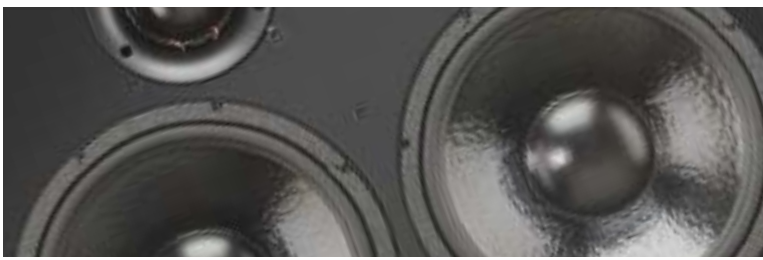
professional series



ACOUSTIC ENGINEERS

professional series

Manufactured in-house to exacting tolerances, ATC's drive units are legendary for their many design innovations. Hand-wound, short voice coils use only high density edge wound, flat OFC wire and operate in precision long magnetic gaps. Front and rear magnetic venting not only reduces airflow noise, but increases power handling and long term reliability. Massive, motor assemblies offer no-compromise optimisation for each voice coil diameter.

The unique "Soft Dome" technology in the form of the latest SM-150s was originally developed by ATC in 1976 and is featured in the SCM 50, 100, 150, 200 and 300. Its arrival revolutionised professional studio monitoring for all time. Remarkable today, as then, it remains the only mid-range devise capable of giving ultimate performance.

The "Super Linear Technology" found in the professional range is equally ground-breaking. It has long been recognised that the detrimental effects of magnetic hysteresis is a significant factor in the production of distortion in drive units.

With clever use of revolutionary materials developed for the communications industry, the problem has been solved for all time in the form of ATC "SL" drive units. They are unique not only in their ability to accurately reproduce piano, but also in precise manner in which they articulate male voices. This is hardly surprising given the reduction of third harmonic distortion by 10-15 dB between 100Hz and 3kHz achievable with this system.

Each drive unit in ATC professional monitors is powered by its own grounded source amplifier, optimised for its relevant bandwidth. Each amplifier, working substantially in Class A, features an even order filtered active crossover individually aligned and phase-corrected for unmatched stereo imaging.

Each professional product is backed by a 6 year warranty, 24 hour spares turn round and factory technical support.

HAND BUILT

ACTIVE/PASSIVE

PROFESSIONAL

MONITORS

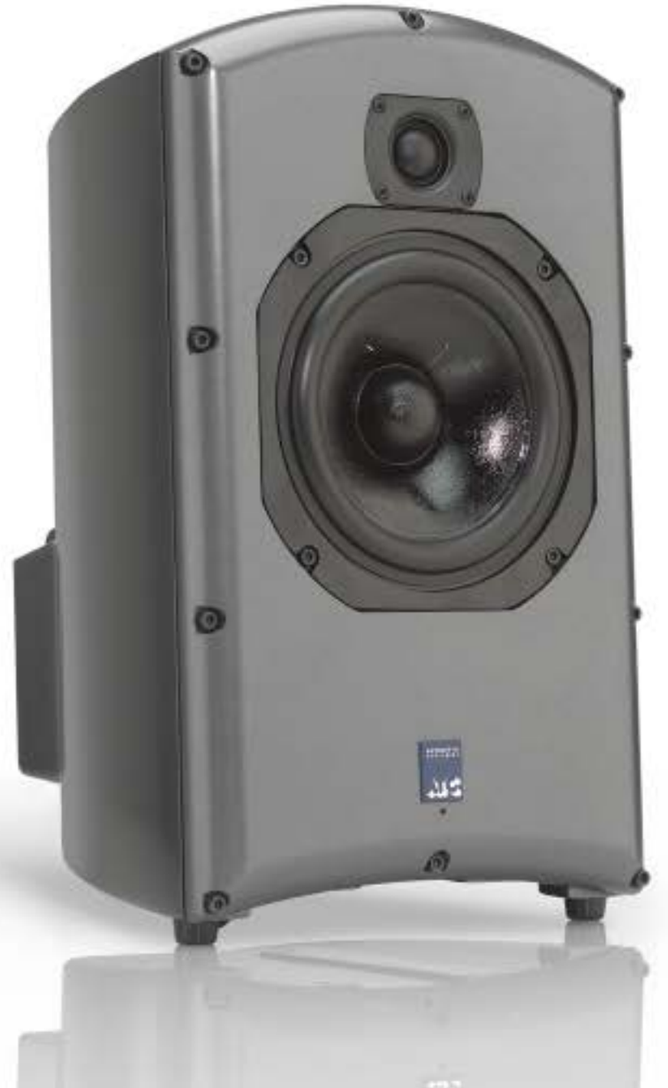
AND ELECTRONICS

FROM ATC

SCM16A: 2-way active

Features

- New soft dome HF unit.
- New ATC "CLD" driver with 45mm integral soft dome.
- In-house, hand-wound precision flat wire coil.
- Precision undercut bass pole for symmetrical magnetic field.
- Massive optimised motor assembly.
- On board ATC built two-way 250W amplifier.
- Heavily damped Aluminium cabinet.



Specifications

Drivers : HF 25mm, Mid/LF 150mm **Amplitude Linearity (±2dB) :** 80Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 60Hz, 20kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 108dB **Crossover Frequency :** 2.8kHz
Input Connectors : Male XLR **Input Sensitivity :** Variable **Input Sensitivity Trim :** 20dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 200 W, **High** 50 W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power on indicator **LF EQ :** +6dB @ 50Hz
Dimensions (HxWxD) : 448 x 270 x 330mm (17.6" x 10.6" x 12.2") **Weight :** 17.5kg / 38.5lbs

ATC reserves the right to vary products and specifications without prior notice.

