



DA1000
DISTRIBUTION AMPLIFIER
OPERATING AND MAINTENANCE MANUAL

© Copyright 2012, DaySequerra Corp.

DESCRIPTION

The 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 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 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 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, 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 input buffer stage (A1), which presents 30,000-ohm bridging impedance to the source. The inputs are protected from over voltage inputs by clipping diodes (CR4-CR7). Dual bypass capacitors (C7, C29 and C8, C39) protect the inputs against common mode RFI pickup. A balance potentiometer (R9) allows setting a precise null for common mode hum inputs.

SIGNAL PRESENT INDICATOR

The second half of A1 monitors the voltage at the output of the input buffer IC. The green Signal Present LED on the front panel will light for audio inputs over -30dBm. The LED will normally flicker with applied program material to tell you that all is well. (Happiness is a green LED).

OUTPUTS

Audio from the input buffer is AC coupled to the front panel level adjusts potentiometer. This control adjusts the level of all outputs. If you are afflicted with lurking knob twiddlers, the knob can be removed leaving a somewhat less inviting screwdriver adjustment. If removing the knob doesn't cure the problem, put your DA out of reach by sticking it to the ceiling using the supplied suction cup feet.

The pot output is applied to the non-inverting input of the HI (in-phase) output stage driver IC (A2-1). The IC supplies the first 10 mA of output current directly and then the complementary Class B output booster transistors (Q1 and Q2) 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 applied to the inverting input of A2-2 in a unity gain, phase inverting configuration and boosted by Q3 and Q4 to form the LO output bus.

The HI and LO output buses are split into nine individual outputs (eight rear and one front panel jack) through 150 ohm build out resistances. All outputs will tolerate short circuits across the output or to 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 single ended (one side grounded) loads from both HI and LO outputs together. Drive single ended loads from either the HI or LO outputs to ground. Up to 18 single ended 600-ohm output loads may be simultaneously driven.

The build-out resistors are split and heavily bypassed to prevent RIF 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 H1 output driver IC (A2-1) is monitored by 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 provides a ninth output with its own set of build out resistors. The phone jack is a convenient metering point, an auxiliary output or headphone output. The jack is wired primarily to drive stereo headphones with an inphase mono signal consequently tip (red) and ring (blue) are wired together and to the HI output

and the sleeve connection (white) is wired to the LO output. To use a standard tip ring sleeve patchcord output, rewire the jack terminals by removing the blue wire from the ring terminal moving the white wire to the ring connection (and grounding the sleeve terminal to the top shield foil of the P.C. board.)

POWER SUPPLY

Your 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 suppresser is placed across the power transformer secondary.

INSTALLATION

MOUNTING

Your DA1000 may be desk mounted on its non-slip suction cup.
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 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 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 so that our ears won't be burning in the middle of the night while you are trying to wrap wires around tiny barrier strip screws. The fanning strips are Kulka part number 649A22 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: Balanced differential output has 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.

MAINTENANCE NOTES

Power supply voltages are + and - 20 VDC nominal. Maximum allowable voltages are +/- 22 VDC (limited by IC). 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 0VDC +/- .5 VDC. Significant deviation indicates IC or circuit problem. Measurable DC difference between +/- amplifier inputs (other than due to meter loading) indicates IC failure.

If hit by lightning, replace A1 through A3.

MODIFICATIONS

230 VAC Operation

Your DA1000 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 R13 to 680 ohms, and increase C15 to 68 uF.

SPECIFICATIONS

OUTPUT CLIPPING LEVEL DISTORTION

@ 24dBm output and input levels to
+24dBm
+24dBm / 600 ohms
.2% maximum THD, 20Hz to 20kHz

FREQUENCY RESPONSE

+/- .25dB, 20 to 20000 Hz.
-3dB at 100 kHz

OUTPUT NOISE

-70dBm maximum
20kHz measurement bandwidth

IMPEDANCE FULL GAIN

600-ohm source

HUM REJECTION

80dB for common mode hum

INPUT IMPEDANCE

Balanced differential inputs, 30,000
ohms bridging +24dBm maximum input
level.

GAIN

26dB, front panel adjustable

OUTPUT ISOLATION

70dB minimum at 1 kHz, any output to
any other output. Unit will tolerate up to
two shorted outputs with no reduction in
headroom.

POWER

115 / 230 VAC +/- 10%, 47-63 Hz.

SIZE

8-1/2" W x 1-3/4" H x 7" D, 2-1/2 lbs.

MOUNTING

Suction feet for non-slip desk mounting
Rack mount system 21075-501 mounts
two units in one rack.