

BEL1

Operating Instructions

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BALDWIN BOX▲LL
C O M M U N I C A T I O N S

BEL1 AMPLIFIER AND LOUDSPEAKER Line Surveillance System

SINEWAVE SURVEILLANCE TONE GENERATOR

This system may be selected to either 30Hz or 20KHz when installed. 30Hz is suitable for systems employing horn loudspeakers or ceiling loudspeakers which have a poor low frequency response. Should speakers of good low frequency response be employed the 30Hz tone could be audible.

Advantages of 30Hz

1. Less power absorbed by cable as compared to 20KHz.
2. More positive fault detection as breaks in the cable are easier to detect due to lower stray capacitive coupling compared to 20KHz.
3. Most digital meters selected to the AC range will accurately indicate a 30Hz signal.

Disadvantages of using 30Hz

1. Speakers with a good low frequency response will produce the 30Hz tone.
2. Any harmonic distortion produced by the amplifier may be audible, even when produced using horn loudspeakers.
3. Interrupting the 30Hz surveillance tone will cause a click thus envelope shaping must be employed.

Advantages of 20KHz

1. Generally inaudible, however some speakers may produce a sub-harmonic i.e. 10KHz.

Disadvantages of 20KHz

1. High capacitive cable such as PYRO, FP200 etc absorb a lot of power at this frequency.
2. Breaks in cable may be difficult to indicate due to the capacitive coupling between adjacent conductors.
3. Possibility of lines resonating at this frequency and therefore consuming unnecessary power resulting in amplifiers overheating with reduced battery standby time.
4. Some digital multi-meters will not accurately read 20KHz AC.

SYSTEM OPERATION

The surveillance tone is fed to the mixer unit and via the power amplifiers it is transmitted to line. At the end of each line, or at the end of each spur on that line a BEL1 detects this signal and super imposes a DC current with reference to ground. Where there are no spurs on the line the single BEL1 is set to produce 1mA. When there are spurs, the BEL1 units are set to produce a total current of 1mA. Eg If there are two spurs each unit is set for 0.5mA. This current is monitored by the Fault Detection module. The constant current source is designed so that if one side of the line becomes disconnected no current flows.

A voltage doubling circuit is incorporated which improves the overall system sensitivity, and care must be taken as high voltages may exist. The recommended surveillance tone level is 10 Volts but detection is not affected when higher speech or music signals are present. The DC line current produced by the BEL1 is extracted by the centre tap of the amplifier's output transformer, which is fed to the input of the fault detector. This input is terminated with a 6.8K resistor and assuming a line current of 1mA produces 6.8 Volts across it. This DC signal is buffered and fed into a window detector via a sample and hold gate. The lower voltage threshold is 5 Volts and the upper is 10 Volts and providing the input signal is within this range the fault detector will indicate a normal condition. The input circuit also includes an AC detector providing a fault condition should the loudspeaker line be unbalanced due to a fault condition.

Setting the BEL1 for use

The switches on the unit are set depending on the number of spurs and hence BEL1s on the line, as follows:

