

# J.W. DAVIS & COMPANY

*"The mark of the professional"*

## **PUBLIC ADDRESS AMPLIFIER DA-30A**

### **PRECAUTIONS**

#### **1. Unpacking**

After removing the amplifier from the carton, inspect for any exterior damage to the unit. If damage is noted, notify the carrier at once so that a claim can be justified. Save all packing material. This is important when the claim is processed.

#### **2. Ventilation**

To offset heat generated by the unit, it is necessary to provide ample ventilation around the unit. Avoid blocking or impeding the ventilation holes on the unit. To prevent unnecessary problems, install the unit on a place free from any vibrations, direct sunlight, humidity or dust circulation.

#### **3. If the unit gets wet or foreign matter enters**

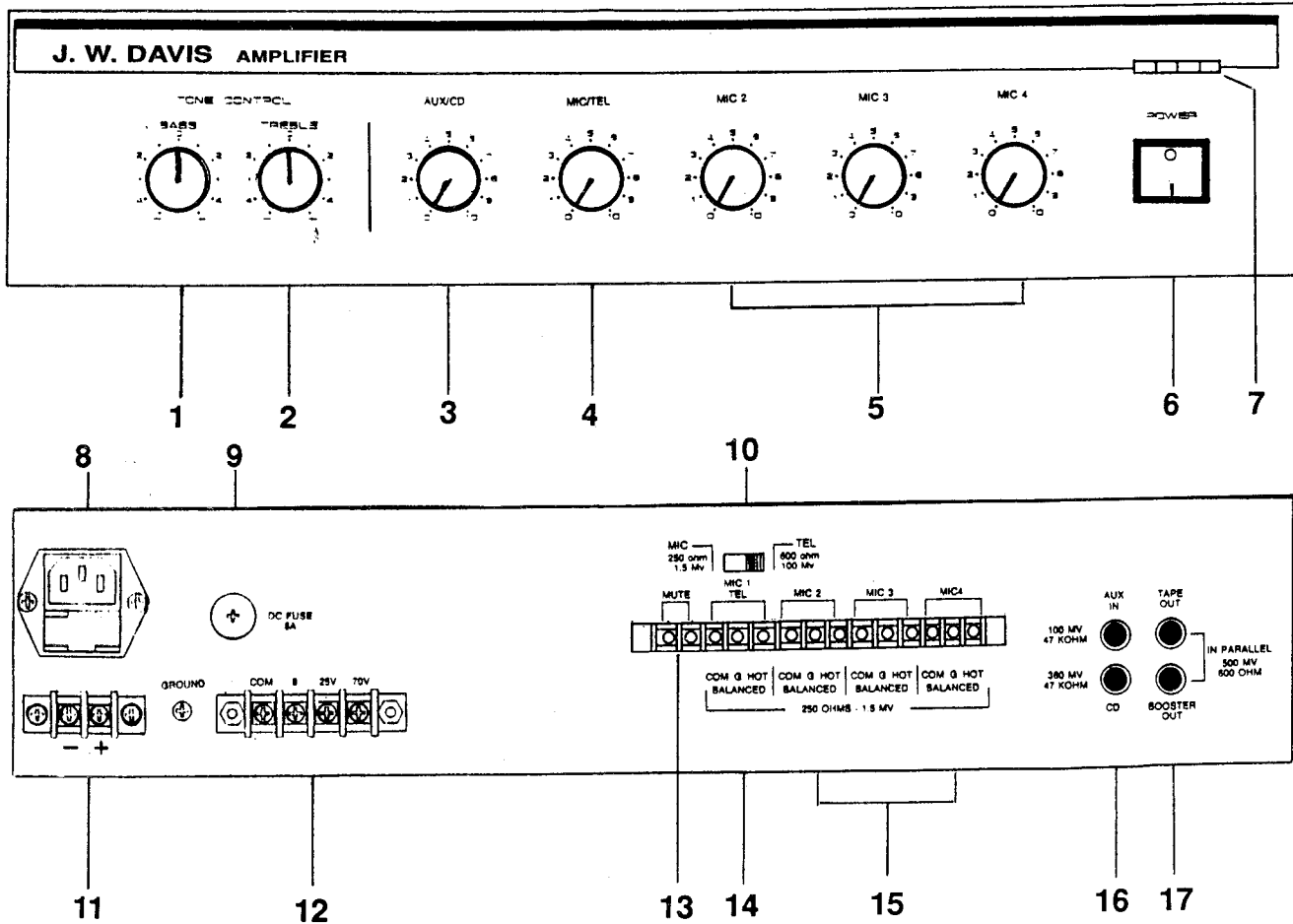
In case the unit gets wet or any water or foreign matter gets into the cabinet, immediately disconnect the a.c. line cord, and consult your dealer or qualified electrician.

