



**AUDIO TECHNOLOGIES INCORPORATED**

DEDICATED TO SOUND ENGINEERING

**OPERATION  
AND  
MAINTENANCE  
MANUAL**

### EQUIPMENT INSPECTION

WITHIN SEVEN DAYS OF RECEIPT of this equipment it should be unpacked and checked for concealed damage. If damage is found, notify the delivering carrier immediately and request an inspection report in writing. Claims for loss or damage cannot be handled without a timely inspection report from the carrier. Forward the original copy of the inspection report to ATI along with a letter detailing the extent of the damage.

### THREE YEAR LIMITED WARRANTY

AUDIO TECHNOLOGIES INCORPORATED (ATI) warrants this product to be free of defects in material or workmanship and to perform to published specifications. ATI warrants all electronic components (wear items excepted) for a period of three years from date of purchase. Wear items such as lamps, fuses, panel controls, connectors, panels and cases carry a one year warranty. All warranties extend only to the original user.

Upon notification within the applicable warranty period, ATI agrees without charge to repair, replace or supply replacement parts for such equipment or parts determined to be defective in materials or workmanship and that are returned in accordance with ATI's instructions to the purchaser. At ATI's sole discretion, the purchaser may be requested to return the defective part to ATI, FOB factory, for defect analysis or for return to the part manufacturer. Parts or equipment may be returned only with prior authorization from ATI and must be identified by a RETURN AUTHORIZATION NUMBER issued by the customer service department. All merchandise returned must be sent prepaid and insured, collect shipments will not be accepted. Full details of the defect or malfunction should be included with the shipment to expedite diagnosis and repair. Warranty repair parts or repaired or replaced equipment will be returned to the customer with shipping charges prepaid by ATI.

This warranty is void if modifications or repairs are made without specific prior authorization from ATI or if in ATI's opinion the equipment has been subject to maltreatment, exposure, excessive moisture, powerline overvoltage or any other environmental conditions or circumstances other than those specifically described in ATI literature or instruction books.

No other warranties are expressed or implied. No dealer or agent is authorized to make any other or additional guarantee or warranty.

### WARRANTY AND REPLACEMENT PARTS

When requesting warranty or replacement parts, please supply the following information: Unit Model Number, Unit Serial Number, Purchase Date, Reference Part Symbol Number and Description, Value, etc.

Replacement parts may be ordered from:

AUDIO TECHNOLOGIES INCORPORATED  
PARTS AND ACCESSORIES DEPT.  
328 West Maple Avenue  
Horsham, Pa. 19044  
(215) 443-0330

Non-warranty replacement parts are subject to a \$10.00 minimum billing.



AUDIO TECHNOLOGIES INCORPORATED

OPERATION  
AND  
MAINTENANCE MANUAL

VU1000

*MicroMeter*

LINE SELECTOR

LEVEL METER

LINE DRIVER

and

MONITOR AMPLIFIER

ATI reserves the right to upgrade equipment performance by making design improvements, and also reserves the right to make production modifications which do not affect equipment operation without prior notification and without incurring liability to upgrade previous productions runs.

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VU1000 Pg. 1



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Congratulations on your acquisition of ATI equipment. Since ATI does not have the biggest name, the most dealers, the fanciest advertising, or the lowest prices, we must assume that your ATI MicroMeter has been purchased because you have searched diligently for the BEST EQUIPMENT to do your job. Congratulations on finding us, we will do our utmost to merit your confidence.

If you have comments or complaints, suggestions or sarcasm, praise or panic, please call us direct at (215) 443-0330 (no panics accepted before morning coffee).

Thank you for selecting ATI.

A handwritten signature in black ink, appearing to read "Ed &amp; Sam", is written over a horizontal line.

Ed Mullin & Sam Wenzel  
Audio Technologies Inc.

EM/SW: ms

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DESCRIPTION

This section is strictly written to boost the designers ego by letting him tell you of some of the clever things we have done inside the MicroMeter. It may be skipped by anyone having better to do.

