

**GUIDE TO BETTER ORGAN INSTALLATIONS
IN CHURCHES AND AUDITORIUMS**

"REVISED EDITION"
REVISION II

CONN ORGAN CORPORATION

OAKBROOK, ILLINOIS
SERVICE DEPARTMENT - ELKHART, INDIANA

GUIDE TO BETTER ORGAN INSTALLATIONS IN CHURCHES AND AUDITORIUMS

TABLE OF CONTENTS

Introduction . . . . .	.2
Planning an Organ Installation . . . . .	.3
Acoustics. . . . .	.3
Placement of Console, Choir and Speakers . . . . .	.5
Planning a Custom Installation . . . . .	.6
Material for a Custom Installation . . . . .	.8 & 48-54
Grille Cloth . . . . .	.8 & 53
The Echo Organ . . . . .	.9
Provisions for Power & Conduit . . . . .	.10
Tone Chambers. . . . .	.11
Wall Mounted Speaker Cabinets. . . . .	.12
Ceiling Beam Installations . . . . .	.13
Leslie Speakers in Custom Installations. . . . .	.14
Altar Type Custom Installations. . . . .	.15
Corner Type Wall Cabinets. . . . .	.15
Replacement of a Pipe Organ with a Conn . . . . .	.16
Removal of the Speakers from the Console . . . . .	.16
Conn Electronic Pipes. . . . .	.17
Pipe Connector Kits. . . . .	.19
Examples of Various Types of Custom Installations. . . . .	.20
The "A" Frame Church . . . . .	.20
Balcony Installations. . . . .	.28
Specifications - Model 255 - 256 Speaker Cabinets. . . . .	.37
Pipe - Console Connections . . . . .	.39
Speaker Hole Sizes . . . . .	.53
Typical Speaker Connections. . . . .	.40
Adapter Cables . . . . .	.41
Instructions for Pipe - Console Connector Kits . . . . .	.42-47
Custom Installation Material & Accessories . . . . .	.48-50
Speaker Information & Level Adjustments. . . . .	.52-53

SCHEMATICS

255 - 256 Speaker Cabinet. . . . .	.51
Kit 85 . . . . .	.55
Kit 86 . . . . .	.56
Blackboard Amplifier 70790-004 . . . . .	.54
Blackboard Amplifier 70790-005 . . . . .	.51

Conn Organ Corporation, 1976
Elkhart, Indiana

PLANNING AN ORGAN INSTALLATION

The proper time to start planning a fine Conn Organ installation is while the church is still in the planning stage, before the first spade of dirt is turned for the new structure, or before remodeling begins. At this time the acoustics, chambers, conduit and console placement should be considered, and whenever possible, try to meet with the architects to make sure that the organ has been given the necessary consideration. If you have any questions, this is the time to request help from the representatives of the Conn Organ Service Department. Plans for new structures can be submitted to the Service Department at Elkhart for their suggestions, or to the District Service Manager who can be called to meet with the architect or building committee to discuss the installation.

When questions arise pertaining to existing structures, the Service Department can be of the most assistance if they can be supplied with a floor plan with measurements, seating capacity and acoustical conditions. Photos of the interior are very helpful. Pictures of the nave, chancel, transepts, ceiling construction, choir location, and any possible speaker locations should be included. The quality of the picture is unimportant as long as they show the structural interior of the church. A Polaroid camera works very well for this purpose.

Send all requests for advice to the Conn Organ Service Department, 1101 East Beardsley Avenue, Elkhart, Indiana 46514 or the Service Manager in your area.

ACOUSTICS

The tonal quality of any organ is dependent on the prevailing acoustical properties of the building in which it is installed. It is relatively easy to get a good sounding organ in a building with proper acoustics, but almost impossible to get a truly fine sounding organ in a building with very poor acoustics. Therefore, it is very important that much thought goes into the planning of any new building or remodeling project to insure that the finished building will have good acoustics.

The mere mention of the fine Gothic cathedrals of the old world brings to mind the awesome, rolling reverberation which can be achieved only with massive proportions and surfaces of stone and marble. To deprive such architectural wonders of their acoustical properties would degrade them to mere piles of stone, useless, except for their visual appeal. Because the acoustical properties are in harmony with their other impressive characteristics, they remain to this day a lasting reminder that greatness is a blending of many things. In these structures are found the ideal acoustical environment for the organ and most great musical literature of the church was composed and meant to be performed in buildings with long reverberation time. Without the proper acoustical setting, such music will not sound natural or authentic.

The acoustical characteristics of any building must reflect the purpose of the structure. An acoustically sterile environment is meant to enhance the feeling of solitude and is desirable for small chapels where an intimate atmosphere is conducive to private meditation but for the main sanctuary to have the proper psychological effect on the congregation, it must be reverberant. When the congregation has joined together to worship, it should be a unified effort; and with the proper reverberation, their voices will rise in a harmonious blending of all present, rather than a group of individual efforts.

Good acoustics should be the concern of all, rather than just the organist and the choir director. Although the musical program will suffer the most from poor acoustics, all other portions of the service will proportionately reduce to a less impressive role. Better than half the sound which reaches the listener's ears is the result of the natural amplification produced by the reflected sound off the hard, smooth surfaces which should surround the original source of sound. This applies not only to the choir and organ, but also the speaker. The impressiveness of the spoken word is greatly reduced when natural reverberation is lacking.

The loss of necessary volume resulting from usage of sound absorbing material can be overcome by installing an elaborate public address system for the spoken word, and purchasing additional amplification and speakers for the organ. This will only increase the volume, and will not replace the natural reverberation which is so necessary for an impressive church service.

For many years, the science of acoustics, which is unpredictable at its best, has been further confused by the manufacturers of sound absorbing materials. They have been waging a vigorous advertising campaign which has led many to believe that their products are capable of correcting all acoustical problems. This is like saying that the undertaker is the final answer in curing all ills. All products which claim possession of acoustical properties have one characteristic in common, that of absorbing sound, and the modern church has no sound to spare.

In past years, sound absorbing material took the form of converted wood products, but today, the worst offender is acoustical plaster which can be blown on instead of being applied with a trowel. The only thing that can be said for any such product, is that the original cost is less than that of a good hard finished surface. Because of the texture, dirt is picked up and retained, and washing is impossible. Redecorating is a problem for, like a sponge, it absorbs paint in great quantities, so the original saving is eliminated by more frequent redecorating at a greater cost. Each application of paint makes the surface less porous and more sound reflective. Acoustics should be permanent and not changeable with each redecorating job.

The logical way to control acoustics is with the shaping of the interior surfaces. All sources of desirable sound should be surrounded by surfaces that will project or reflect it toward the listening area. Once the sound reaches the listeners, it should be diffused into oblivion rather than be absorbed by acoustical material. The only excuse for the inclusion of any acoustical material is to eliminate echo and if the structure is properly designed, echo will be no problem. Echo is the result of sound bouncing between two parallel walls, and the slightest angle of either will prevent the possibility of echo. Even where echo is a possibility, no effort should be made to eliminate it until the auditorium is put into actual use. If there is adequate reverberation, echo will often blend with it and never be noticed. No effort to control acoustics with sound absorbing material should be made until the auditorium has been put to actual use. Never judge acoustics in a building as being too reverberant while it is in an incompleated stage, and the completion of any building is not reached until it is full of the people it was built to house and serve. If echo is a problem during use of the structure, then, and only then, should acoustical material be considered as a remedy. As a rule, it will be decided that the rear wall should be treated; but instead of covering the entire wall, small clusters of acoustical material should be added, a little at a time, until the desired results are attained.

