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MEITNER PA-6i PREAMPLIFIER

Manufacturer's Specifications

Frequency Response: 1 Hz to 100 kHz, +0, −3 dB.

RIAA Equalization Accuracy: Within 0.2 dB; channels matched within 1%.

THD: Less than 0.01% (−80 dB) from 20 Hz to 20 kHz, at +10 dB output.

IM: Less than 0.01%.

Input Sensitivity: Tuner and AUX/CD inputs, 500 mV; phono, 0.6 mV or higher with MM input module.

S/N (A-Weighted): Line inputs, 96 dB; phono inputs, 80 to 100 dB with MM input module, 75 to 90 dB with MC input module.

Maximum Input Voltage: Line inputs, +26 dB (re: 500 mV); phono input, +30 dB.

Maximum Output Voltage: 8 V into 600 ohms at rated THD.

D.c. Output Offset: ±2 mV, maximum.

Input Impedance: Tuner and AUX/CD inputs, 33 kilohms; tape input, 100 kilohms.

Power Requirements: 117 or 220 V; 50/60 Hz; 20 watts.

Dimensions: 12⅝ in. W × 2 15/16 in. H × 12¾ in. D (32 cm × 7.5 cm × 32.4 cm).

Price: $2,395 with wired remote control, $2,495 with wireless remote.

Company Address: Museatex Audio, 6695 Thimens, St. Laurent, Que., Canada H4S 1W2.

For literature, circle No. 94

The Meitner PA-6i preamplifier is one of several components made by Museatex Audio of Quebec, Canaca. They also make an unusual turntable, a CD player, and two solid-state power amps. Most, if not all, of these are the brainchild of Edmund Meitner, a talented, innovative designer who also is responsible for Amber Electro Design audio test equipment. The preamp and the two power amplifiers are housed in very attractive wooden cabinets of similar appearance and identical size.

What is unusual about the PA-6i is that the front panel is devoid of the usual knobs and pushbuttons that typically control preamplifier functions. This is a remote-control preamp, with input selection, tape monitor, output polarity, mute, balance, and volume all remote operated. Two kinds of remote units are available—wired and wireless. The wired remote has rotary controls for volume and balance; the wireless is more like the usual video controller, with up/down buttons for volume and left/right for balance. On both remotes, other functions are handled by selector pushbuttons. The wired remote plugs into a socket on the back of the preamp; when the wireless remote is used, a separate receiver box plugs into the rear-panel socket.

A vertical row of LEDs on the front panel indicates which input is selected and whether the tape monitor, output phase inversion, and mute are on. Adjacent to these indicator LEDs is a panel area that, when pushed, activates the mute function. On the rear of the PA-6i are two DIN connectors (one for power input from the remote power supply, the other for remote control), two sets of main output jacks, a set of tape in and out jacks, AUX/CD and tuner inputs, and a slot for installing one of three available types of phono-circuit plug-ins. Tiffany signal connectors are used throughout this preamp.

The chassis metalwork is quite simple, consisting of three pieces. The main piece, which forms the bottom of the unit, is bent up to form the front panel. Other bends on the sides of this piece form a mounting surface for the main p.c.

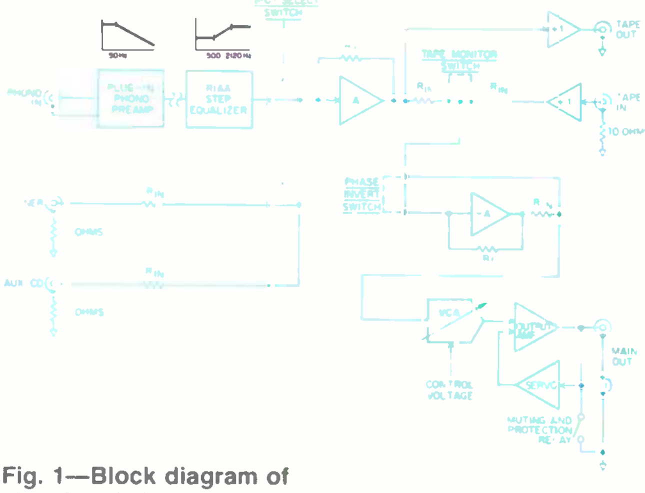

Fig. 1—Block diagram of signal path (one channel shown).

board. A second piece, bent into a shallow "U," serves as the rear panel. A third flat piece joins the top of the front and rear panels as a top cover. The sides of the enclosure are not covered by metal. A beautifully finished shell of highly polished wood, open in front and rear, forms the outer cover of the unit.

