Engineering News

ALTEC®
A DIVISION OF ALTEC CORPORATION

1515 S. Manchester Avenue, Anaheim, California

TECHNICAL LETTER NO. 219

IMPROVING THE 1605A NOALA FOR OPERATION UNDER ADVERSE NOISE CONDITIONS

By

R. J. Bird

A look into the desirability of 30 dB as the corrective range of the 1605A NOALA was prompted by a recent evaluation of the paging system installed at the Honolulu International Airport.

The causes of the problem were immediately apparent. Open-air passenger waiting areas are often within 50 feet of the loading aprons and are directly exposed to jet noise. No sound barriers are interposed. Hawaiian guitar music is played almost constantly through the sound system for background effect. Ambient noise levels (predominately jet noise) vary 60 dB or more.

NOALA was installed in this environment to compensate for these adverse noise conditions. Impairment of sampling time caused by the constant background music, in conjunction with the abnormally large ambient noise variations, resulted in NOALA either not responding or responding with fully 30 dB of correction. Lack of response resulted in unheard pages. Full response boosted the background music to uncomfortably loud and distorted levels. To better understand the extremes encountered at the Honolulu installation, the following typical example is presented.

Pressure sensitivity produced by the ALTEC 755E Loudspeaker is 92 dB SPL when measured at 4' on axis with 1 watt of electrical input. The ambient noise base of normal conversation is 70 dB SPL (see Figure 1). Adequate SPL to override normal conversation requires an additional 6 dB SPL. System power requirements may be quickly obtained by using the ALTEC Inverse Square Law Calculator as shown in Figure 2. Based upon a typical D_2 (distance from loudspeaker to listener) of 15', the power required to provide 76 dB SPL at 15' (87.5 dB SPL at 4') from one 755E is 0.35 watt. The power required for a 10-speaker system is 3.5 watts.

The maximum gain change of 30 dB provided by the ALTEC 1605A NOALA could increase the input to each 755E in the system by a factor of 1000, or to 350 watts (3500 watts for a 10-speaker system), if such power were available. A properly designed system will not deliver power at such levels, with the result that power amplifier distortion due to overdriving and clipping would make the signal unusable long before the maximum gain change was attained. A more realistic and achievable gain change is 15 dB. The input applied to each 755E then increases by a factor of 32, or to 11 watts (110 watts for a 10-speaker system). This is a reasonable power level and produces a 6 dB SPL override change from normal conversation level to just below the sound level at Niagara Falls (see Figure 1).

From the limitations imposed by system realities and the excessive noise level changes, a 15 dB change was considered adequate to fulfill the subjective requirements of a 'pleasantly quiet' system for late night or light traffic conditions, yet suitable for audible paging during high ambient noise conditions without impairment of speakers or human hearing when noise levels subsided.

The 1605A NOALA systems at Honolulu International Airport were modified in accordance with the following steps. The changes resulted in excellent performance and final system acceptance.

Step 1. Modify Sampling Response Time (see Figure 3)

Remove existing R179 (8.2MΩ) resistor.

Install new R179 (1.0MΩ) resistor.

Set R182 resistor to the 3:00 position as viewed from front of 1605A.

Step 2. Modify Range to Approximately 15 dB (see Figure 3)

Remove existing R111 (330Ω, 1/2W) resistor.

Install new R111 (1.2KΩ, 1/2W) resistor.

Step 3. Recalibrate Meter Controls (see Figure 3)

With no page or background program applied, turn NOISE SENSITIVITY control on front panel fully clockwise (cw).

Apply a -40 dBm, 1 kHz sine wave to terminals 3 and 4 of TB2 on rear panel (marked 'SPKRS').

While alternately applying and removing the signal at TB2, adjust R102 resistor for a '0' meter reading with no signal applied.

Adjust R108 resistor for an approximate meter reading of 15 with the signal applied.

Repeat this high/low meter adjustment several times, allowing a meter recovery time of three to five seconds before each adjustment.

Readjust R182 resistor (see Step 1) for smooth up/down response time of meter pointer while alternately applying and removing signal at TB2.

