



**TAD** Technical  
Audio Devices

**TAD — Speaker Components for Professional Sound Systems**

 **PIONEER®**



## Speaker Components for Professional Sound Systems

Technical Audio Devices (or TAD for short) is a specialist in speaker components designed exclusively for professional applications. We cater to the most stringent needs of musicians and professional audio-system designers. Our products are found in sound reinforcement systems, public address and concert-hall audio systems and other places where dependable, highly specialised components are required for the reproduction of sound.

At TAD, prototypes are subjected to a series of ultra-sophisticated tests and measurements using advanced computers, lasers and holographic equipment. Materials used are carefully selected to suit the specific design criteria. Units are hand made to the most exacting tolerances.

Technical Audio Devices — the audio specialists for professionals.

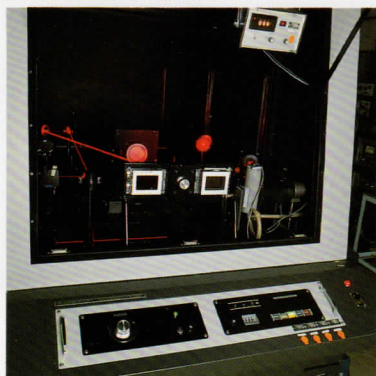
### High Technologies at TAD

At TAD, before a product hits the market, it must go through three stages — preliminary design, refinement and actual manufacture. At each stage we are helped by a host of advanced computer and optical technologies.

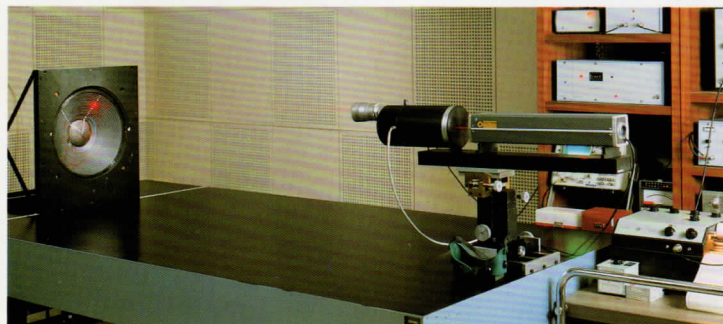
During the design process, our computers let us analyse the performance of a speaker component — impulse response, frequency response, phase uniformity, transient response, etc. — without actually building it. Flaws in basic design are eliminated even before the first prototype unit has been made.

Next the refinement stage follows. A prototype is subjected to a number of computer-controlled measuring systems. A doppler laser meter measures the velocity of diaphragm movement, which helps us achieve flatter response and reduced distortion in a speaker unit. Laser holography records displacement in a vibrating diaphragm and presents it visually for careful analysis. Successive tests are made on the prototype in a reverberant room and in an anechoic chamber.

Actual manufacture is the last stage. Here we use hand-made parts to hand build the units. For instance, a diaphragm is assembled with watchmaker's delicacy for a gap precision down to  $\pm 25\mu\text{m}$  ( $\pm 1/1,000,000$ th of an inch). This meticulous, time-consuming production method assures long-term peak performance and higher reliability.



Laser Holographic System



Laser Doppler Vibrometer



## TL-1601a

### Low-Frequency Loudspeaker

The TL-1601a is a low-frequency loudspeaker conforming to the very highest technical standards. It is specifically designed to reduce all forms of distortion and colouration to a bare minimum.

**VOICE COIL.** The TL-1601a employs an edgewise-wound long-travel type voice coil. Since the coil stays completely within the magnetic gap even during peak excursions, bass output is powerful, and distortion low, at all input levels. And since the coil makes more effective use of the flux within the magnetic gap, it provides high conversion efficiency. The voice coil bobbin and adhesive materials have high heat resistance.

**MAGNETIC CIRCUIT.** The magnetic circuit is designed for low distortion and high efficiency. Thanks to the use of a powerful alnico ring magnet (1.65kg or 3 lbs. 10 oz.), it features an extremely high flux density of 11,800G. In combination with light moving parts and the long-travel coil, it results in exceptionally high efficiency for a unit of this size.

**DIAPHRAGM.** The cone diaphragm of the TL-1601a is made of a newly-developed tough and lightweight material that is capable of withstanding high amplitude levels without deformation. Corrugations are added across the cone surface to assure smooth response down to the extreme low end. The surround is coated with a damping material to ensure proper internal loss and linear excursions, and to reduce cone breakup in the high frequencies. The result is extremely low distortion and colouration.

**HOUSING.** The TL-1601a is mounted in a sturdy aluminium alloy diecast frame that supports the heavy magnetic circuit. The frame is essentially resonance-free.