SCM20ASL PRO: 2-way active

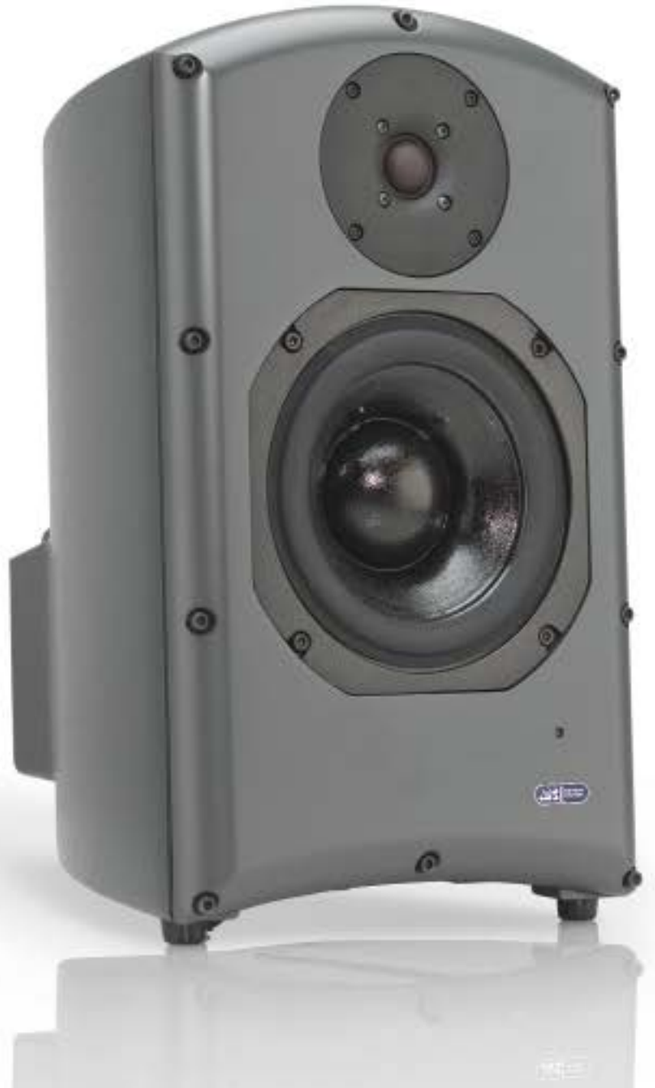
Features

- 25mm soft dome HF unit.
- Full "SL" spec ATC bass driver with integral 75mm soft dome.
- 9kg precision machined and optimised motor assembly.
- LF contour control
- On board ATC built two way 300W amplifier
- Heavily damped Aluminium cabinet
- 6 year warranty

Specifications

Drivers : HF 25mm, Mid/LF 75/150mm **Amplitude Linearity (±2dB) :** 80Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 60Hz, 22kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 108dB **Crossover Frequency :** 2.8kHz
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Sensitivity Trim :** ±6dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 250W, **High** 50W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power On indicator, Gain Reduction warning
LF EQ : +6dB @ 40Hz **Dimensions (HxWxD) :** 448 x 270 x 310mm (17.6" x 10.6" x 12.2") **Weight :** 30kg / 66lbs

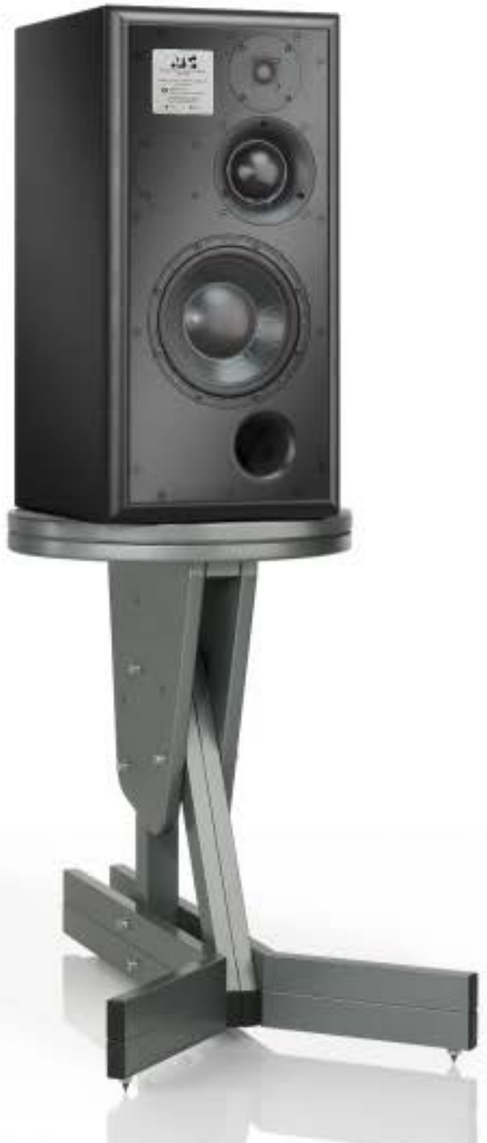
ATC reserves the right to vary products and specifications without prior notice.



SCM50ASL PRO: 3-way active

Features

- 25mm soft dome tweeter.
- Full "SL" spec 9"/234mm bass driver.
- ATC 75mm "Super Dome" mid driver.
- On board ATC grounded plane 350W Tri-amplifier.
- LF contour control.
- Clip indication.
- 6 year warranty.



Specifications

Drivers : HF 25mm, Mid 75mm, LF 234mm **Amplitude Linearity (±2dB) :** 70Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 38Hz, 22kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 112dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Sensitivity Trim :** ±6dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 200W, **Mid** 100W, **High** 50W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power On indicator, Gain Reduction warning
LF EQ : +6dB @ 40Hz **Dimensions (HxWxD) :** 716 x 351 x 400mm (28.2" x 13.8" x 18.8") Depth with amplifier at rear adds 3" **Weight :** 49kg / 107.8lbs

Passive versions available. ATC reserves the right to vary products and specifications without prior notice.

SCM100ASL PRO: 3-way active

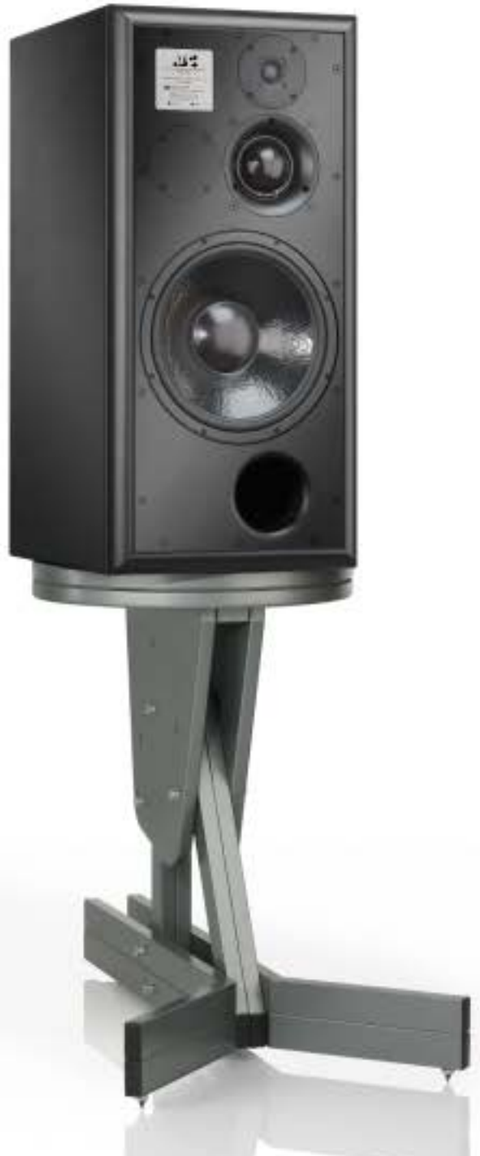
Features

- 25mm soft dome tweeter.
- Full "SL" spec 12"/314mm bass driver.
- ATC 75mm "Super Dome" mid driver.
- On board ATC grounded plane 350W Tri-amplifier.
- LF contour control.
- Clip indication.
- 6 year warranty.

