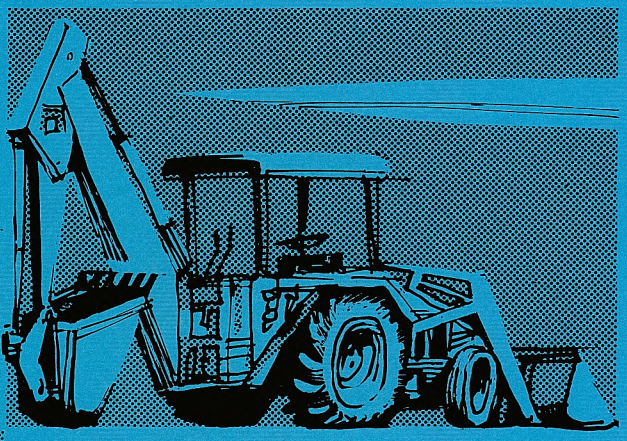
BAND TECHNICAL PUBLICATIONS



INTERCOM AND AUDIO SYSTEMS
FOR BAND BUILDINGS

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INTERCOM AND AUDIO SYSTEMS FOR BAND BUILDINGS

1.0 INTRODUCTION

This publication provides guidance to band administrators and project managers who are responsible for the selection of intercom and audio systems for band buildings.

In some buildings, such as band halls and offices, an office type intercom system may be suitable. These systems enable two-way communication between desired offices or other specific locations.

In other buildings, such as sports centres and auditoriums where public activities are carried out, it may be desirable to provide an audio system with the capacity for public address (voice announcements etc.) and radio/tape music. Audio systems may be portable or permanently wired-in.

This publication describes typical intercom and audio systems and provides a technical checklist for audio system components in Appendix 1. Appendix 2 gives approximate costs of typical intercom systems. Intercom and audio systems are available from commercial sound equipment distributors in most major towns and cities.

If telephone service is available, the local telephone company may furnish a rental intercom version of the commercially available intercom systems described below, which should be considered as an alternative.

2.0 INTERCOM SYSTEMS

2.1 Open Voice Wired Systems

2.1.1 Basic System

The "open voice single talk channel" system is a basic intercom system. It consists of a "master" unit which is wall or desk mounted with a built-in transmit and receive speaker and up to three "sub-master" units. A single channel talk system allows only one two-way

conversation at a time. The subs cannot call one another but each can call in to the master. This basic system can serve up to four offices. A number of different types of sub-master units are available. These include a privacy feature so that users of other sub-master units cannot listen in, and weather resistant sub-master units for external use.

2.1.2 Deluxe System

A typical deluxe, open voice single talk channel system has the capability of intermixing a number of master units and sub-master units. 3, 5 or 10 call units are available. Each master can communicate with other masters, and with its interconnected sub-master unit. All master units have a privacy feature. The single talk channel allows only one conversation to be carried on at a time. Weather resistant sub-master units are also available. System options include:

a. a telephone handset for master units in addition to the built-in speaker;

b. a horn-type speaker connection outside the main door;

c. "all-call" paging which allows announcements to be made over the entire system; and

d. a connection for a record or tape player to provide background music through the system.

2.2 Telephone Type Systems

2.2.1 Basic System

A basic telephone type system is wired-in and is known as a common talk selective ring type system. The transmitter/receiver resembles a push-button telephone and the system has only one talk channel. It is available with either 1, 3, 6, or 12 call selectors/push buttons. Two way conversation is possible from master to master, master to sub-master and master to door. The system cannot provide background music but otherwise, with the addition of a paging speaker, is similar in function and options to the deluxe version in 2.1.2. It does offer more privacy in that the received conversation can only be heard by the person who is holding the receiver.

2.2.2 Deluxe Systems

A typical deluxe multi-channel system consists of 6, 12 or 24 call push button selectors allowing up to 3, 6 or 12 simultaneous conversations. Master units are normally interconnected to provide a semi- private conversation; any master may, however, monitor or join in an existing conversation by pushing the selectors in use.

A version of this deluxe system is available which provides complete privacy. This system is even more expensive and would not normally be justified in office situations. An exception might be doctor's and lawyer's offices where the conversation must be confidential.

2.3 Wireless System

This system is similar to the portable FM radio transceiver in commercial use, except that it operates on a different frequency band and its range is much less. The power supply is a 120 volt line cord and standard wall receptacle. The basic unit consists of a single frequency transmit and receive channel but multi-frequency versions are available for up to 6 channels. The cheaper single channel versions cost $100 or less but they tend to be interference prone and are not recommended.

The more expensive units cost up to several hundreds of dollars but are more stable. These systems are more expensive to buy than the comparable wired-in version, but the cost of labour to wire in the latter system tends to make the costs equivalent.