Low, flat ceilings produce the poorest of church-like acoustics. There is little chance for any reverberation to develop and sound is usually concentrated in the area of its origin. With such poor design, it is important that the acoustics be not further emasculated by the inclusion of sound absorbing material on the ceil-

ing or walls. Basement churches, with their porous building block walls, offer perfect example of the worst possible acoustical conditions for a church service. Where it is necessary to utilize such a structure, even if only temporary, all interior surfaces should be made as smooth as possible. The cement or cinder block walls should be surfaced with some sort of paint or plastic material that will fill the pores. Remember, the better the acoustics the more impressive the tone of the organ will be, and good acoustics mean ample reverberation resulting from hard surfaced interiors properly designed.

PLACEMENT OF CONSOLE, CHOIR AND SPEAKERS

Placement of the console, choir and organ speakers is very important to the success of any church organ installation. It is necessary that the choir be located where their performance can be fully heard throughout the nave of the church. It is equally important that the organ installation be planned so the organist and choir can hear the organ without the organ being too loud for the congregation.

For the best of sound, the choir should never be bottled up in a side room or other area where their efforts cannot be fully heard. The ceiling should be high with all surfaces in the choir loft being of a hard, smooth material with no restrictive partial partitions which can prevent projection of all the tone. The usual choir location is either the chancel, transept or the balcony. Where the choir is to be heard and not seen, either the balcony or the area behind the altar is suitable. If it is necessary to install a screen to prevent the congregation from viewing the choir, it must be of a porous material such as Conn grille cloth.

Console and speaker location is dictated by the location of the choir, for the organist must be in a position to determine the balance between the organ and choir as heard by the congregation. It is imperative that the organist, choir and speakers be placed close together. An ideal location is often one which will permit the organist to conduct the choir from the console.

For the organ to do a good job of accompanying the choir, it should be adequate to supply the necessary rhythmic guidance without being overpowering. The organ should always be in the background and never predominate the choir. For this reason, the speakers must be located reasonably close to the choir and yet the tone should not be too directional for any of the choir members. The speakers in the console often are adequate for choir support, and where the Conn Organ chosen does not have built in speakers, the best location is usually above and behind the heads of the choir. Where the choir is in the rear of the chancel, the speakers can be located off to both sides and well above their heads, but never out in front of them.

If a speaker installation for choir support will not supply adequate accompaniment for congregational singing, another complete set of speakers should be installed for this purpose, making use of the Conn echo switches. If two sets of speakers in two separate locations will do a better job than one, the installation should be planned that way. Never compromise on the number of speakers. A poor installation will discourage sales and a fine one will lead to more. Every installation should be a showpiece for the dealer; acoustically and visually.

PLANNING A CUSTOM INSTALLATION

In planning any Conn Organ installation, there are three main questions; speaker location, the number and size of speakers to use, and of course the installation cost. The speaker location will depend on the architectural layout of the church. Where chambers of the proper size are logically located, there is no problem, but if no thought has been given to the placement of the organ speakers, an installation must be planned which will provide proper coverage for the choir and congregation while being visually acceptable to the purchaser.

If no chamber has been provided, look for attic space where openings can be made in existing walls or ceiling, Fig. 1. Often chamber or speaker space can be found off to the sides of the chancel or in the rear of the church, Fig. 2. Side rooms can be converted to usable chambers if the openings can be made above the heads of the people, Fig. 3. If there is walking space behind the altar, Fig. 4, speakers can be mounted here, either facing out to the sides or up toward the ceiling. There are many locations for speakers: ceiling installations in scissor beams, Fig. 5, a custom built communion table, light wells, flower boxes, Fig. 6, ornamental facades between the nave and chancel, in the balcony rail, Fig. 7, storage rooms, areas in and above doors, Fig. 2, above confessionals, corner cabinets, Fig. 8, or other architecturally designed wall cabinets, Fig. 9. Above all, consider Conn Electronic Pipe Speakers which can be used with all Conn Organ models and blend very well ornamentally with any church design. Use of the Electronic Pipes makes possible the creation of tone where it is needed.

In installations where Conn Electronic Pipes are not used, always install as many cone speakers as possible. A good rule is to figure what is necessary to make a good sounding installation and then double the number of speakers using the same amount of amplification. You will find that the additional speakers will improve the tone with but little additional cost. More speakers do not mean additional volume, but rather, improved tonal quality.

When doubling the number of speakers, it is not necessary to double the number of Leslies. One Leslie on each channel requiring a Leslie is usually adequate, and a ten inch speaker or model 145 Pipe Speaker can be used in place of the second Leslie.

When planning a church installation for Conn Organ which has built-in speakers, always try to include external amplification and speakers. Even where the console speakers are capable of filling the church with organ music, additional speaker equipment makes it possible to provide the necessary support for congregational singing without the organ being objectionably loud for the organist and the people in its immediate area. A good, versatile installation is made when the console speakers are expected to do no more than provide support for the choir, and the external speakers are used for organ solos and congregational support. This allows the console speakers to be turned down to the point where the organist can actually hear the externals come in when they are added. (When leveling this type of installation always level the console first, for any change in console levels will have a proportional effect on the external speakers.)

Figuring the cost of a custom installation will depend on the complexity of the work involved. Speaker and amplification equipment can be easily figured by referring to the Service Manuals and Conn price sheets, but the cost of labor will depend on what the dealer offers to do in the way of architectural changes and other work in the church. It is best if removal of walls and other modifications are made the responsibility of the church with the dealer offering nothing more than plans and advice. A professional electrician should be employed to install electrical outlets and run cable through conduit. Trying to get cables through conduit can be a time