## **INSTRUCTION MANUAL**

**WARNING!**  
TO PREVENT FIRE OR SHOCK HAZARD,  
DO NOT EXPOSE THIS APPLIANCE TO  
RAIN OR MOISTURE

Write Your Serial Number Here. \_\_\_\_\_

# Controls and Connections



## FRONT PANEL

- 1) Bass control
- 2) Treble control
- 3) Aux/CD level control
- 4) Mic/Tel level control
- 5) Mic2 to Mic4 level control
- 6) Power on/off switch
- 7) LED indicator

## REAR PANEL

- 8) AC power socket
- 9) Fuse holder
- 10) Mic/Tel selector switch
- 11) DC power input terminal
- 12) Speaker output terminals
- 13) Mute terminal
- 14) Mic/Tel input terminal
- 15) Mic2 to Mic4 input terminals
- 16) Aux/CD input
- 17) Booster/Tape outputs

## FRONT PANEL

- 1) **Bass control.** Affects all input signals.
- 2) **Treble control.** Affects all input signals
- 3) **Aux/CD volume control.** Controls volume of unbalanced input on Aux and CD input.
- 4) **Mic/Tel volume control.** Controls volume of selected input (see 10)
- 5) **Mic2 to Mic4 volume controls.** Control volume of respective microphone input.
- 6) **Power on/off switch.** Includes a 2-3 second delay to protect speakers from "thump."
- 7) **LED indicators.** Illuminate when power is on and indicate output level.

## REAR PANEL

- 8) **AC power connector.** For use with a 120 volt 50/60Hz power source.
- 9) **Fuse holder.**
- 10) **Input selector switch.** Allows selection of either a low impedance microphone or telephone paging source.
- 11) **DC power terminal.** For use with DC power source.
- 12) **Speaker outputs.** Speaker lines must be connected to 'COM' and one (and only one) of the remaining screw terminals. See "Speaker Connections" for more details.
- 13) **Mute terminal.** Provides contact closure muting of all inputs except the Mic/Tel input.
- 14) **Mic/Tel input\*.** Accepts a balanced low impedance microphone or telephone paging signal. This input includes adjustable VOX muting of all other inputs during paging.
- 15) **Mic2 to Mic4 inputs.** Accept balanced low impedance microphone inputs. These inputs also have mute override switches on the printed circuit board.
- 16) **Aux/CD inputs.** RCA connector jacks for high impedance inputs.
- 17) **Booster/Tape outputs.** Parallel, RCA, line level outputs to feed other devices.

### Phantom Power

Some electret and condenser microphones require phantom power. All of the DA-30A microphone inputs are capable of providing phantom power. To activate this feature:

- 1) Unplug power source.
- 2) Remove chassis cover by taking out the nine screws.
- 3) On the microphone input PC boards there are a set of three upright pins for each mic input channel. These have a small black jumper which connects two of the pins (either center-left or center-right)
- 4) For each input on which phantom power is desired, move the jumper so that it connects the center and opposite pin. This will supply 12 volts between shield and each of the signal pins (or terminals)
- 5) Replace the amplifier cover

**Note:** A balanced dynamic microphone may be safely connected to a microphone input with phantom power without damaging the microphone. The phantom power voltage is present between the shield and signal pins so the potential across the signal wires is zero.