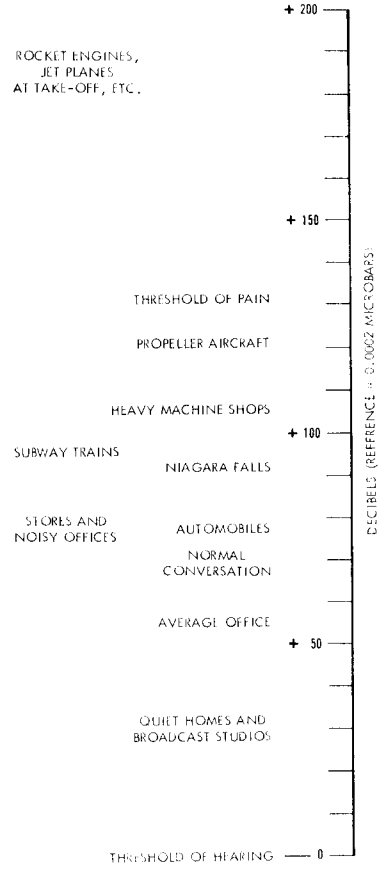

Figure 1. Sound Level Measurement Chart

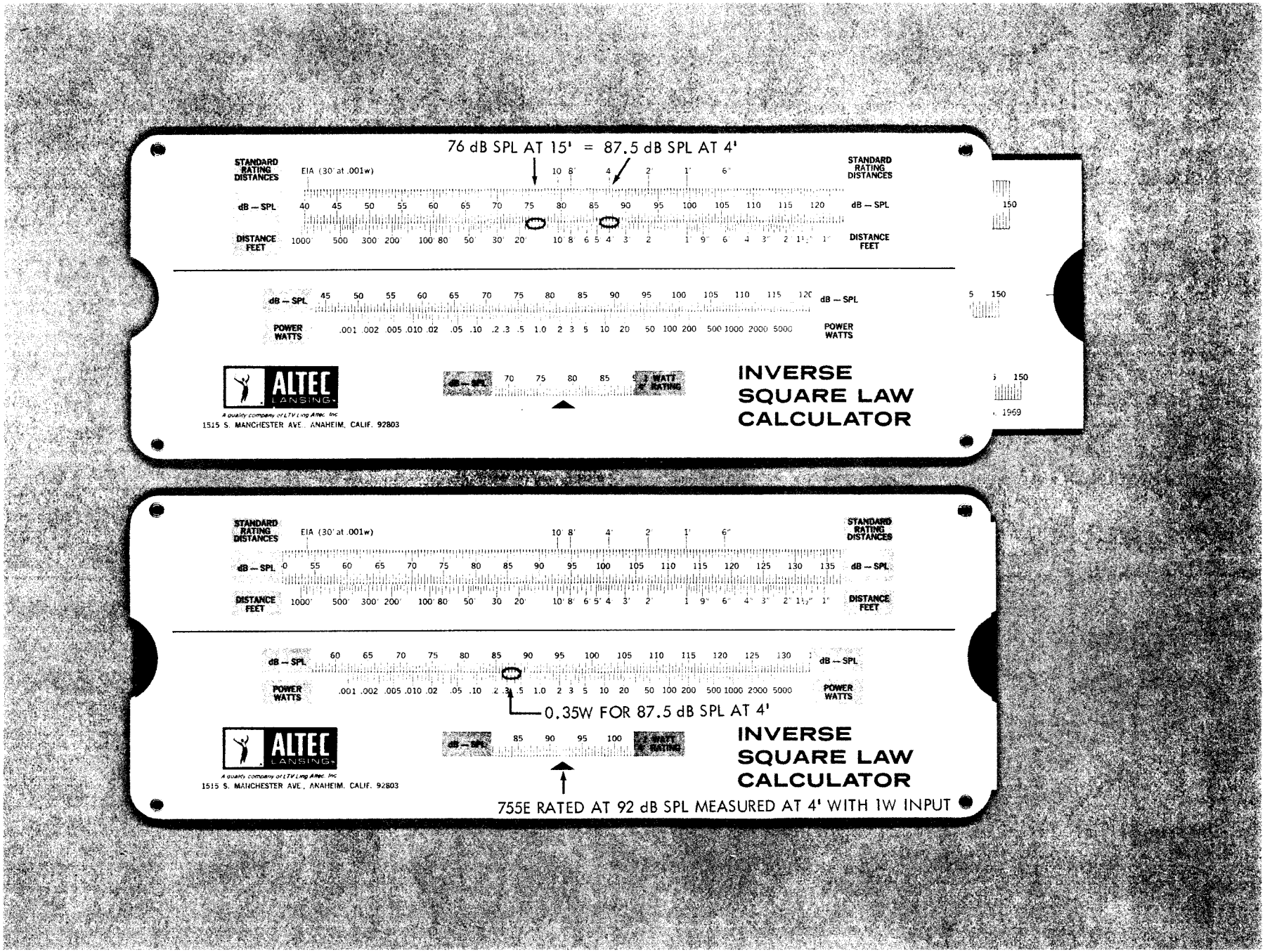