The main preamp p.c. board is double-sided (printed traces on both sides) and takes up almost the whole area of the chassis. Numerous parts are mounted on both sides of the board and appear to be of high quality. Compared to the picture in the brochure for the Model PA-6, the PA-6i reviewed here had some visible internal modifications, such as a pair of film capacitors laid flat on the board and shielded with copper foil, multiple transistor devices which are not covered up or potted and are presumably in the voltage-controlled amplifier (VCA) area, and some hand-wired buses used for interconnections on top of the board. The board's traces are not plated, as is usual, because the designer feels that unplated traces sound better. The board is coated with a green solder mask that protects the traces from corrosion. The separate power-supply enclosure houses the power transformer, filter chokes, capacitors, and two three-terminal TO-220 voltage regulators.

Ed Meitner, upon request, provided me with some generalized information on how the PA-6i works. However, no specific circuit schematics with values were given.

The main thing that distinguishes the circuitry in the PA-6i from conventional preamps is the way its signal-switching, volume, and balance functions are accomplished. Input-selection, tape-monitor, and phase-reversal switching are all done with what Meitner calls current-mode FET switches. In Fig. 1, a block diagram of the PA-6i, every place marked "X" is a C-MOS FET switch. By placing the FET switch at the summing junction of an op-amp, the signal voltage on the drain and source of the FET is low because of the "virtual ground" of the summing junction. Further, and more important to the linearity of the "on" resistance of the FET switch, the signal level at the source and drain is low in respect to the d.c. gate-control voltage. In the case of the input selector, only one switch is on at a time. Since the feedback

Signal switching is done with FETs, so there are no mechanical switch contacts in the signal path.

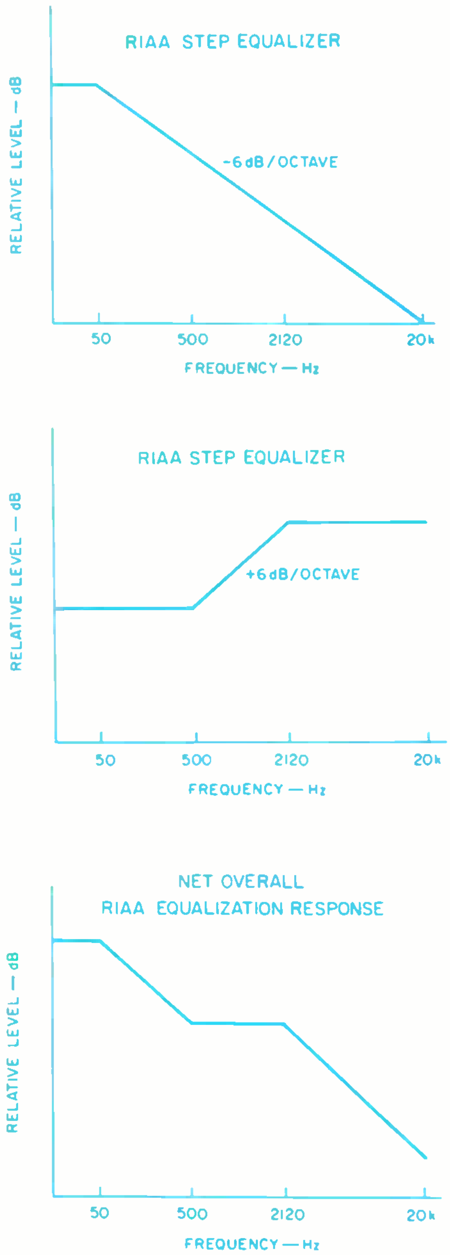

Fig. 2—Two-step phono equalization system used in the PA-6i. Adding the results of the integration circuits on the plug-in phono board (top) to those of the RIAA step equalization circuit on the main board (middle) yields the overall RIAA equalization response shown (bottom).

