

Sound Checking the MAV-20 (Theory & Procedure)

Thank you for selecting the MAV-20 audio module for your present alarm installation. The purpose of this document is to provide the system installer with additional (and hopefully helpful) information on the addition of audio to the alarm system. As this document will center on audio, we'll assume that you've studied the MAV-20 users / installation manual and are familiar with the concepts of audio verification.

Overview

From the point of view of sound quality the MAV-20 has 3 basic functions to perform once an audio session has begun.

1. Recover voice information from the Telco line and distribute it at an appropriately placed speaker. Thus to alert & communicate with the party in question.
2. To collect voice signals from a given location via microphone, amplify these signals then transmit them onto the telco line and off to the central station.

And !

3. During speaker phone operation properly switch between the two above modes of operation based on which party is talking.

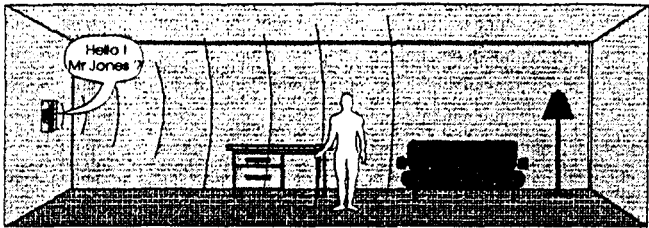
First we'll talk about receiving voice off the phone line from the central station . the point in question being volume and sound quality produced at the speaker. the variables here are the magnitude of the audio signal presented to the MAV-20 from the phone line, the systems speaker and the speakers placement. (Especially when using speaker phone mode,)

The MAV-20 provides 2 methods of adjusting volume levels to the speaker. Pot R67 is the speaker volume control and electronically controls the level of signal to the speaker. This pot is factory set to its maximum position when shipped and should provide adequate volume levels on most phone lines. However if the installation is on a very long phone line where signal loss can be higher, more signal gain may be required. Resistor R37 Labeled **Cut For Boost** is provided for this reason. Cutting this part will increase signal levels by approx. 10db , or to the average listener 2 times as loud. NOTE: It is cautioned to cut this part only when necessary as excessive gain & volume can reduce the performance of Speaker Phone operation.

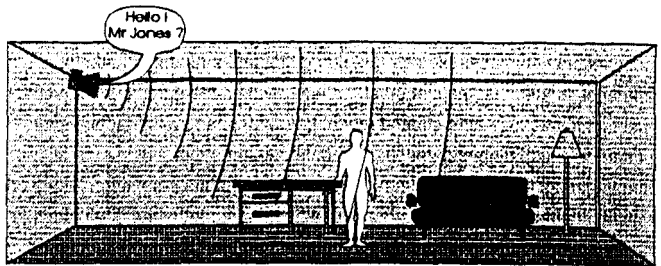
Having discussed the MAV lets move to a far more critical component, the speaker and its placement. Ultimately we want to transmit as much audio information in terms of volume and clarity into the premises as practical. (During High Gain talk volume is required to get the attention of any one at the site, while in Speaker Phone mode volume need only be adequate for normal conversation) Generally speaking larger speakers 6-8 inches offer greater efficiency and clarity than smaller types . Note that efficiency is the measure of audio volume in terms of S.P.L. sound pressure level vs. unit of energy applied. Thus for any given installation a higher efficiency speaker will provide more usable volume. If a larger more efficient speaker is not available or usable, several smaller speakers wired in series / parallel can provide the same result. As a general rule the greater the total speaker area the greater the efficiency.

Finally the topic of placement. Though all installations will be different, varying room sizes, wall textures etc.. and an argument could be made in favor of any installers choice of placement , the following generalization can be made. Place the speaker such that its output will transmit outward into and across the room in question.

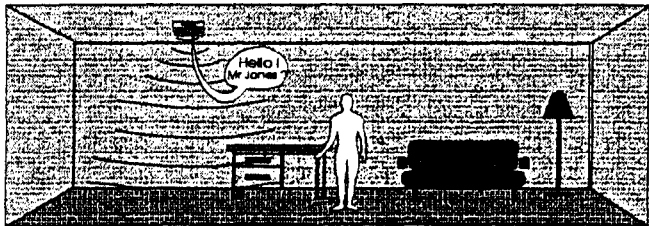
(and hopefully directly to the ear of the person were trying to communicate with) Usually placement on a vertical wall at approx. shoulder height or higher is best. Mounting near a typical wall telephone is another good location The following diagrams should help to illustrate the pro's and con's of various speaker placements.



