Threshold

1982

technical information sheet

model *S*/150
model *S*/300
model *S*/500
model *S*/1000

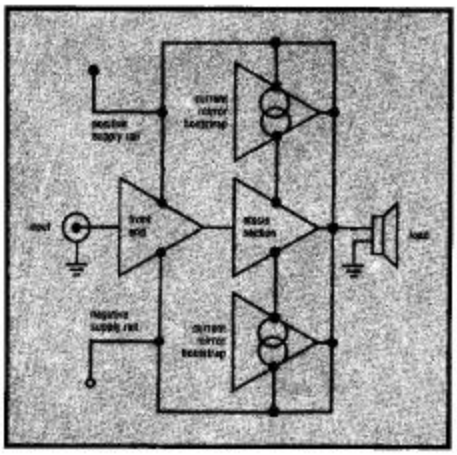
model FET two
model FET one

Because Threshold is constantly researching new materials and technology the option is reserved to incorporate design refinements and/or modifications into existing product lines without notice or obligation.

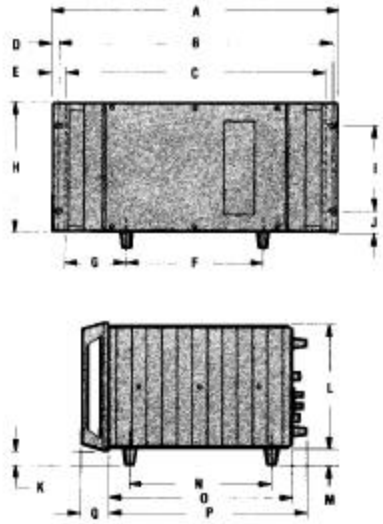
Threshold Corporation

1832 tribute road suite e
sacramento california_ 95815

model *S*/150 model *S*/300 model *S*/500 model *S*/1000



Conceptual block diagram of Threshold STASIS amplifier operation.



dimension	*S*/150	*S*/300	*S*/500	*S*/1000
A	19.00 (48.26)	19.00 (48.26)	19.00 (48.26)	19.00 (48.26)
B	18.20 (46.23)	18.20 (46.23)	18.20 (46.23)	18.20 (46.23)
C	17.24 (43.79)	17.24 (43.79)	17.24 (43.79)	17.24 (43.79)
D	.40 (1.02)	.40 (1.02)	.40 (1.02)	.40 (1.02)
E	.88 (2.24)	.88 (2.24)	.88 (2.24)	.88 (2.24)
F	5.10 (23.11)	5.10 (23.11)	5.10 (23.11)	5.10 (23.11)
G	4.07 (10.34)	4.07 (10.34)	4.07 (10.34)	4.07 (10.34)
H	8.72 (22.15)	8.72 (22.15)	8.72 (22.15)	8.72 (22.15)
I	5.75 (14.60)	5.75 (14.60)	5.75 (14.60)	5.75 (14.60)
J	1.485 (3.77)	1.485 (3.77)	1.485 (3.77)	1.485 (3.77)
K	.945 (1.74)	.945 (1.74)	.945 (1.74)	.945 (1.74)
L	8.31 (21.11)	8.31 (21.11)	8.31 (21.11)	8.31 (21.11)
M	1.05 (2.67)	1.05 (2.67)	1.05 (2.67)	1.05 (2.67)
N	5.40 (13.72)	9.40 (23.88)	13.40 (34.04)	13.40 (34.04)
O	8.125 (20.64)	12.125 (30.80)	16.125 (40.96)	16.125 (40.96)
P	9.125 (23.18)	13.125 (33.34)	17.125 (43.50)	17.125 (43.50)
Q	1.875 (4.76)	1.875 (4.76)	1.875 (4.76)	1.875 (4.76)

decimal inches
(centimeters)