Mobility is an advantage of the wireless intercom system, as only a 120 volt AC outlet is required to power the unit. This may be a consideration where offices are temporarily located or change their use. The disadvantages are the possibility of vandalism, theft and accidental breakage due to dropping. The system also may not be immediately available when needed.

3.0 AUDIO SYSTEMS

3.1 General Description

An audio system is used to originate and amplify voice and music using a combination of components consisting of:

a. an amplifier, with input connections for:
   - microphones,
   - AM/FM tuner,
   - tape cassette, and
   - record player; and

b. output connections for speakers -- these may be permanently wired-in or portable, depending on the use and flexibility required.

A single enclosure may include all components, except remote speakers which may be recessed or surface mounted. The system components may be separate for complete portability. Additional technical information on the various components is provided in Appendix 1.

3.2 Components

3.2.1 Amplifier

Basic amplifiers for public address (PA) and music, used with permanently wired-in speakers, only provide for monaural (mono) sound. Stereo equipment can be used most effectively with a portable system.

The cost of an amplifier depends on its rated power output in watts and the degree of distortion produced. A good PA amplifier could cost from $500 to $800. The wattage of the amplifier is related to the load posed by the speakers. Amplifiers in the range of 50 to 60 watts (r.m.s.) should meet the requirements of most auditoriums/gyms or band halls. Because of the large space and the background noise associated with sports, the rated power of an amplifier in an arena might need to be 100 watts (r.m.s.) or more to provide good sound coverage.

The type, number and placement of the speakers has a major effect on the quality of the amplified sound. An industrial sound specialist (with the supplier) would be able to optimize the various components to provide adequate sound at a reasonable cost.

When equipment is being purchased, bids should be requested from several sound equipment suppliers before a final system is selected.

3.2.2 AM/FM Tuner

The tuner is connected to the amplifier to provide AM and FM radio programs. A stereo FM tuner with a monaural selector switch is readily available and the best choice.

3.2.3 Record Player

The record player should be at least two speed (33.3 and 45 rpm) with an auto/manual/off selector switch. It should have a standard ceramic cartridge and replaceable diamond needles (styluses) for playing stereo records. The unit should have a shock absorbing base to reduce record skip when the player is jarred slightly, and a plastic dust cover.

3.2.4 Cassette Deck

A cassette deck is used to play tape programs through the system. A cassette deck is preferable to an open reel tape deck for convenience, availability of pre-recorded tape, and cost. The cassette deck should have record and play-back facilities, and should consist of the standard four track two channel unit with a noise reduction feature and a tape quality (bias) selector switch.

3.2.5 Microphone

A microphone is used to pick up voice or music and transmit it to the sound amplifier and to the speakers. The amplifier should have at least two separate microphone input connectors. For permanently wired-in sound systems in facilities such as band halls and gyms, at least one microphone plug-in jack should be located at the front, on stage, and at the rear. For an arena, one microphone jack should be located in

the main office, and another near the centre of activity, for example, beside the announcer in a home team box. The microphone input jack located on the amplifier can also be used if its location is suitable.

3.2.6 Speakers

A variety of speakers is available with a large range of quality and cost.

Public address type speakers are available from commercial sound equipment suppliers and these should provide long life expectancy with reasonable sound reproduction and costs. The following types of speaker are available:

a. column speakers permanently installed on either side of an auditorium stage;

b. co-axial speakers capable of reproducing music and speech fairly well from a number of ceiling locations;

c. horn type high power speakers for large spaces, arenas, etc., both indoors and outdoors; and

d. portable speakers.

A combination of speakers may be required to provide the desired effect.

Speakers should be chosen and installed to give clear and complete sound coverage throughout the facility. Some experimenting with actual speaker location is often required. The sound consultant/specialist who supplies the system can provide this service.

Appendix 1

TECHNICAL CHECKLIST FOR AUDIO EQUIPMENT

This checklist provides generally acceptable performance data.

1. Amplifier

   a. Program-paging amplifier, solid state, 60 watts (rms) output with less than 1% total harmonic distortion at 1000 KHz.

   b. 3-micropnone Hi/Lo inputs.

   c. Separate input for crystal, and magnetic phono, AM/FM tuner and tape, with front panel selection.

   d. Frequency response 30-20,000 Hz ± 1 dB from 1 watt to 60 watts.

   e. Regulation less than 1 dB from no load to full load.

   f. Output impedances: 1, 8, 12.5, 16, 100 ohms.

   g. Noise 80 dB below rated output.

   h. Controls: master volume, volume on each microphone and auxiliary inputs.

   i. Speech filter on/off switch on each microphone input.

   j. Bass and treble tone controls ± 10% minimum.

   k. Power on indicator.

   l. Rack mount facility. A 100 watt amplifier would generally have the same requirement.

