



DA2008  
**DISTRIBUTION AMPLIFIERS**  
OPERATING AND MAINTENANCE MANUAL

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## DESCRIPTION

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, 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 741op 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 thus eliminating the necessity for input step up transformers. An output stage capable of driving 600 ohm loads directly to +22dBm with total freedom from crossover distortion, high inherent linearity, 100dB open loop gain and 50MHz 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 MICROAWPT" a minimum of 40dB of loop gain is available for 100: 1 distortion reduction even at 20kHz. All program audio stages in the Distribution Amplifiers use this unique device in its' dual version (NE5533).

## INPUT

Input audio feeds a unity gain balanced differential high slew rate, Bi-FET input buffer stage, which presents 30,000-ohm bridging impedance to the source. The inputs are protected from over voltage inputs by clipping diodes. Dual bypass capacitors protect the inputs against common mode RF pickup. Balanced potentiometers (R15, R16) allow setting a precise null for common mode hum inputs.

## **OUTPUTS**

Audio from the input buffer is AC coupled to the front panel level adjust potentiometers.

The pot outputs are applied to the non-inverting input of the HI (in-phase) output stage driver ICs. The ICs supply the first 10 ma of output current directly and then complementary Class B output booster transistors take over. The unique, wide bandwidth, high slew rate circuit design provides effective class AB operation with minimal crossover distortion from a power output stage operating true Class B with zero quiescent power dissipation.

The HI output bus is inverted and boosted to drive the LO output bus.

The HI and LO output buses of each channel are split into four individual balanced outputs through 150 ohm build out resistances. All outputs will tolerate short circuits across the output or to the ground without damage. Up to two outputs can be shorted with no significant reduction in headroom. Needless to say, this is NOT the recommended mode of operation. Do not drive a LO output into the grounded end of an unbalanced load. Drive single ended loads from either the HI or LO output to ground. Up to 16 single ended 600-ohm output loads may be simultaneously driven by our Micro DA.

The build-out resistors are split and heavily bypassed to prevent RF pickup on the output lines from affecting operation of the DA. These bypasses will place a very heavy load on the outputs under sustained sine wave operation above 20kHz and such operation may over dissipate the 47 ohm build-out resistors—don't do it!

## **OUTPUT CLIPPING INDICATOR**

The differential input voltage of each HI output driver IC is monitored by a section of A3. The differential voltage is under a few millivolts under linear operation, however, if the output is driven to clipping the differential voltage rapidly increases and is amplified to light the yellow OUTPUT CLIPPING LED. Conserve power—try not to light the yellow LED.

## **HEADPHONE OUTPUT**

The front panel headphone jack is a convenient metering point, an auxiliary output or headphone output. The jack is wired to drive stereo headphones with channel A to the tip and channel B to the ring. The sleeve connection is wired to ground. The jack is isolated by 470-ohm build out resistors.

## **POWER SUPPLY**

Your DA power supply incorporates a couple of unique regulating devices called zener diodes. In contrast to most fancy IC regulators, these devices will live through most line transients and simultaneously protect your expensive circuitry. As further insurance, a varistor suppressor is placed across the power transformer secondary.

## **INSTALLATION**

### **MOUNTING**

Your DA may be desk mounted on its non-slip suction cup, or rack mount system 21075-501 mounts two units in one rack.

### **WIRING**

There are three wire grounded plugs. The third wire ground can cause a ground loop with your station ground. If you are sure your station 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 station ground from the DA chassis.

The four inch silver bearing copper strap, which you are, of course, using for your station ground is not going to fit around the #6 chassis ground screw on the DA2008 rear panel. Run the strap to within a few inches of the chassis and 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 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 649A22 and extras are available from our parts and accessories department. For convenience, the fanning strips may be easily cut into shorter input or output sections.

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

**Caution:** Balanced differential outputs have active drivers for both HI and LO output terminals. DO NOT GROUND either HI or LO terminals. 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.

#### Maintenance Notes

IC power supply voltages are + and -16 VDC nominal. If zeners are replaced, remove ICs and check output voltage before plugging ICs back into the circuit. Remove power when inserting or removing ICs.

IC output DC voltages (no signal conditions) should measure OVDC  $\pm$  .5 VDC. Significant deviation indicates IC or circuit problem. Measurable DC difference between + amplifier inputs (other than due to meter loading) indicates IC failure.

## MODIFICATIONS

### 230 VAC Operations

Your DA is wired for 115 VAC 50/60 HZ operations 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.

### Gain

To increase gain by 10db, change R25 (R26) to 680 ohms, and increase C23 (C24) to 68 microfarads.

## Technical Specifications

<b>OUTPUT CLIPPING LEVEL:</b>	+24 dBm/600 ohms
<b>DISTORTION:</b>	@ +24 dBm output 0.2% maximum THD, 20 to 20kHz and input levels to +24 dBm
<b>FREQUENCY RESPONSE:</b>	+/- .25 db, 20 to 20000 Hz. -3 db at 100KHz.
<b>OUTPUT NOISE:</b>	-70-dBm maximum 20kHz measurement bandwidth 600-ohm source impedance full gain
<b>HUM REJECTION:</b>	80db for common mode hum inputs.
<b>INPUT IMPEDANCE:</b>	Balanced differential inputs, 30000 ohm bridging, +24dBm maximum input level.
<b>GAIN:</b>	26db, front panel adjustable
<b>OUTPUT INSULATION:</b>	70db minimum at 1 KHz, any output to any other output. Unit will tolerate up to two shorted outputs with no reduction in headroom.
<b>POWER:</b>	115/230 VAC +/- 10%, 47-63 Hz.
<b>SIZE:</b>	8 1/2" W X 1 3/4" H X 7" D, 4 lbs.
<b>MOUNTING:</b>	Suction feet for non-slip desk mounting. Rack Mount System 21075-501 mounts two units in one rack.