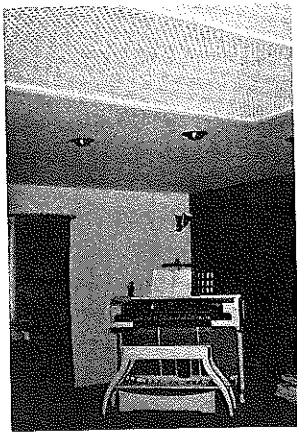


Figure 1

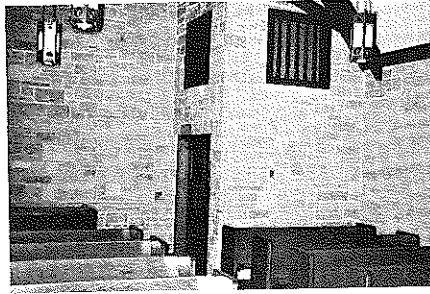


Figure 2

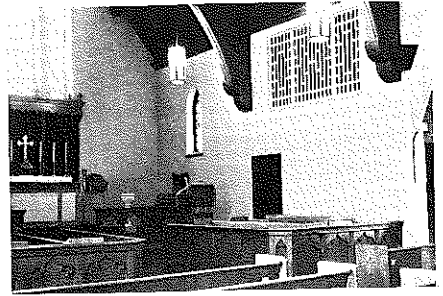


Figure 3

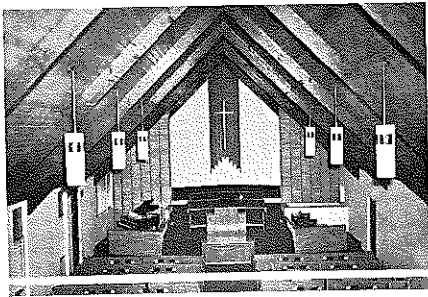


Figure 4

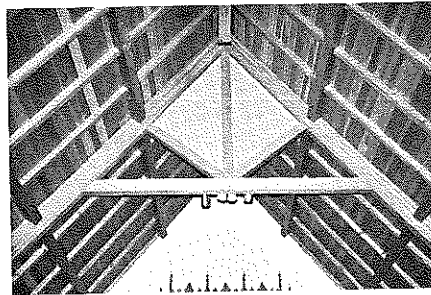


Figure 5

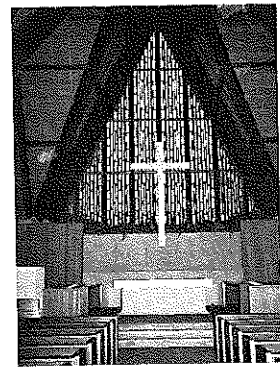


Figure 6

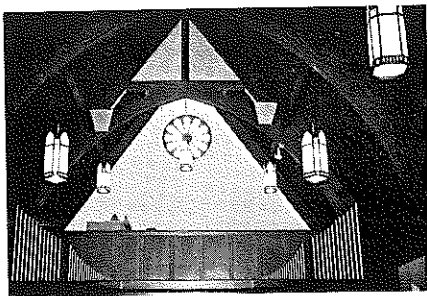


Figure 7

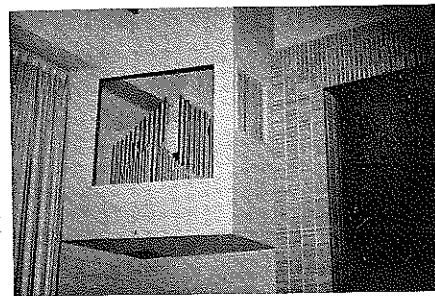


Figure 8

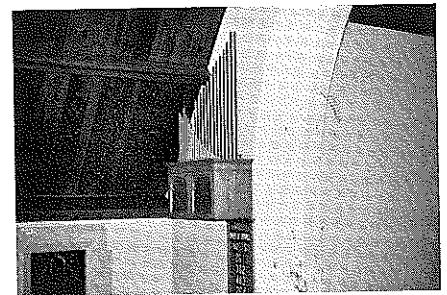
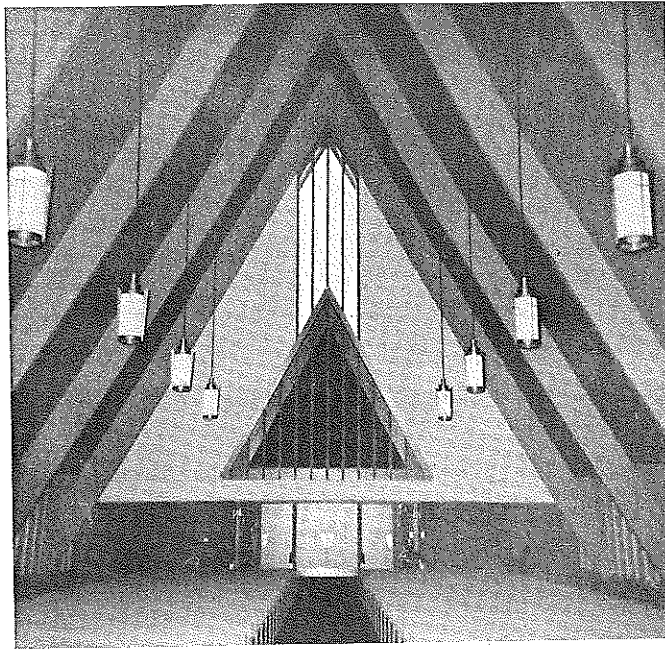


Figure 9



echo installation

PROVISIONS FOR POWER AND CONDUIT

Most Conn organs use 120 volt 60 Hertz power. Where the organ is to be installed in an area where the voltage or frequency differs from this, the Conn Organ Service Department should be consulted before the installation is made. Normal outlets capable of supplying 20 amps each should be located at the console and at each amplifier location, and should be separately fused. All Conn organs are transformer operated so no grounding is necessary.

External speaker and amplifier installations require low voltage signal or speaker wire and 120 volt AC power for the amplifiers and operation of relays. Local building codes usually require separate conduits for each type of voltage so two separate conduits should be installed. A good rule to follow is to provide two one inch rigid conduits between the console and amplifier locations for each four channels (or less) of the organ being installed.

The amplifiers will usually be located in the same room as the speakers but if the speakers are in an area where access is difficult for servicing, the amplifiers should be installed in a more accessible location. In this event additional conduit will have to be installed between the amplifiers and speakers. Two one inch conduits are adequate.

If special equipment, such as external Conn tone generators, is to be included in the installation or is contemplated, additional conduit will have to be installed to accommodate the additional cables. No such installation should be planned without first asking the advice of the Conn Service Department in Elkhart or talking with your District Service Manager.

When advising a church on the proper inclusion of conduit it is best if conduit is included for the addition of chimes which can be added to the organ. This should include the necessary conduit to the tower for outdoor speakers. Consider all future possibilities for additional runs to accommodate future features.

TONE CHAMBERS

Properly designed, located and constructed chambers provide a good installation and are the easiest to work with. The best type of chamber installation is where the openings fill all or most of the walls facing the area where tone is desired. Stock Conn speaker cabinets can be used with the advantage of being movable within the chambers until the best coverage is attained. It is not necessary to have the speakers face the listeners. If the interior walls of the chamber are of highly reflective material, the speakers can be aimed at them so the tone that reaches the listeners is completely non-directional. Or the tone can be bounced off a wall outside the chambers such as the end wall of the chancel. The greatest advantage of such an installation is that the speakers can be moved until the proper coverage is attained and the amount of work is minimized by using stock Conn tone cabinets.

Infinite baffle installations offer some advantages over the chamber types. The chamber interiors can be left in an unfinished condition, or if the opening is made in an attic space no chamber is required. Where a wall is being removed to create a "chamber", the studs can be left to help reinforce the baffle board, Fig. 10. This will reduce the cost of construction and the money saved here can be used for additional speakers and amplification thus improving the sound. The chambers should have a minimum of six cubic feet of space for each speaker with the opening large enough to accommodate the necessary number of speakers. To determine how much baffle area is required for each channel, refer to page 53 (typical speaker hole sizes). Better results can generally be obtained if enough baffle area is provided to space the speakers farther apart.

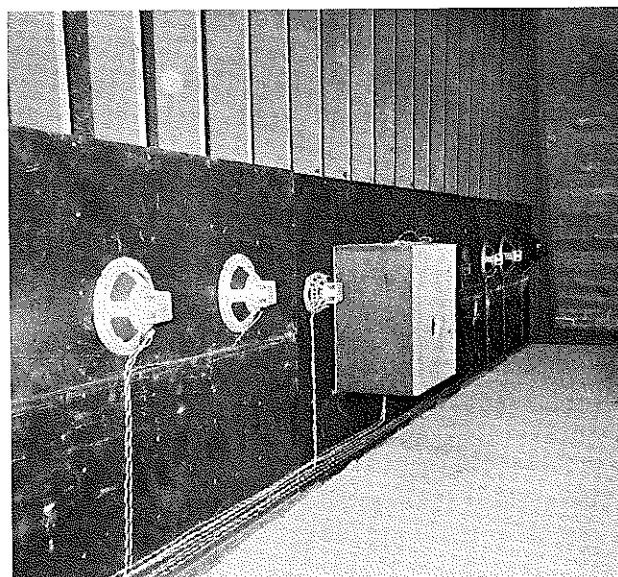


Figure 10

Placement of the speakers on the board is not critical. The only speakers which benefit from close proximity are the pedal speakers which handle the low tones, so the 15" speakers should be mounted as close together as possible. Better bass is obtained if the pedal speakers are mounted so the tone is projected out of a corner or along a wall. All other speakers should be spread over as large an area as possible. When there is a separation of six or eight feet between the Leslie and the flute bass speaker, the flute tone will seem to travel across the area between the two speakers when the keyboard is keyed from one end to the other with a flute stop on. This is very effective when a custom installation is made in a dealer's store.