2. AM/FM Tuner

   Controls and indicators on front panel:

   a. AM/FM tuning control.
   b. Power on-off switch.
   c. FM muting switch.
   d. AM/FM selector switch.
   e. Peak meter for signal strength.
   f. FM zero centre tuning meter.

Appendix 1 (cont'd)

Rear panel functions:

a. AM/FM antenna connections.
b. Audio output jacks low/high.
c. Fuse holder.

FM Channel:

a. Tuning range 87.5 to 108.5 MHz.
b. Hum and Noise 57 dB below 100% modulation.
c. Typical sensitivity 2 micro-volts for 30 dB signal/noise.
d. Frequency response 20 to 15 KHz + 3dB.
e. Alternate channel selectivity 70 dB.
f. IF rejection 90 dB.
g. Spurious rejection 45 dB.
h. Image rejection 45 dB.
i. Capture Ratio 2.0 dB.
j. Antenna: 300 ohms balanced, 70 ohm unbalanced.

AM Channel.
a. Tuning range 530 to 1650 KHz.
b. Hum and noise 48 dB below 100% modulation.
c. Selectivity 27 dB (IHF).
d. Sensitivity 200 uV (bar antenna).
e. Image rejection 43 dB.
f. Antenna, AM loostick and screw terminals for use with external wire antenna.

Power consumption 20 W max.

Tuner to have rack mount facility.

3. Record Player

a. Auto-manual control.
b. Three speed - 33 1/3, 45 and 78 rpm.
c. Automatic play up to 6 vinyl records.
d. Heavy duty hysteresis synchronous motor, belt drive.
e. Non resonant arm statistically balanced witn adjustable counterweight.
f. Wow and flutter 2%, rumble 45 dB.
g. Ceramic stereo cartridge, wired for monaural output; replaceable stylus 7 mil radius diamond for LP and 3.0 mil radius sapphire for 78 rpm record.

Appendix 1 (cont'd)

h. Changer controls: speed selection, stylus selection, start- stop-auto switch, cue/pause selection and stylus pressure adjustor.
i. Installation in slide drawer of equipment housing (see Item 7, Equipment Housing).

4. Cassette Deck

Regular commercially available 4 track 2 channel stereo cassette deck with monaural mode switch for recording and playback of paging information or prerecorded program tapes.

a. Frequency response: 40-15000 Hz ± 3 dB (FE CR tape).
b. Signal to noise ratio with Dolby off 57 dB (FE CR tape).
c. Wow and flutter 0.80% W.R.M.S.
d. Harmonic distortion 1.5% (FE CR tape).
e. Line-in and microphone inputs.
f. Line-out and headphone output.
g. Front loading.
h. Ferrite & Ferrite Head.
i. 2-illuminated peakLED VU meter.
j. Recording level control.
k. 3 position tape bias selector.
l. Dolby noise reduction switch.
m. Input selectors: - record, play, fast forward and reverse, eject.
n. Tape counter with reset button.
o. Cassette deck to have rack mount facility.

5. Microphone

a. Dynamic cardioid type microphone, frequency range 60-15000 Hz.
b. Impedance; high and low selectable; output level -57 dB.
c. On-off switch.
d. Satin chromium finish with 4.6 m (15 ft.) shielded pair cable, and matching floor stand adjustable from 880 mm to 1600 mm (35" to 63") approximately.

6. Speakers

Column speakers:

Wall mounted speaker column for band hall or auditorium/gym and arena sound coverage, (with flush niche

Appendix 1 (cont'd)

mounting modification kit and perforated grille if required). Frequency response 80-13 000 Hz; 25 watt program handling, (50 watts peak) 8 ohms, dispersion angles 140° horiz. and 30° vert. minimum of 6 - 200 mm (8") dia. speakers per column; approximate size 1200 mm high x 300 mm wide x 125 mm deep. These speakers may be used in conjunction with the horn type speakers for arenas, but surface mounted.

Co-axial speakers:

For ceiling mounting in band hall or auditorium/gym without stage: co-axial speaker 200 mm diameter, 15 watt with 90 gram tweeter and 300 gram main ceramic magnet; frequency response 45-20,000 Hz, SPL 91 dB at 1200 mm; recessed mounting with flush grille.

Horn type speakers:

Horn type speaker for arenas 15 watt full range: frequency response 250 to 13000 Hz; dispersion 110 degrees; impedance 8 ohms, SPL 120 dB at 1200 mm on axis, with 15 watt input, approximate dimensions 260 mm diameter and 225 mm deep, complete with adjustable mounting bracket. An outdoor weatherproof version of the horn type speaker is also available.

7. Equipment Housing

When part of a wired-in system, items 1 to 4 may conveniently be mounted in a metal equipment cabinet with lockable door.