\*Screw terminal assignments: G - shield, Hot - signal positive, COM - signal negative .

## CONSIDERATIONS FOR PA SPEAKER LAYOUT

### SPEAKER CONNECTIONS

In connecting speakers to a public address amplifier, it is important to present the amplifier with the load impedance it is designed to handle. Failure to do this can cause overheating and component failure. In many cases problems can take months to appear in the form of reduced intelligibility and unnecessary service calls. A load impedance that is too low is especially bad. You should strive to have a load impedance of not less than 70% of the chosen amplifier output impedance. For example, do not connect a 4 ohm speaker to the 8 ohm output. Driving a load of higher impedance than rated amplifier output is not as serious, but results in a power loss proportional to the mismatch and should be avoided. For example, driving a 16 ohm load through the 8 ohm output will result in a 50% loss in power. The high impedance mismatch should be kept to less than 200%, especially if it is anticipated that more than 50% of the rated amplifier power will be required.

There are two methods of connecting groups of speakers to the amplifier. First, using the low impedance (i.e. 4, 8, 16 ohm) outputs. This is preferable where:

- Runs are short (less than 200 ft. (70 m)).
- Few horns or speakers are to be used (i.e. typically 4-8)
- Same sound levels are required at each speaker.
- Low impedance also provides slightly better fidelity and frequency response.

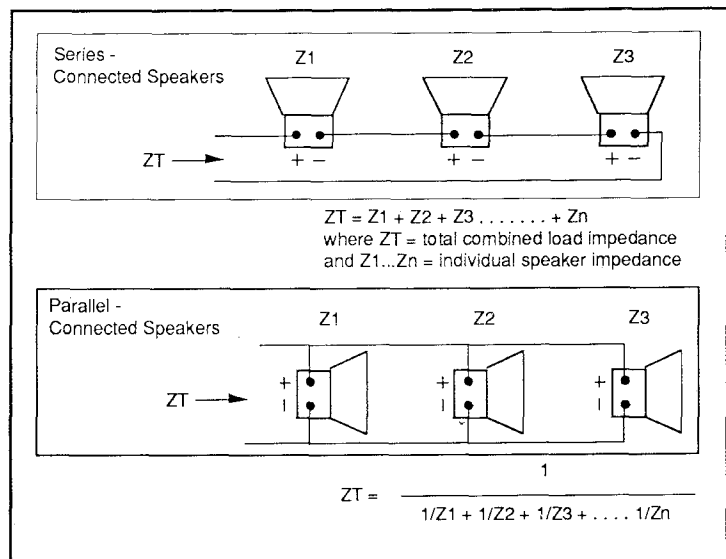
High impedance or constant voltage is the second method and is preferable where:

- The runs are long and line losses are to be avoided.
- Many speakers are to be used.
- Different sound levels are required at different locations, for example, indoor speakers and outdoor horns.
- Future expansion possibilities require flexibility in wiring layout.

The following is a more detailed discussion of these two methods.

### LOW IMPEDANCE CONNECTION

The speakers must be connected so as to present a combined impedance equal to the selected amplifier output impedance, i.e. 4, 8, 16 ohms. The connections should be arranged in a series/parallel combination to achieve this according to the following formula. The impedance should be between 70% and 200% of the output impedance selected. If the amplifier is to be driven anywhere near its full rated output the impedance should be well within these tolerances.