When working with unfinished chambers which are not acoustically "live", the entire opening between the chamber and the auditorium should be covered by the baffle board which supports the speakers. There should be no slots, holes or other openings of any type between the chamber and the auditorium. The baffle board should be a minimum of 3/4 inch plywood securely fastened to the studs every 8" with 2" screws. Where there are no reinforcing studs, additional 2" x 4" bracing should be added every 16" to 24" running the short way on the board.

Where a custom baffle installation is to be made in a large, acoustically live chamber, it is permissible to leave a portion of the grille opening uncovered. This is usually done where complete 4' x 8' sheets of plywood can be used without much trimming or cutting. It is important to provide proper baffle area for the speakers. The center of the fifteen inch speakers should be no less than 30 inches from the edge of the baffle board. All 12 inch speakers should be a minimum of 16" from the edge and all other speakers at least a foot from the open edge. One corner of the plywood should fit snugly into a corner so that no more than two edges of the plywood are left open. Always mount the bass speakers in the corner as far away from the open edges as possible where the plywood is braced the best and most rigid. All other speakers can be mounted where convenient as long as they are not too close to the open edges of the plywood. In addition to making the installation of the baffle board much easier, the Leslie usually presents less of a problem. If the uncovered portion of the grille is two feet or more the Leslie can merely set on the floor in front of it. If the only opening is at the top, mount the Leslie there on a shelf or directly to the studs.

In mounting speakers, all of the mounting holes should be utilized. 15" speakers should have 8 mounting bolts and all other should have 4 bolts. Both flat and locking washers should be used under the nuts.

WALL MOUNTED SPEAKER CABINETS

In most modern churches with their solid brick walls and no attic space, it is usually impossible to create any type of chamber that will accommodate a decent Conn organ installation, or there may be a chamber which will not supply the necessary support for both choir and congregation. The easiest solution to this problem is to make use of stock Conn speaker cabinets which can be mounted directly to the wall without any additional support or brackets. They are finished on the bottom as well as both ends and the top in a walnut finish and the front has an ornamental grille. Identical looking cabinets are available for all channels of all Conn organs with the exact number varying according to the model of the organ and whether pipes are used or not.

All of the components of the cabinets are accessible from the front through the grille opening so it is not necessary to remove the cabinet from the wall for servicing. The cabinet which contains the amplifier should be mounted about an inch away from the wall to provide proper ventilation for the amplifier, but this can be easily accomplished by mounting a board to the wall at the top of the cabinet and then fastening the cabinet to it. A thin board of equal thickness can be tacked to the back edge of the bottom board to keep the cabinet level. Where the cabinet is to be mounted in an inaccessible location, the amplifier can be removed and relocated in a more accessible area.

One of the advantages of a stock Conn speaker cabinet is that it provides an ideal shelf for Conn Elec-

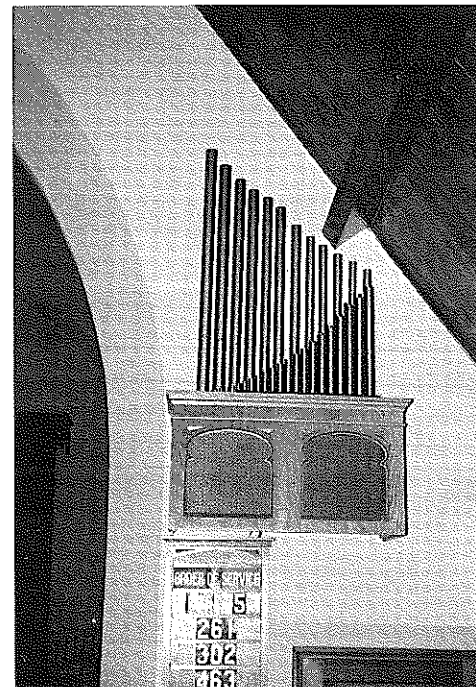


Figure 11

tronic Pipes, Fig. 11. The cabinets are the same width as the pipes and the finishes match. The flute pedal channels can speak through the speakers in the cabinets and all other channels can make use of the pipes which can be placed on top of the cabinets. For demonstrations, casters can be mounted to the bottom of the cabinets and the pipes placed on top for easy movement from one location to another. A dealer demonstration hint: if a 71770-5 pipe-console connector kit is used in connection with a 255/256 speaker cabinet, it can be very effective when showing the organ with external speakers to a church group.

In some installations, it may be necessary to install wall mounted cabinets that are more ornate than the stock Conn speaker cabinets. One solution to this problem is to start with stock Conn cabinets, such as the 255 or 256, and add more ornamentation to them in the form of elaborate shelf brackets and attach different sides and fronts directly to the cabinets. When modifying the 255 and 256 cabinets remember that the front grille has to be removable for service. When speaker cabinets have to be constructed from scratch, they should contain the same cubage as the 256 and if the amplifier is to be inside the cabinet, proper ventilation must be provided.

CEILING BEAM INSTALLATIONS

Ceiling beam installations Figs. 12 & 13, offer the advantages of being unobtrusive, occupy no floor space, and being high off the floor, produce good non-directional tone. Custom built cabinets can be constructed to match the angle of the ceiling and can be mounted on a shelf between the purlins or to the purlins themselves. The back of the cabinet can be left open and the cabinet set out from the wall far enough to permit access for servicing. If the cabinet is large enough to permit a compartment of at least 12 cubic feet for the bass section, a back can be installed.

Where there are scissor beams in the ceiling, they can be used as a framework to support three quarter inch baffle boards which can be cut to fit inside the beams and mounted to one inch cleats so the front of the baffle board is flush with the front of the beams. Grille cloth can be folded around the edges of the baffle board and stapled to the back side eliminating the need for trim (remember to paint the board flat black). The best location for such a scissor beam installation is about ten to fifteen feet from an end wall of the church and the back should be left open, for this one instance, where the back wave of speakers can be put to good use. The back side of the speakers should be covered with Conn grille cloth for the sake of appearance.

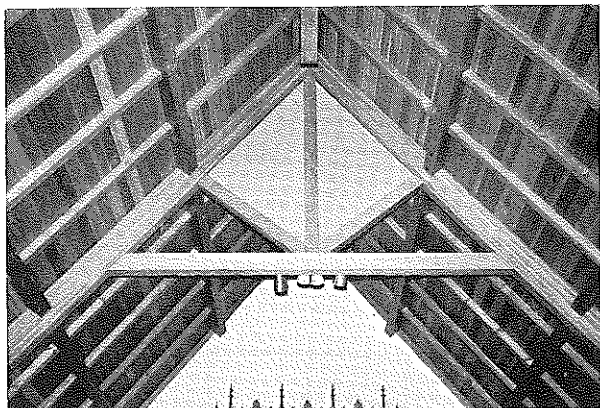


Figure 12

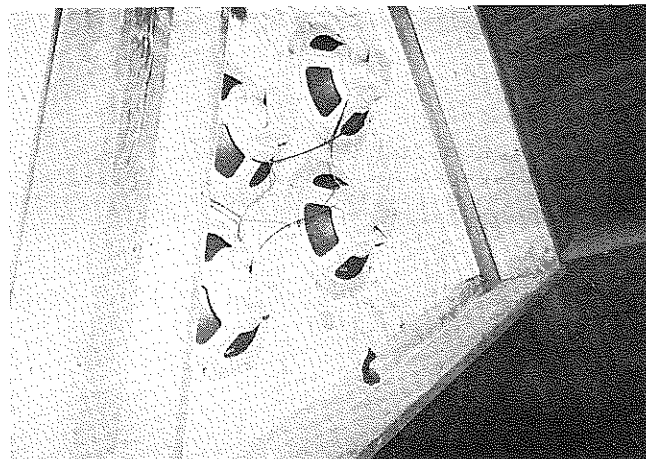


Figure 13

The bass speakers should be mounted as high in the peak as possible to provide the maximum baffle area but the location of all other speakers is not critical and they can be layed out to provide the neatest wiring. Vertical mounting of the Leslie is best as it will require less depth, and it can be mounted to the back side of the baffle board with angle brackets. Once again, it must be accessible for servicing.