Specifications

Drivers : HF 25mm, Mid 75mm, LF 314mm **Amplitude Linearity (±2dB) :** 65Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 32Hz, 22kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 115dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Sensitivity Trim :** ±6dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 200W, **Mid** 100W, **High** 50W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power On indicator, Gain Reduction warning
LF EQ : +6dB @ 40Hz **Dimensions (HxWxD) :** 832 x 398 x 581mm (32.8" x 15.7" x 22.9") Depth with amplifier at rear adds 3" **Weight :** 65kg / 143lbs

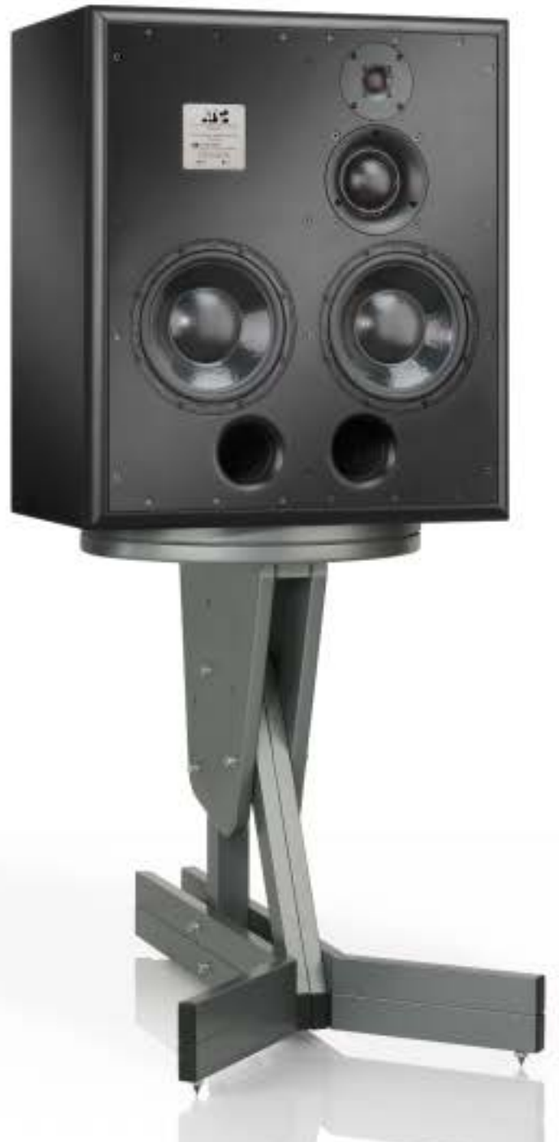
Passive versions available. ATC reserves the right to vary products and specifications without prior notice.



SCM110ASL PRO: 3-way active

Features

- 25mm soft dome tweeter.
- Twin full "SL" spec 9"/234mm bass driver.
- ATC 75mm "Super Dome" mid driver.
- On board ATC grounded plane 350W Tri-amplifier.
- LF contour control.
- Clip indication.
- 6 year warranty.



Specifications

Drivers : HF 25mm, Mid 75mm, LF 2x234mm **Amplitude Linearity (±2dB) :** 50Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 30Hz, 22kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 115dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Sensitivity Trim :** ±6dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 200W, **Mid** 100W, **High** 50W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power On indicator, Gain Reduction warning
LF EQ : +6dB @ 40Hz **Dimensions (HxWxD) :** 715 x 625 x 420mm (28.2" x 24.5" x 16.5") Depth with amplifier at rear adds 3" **Weight :** 73kg / 160.6lbs

Passive versions available. ATC reserves the right to vary products and specifications without prior notice.

SCM150ASL PRO: 3-way active

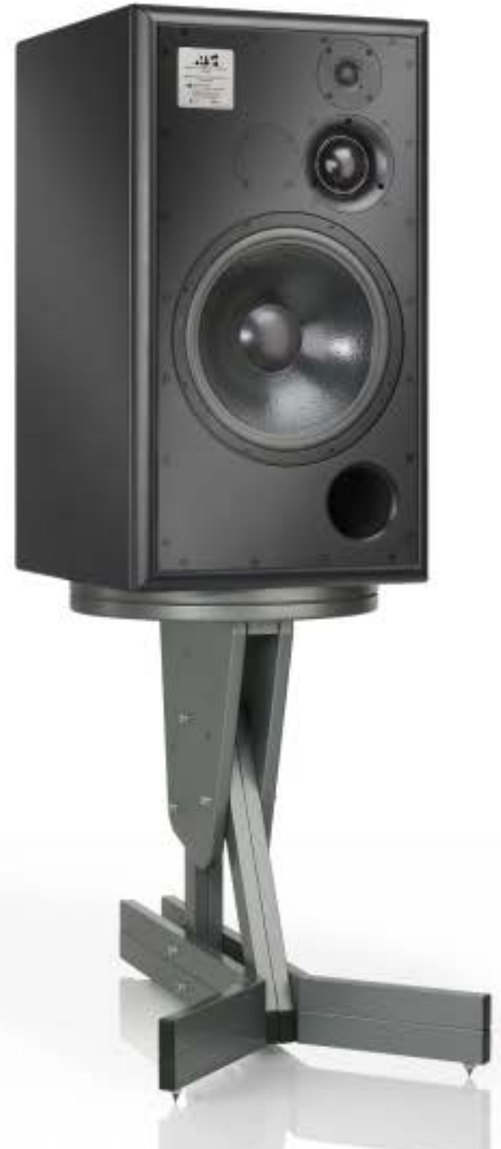
Features

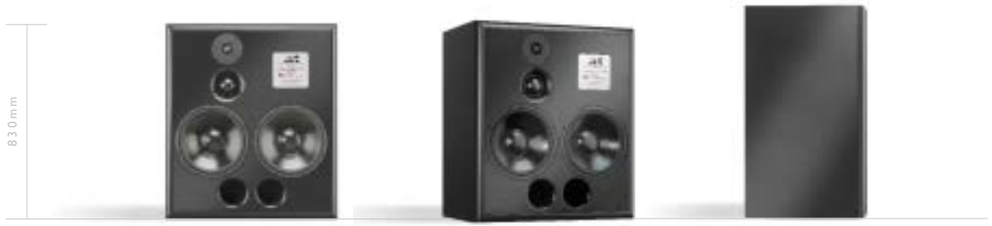
- 25mm soft dome tweeter.
- Full "SL" spec 15″/375mm bass driver.
- ATC 75mm "Super Dome" mid driver.
- On board ATC grounded plane 350W Tri-amplifier.
- LF contour control.
- Clip indication.
- 6 year warranty.

Specifications

Drivers : HF 25mm, Mid 75mm, LF 375mm **Amplitude Linearity (±2dB) :** 60Hz-17kHz **Cut-off Frequencies (-6dB, free-standing) :** 25Hz, 22kHz
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 117dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Sensitivity Trim :** ±6dB **Input Impedance :** Balanced > 10kΩ
Amplifier Output : Bass 200W, **Mid** 100W, **High** 50W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction plus thermal tweeter protection **Front Panel Indicators :** Power On indicator, Gain Reduction warning
LF EQ : +6dB @ 40Hz **Dimensions (HxWxD) :** 884 x 498 x 568mm (34.8″ x 19.6″ x 25.5″) Depth with amplifier at rear adds 3″ **Weight :** 75kg / 165lbs

Passive versions available. ATC reserves the right to vary products and specifications without prior notice.