resistor (R_f in Fig. 1) is the same value as the high-level input resistors (R_{IN}), the selected output is transferred, inverted in polarity, to the output of the selector-switch op-amp. The output of this op-amp is equivalent to the wiper of a conventional selector switch, which usually goes directly to the tape-out jack. In the PA-6i, it feeds this jack through a noninverting, unity-gain buffer amplifier.

The output of the selector-switch op-amp and the buffered tape input, each through its own series resistor and FET switch, feed a new summing junction. This junction feeds a VCA, a circuit whose gain varies with the control voltage applied to it. Depending on which switch is activated, the selected input or tape play will be routed to the VCA summing junction.

Also in series with the tape-monitor/input-signal choice going to the VCA summing junction is a further function choice of signal polarity. If the polarity-inversion function is not activated, the signal from the tape monitor or input selector goes straight into the VCA summing junction. If the polarity-inversion function is activated, the signal is routed to the summing junction of a polarity-inverter amplifier, whose output goes through a summing resistor into the VCA's summing junction. The "Phase" LED is off when the polarity-inverter amp is switched out; by implication, that's the normal output-signal polarity. It's interesting, however, to note that my measurements show the absolute phase of this preamp to be inverted from every input except tape in, at both the main and tape outputs! If one doesn't want polarity to be inverted at the main outputs, the signal must go through another amplifier. Again, for tape recording, all inputs are inverting.

The control signals for all of these switches come from interface circuitry that connects to either the wired remote or the separate receiver box for the wireless remote.

The voltage-controlled amplifier is a circuit whose gain is set by a d.c. control voltage. Here, the VCA serves as the electrical equivalent of the usual mechanical potentiometer, functioning as a volume or balance control. There are two VCAs in a stereo preamp, one for each channel. Balance between channels is achieved by having the balance control alter the relative control voltages to the two VCAs. Design of a good VCA is very difficult. The major problems involve obtaining adequate S/N ratio, low enough distortion, and low control feedthrough (output d.c. surge with changes in d.c. control voltage). Finally, after getting decent measured performance, acceptable sonic quality must also be achieved.

When the wired remote is used, the d.c. control voltages for the VCAs come, in a straightforward manner, from the volume and balance controls in the remote itself. For the wireless remote, the derivation of the d.c. control voltages is a bit more complex. Volume and balance controls are of the up/down pushbutton type, which generate a digital code that modulates an infrared transmitter. Volume and balance are adjusted in increments of 0.25 dB, which means that 0.25 dB of change takes place with each button push. Of course, larger changes of level take place in proportion to the length of time the buttons are pressed. A special button restores balance to center with a single push. In the receiver box that plugs into the PA-6i, the information is demodulated

The RIAA equalization is split in two; half takes place on the main p.c. board and the other half on the plug-in phono board.

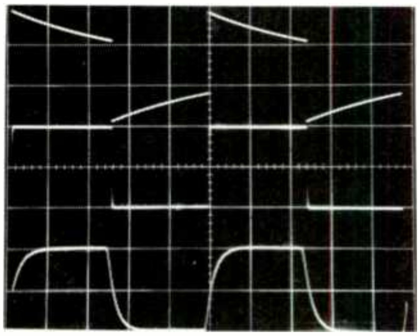

Fig. 3—Line-section response to square waves of 20 Hz (top trace), 1 kHz (middle), and 20 kHz (bottom). See text. Scales: Vertical, 5 V/cm; horizontal (top to bottom), 10 mS/cm, 200 µS/cm, and 10 µS/cm.