Ideal placement of cone speaker . Output is transmitted clear across the room .



Horn type Speakers offer easy installation and are very efficient. The mounting bracket also makes them easy to aim for good sound dispersion.

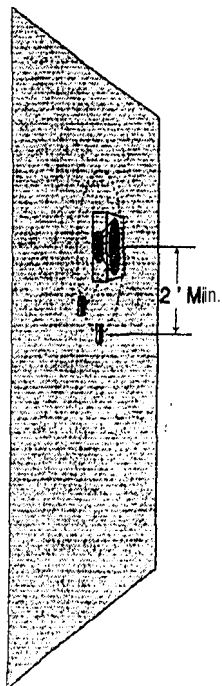


Ceiling mounted speakers usually are reasonably loud while the listener is beneath them. However sound pressure drops quickly approaching the corners of the room.



(Hallway Top View) .

Placement in a hallway as shown is the least desirable placement . as sound dispersion is muffled by the wall .

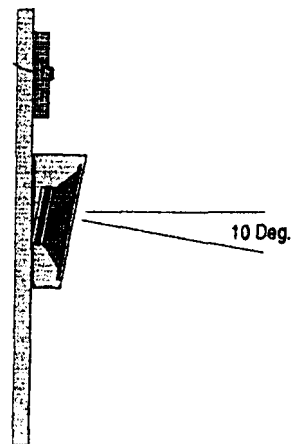


Recommended Placement of Microphone relative to the Speaker

Specifically systems using larger speakers with high output will require more separation, as smaller speakers with lower volume may function well with much less. Experimentation is recommended.



An additional offset of one component from the other by approx. 10 degrees (As Shown here) Helps to minimize acoustic crosstalk and maximize performance.



Transmission to The Phone Line

This topic is far easier to deal with as the MAV-20 handles the bulk of the hurdles with electronics. All that is needed is a good quality two or three wire electret microphone such as Napcos MIC-30 . (Though the speaker itself can be used as a Mic. , this technique offers inferior audio quality and does not allow the use of speaker phone mode.) Microphone sensitivity can be adjusted on the MAV-20 Via Control Pot R60 appropriately label MIC GAIN . This control is set to its half way point when shipped from the factory and should provide a good starting point for the installers sound check. The topic of Mic. placement will be discussed in the section on Set Up For Speaker Phone , though for now we will simply state that Mic. is best placed on the same wall as the system speaker but at a distance of no closer than approx. two Feet.

Set Up For Speaker Phone Proper Switching

In order to help justify the reasoning for the text to follow I have found it desirable to first describe basically what speaker phone is and how it functions . Hence the following !

When the MAV-20 is in Talk Mode, There is one audio signal path open. Ex. The central station operators voice signal traveling to the listen in site speaker.

In listen in mode we still have only one path. But in this case, FROM the listen in site traveling towards the central station operators head set. Ignoring the volume differences the only major change during Speaker phone mode is THE CONTROL of which signal path is open /on .

In Talk / Listen mode the central station operator must manually with the press of a button, switch the MAV from talk and then to listen mode. In Speaker phone mode the MAV-20 does the switching electronically and automatically based on which party is talking. The MAV-20 is constantly monitoring the audio signal from the microphone and comparing it to the signal coming in from the central station over the phone line. Based on which signal is greater in magnitude (size) the MAV-20 turns on the appropriate signal path.

Based on the above , the performance consideration is simply this . How quickly does the MAV-20 evaluate who is talking and follow through by turning on the appropriate signal path , What effects this performance ?

Proper switching is easiest when one person is talking and the other person (Who should be listening) is quiet. This is the best situation and is typical of normal conversational speech . However if both parties are talking the circuitry requires more time to determine which path to give control to . This condition is technically known as an idle state and usually leave both parties unable to hear or understand the other. Having pointed this out we can now explain why Mic. gain settings, Mic. placement and speaker placement are so critical to proper operation.

