than 30	Superb
COMPONENT MATCHING CHARACTERISTICS		
Output level, 1 kHz, 3.54 cm/sec (mV)	4.0	
Optimum load impedance (ohms)	47K (400 pF)	
Tracking force range (___ to ___ grams)	1.0 to 1.75	
Cartridge weight (grams)	2.5	
OVERALL PHONO CARTRIDGE RATING		Excellent

Lab Measurements

Table 1 lists the results of our lab measurements of the turntable, while in Table 2 we have summarized our findings with respect to the optional Ortofon cartridge. Wow-and-flutter was extremely low, measuring even a bit less than the 0.03% WRMS specified by the manufacturer. As for rumble content, the 75 dB reading obtained for weighted (Din B) rumble was surpassed in the past only by turntables costing nearly three times as much as the Dual *606*. Once set by means of the pitch control, the strobe markings remained "stationary" for the better part of two hours; the time required to complete all of our measurements. Correct speed, from a non-rotating condition, was reached by the platter in just over 1.0 seconds, as opposed to the 2.0 to 2.5 seconds claimed by Dual while pitch-adjustment range measured 9.0%, just a bit less than the 10% claimed.



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Frequency response of the ULM cartridge is plotted from 20 Hz to 20 kHz (the available frequencies on our test record) in Fig. 5. To obtain that response, we had to add about 200

pF of external capacitance at the input jacks of our reference phono preamp, since the total cable capacitance of the *model 606* was only 150 pF per channel. Failure to add that additional capacitance would have resulted in a somewhat higher positive peak in the response curve at around 15 to 16 kHz. We can, of course, understand why Dual elected *not* to incorporate, the extra capacitance (or to use higher capacitance audio cables) since, after all, the *model 606 can* be used with many other cartridges, some of which would have a severe high-frequency attenuation if they were "loaded" with 400 pF of capacitance at their output terminals.

In examining Table 2 you will note that results for trackability both use the phrase "better than" (40 cm-per-sec for mid-frequencies; 30 cm-per-sec for high frequencies). That is because those figures represent the greatest velocities supplied in the trackability test record (Shure *TTR-103*) that we used for our tests. At those high velocities, the cartridge was still tracking perfectly, so the presumption is that we might have been able to achieve proper tracking at even higher velocities. In that respect, however, it should be noted that we had to adjust the anti-skating control so that it was set to a reading of 1.0 gram, even though our tests were conducted at a downward-tracking force of 1.5 grams. It is not unusual to find that anti-skating calibration is not precisely accurate on turntable systems and this critical adjustment should really be made under actual listening conditions, preferably with a test record such as the one we used. Even if such a test record is unavailable, it is often possible to achieve a correct anti-skate setting by listening critically to very heavily recorded passages of a musical record and noting any breakup. Sometimes, an adjustment of as little as 0.5 grams (of the anti-skate calibration indicator) can make the difference between adequate tracking of such passages and inability to track them properly.

Summary

Our overall product analysis together with our summary comments about this excellent turntable/cartridge combination will be found in Table 3. Both in terms of lab measurement and extensive listening tests, the Dual *model 606* performed in a most exemplary manner. If you own, or plan to own, some of the new direct-to-disc or digitally-mastered records, turntables such as this new *Dual 606* come not a moment too soon, for such records are more demanding of a turntable/cartridge system than anything you have previously played. We were unable to find any records of either type which posed problems for this combination of turntable and cartridge. Considering its price, performance and sound quality, we would therefore assign a R.E.A.L. rating of Excellent bordering on supurb, to this moderately priced combination. **R-E**

TABLE 3

RADIO-ELECTRONICS PRODUCT TEST REPORT

Manufacturer: **Dual/Ortofon** Model: **606/ULM-55E**

OVERALL PRODUCT ANALYSIS

Retail price	**$280.00 ($390.00 with optional cartridge)**
Price category	**Medium**
Price/performance ratio	**Superb**
Styling and appearance	**Excellent**
Sound quality	**Excellent**
Mechanical performance	**Superb**

Comments: The engineers at Dual seem to have met every remaining problem that has plagued the science of record playing in this moderately priced turntable/cartridge combination. Frankly, while most audiophiles prefer to choose their own phono cartridges when purchasing a record-playing system, it would be counterproductive in our view to purchase the *606* with anything but the ultra-low-mass Ortofon cartridge for which it was so obviously intended. With a total effective mass (including the 2.5 gram cartridge) of only 8 grams, overall pickup-arm/cartridge low-frequency response is pushed up to around 10 Hz, well above the region of maximum warp-frequencies and nicely below the lowest frequency of recorded sound. Furthermore, the unique anti-resonance filters incorporated in Dual's pick-up arm counterweight reduce the amplitude of this resonance to levels which permit positive tracking of the grooves of even badly warped records. In our listening tests it was clear that harmonic and intermodulation distortion levels had been suppressed to virtually inaudible levels, even when listening to pure-tone signals from test records which had previously yielded clearly perceptible distortion levels.

The suspension system used for the baseplate of the *606* is also excellent, as evidenced by our ability to bring the system into close proximity with the loudspeakers while playing music at very loud levels. Properly positioned (away from the speakers) the *606* was virtually impervious to any form of acoustic feedback, either airborne or mechanically induced.

In terms of performance, the Dual *model 606* has all the refinements of that company's higher-priced *models 622* or *650RC*, the chief difference being that the *622* offers automatic start and repeat-play while the *650RC* offers wireless remote control of start and cue functions. Thus, if you are seeking pure performance and are willing to set down the pickup arm (by means of the cueing lever) at the right position in the record, the *606* represents the best value of these three turntable offerings from Dual. Everything about this fine turntable system smacks of precision mechanical craftsmanship and, judging from its construction, this system should perform in a trouble-free manner for many years to come. In our opinion, the Dual *606* with its Ortofon cartridge rates an Excellent R.E.A.L. rating, bordering on Superb.