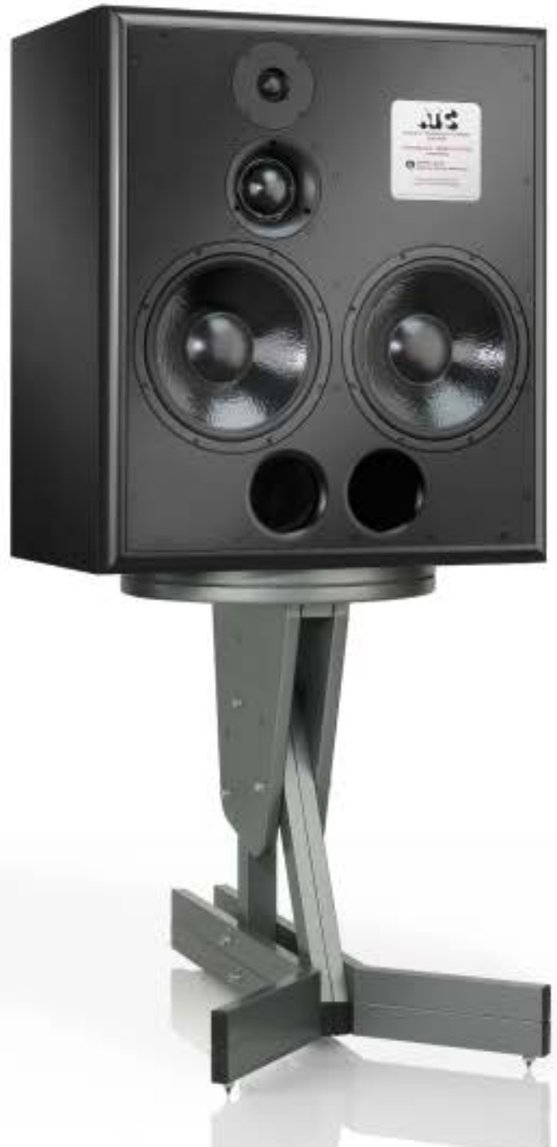




SCM200ASL PRO: 3-way active

Features

- 34mm soft dome tweeter.
- Twin full spec "SL" 12"/314mm bass drivers.
- ATC 75mm "Super Dome" mid driver.
- Rack-mount ATC 4 way grounded plane 850W amplifier.
- Clip indication.
- 6 year warranty.



Specifications

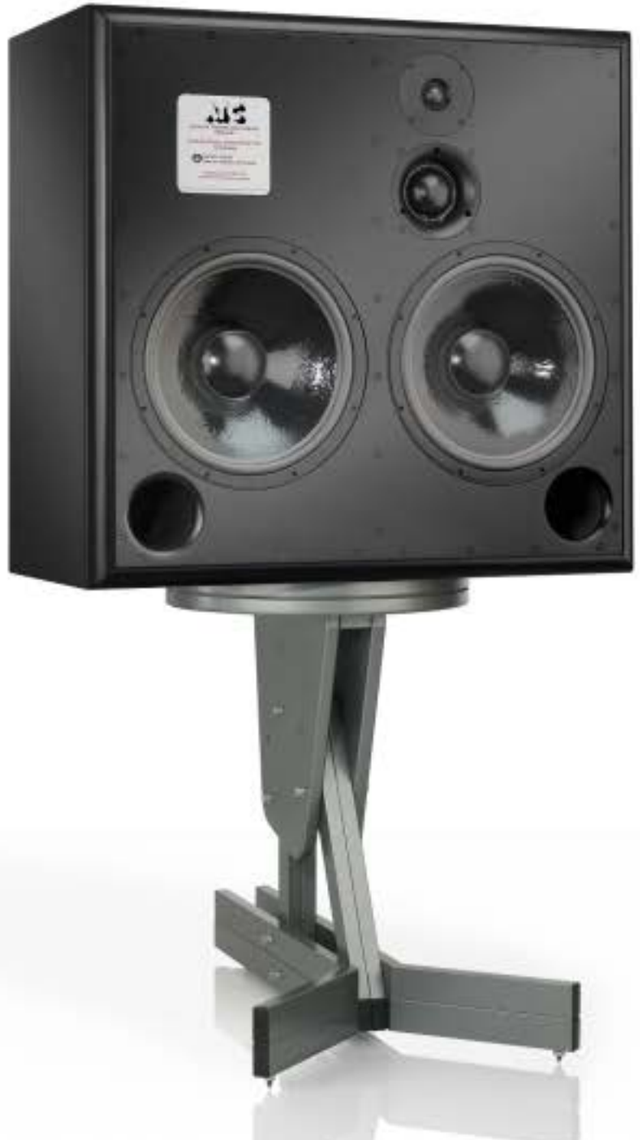
Drivers : HF 34mm, Mid 75mm, LF 2 x 314mm **Amplitude Linearity (±2dB) :** 60Hz-12kHz **Cut-off Frequencies (-6dB) :** 32Hz, 20kHz (free standing) 25Hz, 20kHz (soffit mounted)
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 118dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 2V **Input Impedance :** Balanced > 10kΩ **Amplifier Output : Bass** 275+275W, **Mid** 200W, **High** 100W
Filters : Even Order Critically Damped **Overload Protection :** Active FET momentary gain reduction plus thermal tweeter protection
Front Panel Indicators : Power On indicator, Gain Reduction warning **Dimensions (HxWxD) :** 830 x 730 x 440mm (32.7" x 28.7" x 17.3") **Weight :** 116kg / 255.2lbs

Passive versions available. ATC reserves the right to vary products and specifications without prior notice.

SCM300ASL PRO: 3-way active

Features

- 34mm soft dome tweeter.
- Twin full spec "SL" 15"/375mm bass drivers.
- ATC 75mm "Super Dome" mid driver.
- Rack-mount ATC 4 way grounded plane 850W amplifier.
- Clip indication.
- 6 year warranty.