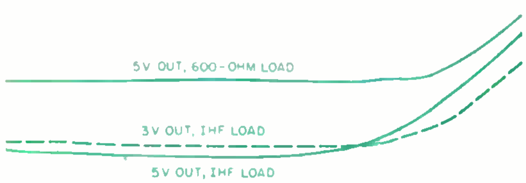

Fig. 4—THD + N (measured over 80-kHz bandwidth) of line section, for various output levels and loads.

and fed into a D/A converter, which generates the appropriate d.c. control voltages for the VCAs.

Following the VCA stage, which is signal-inverting, is the output amplifier (also inverting), resulting in a noninverting configuration from the VCA's input summing junction to the main outputs. A d.c. servo amplifier is applied around the output amplifier to keep d.c. offset to a low value.

A turn-on delay muting circuit operates a relay that automatically shorts the main outputs during turn-on delay or when excessive d.c. is sensed at the main output jacks. If the muting function is engaged, the relay will also mute the output when the volume control is turned down to the bottom 20% of its range, to prevent audible bleedthrough.

Not to be outdone by the rest of the preamp, the phono circuitry is unusual as well. Meitner has three phono system options available for the PA-6i. All three break the generation of the RIAA equalization curve into two parts, in a manner I haven't seen before. As can be seen in Fig. 2, each of the three phono circuits integrates the response above 50 Hz (i.e., response is flat up to 50 Hz, and then a 6-dB/octave roll-off occurs over the rest of the audio range and beyond). In the coupling of the phono circuit boards to the input-selector summing junction, there is, on the main circuit board and common to each type of phono circuit that might be plugged in, an RC step network that boosts frequencies between 500 and 2,120 Hz. The net result, as seen in Fig. 2, is the RIAA equalization playback curve.

To place a constant-bias polarizing voltage on the capacitors associated with generating the RIAA equalization, a circuit technique called charge biasing is employed. This is said to increase the clarity and transparency of the phono circuitry.

The first option for the phono circuit is a straightforward moving-magnet board with high-impedance input. Output from the pickup goes into the noninverting input of an IC op-amp. The 50-Hz roll-off is accomplished in the feedback loop from output to the inverting input of the op-amp, as in the usual feedback equalizer that generates the more complicated complete RIAA curve. Provisions on this particular board allow, via plug jumpers, resistive loading on the pickup of 100 ohms or 1, 10, or 51 kilohms; capacitive loadings of 50, 100, 150, 200, or 250 pF, and a gain selection of ×1, ×2, or ×4.

The second phono circuit is what Meitner calls a "Trans Impedance" moving-coil stage, for cartridges whose output ranges from perhaps 100 to 1,000 µV. This circuit has an input stage ahead of an IC op-amp that looks like an npn-transistor differential-amp topology. Input from the cartridge goes (schematically) into the left-hand transistor. The right-hand transistor is diode-connected, with its collector tied to its base and grounded. The gain of this stage can be selected by plugging in a jumper to short out a resistor between the emitters of the two transistors. The emitters are fed by resistors from a negative supply; the amplifying collector, fed by a resistor from a positive supply, feeds the inverting input of the following op-amp. A parallel RC combination, from the op-amp output to this summing junction, provides the necessary integration above 50 Hz. This circuit has a high input impedance, according to Meitner, and, by looking at the board, it doesn't appear easy to load down the cartridge short of soldering a pair of resistors to the input jacks or to the board itself. The unit reviewed here was sent with the standard moving-magnet board and with the moving-coil board just described.

Probably the most "out there" circuit of all is the third, which is custom-tailored for specific, high-inductance moving-magnet pickups and is available on special order. This circuit provides a specific amount of negative input resistance such that, when subtracted from the positive value of the specific cartridge's winding resistance, a 50-Hz low-

I'm impressed by Meitner's floating-charge power supply. It very cleverly isolates the signal from line and rectifier noise.