For many years engineers (ourselves included) have been using operational amplifier ICs in audio circuitry. These ICs, developed primarily for the instrumentation market, had many shortcomings when used in high quality audio applications. The lack of audio related specifications, crossover distortion, high noise for low source impedances, limited output capability and limited gain bandwidth product forced many compromises when used in audio systems. High ratio input transformers, output boost stages and multiple stage designs were all used to compensate for op amp deficiencies and in turn added additional response and distortion problems of their own.

Walter Jung in a definitive series of articles<sup>1</sup> analyzed and defined slew rate induced distortion mechanisms, tested many commonly available ICs and correlated various distortion tests with subjective (listening) criteria. A very significant result of his efforts was the identification of an IC originally developed for the European professional audio market which has almost ideal characteristics for audio use and in particular provides a high slew rate capability of 13 volts/microsecond, virtually eliminating slew induced Transient Intermodulation Distortion. By contrast the old standard 741 op amp has a slew rate of only .6V/microsecond.

This op amp is now available from several U.S. Manufacturers in single and dual versions and forms the basis for our MicroAmp designs. This chip incorporates an input stage designed for excellent noise performance with a wide range of source impedances. It has an output stage capable of driving 600 ohm loads directly to +22 dBm with total freedom from crossover distortion. High inherent linearity, 100 db open loop gain and 50 Mhz gain bandwidth product make this an ideal device for highest quality audio. The absence of Transient Intermodulation Distortion may be detected by the smooth effortless high frequency output capability, the absence of the harsh, raspy sound typical of IC amplifiers driven to full output at high frequencies and the freedom from increasing harmonic distortion vs. frequency. As used in the MicroAmp a minimum of 40 db of loop gain is available for 100:1 distortion reduction even at 20 Khz. All program output stages in the MicroAmp Amplifiers use this unique device in its dual version (NE5533).

<sup>1</sup>Walter Jung "Slewing Induced Distortion in Audio Amplifiers" The Audio Amateur 1977.

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## AUDIO TECHNOLOGIES INCORPORATED

### SYSTEM OVERVIEW

The INPUT SELECT pushbutton drives the INPUT indicator and an eight input analog multiplexer. The multiplexer samples the outputs of eight balanced differential input stages and feeds the selected audio input to the meter amplifier. The gain of the meter amplifier is controlled by the front panel 0 VU CAL switch and can be set so that line input levels of -10, 0, +4, +8, or +18 dBm will produce 0 VU indications on the LED Bargraph meter. The front panel DISPLAY RESPONSE switch controls the time constants of a network in the meter drive circuit to allow close visual approximations to the ballistic characteristics of VU meters (SLOW), fast reading indicators (AVG) and PPM meters (PEAK).

A line level output is also derived from meter amplifier. The line amplifier is arranged such that 0 VU meter indication on any range will produce a constant line output level. This constant level can be selected by internal plug jumper to be 0, +4, or +8 dBm.

A monitoring amplifier feed is taken from the multiplexer output through the front panel MONITOR LEVEL control. The VU1000-1 provides a monitor output sufficient to drive 600 ohm and higher impedance headphones through the front panel phone jack and provides an output at the rear terminal block which can drive an external power amplifier. An ATI MA1000 MicroMonitor will mount side-by-side with the VU1000 and provide a 25 watt monaural output into an eight ohm speaker load. The VU1000-2 provides its own internal 6 watt power amplifier suitable for driving LO-Z headphones or a 8 ohm external speaker. The external monitor output is interrupted whenever headphones are plugged in.

### CONTROL LOGIC

A 2 Hz oscillator, gated by the INPUT SELECT switch, is formed from three CMOS inverters of A14. The oscillator drives the binary counter A15 to generate a three bit binary code. The three binary data lines plus an ENABLE line are applied to the analog multiplexer A6 to select one of the eight inputs. The ENABLE line blocks audio transmission through A6 while the INPUT SELECT pushbutton is actuated. This feature prevents undesired outputs from appearing at the LINE and MONITOR outputs while scanning across the eight inputs. Audio is not turned on until the select button is released.