Specifications

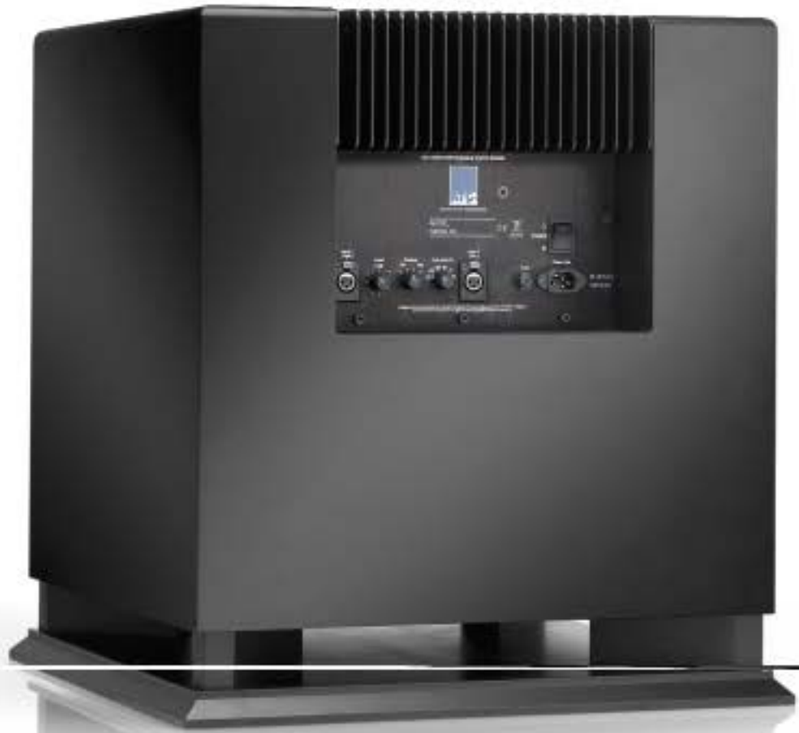
Drivers : HF 34mm, Mid 75mm, LF 2 x 375mm **Amplitude Linearity (±2dB) :** 50Hz-12kHz **Cut-off Frequencies (-6dB) :** 25Hz, 20kHz (free standing) 20Hz, 20kHz (soffit mounted)
Horizontal Dispersion : ±80°, Coherent **Vertical Dispersion :** ±10°, Coherent **Max. Continuous SPL (1 metre) :** 121dB **Crossover Frequencies :** 380Hz, 3.5kHz
Input Connectors : Male XLR **Input Sensitivity :** 2V **Input Impedance :** Balanced > 10kΩ **Amplifier Output : Bass** 275+275W, **Mid** 200W, **High** 100W
Filters : Even Order Critically Damped **Overload Protection :** Active FET momentary gain reduction plus thermal tweeter protection
Front Panel Indicators : Power On indicator, Gain Reduction warning **Dimensions (HxWxD) :** 884 x 925 x 460mm (34.8" x 36.4" x 18.7") **Weight :** 140kg / 308lbs

Passive versions available. ATC reserves the right to vary products and specifications without prior notice.

SCM0.1-15: active sub bass

Features

- Full "SL" spec 15"/375mm bass driver.
- 1000W Class A amplifier.
- Phase adjustment.
- Variable cut off frequency.
- Variable gain.
- Stereo inputs.
- 6 year warranty.



Specifications

Driver : LF 375mm **Amplitude Linearity (±2dB) :** 30Hz-300Hz **Cut-off Frequency (-6dB, free standing) :** 20Hz **Max. Continuous SPL (1 metre) :** 118dB
Input Connectors : Male XLR **Input Sensitivity :** 1V **Input Impedance :** Balanced > 10kΩ **Amplifier Output : Bass** 1000W **Filters :** Even Order Critically Damped
Overload Protection : Active FET momentary gain reduction **Panel Indicators :** Power On indicator
Dimensions (HxWxD) : 631 x 580 x 580mm (24.8" x 22.8" x 22.8") **Weight :** 90kg / 190lbs

ATC reserves the right to vary products and specifications without prior notice.

P 4 : 4-way 850W monoblock power amplifier

Features

- 4-way mono block design.
- ATC “Grounded Plane Technology”.
- 850W Class A to 2/3 output.
- 4th order active crossovers with phase correction.
- Soft limiting driver protection.
- Triple fan cooling.
- Military specification interconnects.
- 6 year warranty.

Specifications

Output Power : HF 100W into 6Ω, Mid 200W into 16Ω, LF 275W x 2 into 8Ω **Input Sensitivity :** 1V **Input Inpedance:** 10kΩ
Frequency Response : 5Hz – 20 kHz ±0.1dB **Signal to Noise Ratio :** Better than 105dB **Crosstalk :** Better than 90dB
Power Requirements : 100, 115, 230 Volts (region dependant 50/60Hz factory set)
Dimensions : 19″ Rack Mounting 5U high (222mm / 8.7″), Overall Depth 545mm (21.4″), Front Panel and Handles 75mm (3″), Rear Handles 40mm (1.6″), Amplifier Body 430mm (16.9″) **Weight :** 40kg approx.

ATC reserves the right to vary products and specifications without prior notice.

The design and development of high performance loudspeakers

The aims of the forefathers of the industry seem to have been completely forgotten and many loudspeakers of todays manufacturers are described as being musically involving, having pace, rhythm and slam or as just being a musical experience, words which might have a definite subjective meaning to the originator, cause confusion and suspicion in the mind of the public, and provide the less scrupulous with a cover for rather cynical products poorly engineered.

To be able to describe a loudspeaker as being of high performance it must comply with a range of related yet quite complicated criteria. These, when detailed, may appear obvious, however, the significance of the following simple ideas and design criteria, and their relative importance to each other in the design of a high performance loudspeaker, are all too often not properly understood.

The performance of a loudspeaker can be defined by its linear and non-linear behavior. Linear performance is defined by the impulse response and non-linear performance by harmonic distortion measurements.

The most important elements to consider in a practical design, which are encompassed by the characteristics of linear and non- linear behavior, are detailed under the following headings: 1. Magnitude Response

2. Phase Response
3. Time Domain Anomalies
4. Dispersion and Directivity
5. Harmonic Distortion
6. Amplitude Intermodulation Distortion
7. Hysteresis Distortion
8. Dynamic Range
9. Motional Impedance

Linear Distortion

1. Magnitude Response

The magnitude response of a loudspeaker, measured using analogue techniques, has been the mainstay of most loudspeaker assessment for decades.

By definition a "Linear Magnitude" refers to a magnitude response that has a constant level with frequency and only then will it not cause any linear distortion. We all know that this is practically not achievable and that the impulse response of a loudspeaker is largely dominated by the low and high frequency roll-off characteristics and by any resonant peaks in the amplitude response.

It is possible, however, to produce loudspeaker systems that maintain a variation in magnitude response within +/- 1.5dB consistently between 100 Hz and 10 kHz and that have an excellent overall balance between bands. We believe that the balance between drive unit frequency bands is critical, particularly between bass and midrange in three way systems, and should always be better than 1dB.

Time is well spent on drive unit development in order to meet this magnitude response limit. It is much more elegant to use properly developed drive units which will then enable the use of simple crossover filters than to use complex equalization in an effort to correct drive unit magnitude response anomalies.

2. Phase Response

As with the magnitude response, the phase response of a system is usually measured on a single reference axis, midway between the bass/mid and high frequency drive units in a two way system and on the axis of the midrange drive unit for a three way system.

A system will be defined as being "Linear Phase" if the phase response is a straight line, when the frequency response has a linear scale and passes through the origin. The effect is then of a true time delay and will therefore not cause any linear distortion.