8. Operation and Maintenance Training

The supplier of commercial intercom or audio systems should be requested to provide all pertinent operation and maintenance data for the system, and a list of common spare parts with their unit costs. The supplier should also provide a course of instruction to designated band personnel on the basic operation and routine maintenance of the equipment to allow parts replacement and adjustment as necessary after the normal warranty period.

Appendix 1 (cont'd)

For major maintenance, the equipment should be shipped back to the supplier for repair or replacement during and after the warranty period according to the supplier's instruction.

Appendix 2

COSTS OF TYPICAL INTERCOM SYSTEMS

These costs are approximate, and are based on 1984 Ottawa prices. They are intended as a guide only.

Basic Open Voice Wired System

Cost of 1 master unit @ $70 each:	$ 70
Cost of 3 sub-master units @ $30 each:	90
	$160
Installation costs (approximately same as cost of materials):	160
Total cost of system:	$320

Deluxe Open Voice Wired System Allowing 10 Calls

Cost of 2 master units @ $250 each:	$ 500
Cost of 8 sub-master units @ $30 each:	240
	$ 740
Installation costs (approximately same as cost of materials):	740
Total cost of system:	$1,480

Basic Telephone Type System

Cost of master units: 1-call $75; 3-call $85; 6-call $95; 12-call $110 ea.

A 12-call system would cost:	
12 x $110 = $1,320	$1,320
Installation costs (approximately same as cost of materials):	1,320
Total cost of system:	$2,640

Deluxe Telephone Type Semi-private System

Cost of master units: 6-call $110; 12-call $125; 24-call $150 ea.

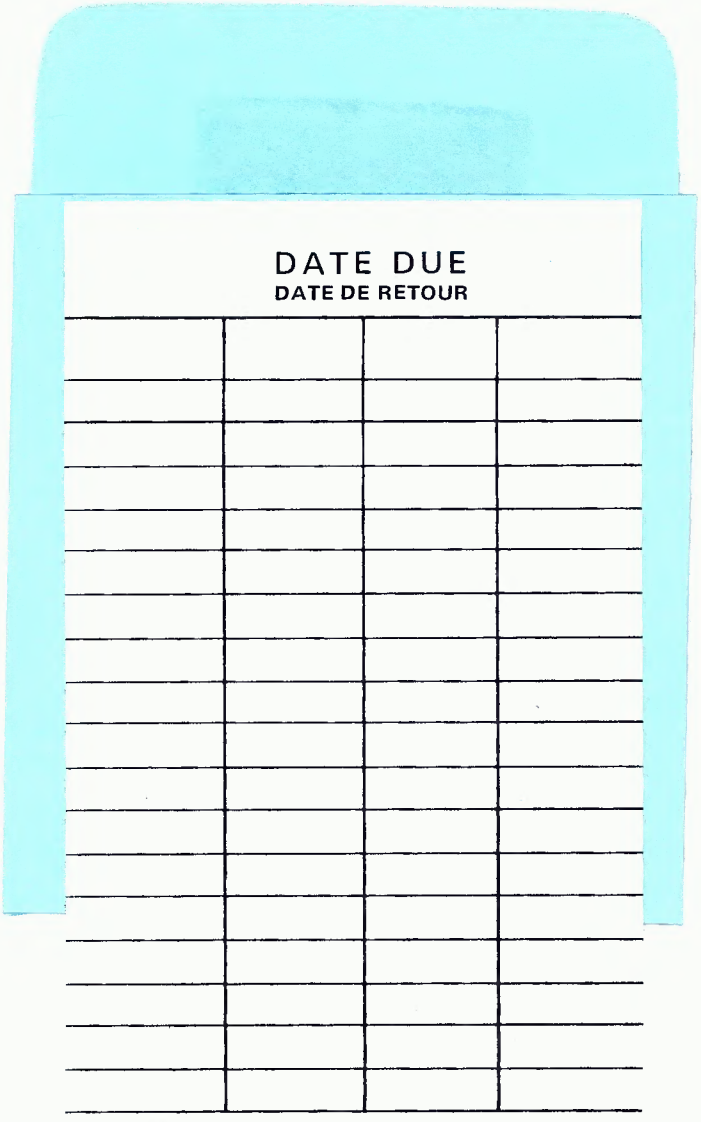
A 12-call system would cost:	
12 x $125 = $1500	$1,500
Installation costs (approximately same as cost of materials):	1,500
Total cost of system:	$3,000

Appendix 2 (cont'd)

Deluxe Telephone Type Completely Private System

Cost of master units: 6-call $100;
12-call $125; 24-call $150 each
A 12-call system would cost:

12 x $125 = $1500	$1,500
Control panel:	150
	$1,650
Installation costs (approximately 2 x cost of materials):2 x $1650	3,300
Total cost of system:	$4,950



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