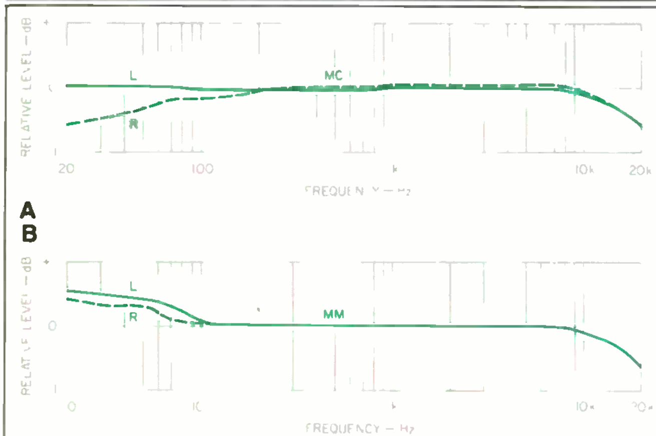

Fig. 5—RIAA phono equalization error for MC board (A) and MM board (B).

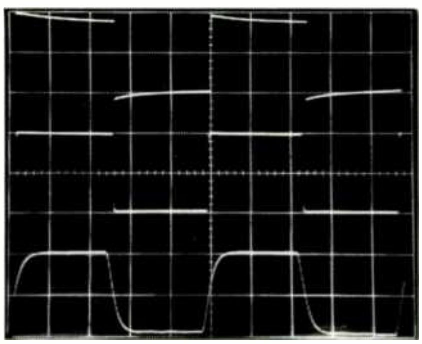

Fig. 6—MC phono response to pre-equalized square waves of 40 Hz (top trace), 1 kHz (middle), and 10 kHz (bottom). Scales: Vertical, 0.5 V/cm; horizontal (top to bottom), 5 mS/cm, 200 μS/cm, and 20 μS/cm.

pass filter with 6-dB/octave slope is formed by the cartridge's inductance against the net positive circuit resistance. Topologically, this is accomplished, again, by an IC op-amp connected with a resistor from output to the inverting input (which is also the cartridge signal input). A resistor of similar value is connected from output to the noninverting input of the op-amp. A small-value resistor, selected for the particular cartridge model, is connected from the noninverting input to ground. This latter is a positive feedback loop and causes the impedance in the inverting input (which is normally low in value and positive in magnitude) to assume the required negative input resistance. A small capacitor across the feedback resistor that goes to the inverting input helps to equalize out a mild rising response in the high end; this rise is due to the elimination of the usual LRC low-pass filter network formed by the L of the pickup, the 47-kilohm resistive loading, and perhaps 50 to 200 pF of cable capacitance. This circuit is covered by a U.S. patent assigned to Amber Electro Design of Montreal, Canada, with Edmund Meitner and Howard Burman as co-inventors.

The power supply of the PA-6i also is innovative, employing a design concept that Meitner calls "floating charge." Inductors separate the bipolar, capacitor-input, unregulated power supply from the final filter and TO-220 regulators. The beauty of this arrangement is that it isolates the regulators and preamp circuitry from rectifier circuits whose current and voltage waveforms have high harmonic content, and from high-frequency line hash. The regulators need only contend with virtually sinusoidal 120-Hz ripple voltages, at lower amplitude than is the case with conventional rectifier/regulator circuitry. The sound is much nicer if 120-Hz ripple signals with high harmonic content are not circulating within the IC regulators, potentially modulating the signal currents being regulated. A very clever idea, this power supply—I'm impressed.

Measurements

Line-section gain was measured with three loads: Instrument (91 kilohms in parallel with 200 pF), IHF (10 kilohms in parallel with 1,000 pF), and 600 ohms. By slightly adjusting the balance control, both channels were trimmed to have the same gain. Results were 9.4× (+19.46 dB) with the instrument load, 9.3× (+19.37 dB) with the IHF load, and 8.5× (+18.59 dB) with the 600-ohm load. Output impedance of the main outputs was about 60 ohms.

Not mentioned in the circuit description is the presence, on the p.c. board, of three one-turn pots that adjust line-level gain or sensitivity in order to equalize the two-high-level signal sources and phono. These pots are presumably switched in along with the input selection and affect the VCA gain range independently of the volume and balance controls. The line-selection gain just mentioned was measured with these pots centered, as supplied by Meitner. It was found that the line-level gain could be varied about ±10 dB from this factory-set midpoint. In effect, the line-section gain is variable from +10 to +30 dB, separately and independently for phono and the two high-level inputs. The balance control, at its extremes, raised the favored channel's gain by about 6 dB and attenuated the other channel by about 6 dB from center values.