description

All models are a non-inverting, complementary-symmetry audio power amplifier employing Threshold patented constant-voltage/constant-current STASIS circuitry to create a tandem output stage consisting of a linear state system dominating performance accuracy and connected directly to the load, operating in conjunction with a current mirror bootstrap sourcing the working power and also connected directly to the load. STASIS operation shields the power output stage transistors from dynamically induced nonlinearities to achieve an operating accuracy so high that a corrective loop system is not employed around the amplifier. The amplifier output stages are not V/I limited and all specifications will be met into fully reactive loads. Doubly regulated active constant current sourcing is employed at every gain stage. Dual bias circuits eliminate a "warm up" period prior to reaching optimum performance. Power is supplied through a precision, heavy duty toroidal transformer and computer grade electrolytic capacitors. Every completed amplifier channel receives three comprehensive checkouts: twice prior to, and once again after, a "burn-in" period during which the channel is self-oscillated, at power, with a logarithmic wave. *Every* transistor undergoes individual testing and characterization, as necessary, for transconductance, matching, noise, saturation, and voltage breakdown prior to entering parts inventory. Circuits are gold plated over a nickel layer over the base copper path on glass-epoxy boards. Input and output connectors are gold plated. Input connectors are Teflon insulated.

rated output

MODEL *S*/150: 75 watts per channel.
MODEL *S*/300: 150 watts per channel.
MODEL *S*/500: 250 watts per channel.
MODEL *S*/1000: 500 watts.
Rated output is measured into an 8 Ohm load with 120 volt line source, both channels driven for dual channel models.

harmonic and intermodulation distortion

No greater than .1% at rated output for all models.

bandwidth characteristics

−3 dB points: .5 Hz and 100 kHz. ±.1 dB 20 Hz through 20 kHz at rated output for all models.

output transistor complement

MODEL *S*/150: 8 high-speed, 250 watt rated devices per channel.
MODEL *S*/300: 14 high-speed, 250 watt rated devices per channel.
MODEL *S*/500: 22 high-speed, 250 watt rated devices per channel.
MODEL *S*/1000: 44 high-speed 250 watt rated devices.

slew capability

MODEL *S*/1000: 160 volts per microsecond.
ALL OTHER models: 80 volts per microsecond.

instantaneous current capability

MODEL *S*/150: 10 amperes per channel.
MODEL *S*/300: 15 amperes per channel.
MODEL *S*/500: 22 amperes per channel.
MODEL *S*/1000: 30 amperes.

power supply characteristics

MODEL *S*/150: 400 watt toroidal transformer. 30,000 microFarads capacitance. Rail voltages: ±49 volts.
MODEL *S*/300: 700 watt toroidal transformer. 60,000 microFarads capacitance. Rail voltages: ±62 volts.
MODEL *S*/500: 1,000 watt toroidal transformer. 120,000 microFarads capacitance. Rail voltages: ±76 volts.
MODEL *S*/1000: 1,000 watt toroidal transformer. 120,000 microFarads capacitance. Rail voltages: ±62 volts.

input impedance

75 kOhms for all models.

gain factor

ALL MODELS: +26.6 dB.

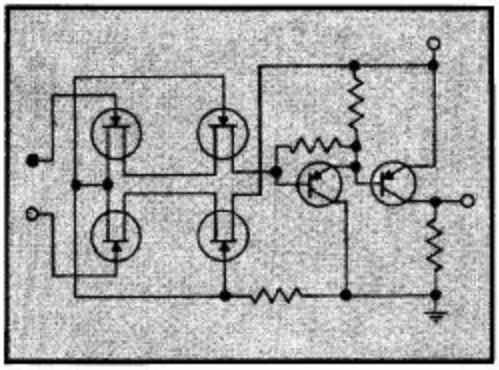
hum and noise

No greater than 200 microvolts at the output for all models.