In practical loudspeaker systems however, the aim is to

design for a minimum phase response free from any abrupt changes that are usually indicative of high Q resonances. Even order frequency dividing networks using Butterworth filters offer the special characteristic that the phase of complimentary low and high pass filters are the same. The result is a greatly improved polar response and therefore improved coherence of the audio signal.

It is also relevant to include here that the delay between drive units due to acoustic centre misalignment is not audible, we believe, for delays below 2 ms. Therefore, providing the overall delay is within 2 ms. and there are no sharp phase response irregularities, then the system should be free from any subjective phase effects. ATC has incorporated analogue phase correction, operating through the crossover regions, in its active loud-speakers since 1982. This is achieved by the addition of an all-pass filter (i.e. one with a magnitude response of unity for all frequencies, but a varying phase response) enabling correction for the delays due to the extra sound path length from the various drive units in a multi drive unit system. Such correction

serves to steer the main radiation lobe at the crossover frequency toward the listener. The result of such active filtering is to give much better control over the filter shapes with greater phase coherence and therefore a more uniform group delay characteristic. The subjective result, when compared with the same loudspeaker system but with a passive crossover, is of a broader and more stable stereo sound field with much more coherent drive unit integration and improved openness and timbre of reproduced sounds.

Digital signal processing promises several advances in phase response manipulation in the future:

A. Linear Phase Crossovers

Delays enables crossover filters to be constructed with a constant group delay, i.e. no changes in phase in the audio band. ▶

B. Excess Phase Equalization

The phase response of a loudspeaker through its low frequency roll-off can be equalized using digital delays producing subjectively a deeper and tighter bass response.

C. Magnitude Response Equalization

Digital signal processing can also be used to equalize a drive units magnitude response. However, in most cases, response anomalies will be polar dependent and therefore not equalizable with a single dimension equalizer. Magnitude equalization should therefore be applied with great caution.

3. Time Domain Anomalies

A high performance loudspeaker should have no high Q or delayed resonance's and must also minimize multiple arrivals of the same signal caused by reflections and diffraction effects as these add a hard and claustrophobic coloration to the sound, masking ambient detail and confusing the stereo image. Time domain anomalies are without doubt the most intrusive and tiring to the listener of all distortions. Careful drive unit and crossover design can ensure a flat and even magnitude response free from any low Q broad band resonances or response irregularities. High Q and delayed resonances however, which are common in hard undamped diaphragms and poorly designed crossover filters, are not so easily ameliorated. In fact the only successful solution is to design heavily damped flexible diaphragm structures having high internal resistance and great structural integrity even under high drive levels.

Best results have been achieved using quite steep curvilinear and domed diaphragms formed from polycotton and acrylic fabrics which are impregnated with plasticized PVA and other viscous damping mediums to control resonant break-up modes which occur at high frequencies.

It is also equally important for the fundamental system resonance to be well damped, that is, have a Q between 0.3 and 0.6.

Loudspeakers with an under damped system resonance produce ill defined bass which sounds uncontrolled and excessive and masks midrange detail.

In fact what is really being said here is that for a high performance loudspeaker all resonant systems should be at least critically damped whether they are due to diaphragm break-up or the fundamental system resonance.

4. Dispersion and Directivity

The relationship between direct and reverberant sound is very important in high performance loudspeakers. It is clear that not only must the on-axis magnitude response be accurate and linear but also that the behavior off-axis must be both broad and even with frequency exhibiting no abrupt dips in amplitude. The aim should be to achieve a horizontal dispersion of +/-80 deg. With a -6dB @ 10KHz and a vertical dispersion of at least +/-10 deg. To ensure that in a well behaved room with a good RT vs frequency characteristic, The reverberant sound will be consistent with the direct sound in the listening area.

To achieve this criteria the highest performance loudspeakers will be either small two way systems with bass/mid drive units up to 160mm diameter or preferably three way designs where the midrange is no more than 75mm diameter and crosses over from the bass drive unit at around 300 Hz. The tweeter in this system should not be greater in diameter than 34mm and should be crossed over from the midrange at around 3 KHz.

In a well behaved room when listening to a stereo pair of loudspeakers with a good relationship between direct and reverbant responses you will first hear the direct sound and then the reverberant field. It is generally agreed and probably true that the reverberant field masks periodic signals, however, it is also apparent that the ear has a precedence effect which means that for impulsive sounds the ear can hear phase dependent effects. Therefore, we believe that any critical judgment of reproduced sound is made principally on the first arrival or direct sound which gives most of the phase related cues and also the low level detail which is quickly lost in the reverberant field.

However, the way we perceive magnitude band balance and the full energy of percussive or impulsive sounds, is dependent upon the power response of the loudspeaker or how evenly it excites the reverberant field with frequency.

Clearly it is impossible to exclude from such a relationship the effect of room acoustics, however, for the purpose of discussing loudspeaker performance we will assume that the listening room has been properly treated and has no serious intrusive acoustic problems.

It should also be stated here that the use of DSP to equalize loudspeaker room interface problems is not an acceptable solution to that problem in critical listening environments if it involves modifying the direct sound from the loudspeaker. A dramatic effect of poor midrange dispersion, common in many two way loudspeaker systems, is demonstrated by recording engineers making incorrect magnitude band judgments and applying equalization, usually to the upper midrange, in an attempt to compensate for the apparent lack of energy in that region. Many examples of pop recordings are available which demonstrate this characteristic. That is, a hard strident upper midrange which masks high frequencies, and makes vocals sound recessed while accentuating the bass.

Non Linear Distortion

5. Harmonic Distortion

Non linear distortion is the product of non-linearity in a system's transfer function. There are three principal sources of non-linear distortion in loudspeakers and they are all related to the drive system.

The first relates to the voice coil and magnet gap geometry and the non-uniformity of the distribution of magnetic lines along the length of the magnet gap. A short coil in a long gap renders the best solution regarding geometry, although not the most commonly used, and the distribution of magnetic lines will be improved by the use of an undercut centre pole. Further advantages of this geometry are the improved heat dissipation and therefore reduced operating temperature of the voice coil as well as a reduction in the variation of voice coil induction in relation to its instantaneous position in the magnet gap.

The second principal source of non-linear distortion is generated in the suspension system of the diaphragm assembly and is mainly contributed to by the spider. The spider presents a number of difficult design compromises when longer excursions are required in high power drive units. It must exhibit high axial compliance while also being progressively resistive towards the extension extremes so as to avoid mechanical damage and at the same time be very stable normal to the axis so as to ensure good voice coil centering in small magnet gap clearances. ▶

The third source of distortion is due principally to the inherently non-linear magnetic performance of steel. The alternating magnetic field created by the voice coil induces eddy currents into both the pole and front plate, adjacent to the coil, of the permanent magnet assembly. These eddy currents flow in such a way as to oppose the magnetic field producing them, (i.e. from the voice coil), and cancel out much of the self inductance.