A seven segment LED display reads out the selected input channel and is driven by the Decoder-driver A17. Since the binary counter A15 generates the equivalent digits 0 through 7, we have added A16 to add one to each digit to make the channels read out as 1 through 8 so that our logic can match your logic.

Two VU1000 may be ganged for stereo use by interconnecting the counters with cable 20209-501 from P5 of either unit to P4 of the other. This interconnection parallels the INPUT SELECT switches of both units and parallel loads the Master counter (P5 connection) output into the Slave counter (P4 connection). Either unit may be master or slave and both channel selectors will always select the same input.

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The INPUT SELECT switch may be operated remotely (up to 100 feet away) from an external momentary switch connected into connector P4 via Remote Control Scan Cable 20214-501.

#### AUDIO INPUTS

Input audio feeds unity gain, balanced differential, high slew rate, BI-FET input buffer stages (A4 and A5) which present a 30,000 ohm bridging impedance to each audio source. Dual bypass capacitors protect against RF pickup and precision matched components maintain 60 db rejection of common mode hum. Inputs up to +24 dBm may be handled without input clipping. Buffer outputs are attenuated so that maximum levels cannot exceed the feed through limits of the Multiplexer A6.

#### METER AMPLIFIER

The meter amplifier (A7a) is a switched gain stage controlled by the front panel 0 VU CAL switch. Gain is varied from 8 db in the +18 dBm position to 36 db in the -10 dBm position. The meter amplifier output is 1.6 Vrms at the specified 0 VU input level on each range.

#### LINE OUTPUT

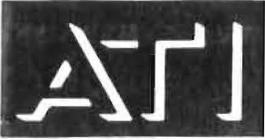
The meter amplifier output is applied to a jumper programmed attenuator R83, 84, 85, and P10. The position of a jumper plug P10 determines the nominal output level from the LINE amplifier at 0 VU. Nominal outputs of 0, +4 or +8 dBm may be selected. Factory set trimmer R86 may be adjusted for even lower outputs if required.

The line amplifier is an active balanced circuit consisting of a non-inverting gain stage (A8a) driving the HI output and a unity gain inverter (A8b) driving the LO output. The LO output must NOT be connected to the grounded side of an unbalanced (single ended) load since this effectively shorts one amplifier output to ground. Drive floating balanced or center tapped balanced loads across HI and LO LINE terminals, connect unbalanced, single ended and one side grounded loads between HI and GND or LO and GND. The LINE output will drive balanced or unbalanced loads of 600 ohms and up. The outputs are protected from shorts and RF pickup by 150 ohms of split and bypassed build out resistance in each line. Maximum LINE output is +22 dBm into 600 ohms.

#### METER DRIVE CIRCUITS

The meter amplifier output drives a full wave active rectifier A9 through the METER CAL trimpot R103. The rectified signal is then applied to the switchable time constant network of A9, A10, R109 through R112, C41 and C42. A10 is a quad CMOS switch controlled by the front panel DISPLAY RESPONSE switch, S1. Slow and visually equal rise and fall time constants closely approximate VU meter ballistics in the SLOW position of S1. A similar but ten times faster response is produced in the AVG position. The PEAK position of S1 produces a very fast rise and a slow fall time very close to PPM meter ballistics.

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Circuit gain is varied through R111 and R112 to maintain a constant 0 VU indication for sine wave signals in each mode.

Resistive divider string R115 to R130 sets the audio reference levels for three quad comparators A11, A12 and A13. The comparator outputs drive the 12 segment LED bargraph display.

### MONITOR AMPLIFIER

An output from the Multiplexer is fed to the monitor amplifier A7b through the front panel MONITOR LEVEL CONTROL. The monitor stage in the VU1000-1 will drive headphones of 600 ohms and up through a 150 ohm limiting resistor R100. An external power amplifier such as the ATI MA1000 MicroMonitor may be fed from the rear MONITOR terminals. A special rack mount kit P/N 20215-501 allows a single VU1000-1 to be mounted side-by-side with a MA1000. The external amplifier is muted when headphones are inserted. Deleted components and alternate values for the VU1000-1 are indicated on the schematic by an asterisk.