Consider an example where an 8" speaker is mounted in a wall directly above the microphone. Boost resistor R37 is cut , the speaker volume pot is at max. as is the Mic. gain pot. The volume from the speaker will be very loud during TALK and the signal to the station operator will be overwhelming during LISTEN. However an attempt to use speaker phone / VOX . will leave both parties unable to communicate . Here's what happens . The station operator activates speaker phone and attempts to talk . The audio signal after traveling through the phone line is presented at the input of the MAV-20 . The signal activates the talk path and the signal is passed out on to the speaker. Since 1. The speaker is too close to the Mic. 2. The speaker is making far too much volume and 3. The Mic. gain is maxed out . The signal output of the speaker is recovered by the Mic. , transmitted back into the MAV and wrongfully forces the into Idle. (The circuit thinks both parties are talking)

The result is that the person at the premises will not be able to hear the station operator. In severe situations the MAV can even begin to oscillate .

Having gotten to this point in this document we come to one of its main points. How do you install and set up the audio system to make VOX work ?

Setup and Adjustments

The adjustment procedure to follow will work for most any components selected even if installed under the worst case conditions of the previous text. However the quality of a selected component and its placement can mean the difference between a poor and a great performing system. The following components have been tested with the MAV-20 and have proven to work well. MICS.

Napco	MIC-30
Radio Shack	P/N 270-092
Mouser Electronics	P/N 25LM044 & 25LM05 1

SPEAKERS

Moose	MPI-3 5
MG or other	8" public address speakers
Ademco	705-820 (Horn Type)
ATW	H50 (Horn Type)

Note : Remember unless you are using a specially designed Mic & Speaker enclosure, it is best to mount the speaker at least 2 Feet from the Mic. See Drawings illustrating best component placement . (Page 2)

Having read the text and studied the illustrations lets assume all parts have been placed and the system has been powered up. Setup is as follows.

1. Call the central station and inform them of the test to be performed. (Alarm system communications and audio verification.)
2. Trip the alarm panel such that a central station call is made and the MAV-20 activated.
3. Upon central station kiss of , The MAV-20 should go on line with the central station operator
4. First Verify adequate volume from the operator while in high gain 'talk (This level will be noticeably louder than when in VOX) If volume levels at this point are considered too low then it is recommended to cut R37 and make further adjustment with pot R67
5. Ensure that the MIC GAIN pot R60 is set to the 50% position. Have the station operator press the 2 button putting the MAV-20 into VOX . Have the operator activate Mic # 1 only (Remember ! only Mic 1 is usable during general Speakerphone operation) Ensure that Speaker volume is acceptable for normal conversation. If not, Cut R37 and make further adjustment with pot R67 (Volume) .

6. The next procedure we call a Ping Pong Test and is meant to ensure that speaker volume, Mic gain and VOX performance are optimized. An example of this test is as follows.
 - I. Ask the operator for his/her name and inform them that you are doing a VOX Ping Pong Test.
 - II. Inform the operator that you are going to announce their name and that you would like them to respond with a quick one word reply such as "What"

Example : If the operator's name is Carol , Then the test would sound like this.
 YOU SAY " CAROL" , OPERATOR REPLIES "WHAT" Repeated it sounds like "Carol" "What" "Carol" " What" etc....

 - III. If all is working properly then each word will be heard correctly by the other party.
 If either a. The operator's reply is missed or partially blanked or b. the operator has trouble hearing you. Then you need to either reduce speaker volume or Mic Gain.
 If steps 4 and 5 were followed properly then you likely do not want to reduce speaker volume , Thus you would reduce Mic gain until the Ping Pong test produces the desired results. (All words are heard correctly) Note: As pointed out performance on this test can also be improved by better separation of the speaker and the Mic.
 - IV. Recheck high gain Talk/Listen Volumes . Have operator verify adequate gain levels during listen in and VOX.
7. Have the operator switch several times from talk to listen and if available, independently switch through all Mic. channels. This will insure that the system is switching properly. As a further test turn on any stereos , TV's or any thing else that would make the room noisier than usual . Any problems that are noted would be remedied by a further reduction of Mic. gain
 A final Ping Pong test and check of talk/listen levels should now bring the installation to its conclusion. The job is complete !