This mechanism is minimized in ATC bass and bass/mid drive units by the use of a new material, which has the unique properties of high magnetic permeability and saturation as well as low electrical conductivity. We call it a super linear magnet material (SLMM). With this material fitted to the pole and front plate adjacent to the voice coil the eddy currents are suppressed and the impedance (self inductance) increases. The result is that third harmonic distortion is reduced by between 12–15dB.

It is evident from experiment, that distortion caused by eddy currents in the magnet assembly, is worse in long gap than short gap magnets.

In practice it will be careful drive unit magnet system and suspension design that will most effectively minimize non-linear distortion.

Having said all of that, since the main use of loudspeakers is to listen to music and speech, both of which have complex structures dominated by harmonically related tones, the presence of low order harmonic distortion is generally considered to be less audible and more tolerable than other forms of distortion.

6. Amplitude Intermodulation Distortion

Amplitude intermodulation distortion, however, is much more intrusive than harmonic distortion due to the products not being harmonically related to the original sound.

A recent review of active and passive loudspeakers at ATC confirmed that active loudspeakers, due to each drive unit amplifier operating only over a restricted frequency band, will have much lower amplifier borne amplitude intermodulation distortion than the same loudspeaker operated passively driven over the full audio frequency range, in fact, a full 20dB difference.

7. Hysteresis Distortion

The presence of hysteresis distortion implies that the system transfer characteristic is not always singlevalued for a given instantaneous input and will vary with both the change of direction and the level of the input and that it will therefore produce distortion that has a different phase to that produced by harmonic distortion.

Hysteresis distortion, as much as it exists in loudspeaker suspension systems and heavily damped soft diaphragm assemblies, does not manifest itself as an intrusive distortion. It is certainly not particularly evident in other measurements, for example, transient response, magnitude response or in harmonic distortion measurements. In fact, if care is taken over the choice of both diaphragm and suspension materials then they will largely have the characteristics of a simple damped spring and exhibit negligible hysteresis.

8. Dynamic Range

The issue of dynamic range is a complex one and although it is primarily controlled by voice coil operating temperature and magnet total flux it must be considered along with the mechanical integrity and freedom from break-up of the diaphragm and suspension structure. There can be no doubt that system dynamic range significantly effects the clarity of reproduced sound. Even quite simple combinations of instruments, for example a string quartet, will produce a maximum SPL well in excess of 100dB at 2m when starting from just audible pianissimo passages.

A loudspeaker that has significant power compression will tend to sound dull and boomy and the high voice coil temperature and consequent resistance rise will effect the loading of the passive crossover and therefore also modify the magnitude response of the system.

The dynamic range of direct radiating loudspeakers is in fact almost entirely determined by cost. Designers do strive to produce more sensitive small systems through the use of very light diaphragm structures but the scope for maneuver is limited if a correct balance between bass and midrange magnitude response is to be achieved for a given diameter of drive unit. Furthermore, light diaphragm structures almost always have low internal damping and therefore a tendency to exhibit high Q resonances.

To qualify in all respects as a high performance loudspeaker the requirements of dynamic range will for most designs be the largest compromise. A choice, which is made much more difficult as a consequence of the rapid developments in digital electronics

ATC SCM150A active monitors, Blackbird Studios, Nashville

during the past decade. Digital recording mediums offer a huge dynamic range with a peak to average of typically 12–16dB which means that even the most modest loudspeaker wearing the tag "high performance" must be capable of continuous output of at least 94dB at 1m while being driven from an amplifier of 100 watts or more.

9. Motional Impedance

The complex motional impedance of a typical two or three way passive loudspeaker system must have a modulus of impedance which varies within defined limits, never falling below the voice coil resistance. A minimum impedance modulus which does fall below the voice coil resistance indicates a ringing filter in the passive crossover which will cause time domain distortion as well as presenting a difficult load for the driving amplifier. ■

ENGINEERS & PRODUCERS

DOUG SAX
JOHN MC BRIDE
GEORGE MASSENBURG
CHUCK AINLEY
BYRON GALLIMORE
DHANI HARRISON
MATT AITKEN
GREG WALSH
BRUCE LEEK
FRED VOGLER
TONY WASS
STEVE ROSENTHAL
IAN BROUDIE
PETER WALSH
MICHAEL BISHOP
RICH COSTEY
MIKE ROSKELLY
MICK GLOSSOP
STEVE KEMPSTER
JOHN RICHARDS
DENNIS SANDS
JOHN KURLANDER
ROBERT MILES
RYAN ULYATE
FRANK WOLF
JOEL IWATAKI
BOBBY FERNANDEZ
BOB LUDWIG
GAVIN LURSSEN
JAMES GUTHRIE

ARTISTS

MARK KNOPFLER
LENNY KRAVITZ
SKIN
DEEP FOREST
CLINT BLACK
MARTINA MCBRIDE
PINK FLOYD
IAN ANDERSON
TOM PETTY
MANFRED MANN
DANIEL BEDINGFIELD
THE ROLLING STONES
DHANI HARRISON
KATE BUSH
LOU REED
RICK SPRINGFIELD
DAVID and ZIGGY MARLEY

STUDIOS AND SOUNDSTAGES

LURSSEN MASTERING
SONY MUSIC STUDIOS NEW YORK
WARNER BROS CA
POLYGRAM WISELORD HOLLAND
HEATHMANS MASTERING
K&A PRODUCTIONS NAXOS
PIONEER BARCELONA
TELARC RECORDS
PARAMOUNT HOLLYWOOD
THE ASTORIA
ELECTRONIC ARTS
JARVIS RECORDING NEW YORK
DEP INTERNATIONAL
BEACON DUBLIN
ALBERTS LONDON
ANGEL STUDIOS LONDON
CHELSEA NEW YORK
THEIRRY ALLARD BELGIUM
MATRIX LONDON
YORK STREET LONDON
BOOGIEPARK HAMBURG
BRUCE DUNLOP ASSOC LONDON
SIRENSOUND AUDIO ARCHIVING
MONSTER MUSIC MADRID
CRAZY SOUND GUADELOUPE
OORONG JAPAN
YELLOW SHARK CHELTENHAM
EXPAND LONDON
BLACK LAB NASHVILLE
ABKO NEW YORK
SONY SACD NEW YORK
BACKSTAGE NASHVILLE
FLUKE LONDON
SPECTRAL HARMONY BOMBAY
SANCTURY MOBILES
HAMMON TEL AVIV
ZAZA TEL AVIV
LOCO WALES
LAKESIDE SWITZERLAND
HEATHMANS MASTERING LONDON
BLACKBIRD NASHVILLE
LOUD RECORDING NASHVILLE
CRYSTALPHONIC USA
AIR LONDON
BEETHOVEN STREET LONDON
MOLES STUDIO
ARC STUDIO
KASH PRODUCTIONS MADRID
DAIRY LONDON
WILL SHAPLAND MOBILES
SAIN RECORDS
LIQUID SPILLERS HOLLAND
MUTE RECORDS
TODD AO NEW YORK
GROUND CONTROL LOS ANGELES
ANGELL SOUND LONDON
PHOENIX SOUND PINEWOOD LONDON
PLUS XXX PARIS
MOSFILM MOSCOW
DTS
THE PREMISIS LONDON
BEECHPARK STUDIOS DUBLIN
GREAT DIVIDE STUDIOS ASPEN
BRITISH GROVE LONDON
THE MAGIC SHOP NEW YORK
RAINMAKER POST RICHMOND VA
RDB ADLABS KOLKATA
RIVERLIGHT STUDIO'S LONDON
ROYAL PALACE STUDIO, BRUNEI
BALLY SAGOO
PHOENIXSOUND LONDON
LANDSDOWNE
CTS
KEYNOTE ALABAMA
EDISON STUDIOS, NEW YORK
TODD AO LOS ANGELES RADFORD STAGE
DOUG SAX MASTERING OJAI