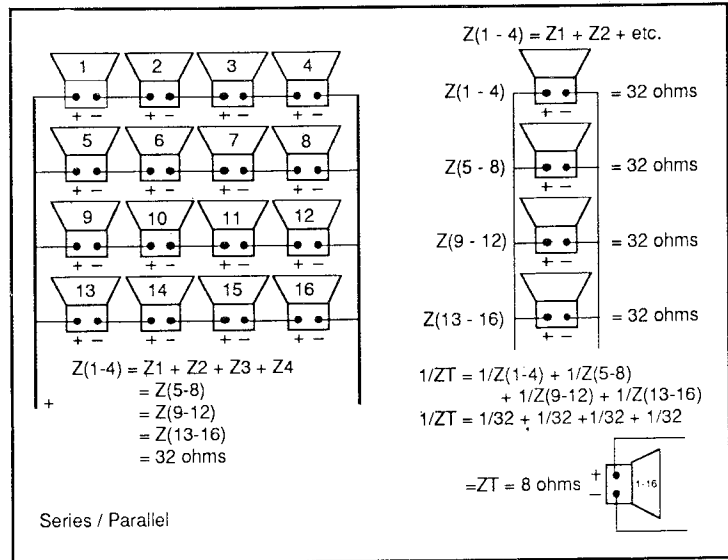
### SERIES/PARALLEL COMBINATIONS

In larger systems it will be necessary to combine series and parallel connections to obtain the necessary impedance. The rule for calculating the total effective impedance is to divide the entire circuit into individual small series or parallel sub-circuits and apply the foregoing rules to them.

The following is an example using 16 x 8 ohm speakers. Each schematic is an impedance equivalent to its predecessor but has been simplified.

As can be seen, a problem arises if one more speaker must be added at some future date, as all the connections must be changed. This is not much of a problem if only a few speakers are involved, but if the network is extensive, the problem is significant. In addition, failure of one speaker can take out a number of associated units.

### HIGH IMPEDANCE OF CONSTANT VOLTAGE (25 AND 70V) SYSTEMS



The high impedance or constant voltage method of impedance matching uses a high impedance amplifier output which is transformed down to 8 ohms by an impedance matching transformer at each individual speaker. The big advantages of this approach as compared to low impedance are:

- (1) Reduced line losses and ability to use smaller wire gauges. This is due to the higher voltage and reduced current in the speaker lines.
- (2) Much simpler impedance matching procedures and connections.

Constant voltage is a misnomer in that the amplifier does not always produce 70V. Rather, the amplifier output impedance is set at such a level that, irrespective of its rated power, it will produce 70.7 volts output at full power. Thus a 10 watt amplifier optimum load would have an impedance of 500 ohms ( $V^2/P = 70.7^2/10$ ), a 40 watt amp would be 126 ohms and 120 watt amp, 42 ohms.

Multiple transformer taps allow the impedance at each speaker to be adjusted individually to give a total matched load. Because of the high impedance arrangement, the system is easier to impedance match and is also inherently less susceptible to problems caused by mismatching.

The transformer taps are marked in W=watts instead of ohms (usually 4, 2, 1, 1/2). Again, it should be born in mind that these levels of power output are only achieved when the transformer is working at 70.7 volts. The transformers are connected in parallel. A good match is obtained by ensuring that the total of all tap settings fits into the range of 40-80% of rated amplifier output. 80% is chosen to allow for transformer insertion loss. It is also good practice not to drive the amplifier to 100% of its capacity.

Examples are shown below. For simplicity it is assumed that all tap settings are the same at each speaker.

For a 120 watt amplifier the range 40-80% is equivalent to 48-96 watts.

Therefore:

- 18 speakers x 4 watt taps each = 72W ..... Good match
- 12 speakers x 1 watt taps each = 12W ..... Poor match
- 60 speakers x 1 watt taps each = 60W ..... Good match
- 60 speakers x 4 watt taps each = 240W ..... Very poor match-overload
- 90 speakers x 1 watt taps each = 90W ..... Good match

**NOTE:** None of the above tap settings guarantee the actual sound levels through each speaker. This is as much a function of the master volume control as the tap setting. The setting simply defines the maximum power consumed by an 8 ohm speaker if presented with 70.7 volt input. In the case of a small number of speakers, it is always preferable to use a high tap setting and reduce the sound level by

turning down the master volume control. In calculating the amplifier rating needed for a typical music/paging system using speakers distributed to an office environment, a good rule of thumb is to allow about 1W per speaker and space speakers at 1 1/2 X ceiling height. For noisy areas, or where the volume level required is higher, more power is required.

## POLARITY

When using multiple speakers in a sound system installation, one must observe proper polarity of the speakers in order to prevent the cancellation effects caused by adjacent speakers being in reverse polarity. Speakers in reverse polarity will lose much of their normal volume and produce poor tonal quality.