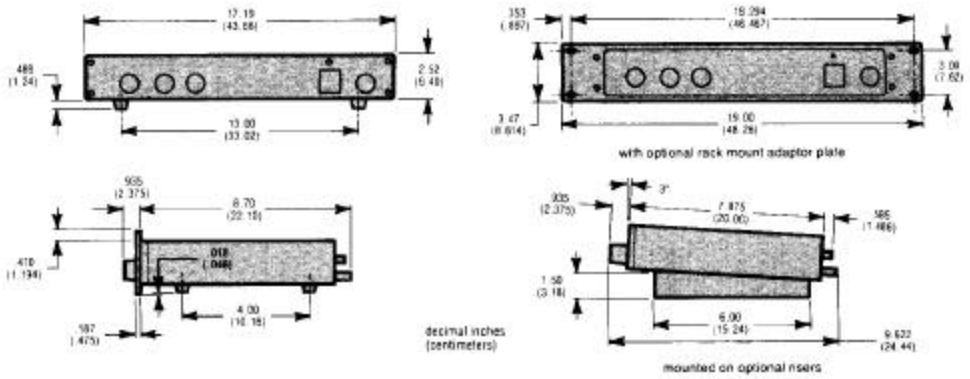
load rating

Recommended minimum load impedance of wideband characteristic: 4 Ohms for all models. All models are capable of operating into fully reactive loads.

model FET two



FET two conceptual schematic.



description

Two channel non-inverting, cascode fet/bipolar preamplifier employing a circuit topology in which the output voltage swing occurs in a single bipolar transistor.

Input loading is provided for both high impedance (moving magnet) and low impedance (moving coil) cartridges having an output of at least .5 millivolts at 5 centimeters per second stylus velocity at 1,000 Hz. Three "line" level inputs are available. Allowance is made for the connection of a tape recorder with instant source or tape monitoring control.

Front panel control functions consist of: Program Selector; Monitor, for source or tape; Channel Balance; Audio Level. Rear panel switching consists of capacitive or impedance matching for low or high impedance cartridges.

Circuit components are selected from among the finest available. All capacitors associated with the signal path are film types. All resistors are precision tolerance metal film devices. Every semiconductor is individually tested and characterized, as necessary, for transconductance, matching, noise, saturation and voltage breakdown. Power supply gain values are individually trimmed. Circuits are gold plated over a nickel layer over the base copper path on glass-epoxy boards. Signal routing is through low capacitance co-axially shielded cable. Control switch contacts are gold plated. All input and output connectors are gold plated and Teflon insulated.

phono section

CARTRIDGE INPUT: High impedance cartridges are provided switch selected capacitive loading of 100 pF or 300 pF. Low impedance, high output cartridges are optimally loaded with 1 kOhm impedance.

RIAA EQUALIZATION: The gain and equalization stages of the phono section employ a combination of active and passive equalization to yield the RIAA playback characteristic. This system achieves exceptional control at low frequencies, with minimum feedback, and the purity of passive equalization at high frequencies through high quality capacitors and resistors outside of the feedback loop. The amplitude and phase accuracy of the RIAA equalization is assured through the selection of high precision components and the referencing of each completed FET two to in-house maintained RIAA pre-emphasis sources. These sources extend their differentiated characteristics to 400 kHz without shelving. The FET two RIAA characteristic itself has a fully integrating curve of 6 dB per octave, without shelving, to past 200 kHz, where it then continues at an increased slope of 12 dB per octave.

ACCURACY: Within .15 dB of Threshold reference RIAA source 20 Hz through 20 kHz.

DISTORTION: Less than .02% at 5 volts preamplifier output into a 10 kOhm load.

high level section

TOPOLOGY: The basic gain stage is comprised of four matched N channel J-fets as a cascoded differential input stage followed by a common-collector and common-emitter bipolar transistor. Both the input pair and the first bipolar transistor operate at essentially constant voltage, virtually eliminating nonlinearities induced through voltage fluctuation, with only the output transistor, serving as the primary voltage swing device, seeing substantial current and voltage variations.

SUPPLY REJECTION: −60 dB.

DISTORTION: Less than .02% at 5 volts preamplifier output into a 10 kOhm load.

SLEW RATE: 25 volts per microsecond.

RISE TIME: 2 microseconds.

OVERLOAD POINT: 14 volts preamplifier output peak.