Frequency response, with volume at maximum and balance centered, was down 1 dB at 10 Hz, 0.25 dB at 20 Hz, 0.3 dB at 20 kHz, 2.35 dB at 60 kHz, and 4.8 dB at 100 kHz. No difference was found between response with instrument and IHF loads. With the volume set for 20-dB attenuation from maximum gain, the output at 100 kHz was down 0.2 dB more. A pair of plug jumpers in the output amplifier affects the low-frequency response of that circuit; the response just quoted was with the jumpers in the 3-Hz (−3 dB) position. The other position lowers the output amp's cutoff frequency

Auditioning the Meitner was a satisfying audio experience. The PA-6i serves the music well.

Table I—Gain and sensitivity for IHF load. Gain figures for instrument load are 0.1 dB higher at main output, 0.5 dB higher at tape out.

	Gain, dB	IHF Sens., mV
AUX to Main Out		
Low Gain	9.3	171.0
Medium Gain	19.5	53.5
High Gain	29.4	17.0
AUX to Tape Out	−0.5	540.0
Phono to Main Out, High Line-Amp Gain		
MM, ×1 Setting	73.9	0.10
MM, ×2 Setting	77.5	0.066
MM, ×4 Setting	83.4	0.033
MC, ×1 Setting	84.5	0.030
MC, ×2 Setting	90.7	0.0145
Phono to Main Out, Medium Line-Amp Gain		
MM, ×1 Setting	64.1	0.32
MM, ×2 Setting	67.7	0.21
MM, ×4 Setting	73.5	0.108
MC, ×1 Setting	74.6	0.092
MC, ×2 Setting	81.0	0.045
Phono to Main Out, Low Line-Amp Gain		
MM, ×1 Setting	54.3	0.98
MM, ×2 Setting	57.8	0.65
MM, ×4 Setting	63.7	0.33
MC, ×1 Setting	64.7	0.292
MC, ×2 Setting	71.0	0.145
Phono to Tape Out		
MM, ×1 Setting	44.2	3.09
MM, ×2 Setting	47.7	2.06
MM, ×4 Setting	53.7	1.03
MC, ×1 Setting	54.8	0.91
MC, ×2 Setting	61.1	0.44

to 0.1 Hz. Rise- and fall-times were 4.4 µS at maximum gain and 4.8 µS with the volume down 20 dB. Waveform was exponential (normal) from small signal levels up to clipping. Square-wave responses of the line section are shown in Fig. 3. The 20-Hz waveform was obtained with the 3-Hz, low-frequency jumper-plug setting. Tilt would be about one-third as much with the 0.1-Hz setting.

Channel-to-channel crosstalk was measured with the volume at maximum and with it set 20 dB down. In general, crosstalk was worse in the left-to-right direction and was measurably poorer at full gain. In the left-to-right direction and at full gain, crosstalk was down more than 83 dB up to 1 kHz, decreasing to −77.6 dB at 5 kHz, −66.6 dB at 20 kHz, and −59.5 dB at 50 kHz. In the right-to-left direction, crosstalk was better: Down 82.5 dB or more up to 20 kHz, decreasing to about 80 dB at 50 kHz. With the gain down 20 dB, crosstalk improved some 3 to 8 dB, depending on frequency. In all cases, crosstalk was in-phase.

The IHF S/N ratio (A-weighted noise below 0.5 V output, with unity gain at 1 kHz) was −83.7 and −83.5 dB for left and right channels, respectively, with line-amp gain set at normal (approximately 20 dB).

Volume-control tracking was found to be within 0.2 dB, down to the −30 dB volume setting, decreasing to 0.4 dB at −55 dB. What's being measured here, of course, is not really the tracking of a traditional, dual-element volume pot, but the precision with which the gain of the two VCAs tracks changes in a common control voltage.