### TL-1601a Specifications

Voice coil impedance:	8 ohms
Low resonance frequency:	28Hz
Frequency range:	28 — 1,000Hz
Rated input power:	150 watts
Maximum input power:	300 watts
Sound pressure level:	97dB/W (1m)
Equivalent mass (infinite baffle):	117gr
Q <sub>0</sub> :	0.31
Total magnetic flux:	260,000 maxwells
Magnetic flux density:	11,800 gauss
Baffle opening:	352mm
Mounting dimensions:	370mm (8 holes)
Weight:	11kg
Outer dimensions:	400 (Dia.) × 167 (D) mm





## TL-1602

### Low-Frequency Loudspeaker

Like the TL-1601a, the TL-1602 is designed for low-distortion, high-efficiency performance under even the most demanding conditions.

**VOICE COIL.** The voice coil is relatively short so that it remains within the magnetic gap even during peak excursions. But its long travel distance results in reduced distortion at high input levels. The coil we use is ribbon wire, wound edgewise on a bobbin with heat-resistant adhesive. Making more effective use of the flux, it assures increased acoustic conversion efficiency and safe operation even when faced with 300 watts max. input.

**MAGNETIC CIRCUIT.** A heavy (1.65kg/3 lbs. 10 oz.) alnico ring magnet of carefully selected materials and pole configuration produce an extremely high flux density of 11,800G. Lightweight moving parts and the long-travel voice coil together result in a sensitivity of 97dB/W (1m), an excellent specification for a unit of this size.

**DIAPHRAGM.** A wide piston motion range is assured thanks to a cone made of highly rigid carbon fibre. The diaphragm is covered with a special TAD-developed damping agent to reduce cone breakup and distortion. The polyurethane surround is structurally symmetrical and highly compliant to further reduce distortion. The  $f_0$  is 21Hz for accurate reproduction of ultra-low frequencies.

**HOUSING.** A rugged, low-resonance frame of diecast aluminium alloy capably supports the heavy magnetic structure and the moving parts. It does its part in keeping colouration to a minimum.

**CROSSOVER.** We recommend a crossover at 900Hz (12dB/oct. or 18dB/oct. roll-off) when using the unit in multi-speaker systems.

#### TL-1602 Specifications

Voice coil impedance:	8 ohms
Low resonance frequency:	21Hz
Frequency range:	21 — 2,000Hz
Rated input power:	150 watts
Maximum input power:	300 watts
Sound pressure level:	97dB/W (1m)
Equivalent mass (infinite baffle):	122gr
$Q_0$ :	0.185 ( $f_0 = 21$ Hz)
Total magnetic flux:	260,000 maxwells
Magnetic flux density:	11,800 gauss
Baffle opening:	352mm
Mounting dimensions:	370mm (8 holes)
Weight:	11kg
Outer dimensions:	400 (Dia.) × 167 (D) mm



## TM-1201

### Mid-Frequency Loudspeaker

The concept behind the TM-1201 mid-frequency loudspeaker is smooth frequency response combined with high efficiency and low distortion at all power levels. It covers a range from 200 to 3,000Hz.

**DIAPHRAGM.** The diaphragm cone of the TM-1201 is made of our exclusive Polymer Graphite (PG\*). PG is characterised by low density, high Young's modulus and high internal loss. This means it provides smooth response, high efficiency, low distortion, excellent power linearity, and, most importantly, clean sound reproduction without a hint of unnatural colouration.

The surround for the diaphragm is a corrugated cloth coated with a damping material to improve internal loss. It helps achieve ideal linear response and low overall distortion.

**VOICE COIL.** The PG cone is driven by a semi-long travel voice coil 11mm (7/16 inches) wide, edgewise-wound on the bobbin. It assures powerful, low-distortion reproduction at virtually all input levels, and high efficiency.

**MAGNETIC CIRCUIT.** The large sized ferrite magnet (3.6kg/8 lbs.) helps yield a high air gap magnetic flux density of 14,500G. It results in high efficiency with extremely low distortion.

**HOUSING.** A sturdy low-resonance aluminium alloy diecast frame is used in the TM-1201 to support the magnetic structure and moving parts of the loudspeaker.