It is not always necessary to include a Leslie in all speaker installations. Where the console has built-in speakers, its Leslie will often be adequate, and if the custom installation is for either choir or congregation support, no Leslie need be included. The Leslie should be replaced with a ten inch speaker and the rest of the installation be made in the normal manner. All installations should include at least one Leslie if for no other reason than to add the mellow tone as only a Leslie can for background music. All denominations will approve of the slow Leslie and many will make full use of the fast. One very fine sounding installation places the Flute and pedal speakers in the ceiling installation, with all other channels sounding through electronic pipes mounted on a nearby wall.

LESLIE SPEAKER IN CUSTOM INSTALLATIONS

There are two dual speed Leslies available from Conn, part number 70229-2, meant for vertical mounting, and 70545-3 for horizontal mounting. When properly installed, there is no noticable difference in the tones. The only difference in the two units is the return spring for the slow motor armature. If a unit meant for vertical mounting is mounted horizontally, the shaft of the slow motor will drag on the rubber tire and act as a brake at fast speed. If a horizontal unit is mounted vertically, the stronger spring will prevent the slow motor from engaging the rubber tire.

Where the number of speakers is doubled, only one Leslie need be used on each channel that calls for one, with the second Leslie being replaced with a Conn ten inch speaker.

Occasionally the Leslie need not be included in the baffle board but merely placed on the floor in front of a chamber baffle, resting on 1" foam rubber blocks, Fig. 14, or it can be fastened to exposed studs.

Leslies must be accessible for belt adjustment and servicing. They should be oiled about once a year and, on occasion, the motors have to be removed for a thorough cleaning. Any custom built cabinet should include an access panel for the Leslie. The speaker and motor leads should have plugs on them near the Leslie so the complete unit can be removed without unsoldering or cutting wires.

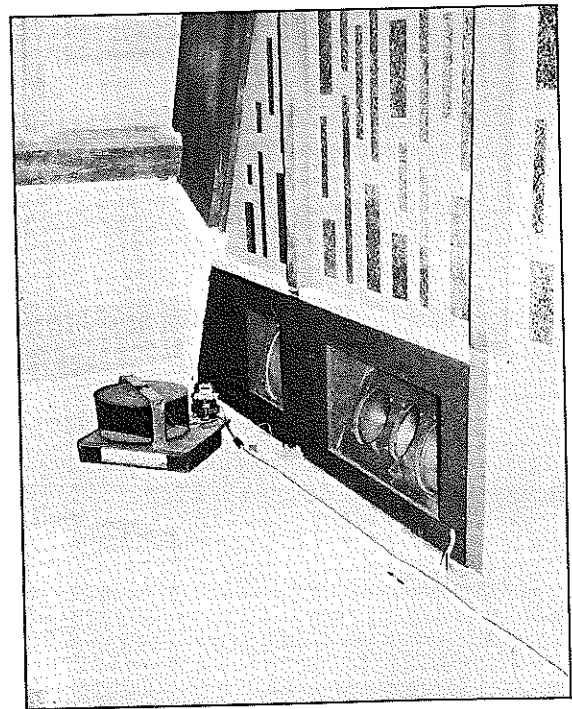


Figure 14

ALTAR TYPE CUSTOM INSTALLATIONS

A properly constructed altar can serve as a speaker cabinet with the speakers facing either out the sides or, if the walls are of a hard reflective material, out the back. Where the space within the altar will permit, Conn speaker cabinets can be set inside, or just a 255 cabinet can be installed within the altar with the other channels being served by the electronic pipes. Such installations serve well where the choir is off to the sides of the altar. Where the altar is large enough and solidly constructed, a baffle board can be mounted on the rear and the entire altar can serve as a tone cabinet.

When this is done, it will be necessary to cover the inside surface of the cabinet with thick sound absorbing material such as fiberglass insulation or tufflex to insure a smoother response from the cabinet. The amplifier will usually have to be mounted elsewhere, so as to receive proper ventilation. Once again, the altar can contain just the Leslie and bass speakers with the other channels being served by pipe units.

Where the altar has a high back with a walkway behind it, this can be used to conceal shelf mounted speakers. Stock Conn speaker cabinets can be used or a special built cabinet. They can face either up or out toward the sides.

CORNER TYPE WALL CABINETS

Corner type cabinets, Figs. 15 & 16, are suitable for churches with flat ceilings where no other type of installation can be made, or used in conjunction with speakers in other locations. Their construction is simple and they can be built to include as many channels as necessary, with a compartment for each channel.

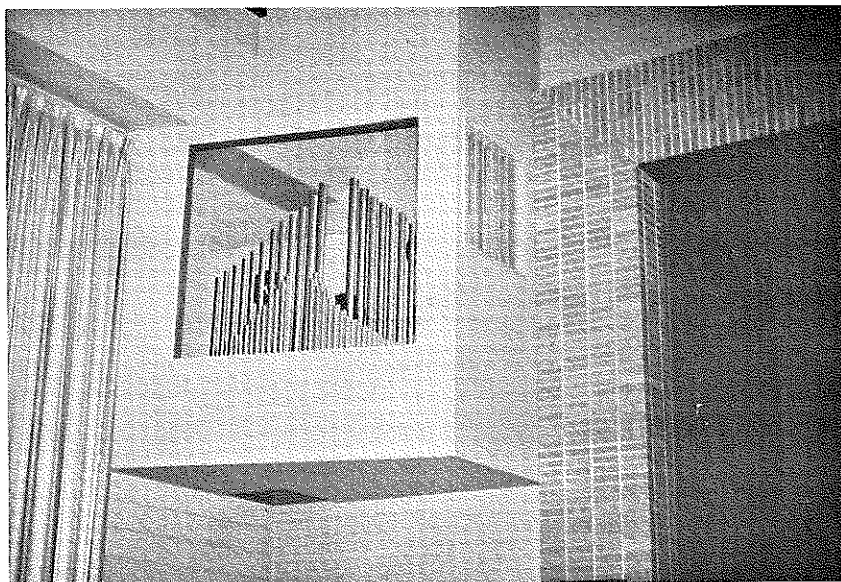


Figure 15



Figure 16

Triangular shaped shelves should be mounted in the corners with the center shelves acting as partitions between the different channels. The only compartment that needs a large cubage is the bass which contains the fifteen inch speaker. Where the cabinet is air tight the compartment should contain a minimum of 12 cubic feet but if a slot of one inch is left between the sides of the cabinet and the supporting walls the compartment need be but six cubic feet. The bass tone from the rear of the speaker which comes out of the one inch slots and follows the walls produce a fine bass. A fine installation is where the corner cabinet accommodates just the bass speakers with all other channels being served by pipe speakers. The cabinet need not be so large and a less directional tone is produced.

REPLACEMENT OF A PIPE ORGAN WITH A CONN

If the pipe organ is contained within chambers and the openings are properly located little work is needed to make the transition to a Conn. The pipe console should be removed and the wire pulled from the conduit, which can then be used for the Conn cables. It is not necessary to remove all the mechanics of the pipe organ. The pipes and their supporting racks must be removed along with the shutters, but it is best if the chests can be left to serve as shelves for stock Conn speaker cabinets. The cabinets can be moved around within the chambers until the best coverage is attained.