Much to my surprise, maximum attenuation with the volume fully counterclockwise was only about −57 dB. With the mute function engaged, the output-shorting relays come on when the rotary control on the wired remote is set at or below about the 9 o'clock position.

Harmonic distortion of the line section as a function of frequency is shown in Fig. 4 for several output levels and loads. This unit will drive 600 ohms very nicely. Harmonic residue with IHF or instrument loading was dominantly second harmonic, while with a 600-ohm load, distortion content was mostly second and third. Clipping occurs at about 9.5 V rms for IHF or higher loads, and the negative half-cycle clips first. At 20 kHz, there is a mild degree of sticking on the positive half-cycle when clipping. Input impedance was 30 kilohms for line-level inputs and 100 kilohms for the tape input.

As can be seen in the block diagram, there is a buffer feeding the tape-out jacks. Output impedance was found to be about 600 ohms, and clipping level into IHF loads was 9 to 10 V rms. Low-frequency response at tape out extends down to d.c.

Gain and IHF sensitivity are shown in Table I. Phono RIAA equalization errors for the two boards I tested are plotted in Figs. 5A and 5B, as measured at the tape output. Oscilloscope photos of square-wave response through the MC board, as measured at the tape output, are depicted in Fig. 6.

Phono overload versus frequency and load is tabulated in Table II for both the MM and MC plug-in boards. Overload for the MC circuit showed up as an aberration near the negative peak up to about 500 or 600 Hz, and above about 600 Hz was simple peak clipping of the negative half-cycle. Above 15 or 20 kHz, the output waveform was turning into a symmetrical triangle wave, a sign of slewing. Overload in the MM circuit was peak clipping, with the positive half-cycle clipping first, below about 300 Hz. Above 500 or 600 Hz, the negative half-cycle clipped first.

Crosstalk as a function of frequency, for both phono circuits terminated with 100 ohms, was better than 80 dB from 20 Hz to 20 kHz. In the MM unit, with the undriven channel terminated in the IHF dummy moving-magnet source, crosstalk was better than 80 dB from 20 Hz to 30 kHz in the L-R direction. In the R-L direction, it was better than 80 dB up to 10 kHz, decreasing to −78.5 dB at 20 kHz and −76.5 dB at 30 kHz. Crosstalk was in-phase. These results are outstanding.

Referred input-noise levels for the two phono circuits are listed in Table III. IHF S/N ratios are shown in Table IV. Noise levels are quite good here, but not state of the art.

For the MM board, THD + N was found to be less than 0.01% at 5 V rms output from 20 Hz to 10 kHz, with either IHF or higher loading. At 20 kHz, distortion rose to 0.015%.

Use and Listening Tests

Equipment used to evaluate the PA-6i consisted of an Oracle turntable fitted with a Well Tempered arm and a Koetsu Black Goldline cartridge, a California Audio Labs

The Meitner PA-6i is a very good, listenable preamp, and I have been favorably impressed with its sound.

Tempest CD player, a Nakamichi 250 cassette deck, and Siefert Research Magnum III speakers. Power amplifiers included my own 845 triode 100-watt Class-A mono amps, a YBA_1, and a Motif MS100. Preamps on hand were a Sumo Athena and a Motif MC8. During the review period, I also had occasional use of a Cook-King tube phono preamp, owned by a friend.

First of all, it's great to have remote control of volume and balance at one's listening position! After you get used to it, it's hard to give up. Subtle changes of volume and balance, while one is in position and critically listening, help get the most out of each recording. I found that I preferred the wired remote, with its real rotary controls for volume and balance. The wireless remote, while neat, doesn't make it for me, with its up/down pushbutton controls for volume and balance. One thing that takes a bit of getting used to is the time constant on the PA-6i's VCA control voltage. When volume or balance settings are changed abruptly, it takes about 1 or 2 S for the changes in actual gain to catch up. All functions worked very nicely, with no hangups or surprises in practice. In the lab, however, I was able to paralyze the controls in a manner that required the unit be turned off and on again to recover.