The VU1000-2 incorporates a fused power boost stage Q1 and Q2 to drive up to 7 watts into LO-Z headphones or an external eight ohm speaker. The external speaker is cut off when headphones are used.

### POWER SUPPLY

Four regulated voltages of  $\pm 15$  VDC and  $\pm 6$  VDC are produced by regulators A1, A2, A3 and zener diode D4.

A separate unregulated supply of about  $\pm 12$  VDC is produced by diode bridge BR2, C48, and C49 to drive the monitor power boost stage and the LED meter display.

Dual transformer primaries allow jumper selection of 115 or 230 VAC operation. A metal oxide varistor (MOV) is connected across the transformer secondary to protect against power line transients.

### INSTALLATION

#### MOUNTING

Your VU1000 MicroMeter may be desk mounted on its non-slip suction cup feet and left out for everyone to see since it is so pretty.

Rack mounting kits are also available for your MicroMeter. P/N 20021-501 mounts a single MicroMeter in 1 3/4" of vertical rack space. P/N 20024-501 mounts two MicroMeters side-by-side in 1 3/4". P/N 20215-501 rack mounts a VU1000-1 side-by-side with a MA1000 MicroMonitor power amplifier.

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WIRING

Our insurance company insists on three wire grounded plugs. The third wire ground can cause a ground loop with your studio ground. If you are sure your studio ground will provide adequate protection to personnel in case of an AC line short to chassis, a 3 to 2 AC adapter can be used to isolate the power line ground. We recommend that the adapter be removed and the power line ground reconnected prior to any service work requiring removal of the studio ground from the MicroAmp chassis.

The four inch silver bearing copper strap which you are, of course, using for your studio ground is not to fit around the #6 chassis ground screw on the MicroAmp rear panel. Run the strap to within a few inches of the chassis, jump to the chassis ground with shield braid.

Audio inputs and outputs should be connected using the rear panel labels as a guide. HI outputs are all in phase with each other and in phase with the HI inputs. Fanning strips are provided with your MicroAmp so that our ears won't be burning in the middle of the night while you are trying to wrap wires around those tiny barrier strip screws. The fanning strips are Kulka part number 649A-22 and extras are available from our parts and accessories department.

To allow maximum flexibility in grounding in high RF environments, the circuit grounds are isolated from case ground. For normal operation, add a ground jumper from the barrier strip ground terminal closest to the inputs to the chassis ground screw.

CAUTION: Active balanced line outputs have active drivers for both HI and LO output terminals. DO NOT GROUND either HI or LO terminals. To drive an unbalanced (one side grounded) load, connect it between HI and GND terminals and let the LO terminal float. Two separate 600 ohm unbalanced loads can be driven from each output without interaction by connecting one between HI and GND and the other between LO and GND. The two loads thus driven will be out of phase with each other.

STEREO INTERCONNECTIONS

To use two VU1000 for monitoring stereo signals, first remove both top covers. Plug either end of jumper cable assembly 20209-501 onto 6 pin connector P5 of the left hand VU1000 and the other cable end on to 6 pin P4 of the other VU1000. Route the cable through the ventilation slots above the terminal block and replace top covers.

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Connect left and right stereo signal pairs to identical numerical inputs on the left and right MicroMeters. Input channel selectors of the two units are locked into synchronism and either input select switch (or a remote switch) will operate both units. Make sure that both 0 VU CAL switches are identically set and realize that headphones plugged into either the left or right units will hear only the corresponding channel. For a single stereo headphone feed wire an auxiliary TRS phone jack to the monitor outputs of both units Left HI to TIP, Right HI to Ring and both LO to sleeve. Adjust Left and Right MONITOR LEVEL individually.