Where a custom installation is made, the supporting frames for the shutters can be used to fasten the 3/4 inch plywood baffle. Additional bracing may be necessary for the plywood and the recommendations for custom installations should be followed, but the installation should be relatively easy and the coverage should be about the same as that of the pipe organ.

In many churches, the chambers are located in the chancel area with the only openings being on the inside walls facing each other. Where poor acoustics prevail or the chancel is very deep, it may be necessary to make additional speaker openings in the front of the chambers to provide adequate support for the congregation, or consider the use of Conn Electronic Pipe units.

Ornamental face pipes can be retained to serve as a grille for the Conn speakers. Their retention will eliminate the necessity of a new grille and act as a pacifying factor for the church members who have sentimental feelings for the old pipe organ.

Where the pipe organ is contained within a free standing case it should be ascertained if the case is to be removed in the future. If the case is retained it is usually only a matter of time before it is decided that the case is occupying space that could be used for additional seating. The case removal may have to wait for the next redecorating program but the Conn installation should be made so the removal of the case will not require an extensive reworking of the Conn installation.

REMOVAL OF THE SPEAKERS FROM THE CONSOLE

In some cases, it may be necessary to remove the speakers from the console and baffle mount them elsewhere. Although this is possible, it is really not recommended and it is best to add additional amplifiers and speakers and leave the console as is. Always leave the amplifier in the console, removing just the speakers and Leslie. In models having a flute or diapason to Leslie switch, or a tibia becomes flute switch, the crossover should be left in the console. On all other two channel organs the crossover can be removed and reinstalled in the new location. Remember that it is possible to substitute electronic pipes for all speakers except the flute and pedal.

Extend all speaker leads and follow the same wiring layout as was present in the console. Number sixteen wire should be used for this purpose and Conn hookup

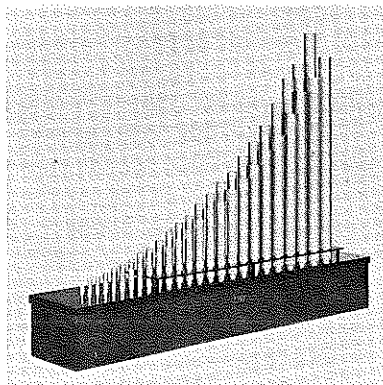
wire can be used. It is a twisted pair of number 16, one black the other white and can be ordered by part number 70971-2. Speaker should be mounted in the usual manner described under Custom Baffle Installations. Three wires will be necessary for the Leslie motors: one common, one slow motor, and the third, fast motor power. Check with the building codes for it is seldom permissible to run the Leslie wires through the same conduit as the speaker leads. *Do not use a "common" for any speaker runs.*

CONN ELECTRONIC PIPES

Conn Electronic Pipes come in three models. The smaller, or treble unit, is the model 145 and comes in three different types with the only difference being the configuration of the pipes on the walnut, wooden base. The 145 pipes have been designed to complement the brighter stops of the string family, the higher harmonics of the diapasons and mixtures, and when added in parallel with the Leslie, the flutes take on a sparkle that the Leslie alone is unable to provide.

The model 146 is made up of larger pipes mounted on the same size wooden base as the 145 and are capable of handling the lower octaves of the manuals. These lower range pipes bring out the body of the diapasons and add authenticity and richness to the reeds.

The pipes are meant to be used on the manual voices only. Although the 146 pipes will produce the tones of the pedal string and reed stops quite well, it is necessary to have the pedal sixteen foot diapasons and flutes speak through ordinary cone speakers in order to bring out the deep bass tones which they produce.

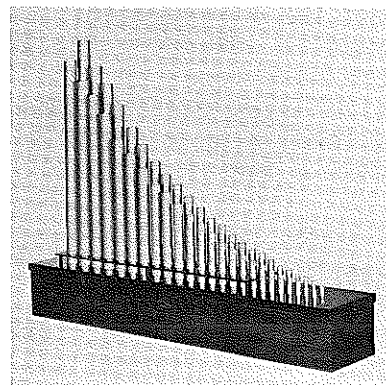


145 type 2

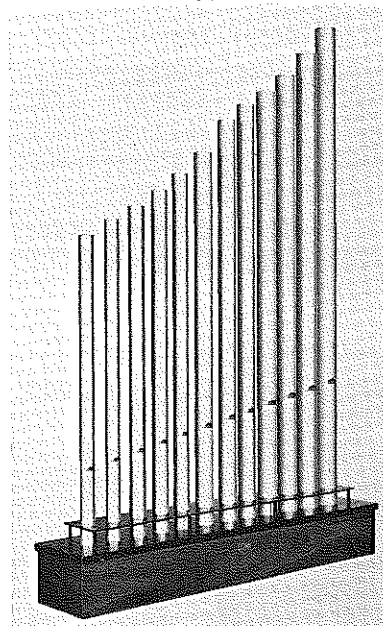
DIMENSIONS
 No. 144 - types 2, 3: 21" wide; 8 1/2" deep; 29 7/8" high. Weight 17 1/2 lbs.
 No. 145 - types 1, 2, 3: 42 1/2" wide; 8 1/2" deep; 34" high. Weight 18 lbs.
 No. 146 - types 2, 3: 42 1/2" wide; 8 1/2" deep; 63 1/2" high. Weight 40 lbs.
 Finishes: Walnut base with choice of gold or silver anodized pipes.

BASE DIMENSIONS

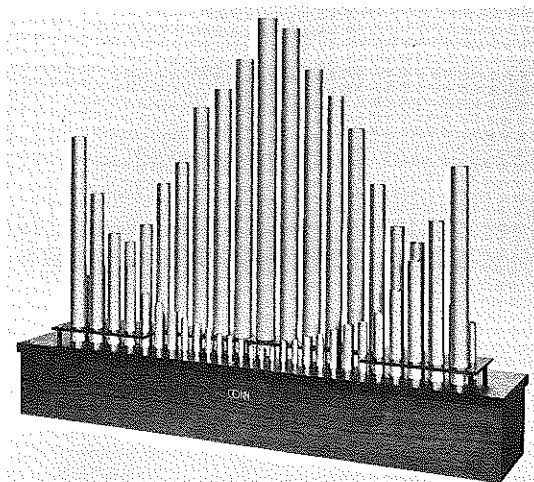
Model 144	Model 145 & 146
Wide: 21"	Wide: 42 1/2"
Deep: 29 7/8"	Deep: 8 1/2"
High: 6 1/2"	High: 6 1/2"



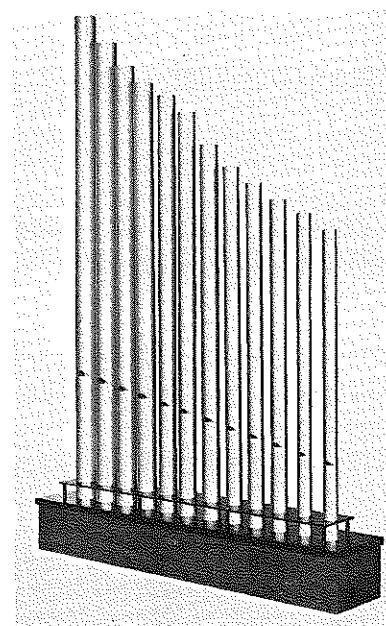
145 type 3



146 type 2



145 type 1



146 type 3

The sound producing portion of the electronic pipes are the four, six by nine speakers located in the wooden base. Each speaker has an impedance of eight ohms and the four of them are wired in series/parallel so the impedance of each pipe is eight ohms. The tone is produced in a common manner but the only way for the tone to be heard is through the pipes, each of which is permanently tuned to resonate at a different frequency of the musical scale. The impedance of Model 144 only 16 ohms.