PREAMPLIFIER OUTPUT IMPEDANCE: 470 Ohms.

power supply section

(performance data relative to 120 volt line source)

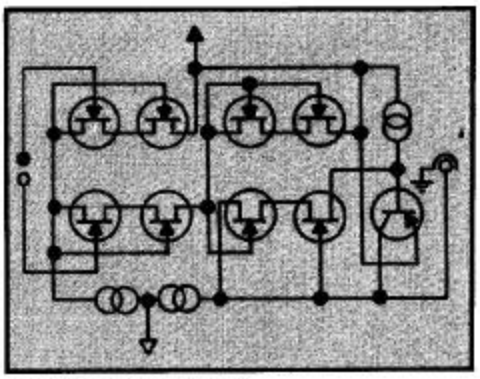
TOPOLOGY: The power supply section uses a large, magnetically shielded toroidal transformer followed by active regulation and passive filtering to achieve a rock stable, low noise dc supply voltage for the signal gain stages. The active regulation employs a doubly regulated voltage reference coupled to a discrete class A gain stage. Following these are mylar film capacitors to passively filter the remaining noise and assure a low active and passive source impedance for the signal gain stages.

SUPPLY VOLTAGE: 40 volts ± .25 volt.

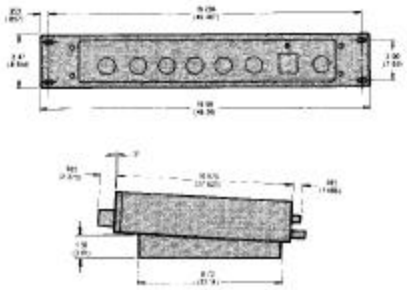
STABILITY: Supply voltage regulation held to within 1% variation over a line voltage of 95 volts to 135 volts.

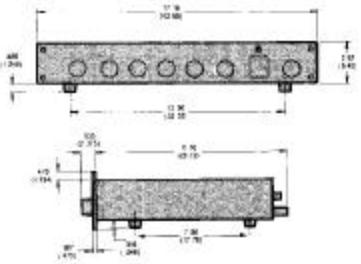
NOISE: Less than 120 microvolts.

model FET one



FET one conceptual schematic.





decimal inches
(centimeters)

description

Two channel, non-inverting, field effect transistor preamplifier employing Threshold patented STASIS constant-voltage/constant-current class A and current bootstrap technology.

Two velocity characteristic cartridge inputs, one for low impedance (moving coil) cartridges and one for high impedance (moving magnet) cartridges, and three "line" level signal inputs are available. Signal inputs/outputs and inter-routing control for the connection of two tape recorders is provided. The preamplifier has dual output connector pairs.

Front panel control functions consist of: Program Selector; Record signal routing; Monitor signal selection; Mode control for stereo, reverse or mono (L+R) signal characteristics; Channel Balance; Audio Level; Power.

Rear panel switching consists of high impedance/low impedance cartridge selection, and capacitive matching for high impedance cartridges.

Components are selected from among the finest available. All capacitors associated with the signal path are film types. All resistors are precision tolerance metal film devices. Every semiconductor is individually tested and characterized, as necessary, for transconductance, matching, noise, saturation and voltage breakdown. RIAA equalization and power supply gain values are individually trimmed using sealed CERMET adjustment pots which are series-parallel shunted by metal film resistors to eliminate, as a factor, wiper contact effects and to avoid possible degradation of the signal. Circuits are gold plated over a nickel layer over the base copper path on glass-epoxy boards. Signal routing is through low capacitance co-axially shielded cable. Control switch contacts are gold plated. All input and output connectors are gold plated and Teflon insulated.

phono section

HIGH IMPEDANCE INPUT: High impedance cartridges look at the extremely high impedance and linear nature of the cascoded input fet of the gain module insuring no source/load interaction. The cartridge sees no rolloff capacitance except as provided by the pF load switch with a selection of 0 pF, 100 pF, and 200 pF.