I approached the sonic evaluation of this preamp by listening to how the line section altered the sound of CD reproduction, as compared to listening to the CD player

Table II—Phono overload vs. frequency and load at tape out (left channel).

	MC BOARD, ×1 GAIN SETTING			
	Instrument Load		**IHF Load**	
Frequency, Hz	**Input, mV**	**Output, V**	**Input, mV**	**Output, V**
20	1.25	6.5	1.32	6.0
50	1.60	6.3	1.66	5.8
100	2.52	6.35	2.58	6.0
300	6.9	7.2	7.0	6.8
600	13.2	9.2	13.5	8.8
1k	16.8	9.35	16.8	8.75
3k	29.0	9.35	29.0	8.75
5k	43.5	9.15	43.5	8.6
7k	61.5	9.1	61.5	8.55
10k	100.0	8.9	100.0	8.35
20k	135.0	4.8	135.0	4.55

	MM BOARD, ×2 GAIN SETTING			
	Instrument Load		**IHF Load**	
Frequency, Hz	**Input, mV**	**Output, V**	**Input, mV**	**Output, V**
20	3.0	7.3	3.0	6.9
50	3.9	7.2	3.9	6.8
100	6.2	7.25	6.2	6.85
300	17.0	8.25	17.0	7.75
600	29.2	9.35	29.2	8.8
1k	36.0	9.35	36.0	8.75
3k	62.0	9.4	62.0	8.8
5k	91.0	9.25	91.0	8.7
7k	123.0	9.3	123.0	8.75
10k	178.0	9.4	178.0	8.8
20k	355.0	9.4	355.0	8.75

Table III—Phono-section noise, referred to input.

Bandwidth	**Source Impedance, Ohms**	**Referred Input Noise, µV** LEFT	RIGHT
MM BOARD, ×2 GAIN			
Wide-band	0	0.45	0.425
Wide-band	1k	0.625	0.6
Wide-band	IHF MM	1.5	1.5
20 Hz to 20 kHz	0	0.375	0.35
20 Hz to 20 kHz	1k	0.525	0.525
20 Hz to 20 kHz	IHF MM	1.5	1.5
400 Hz to 20 kHz	0	0.23	0.22
400 Hz to 20 kHz	1k	0.31	0.30
400 Hz to 20 kHz	IHF MM	1.0	0.95
MC BOARD, ×1 GAIN			
Wide-band	0	0.25	0.25
Wide-band	100	0.30	0.30
20 Hz to 20 kHz	0	0.16	0.145
20 Hz to 20 kHz	100	0.19	0.18
400 Hz to 20 kHz	0	0.09	0.086
400 Hz to 20 kHz	100	0.11	0.107

Table IV—S/N, phono section.

Phono Board	**Source Impedance, Ohms**	**IHF S/N, dB** LEFT	RIGHT
MC, ×1 Gain	100	73.5	73.5
MM, ×2 Gain	IHF	76.0	75.5

through the best volume control I've heard yet, a pair of switched attenuators, made by a friend of mine, which directly drive the system's power amplifier. Compared to this reference condition, going through the line section of the PA-6i took away some of the openness and "thereness," and added a mild bit of edginess. Depending on such variables as my mood, when I did it, what program material was playing, and so on, the effect ranged from "there's no contest!" to "mild but noticeable." I have listened to a lot of CDs, tapes, and tuners through the line section of this preamp, and my overall impression is that it's pretty good and doesn't destroy the essence of the music, which occurs too often.

Listening to records using the MC phono circuit and going through the whole preamp was also a satisfying musical experience. If one bypasses the line section and goes through the stepped volume-control attenuators into the power amp, the sound is more open and transparent. With the reference tube preamp used to feed the external volume control and power amp, the sound was more relaxed, easier, and more real and "there" in the room.

I consider the PA-6i to be a very good, listenable preamp. It serves the music well. I have heard one of these units driving the Meitner power amplifiers a number of times at hi-fi shows, and have always been favorably impressed with the sound. I recommend that prospective preamp buyers give the Meitner gear a listen. *Bascom H. King*