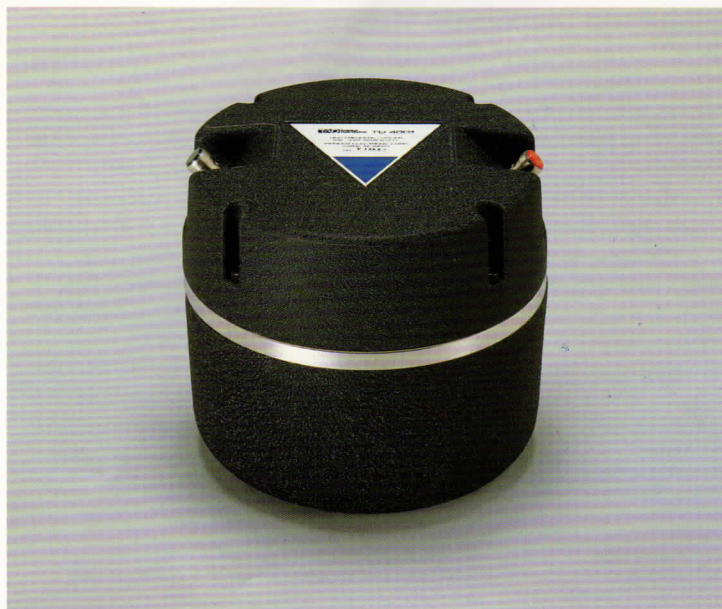
**CROSSOVER.** It is recommended that the TM-1201 be used with an active crossover network (band-pass filter) having crossover frequencies at approximately 200Hz and 3kHz, and cutoff characteristics of 12dB/oct. or 18dB/oct.

\*PG is a trademark of Pioneer.

#### TM-1201 Specifications

Voice coil impedance:	8 ohms
Low resonance frequency:	52Hz
Recommended frequency range:	200 — 3,000Hz
Rated input power:	150 watts
Maximum input power:	300 watts
Sound pressure level:	100dB/W (1m)
Equivalent mass (infinite baffle):	60gr
$Q_0$ :	0.16 ( $f_0 = 52$ Hz)
Total magnetic flux:	324,000 maxwell
Magnetic flux density:	14,500 gauss
Baffle opening:	276mm
Mounting dimensions:	293mm (6 holes)
Weight:	11kg
Outer dimensions:	318 (Dia.) × 110 (D) mm





## TD-4001

### High-Frequency Driver

The TD-4001 successfully achieves all the design objectives we set forth — very high efficiency, wide and perfectly flat response from 600Hz to 20kHz, and low distortion.

**DIAPHRAGM.** The TD-4001 employs a pure beryllium diaphragm 100mm (3-15/16 inches) across. Beryllium is a light but very rigid material that features very high-speed sound propagation. The weight of the dome section has been reduced to a mere 1g, contributing to the very high efficiency (110dB/W) of this driver.

**VOICE COIL.** The TD-4001 employs an aluminium ribbon voice coil, insulated by alumite film and wound edgewise on the bobbin. The voice coil has a small mass yet offers a high conversion efficiency. The bobbin is formed of polyimide film, displaying excellent heat resistance to temperatures as high as 400°C (752°F).

**MAGNETIC CIRCUIT.** Total magnetic flux is 228,000Mx, with flux density of 20,000G, thanks to the use of a very heavy (3kg/6 lbs. 10 oz.) alnico 5DG magnet. An oxygen-free copper shorting ring prevents impedance rise, resulting in low distortion.

**DESIGN.** The TD-4001 is of the rear compression design, which eliminates the resonance and phase distortion produced by a surround. It also eliminates cavity resonance interference, achieving very flat frequency response, extremely natural sound and superb definition. A phasing plug helps smooth the response of extra high frequencies.

**CROSSOVER.** We recommend the use of a crossover frequency of 600Hz or higher, and a cutoff slope of 12dB/oct. or sharper.

#### TD-4001 Specifications

Voice coil impedance:	16 ohms
Voice coil diameter:	101mm
Equalising system:	5-slit type
Frequency range:	600 — 20,000Hz
Maximum input power:	60 watts (600Hz, — 12dB/oct.)
Sound pressure level:	110dB/W (1m)
Crossover frequency:	over 600Hz (— 12dB/oct.)
Total magnetic flux:	228,000 maxwells
Magnetic flux density:	20,000 gauss
Hole size for throat connection:	49.4mm
Mounting dimensions:	101.6mm (4 holes)
Weight:	13.5kg
Outer dimensions	178 (Dia.) x 155.5 (D) mm



## TD-2001

### High-Frequency Driver

The TD-2001 is designed for an exceptionally wide frequency range of 500 to 22,000Hz, high efficiency and high dependability.

**DIAPHRAGM.** A pure beryllium diaphragm is employed in the TD-2001. This diaphragm ensures rapid sound wave transmission, extremely flat frequency response, little cone breakup, excellent transient response and high sound image definition. Deformation is prevented by a surround formed of a special high-polymer compound. It also effectively prevents fatigue and rupture caused by an excessive input level.