When the speakers are energized by a tone from the organ, the column of air in each pipe acts as a cushion on the tone and has to be put in motion before the sound can escape resulting in the volume building up gradually before the tone blossoms out the top of the pipe in all directions. Secondly, the metal walls of the pipes, which are tuned to the frequencies being played, will begin to resonate. Then the pipes which are tuned to the harmonics of the pipes being played will also resonate. The result of all this resonating and pneumatic action within the pipes is a wall of sound totally lacking in the undesirable beam effect produced by ordinary cone speakers alone. When the keys of the organ are released, the column of air within the pipes does not come to rest immediately, allowing the tone to linger for an instant before dying away completely.

Conn Electronic Pipes can be used on any Conn or Connsonata organ. Their addition to even the oldest of Connsonatas improves the tone considerably and is well worth the expense and work involved. When the pipes are added at the same time the organ is rebuilt, the tonal improvement is very noticeable. The main improvement which the Conn Electronic Pipes provide when added to older installations is that non-directional tone can be added where it is needed the most.

When adding Conn Electronic Pipes to the older single channel organs such as the 1A, 2D or 2E, a fine sounding installation consists of two fifteen inch speakers, two 145 pipes, a forty watt amplifier and a Conn crossover network. When a crossover is added, the frequencies are divided with the fifteen inch speakers receiving the bass tones only, and the pipes take care of the mid range and treble. This eliminates the intermodulation distortion which is usually present when the single channel organs are played at maximum volume. One of the 145 pipes can be replaced with a 146 if desired. For a larger installation, use multiples of all the equipment.

On two channel organs consisting of pedal and manual channels, fifteen inch speakers are necessary for the pedals. If it is possible to double the number of speakers and amount of amplification on the pedals, the tonal improvement will be considerable. The old 30A and 259 pedal cabinets can be easily reworked to accommodate two additional speakers but where ever possible eliminate the cabinet and make a custom baffle installation.

The manual channel should have a 145 and a 146 for each two pedal speakers with forty watts on each pair of pipes. Because the pipe speakers are completely non-directional, their placement is not as critical as when ordinary cone speakers are used, and the pipes can be some distance from the pedal speakers. Remember the bass tone is also non-directional. If you have an extra channel of amplification, it may be used to drive the original ten or twelve inch speakers that were on the manuals. Level the pedals and pipes to maximum volume without distortion and then open the gain control on the amp for the original manual speakers until the most pleasing tone is heard.

On three channel organs consisting of pedal, swell and great channels, it is necessary to double the number of pipes with a 145 and a 146 on each manual channel. Each channel should have a minimum of forty watts, and the pedals should use four fifteen inch speakers.

When reinstalling organs with acoustic tremolo, the main channel should be treated as a single channel organ, using fifteen inch speakers and pipes as indicated above.

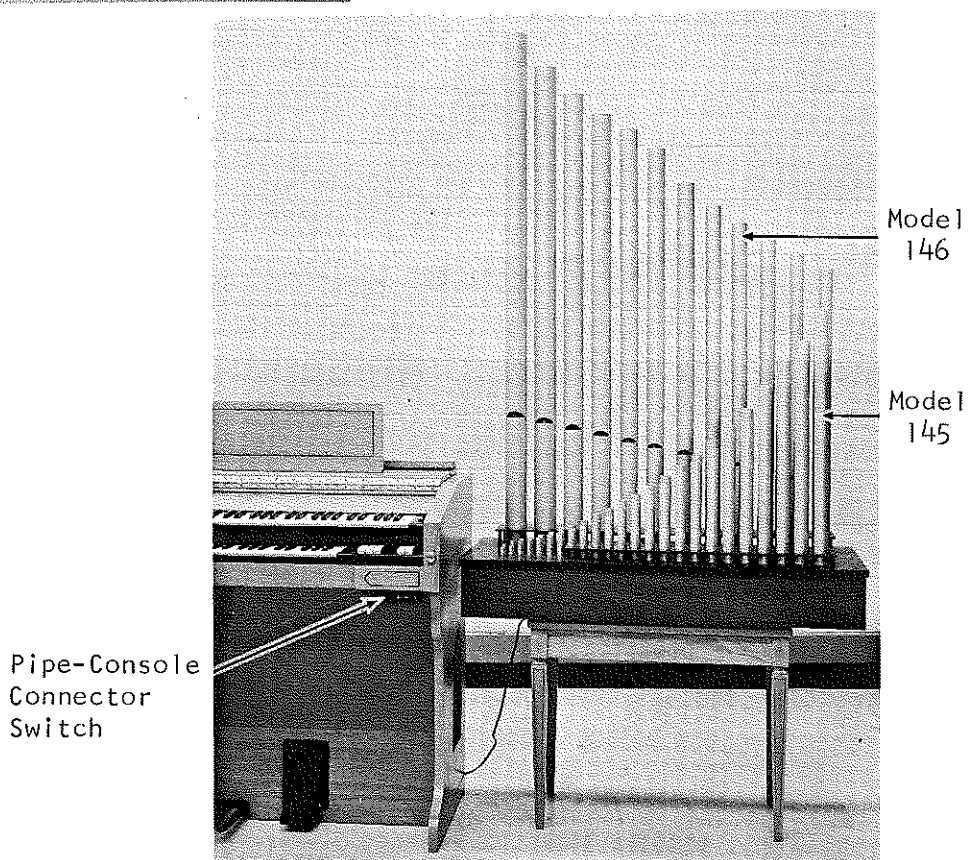
If you need help in planning, installing, or leveling your first pipe installation on an older model organ, contact your district service manager.

PIPE CONNECTOR KITS

Pipe connector kits are available for most self contained Conn Organs of two or more channels that have a built-in Leslie. They make it possible to play the pulse or complex channel, and reed channel on three and four channel organs, through either the speakers in the console, pipe speakers, or both with the flick of a three position switch. In addition to switching the signal, the pipe connector kits are equipped with a control that makes it possible to feed from four to seven db more volume to the pipes that the console speakers receive so they will sound in better balance and be more impressive. On the kits for the tube type amplifiers, there is a slider switch on the rear of the control head which makes it possible to select either the four or eight ohm tap for the pipe speakers. There are several different pipe connector kits available for the different models organs. On certain models, especially in large buildings, pipes should be run from an external amplifier and not used with a pipe switch.

Pipes are best demonstrated when they are about 20 feet from the console, but when permanently installed, can be closer. Pipe connector kits are meant to be used for demonstrations in the store and on pipe installations in the home, not to take the place of an external amplifier in a church installation. Only the smallest of churches or chapels can get by with a pipe connector kit. In the rare occasion where a pipe connector kit is adequate in a very small church, the pipes should be no more than ten feet from the console.

The best church installation is with a 255 speaker cabinet, or equivalent, custom installation for the flute and pedal channel(s) and a 145 and 146 for each of the other channels in place of the 256 cabinet. Page 52, lists the proper hook-ups for the different organs.