INSTITUTIONS

LONDON COLLEGE OF MUSIC
US AIRFORCE
CAMBRIDGE UNIVERSITY
CLEVELAND INSTITUTE OF MUSIC
FIFE UNIVERSITY
BIRMINGHAM UNIVERSITY
ESSEX UNIVERSITY
BRISTOL UNIVERSITY
SURREY UNIVERSITY
THE TATE GALLERY
UNIVERSITY OF WALES
COLUMBIA UNIVERSTIY CHICAGO
LIBRARY OF CONGRESS USA
ISTANBUL TECH. UNIVERSITY

CONCERT HALLS

WALT DISNEY CONCERT HALL L.A
THE WIGMORE HALL LONDON
ROYAL OPERA HOUSE LONDON
SYDNEY OPERA HOUSE

ACOUSTIC AND ELECTRONIC ENGINEERS

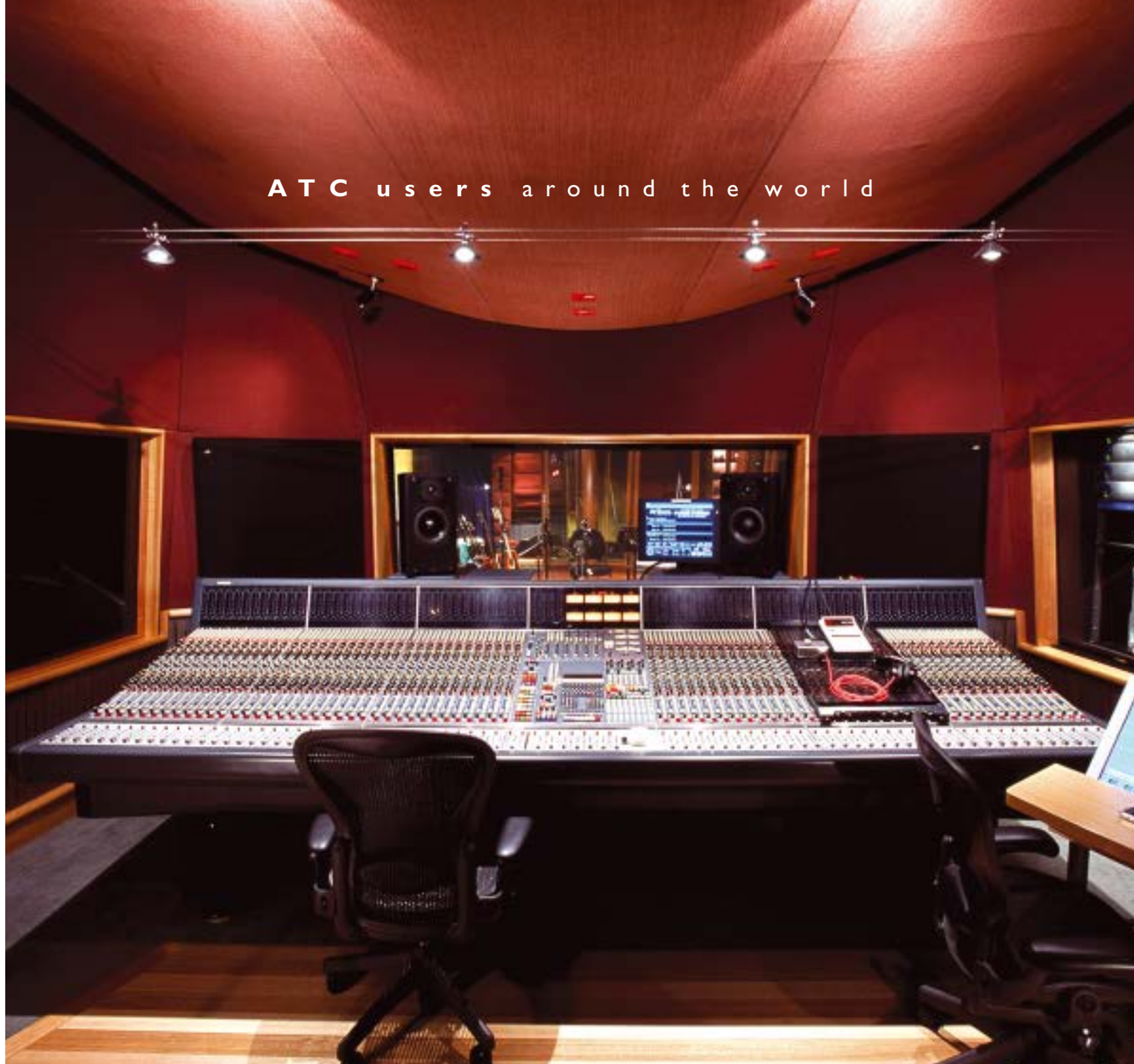
RECORDING ARCHITECHTURE LTD LONDON
SHURE MICROPHONES
CHARLIE BOLOIS VERTIGO RECORDING SERVICES LA
BLACK BOX LTD
RECORDING ARCHITECTURE INDIA PVT LTD
NICK WHITAKER ELECRO-ACOUSTICS
MICHAEL CRONIN ACOUSTIC CONSTRUCTION

CLUBS

AURA LONDON
THE LIVING ROOM NEW YORK
RONNIE SCOTTS
UMBABA
CHINA WHITE
MOVIDA
SILVER
MADDOX

BROADCAST

BBC UK
CARLTON TELEVISION
LONDON POST
SWEDISH RADIO
BROADCAST STATION SAPPORO
LONDON STUDIOS (ITV)
POLISH BROADCAST
CBC CANADA
HOKKAIDO TELEVISION SAPPORO
ASAHI TELEVISION TOKYO
SBS TELEVISION AUSTRALIA
ISHIKAWA TELEVISION JAPAN
TOKAI TELEVISION NAGOYA
FUJI TELEVISION TOKYO
WGBH BOSTON



Loudspeaker Technology Ltd Gypsy Lane, Aston Down, Stroud, Gloucestershire GL6 8HR United Kingdom

Telephone 01285 760561 **Fax** 01285 760683

Email: info@atc.gb.net **Websites:** www.atc.gb.net www.softdome.co.uk