**VOICE COIL.** For the voice coil, the TD-2001 employs edgewise-wound aluminium ribbon wire, insulated in alumite film. This design provides an exceptionally high acoustic conversion efficiency. It is wound on a bobbin formed from a high-polymer compound having ideal heat resistance up to 400°C (752°F).

**MAGNETIC CIRCUIT.** The magnetic circuit includes a 1kg (2.2 lb.) alnico magnet for a total magnetic flux of 68,500Mx. The centre pole is capped by a ring of pure silver to prevent an increase in impedance (and resultant distortion) at high frequencies.

**DESIGN.** A rear-compression mounting system is employed for the diaphragm and voice coil assembly. This assures enhanced clarity, for rear compression neatly avoids the resonance generated at the edge of the diaphragm. It also improves the phase uniformity of all frequencies, particularly highs, since they are emitted from virtually all points on the diaphragm. A phasing plug serves to eliminate phase disturbances at the throat region, achieving virtually flat frequency response.

#### TD-2001 Specifications

Voice coil impedance:	8 ohms
Voice coil diameter:	48mm
Equalising system:	3-slit type
Frequency range:	500 — 22,000Hz
Maximum input power:	30 watts (800Hz, — 12dB/oct.)
Sound pressure level:	109dB/W (1m)
Crossover frequency:	over 800Hz (— 12dB/oct.)
Total magnetic flux:	68,500 maxwells
Magnetic flux density:	18,000 gauss
Hole size for throat connection:	25.4mm
Mounting dimensions:	76.2mm (for 2 holes), 57.2mm (for 3 holes)
Weight:	6.4kg
Outer dimensions	141 (Dia.) x 107 (D) mm



# TH-4001

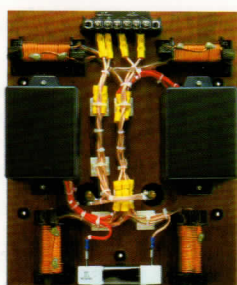


## Stabilised Dispersion Horn

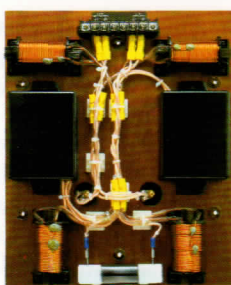
The TAD TH-4001 is a stabilised dispersion horn designed specifically for use with the TD-4001 high-frequency driver. It allows you to exploit the wide frequency response of this unit, providing excellent dispersion of all frequencies, including high frequencies above 10kHz, a feat rarely achieved by large horns. The dispersion pattern is optimised, based on our measurements of actual room acoustics. As a result, the entire output of the TD-4001 is uniformly distributed over a large area. High resolution is another result of our acoustic engineering. The horn is made of genuine maple, for clean, rich, natural sound.

### TH-4001 Specifications

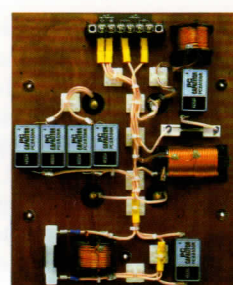
Type:	Stabilized dispersion horn
Cut-off frequency:	320Hz
Flare type:	Hyperbolic curve
Radiation angle:	90° (horizontal)/40° (vertical)
Throat diameter:	50mm (suitable driver throat diameter: 49.2 — 50.8mm)
Driver mounting system:	P.C.D. 101.6mm L90° 4 bolt mounting
Weight:	11.2kg
Outer dimensions:	612 (W) × 239 (H) × 410 (D) mm
Accessories:	Horn mounting hardware pieces × 6, Washers × 6, Bolts with hexagonal heads × 6



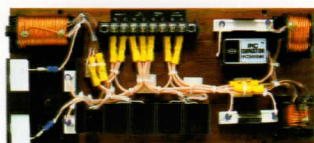
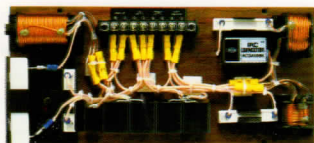
## TN-1



## TN-2



## TN-3



## Networks

TN-1 and TN-2 are dividing networks for our loudspeakers and drivers — TN-1 for 4-ohm driving (twin drive), and TN-2 for 8-ohm driving. In both networks, components and circuits are custom designed. Both use oxygen-free copper connection cables, choke-coil windings, press joint connections, oversized gold-plated terminals, and high-quality capacitors, to assure low loss and low leakage. To reduce inter-leakage due to grounding, the LF circuit is balanced. And to prevent a muddy quality in sounds with frequencies near the crossover frequency,

the HF and LF circuits are physically separated. All this adds up to clear, high resolution sound, comparable to the sound produced by speakers driven by a biamp system.