### REMOTE CONTROL CHANNEL SELECT

The channel select touch switches of one or a stereo pair of VU1000 may be operated from a remote location (up to 100 feet of cable run) using REMOTE CONTROL SCAN CABLE P/N 20214-501. This cable interfaces to a user supplied external shielded cable run and momentary toggle or pushbutton switch. Wire the N.O. contacts of the remote switch through up to 100 feet of shielded, jacketed single or two conductor cable. Terminate the cable end at the VU1000 with the male phone plug supplied with the SCAN Cable assembly. Remove the VU1000 top and plug the SCAN cable onto connector P4. If wiring to a stereo pair of VU1000's plug the SCAN cable into the master left hand unit that does not use connector P4 for the stereo interconnect cable. Route the SCAN Cable out through the ventilation slot above the VU1000 terminal block and replace the top cover. Plug the external cable run into the in-line female phono jack of the SCAN cable.

### OPERATION

Select the desired input for metering by touching the bulls-eye on the panel labeled INPUT SELECT and watching the INPUT readout. All audio outputs and meter indications are muted while your finger remains on the button. This prevents undesirable squawks at the monitor and line outputs while scanning through the eight inputs.

Adjust the 0 VU CAL switch for on-scale meter readings and select the desired DISPLAY RESPONSE.

CAUTION! Keep the MONITOR LEVEL Control at minimum position when not actually monitoring the input signal. This helps protect ears, headphones and speakers from unexpected high levels when switching channels and also prevents some distortion of the LINE OUTPUT which can occur when the Monitor Circuits are driven into 10 to 20 db of very hard clipping.

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MAINTENANCE

Regulated supply voltages are  $\pm 6$  and  $\pm 15$  VDC with a  $\pm 10\%$  maximum tolerance. If necessary to replace a regulator, remove all ICS and check new output voltage before plugging IC's back into their sockets. Always remove power when replacing IC's. DC output voltages of A4 through A9 should be OVDC  $\pm .5V$  under no-signal conditions. Deviation indicates IC or circuit problem. Measurable DC difference between + and - amplifier inputs (other than due to meter loading) indicates IC failure.

No monitor output of a VU1000-2 model may be caused by a blown 3A internal fuse F2 in series with the Monitor output. After replacing fuse check that no D.C. voltage appears at the monitor output before reconnecting speaker or headphones.

Five to ten years hence replace all aluminum electrolytic capacitors.

Keep 250 W soldering guns out of the MicroMeter.

If hit by lightning, replace everything that turns black.

MODIFICATIONS

230 VAC OPERATION

Your MicroAmp is wired for 115 VAC 50/60 Hz operation unless otherwise requested at the time of ordering. It can be modified for 230 VAC use by removing the Power transformer primary jumpers J1 and J3 and inserting a jumper in the J2 holes.

LINE OUTPUT

Line output levels of 0, +4 or +8 dBm at 0 VU meter indication can be selected by jumper plug P10.







AUDIO TECHNOLOGIES INCORPORATED

VU1000

TECHNICAL SPECIFICATIONS

INPUTS	Active Balanced, 30K ohm bridging, +24 dBm maximum level, 60 db hum rejection, RF bypassed, -94 dBm E.I.N.
LINE OUTPUT	Active Balanced, 300 ohm source impedance, +22 dBm maximum output into 600 ohms, jumper programmable for 0, +4, or +8 dBm sine wave output at 0 VU meter indication. $\pm$ .25 db response, .1% THD, 20 to 20000 Hz.
MONITOR	VU1000-1 10 Vrms through 150 ohms, VU1000-2 6 Watts into 8 ohms fused.
METER	Accuracy $\pm$ .5 db at 0 VU on all ranges. SLOW approximates VU meter response, AVG is fast response mode, PEAK approximates PPM meter.
POWER	115/230 VAC $\pm$ 10%, 47-63 Hz
SIZE	8½ Wide X 1 3/4" High X 10" Deep, 5 lbs.
ACCESSORIES	Stereo Interconnect Cable 20209-501 Remote Control Scan Cable 20214-501 Rack Mount, Single, Centered 20021-501 Rack Mount, Double, Side-by-Side 20024-501 Rack Mount, VU1000 with MA1000 20215-501

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