For speakers facing in the same general direction, all speaker cones should move in unison in the same direction. When two speakers face each other, the cone of one speaker should move inward when the other speaker cone moves outward.

All JWD speakers have the "hot" terminal marked with a "+" or a red dot. The "common" terminal is either unmarked or marked with a "-". Positive voltage applied to the "+" terminal will result in a forward or outward movement of the speaker cone.

If using speakers which are unmarked, or using speakers from various manufacturers, the following procedure will provide a fast and simple test for polarity.

1. Connect one side of a flashlight battery to one speaker terminal.
2. Momentarily connect the other side of the battery to the other speaker terminal.
3. Note the direction of the cone movement (inward or outward). If the cone movement is inward (backward), reverse the battery leads.
4. Mark the speaker terminal connected to the positive side of the battery as positive "+".
5. Repeat the procedure for each successive speaker, making sure that the cone movement is forward (outward) in each case.

## POWER LOSS IN LONG LINES

For long lines the power loss in the lines ( $I^2 R$ ) becomes a significant factor. The power supplied by the amplifier is effectively reduced by the line loss. For a 0.5 dB loss in sound pressure the total wire resistance must be limited to 6% of speaker impedance. The following table shows the calculated two wire cable lengths permissible for a number of wire sizes in feet. For a 1 dB loss, the lengths may be doubled. For 2 dB loss, multiply by 4.4.

AWG Size	Resistance (ohms/1000 Feet)	Low-Impedance			High-Impedance Systems		
		4 ohms	8 ohms	16 ohms	100W/70.7V 12.5W/25V (50 ohms)	50W/70.7V 6.25W/25 (100 ohms)	25W/70.7V 3.5W/25 (200 ohms)
14	2.50	48	96	190	600	1,200	2,400
16	4.20	30	60	90	370	740	1,500
18	6.39	19	38	76	230	460	920
20	10.1	12	24	48	150	300	600
22	16.2	7	14	28	93	190	380



## SPECIFICATIONS

TYPE	5-CHANNEL MIXER AMPLIFIER	
MODEL NO.	DA-30A	DA-60A
POWER SUPPLY	AC 117 V/DC 12V	AC 117 V/DC 24V
RATED OUTPUT POWER	30W RMS	60W RMS
FREQUENCY RESPONSE	60-15 KHz $\pm$ 3dB	
TOTAL HARMONIC DISTORTION	$\leq$ 2 % at 1 KHz, RATED OUTPUT	
INPUT SENSITIVITY/ IMPEDANCE	MIC 1-4 : 1.0 mV/600 ohms, BALANCED TEL : 100 mV/600 ohms, BALANCED AUX : 100 mV/47K ohms CD : 360 mV/47K ohms	
OUTPUT	LOUDSPEAKER OUTPUT : 8 ohms, 25 V.70 V BOOSTER/TAPE OUT : 500 mV, 600 ohms	
S/N (BAND PASS 20-20 KHz) (TONE CONTROL CENTERED)	MIC 1-4 : $\geq$ 60 dB TEL : $\geq$ 75 dB AUX/CD : $\geq$ 75 dB	
TONE CONTROL	BASS : $\pm$ 10 dB AT 100 Hz TREBLE : $\pm$ 10 dB AT 10 KHz	
OUTPUT LEVEL INDICATOR	4 RED LED	
VOX PRIORITY (MIC1/TEL TO MIC2-4, AUX/CD)	ADJUSTABLE (OFF-0.7 mV MIC SBNS.)	
MUTE LEVEL (VOX)	$\leq$ -40 dB (SWITCHABLE FOR MIC2, MIC3, AND MIC4 ON INNER PCB)	
PHANTOM POWER	FOR ALL MIC. INPUTS 12V	
DIMENSIONS	430 mm (L) x 88 mm(H) x 234 mm (D)	
WEIGHT	5.8 Kg	6.5 kg
MOOUNTING POSSIBILTY	POSSIBLE MOUNTING IN 19" RACK OR ON WALL	