Figure 2. Calculating Loudspeaker Power Requirements

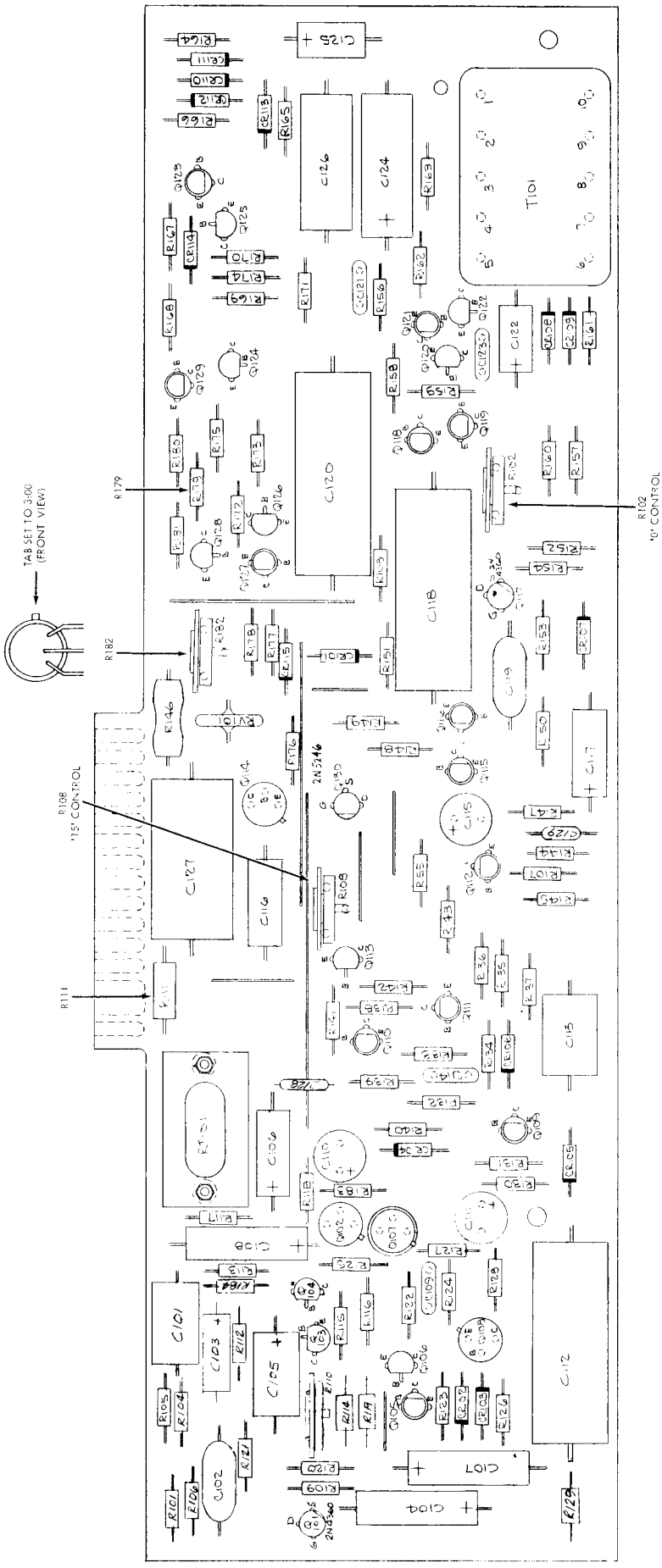

Figure 3. Electronic Part Locations, 1605A PCB Assembly