The TN-3 is an interface network for biamping. It has a built-in compensation circuit to flatten impedance and sound pressure level. The result is a perfect match between the HF driver and the driving amplifier. For low loss and high quality reproduction, parts are carefully chosen, and individually positioned on the board to prevent interference.

### TN-1 Specifications

Type:	2-way dividing network
Crossover frequency:	650Hz
Maximum input power:	600W
Impedance:	4 ohms
Level control:	Built in: fixed at -6dB External: continuously variable
Rated loss:	LF 0.6dB
Attenuation response:	LF: -36dB/oct. HF: -12dB/oct.
Outer dimensions:	LF: 250 (W) × 300 (H) × 142 (D) mm HF: 330 (W) × 59 (H) × 150 (D) mm
Weight:	LF: 3.3kg HF: 1.8kg
Accessories:	Mounting screws (self-tapping screws M4 × 25) × 10, Washers × 10, Y-shaped terminals × 14, Hermetically sealing material × 1, Level control × 1

### TN-2 Specifications

Type:	2-way dividing network
Crossover frequency:	650Hz
Maximum input:	300W
Impedance:	8 ohms
Level control:	Built in: fixed at -10dB External: continuously variable
Rated loss:	LF 0.4dB
Attenuation response:	LF: -36dB/oct. HF: -12dB/oct.
Outer dimensions:	LF: 250 (W) × 300 (H) × 102 (D) mm HF: 330 (W) × 59 (H) × 150 (D) mm
Weight:	LF: 3.0kg HF: 1.8kg
Accessories:	Mounting screws (self-tapping screws M4 × 25) × 10, Washers × 10, Y-shaped terminals × 14, Hermetically sealing material × 1, Level control × 1

### TN-3 Specifications

Recommended speaker units:	LF: TL-160la HF: TH-4001 + TD-4001
Recommended crossover frequency:	600 — 800Hz
Outer dimensions	250 (W) × 300 (H) × 108 (D) mm
Weight	2.3kg
Accessories:	Mounting screws (self-tapping screws M4 × 25) × 6, Washers × 6, Y-shaped terminals × 6, Hermetically sealing material × 1





## TSM-1

53 000 HT

### Studio Monitor Speaker System

The TSM-1 is a scientifically-designed monitor speaker system combining five TAD speaker components — two TL-1601a low-frequency loudspeakers, one TD-4001 high-frequency driver, one TH-4001 stabilised dispersion horn, and our TN-1 dividing network. It is designed for use in large studio control rooms. It provides both high power at all frequencies and superior transient response — a rare combination. Thanks to the use of two parallel-driven low-frequency loudspeakers, the maximum sound pressure level is a particularly high 126dB/W at 1m. Its dispersion pattern is critically controlled, based on our tests of actual studio acoustics: response is smooth over a wide listening area, and consistently clear directivity can be enjoyed.

#### TSM-1 Specifications

Speaker units:	TL-1601a (2 pieces), TD-4001+TH-4001
Dividing network:	TN-1
Impedance:	4 ohms (when built-in network is employed)
Frequency range:	29 — 20,000Hz
Input level:	300 watts (rated) 600 watts (maximum)
Sound pressure level:	98dB/W (1m)
Maximum sound pressure level:	126dB (1m)
Crossover frequency:	650Hz
Dimensions:	1,100 (W) × 900 (H, including 50mm stand height) × 712 (D)mm (enclosure depth: 575.5mm)
Weight:	145kg



## TSM-2

37 700 HT

### Studio Monitor Speaker System

The TSM-2 Studio Monitor Speaker System is designed for use in relatively small studio control or editing rooms. It combines the TL-1601a low-frequency loudspeaker, TD-4001 high-frequency driver, TH-4001 stabilised dispersion horn and TN-2 dividing network. High resolution across a wide range, a high maximum sound pressure level and wide latitude in placement are its distinctive attributes. Like the TSM-1, this studio monitor features superior transient response and a uniform dispersion pattern. It too meets the critical demands of professionals.

#### TSM-2 Specifications

Speaker units:	TL-1601a, TD-4001+TH-4001
Dividing network:	TN-2
Impedance:	8 ohms
Frequency range:	29 — 20,000Hz
Input level:	150 watts (rated) 300 watts (maximum)
Sound pressure level:	95dB/W (1m)
Maximum sound pressure level:	120dB (1m)
Crossover frequency:	650Hz
Dimensions:	660 (W) × 798 (H) × 614 (D)mm (enclosure depth: 480mm)
Weight:	93kg

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