LOW IMPEDANCE INPUT: Low impedance cartridges within the range of 1 Ohm through 40 Ohms are optimally interfaced to the gain module through an extremely high quality step-up transformer. The transformer utilizes a unique and proprietary core material that exhibits a mere one-fifth the hysteresis distortion found in standard MU 80 cores. Its construction features a multiple interleaved layer winding for low leakage inductance, yielding a flat bandwidth that extends to 170 kHz and which is quite insensitive to upper spectrum noise. High frequency characteristics show only −10 degrees of phase shift at 20 kHz.

Low frequency distortion, traditionally a problem in low impedance transformers, is less than .04% at 50 Hz at approximately one volt output — from a transformer whose actual signal level at this frequency is typically in the range of 10 millivolts. At midband and high frequencies distortion is so low as to not be practically measurable, reaching approximately .004% at one volt output at 1,000 Hz. Faraday electrostatic shields are used between the primary and secondary sections and combined with balanced capacitance in the primary windings eliminate capacitive coupling through the transformer of high frequency environmental noise that is common to the two input leads. The transformer is encased in double MU metal shielding. High gain accuracy is realized along with the unique advantages of transformers: passive characteristics, complete immunity to RF and power supply fluctuations, the lowest noise characteristics and complete lack of noise modulation.

RIAA EQUALIZATION: The gain and equalization stages employ a combination of active and passive equalization to yield the RIAA playback characteristic. This system achieves exceptional control at low frequencies, with minimum feedback, and the purity of passive equalization at high frequencies through high quality polystyrene capacitors and metal film resistors positioned outside the feedback loop. The amplitude and phase accuracy of the RIAA equalization is individually calibrated for each FET one through adjustment of sealed trim potentiometers. These are correlated to high precision, vault reference RIAA pre-emphasis sources. These carefully maintained sources extend their differentiated characteristics to 400 kHz without shelving. The FET one RIAA characteristic itself has a fully integrating curve of 6dB/octave, without shelving, to past 200 kHz where it then continues at an increased slope of 12 dB/octave.

DISTORTION: Less than .01% at 5 volts preamplifier output into a 10 kOhm load.

high level section

TOPOLOGY: The elements comprising each gain circuit are sealed in matched fet arrays that contain eight high precision, performance matched fets, formed on two substrates, and four precision resistors matched to the specific fets of the array. Only one fet of each module supplies voltage gain. Two fets are used as voltage followers. The fourth fet is used as an active constant current source. The remaining four fets are used to maintain the other four in constant voltage operation so that they are shielded from the voltage effects of signal swing and supply characteristics. The input buffer fet is isolated from the feedback loop and achieves its low distortion via its matching to the gain fet. The output buffer fet is current bootstrapped by a bipolar transistor to achieve constant-voltage/constant-current operation identical in concept to Threshold STASIS amplifiers. One additional bipolar transistor is used to source a constant voltage to the gain fet. Each sealed and numbered array provides its own and specific operating conditions for its individual fets.

DISTORTION: Less than .01% at 5 volts preamplifier output into a 10 kOhm load.

SLEW RATE: 25 volts per microsecond.

RISE TIME: 2 microseconds.

SUPPLY REJECTION: −80 dB.

OVERLOAD POINT: 14 volts preamplifier output peak.

PREAMPLIFIER OUTPUT IMPEDANCE: 470 Ohms.

power supply section

(performance data relative to 120 volt line source

TOPOLOGY: The power supply section uses a large magnetically shielded toroidal transformer followed by active regulation and passive filtering. The active regulation employs a doubly regulated voltage reference coupled to a discrete class A cascoded gain stage which separately drives two 10 ampere, 150 watt series-pass bipolar transistors, one for each channel. Following these are large electrolytic capacitors, shunted with polystyrene film capacitors, to passively filter the remaining noise and assure a low active and passive source impedance for the signal gain stages.

SUPPLY VOLTAGE: 40 volts ±.1 volt.

STABILITY: Supply voltage regulation held to within .05% over a line voltage range of 95 volts to 135 volts.

NOISE: Less than 100 microvolts.