Typical Speaker Connection

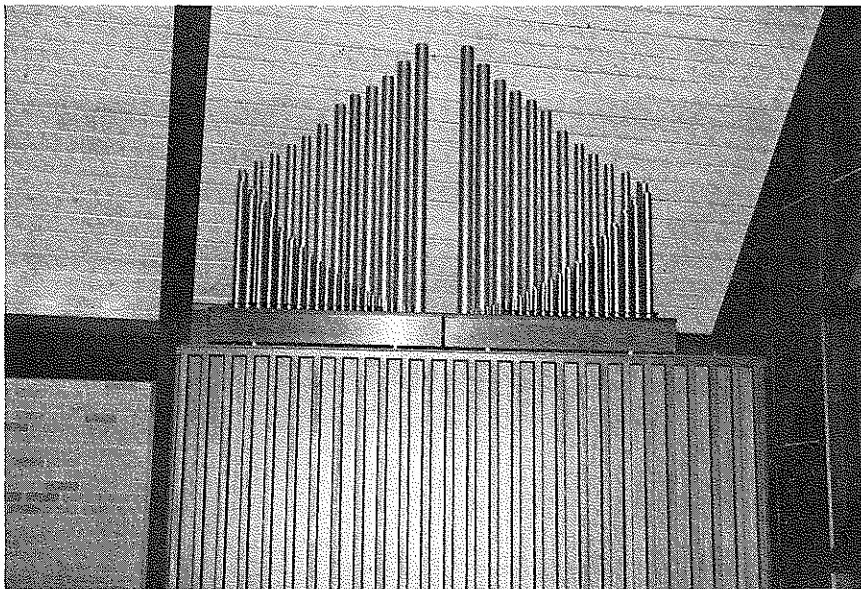
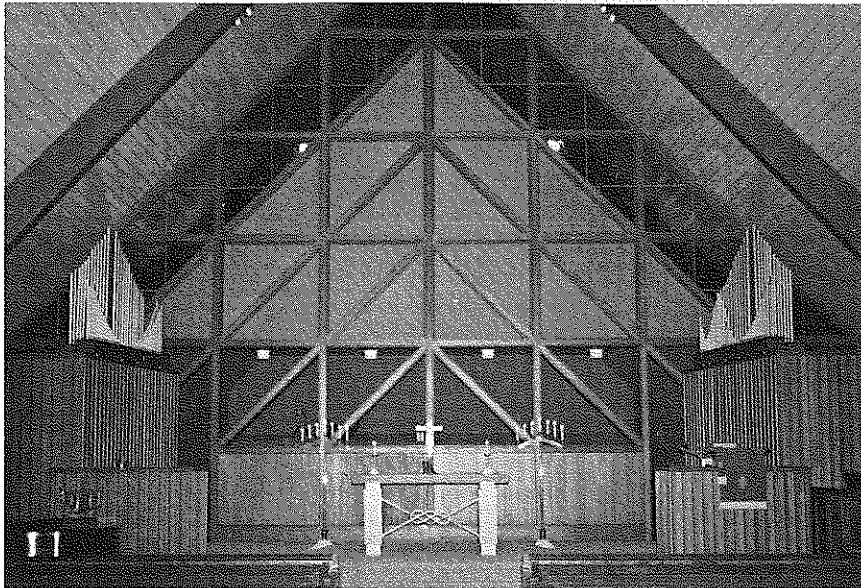
EXAMPLES OF VARIOUS TYPES OF CUSTOM INSTALLATIONS

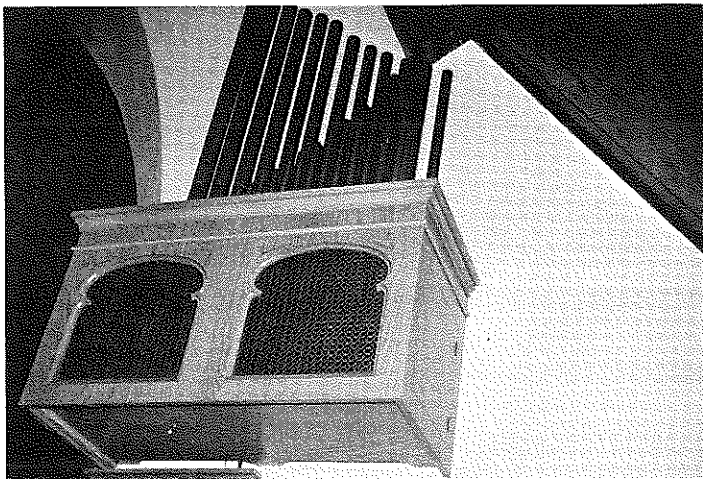
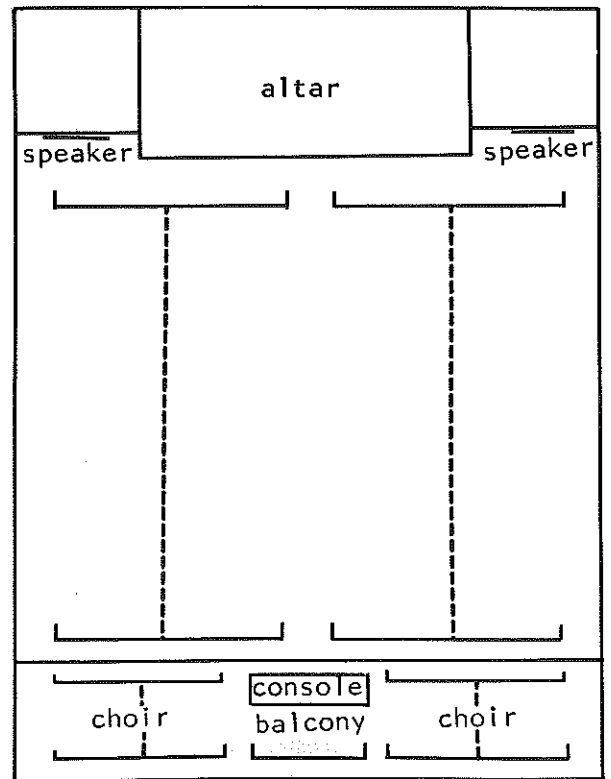
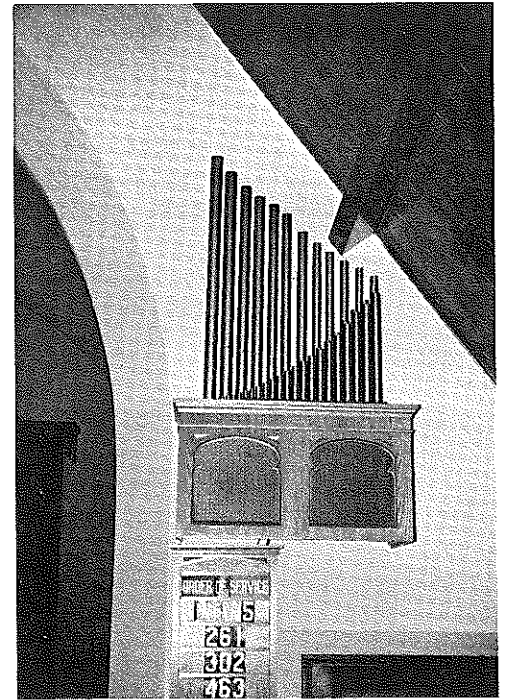
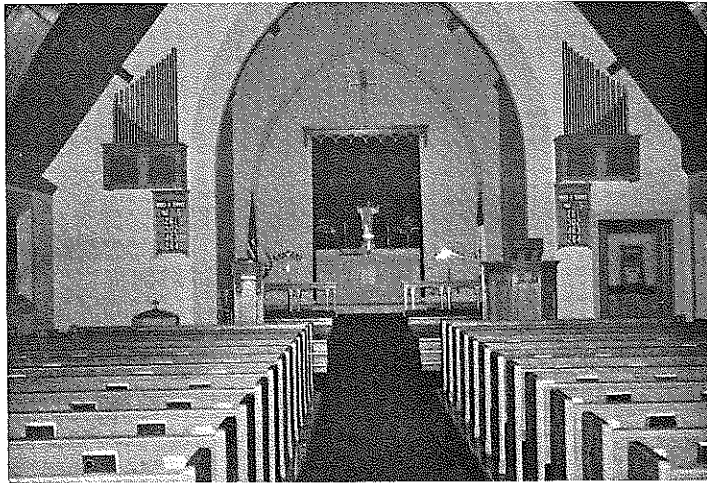
On the following pages you will find several examples of installations in different styles of church buildings and auditoriums. These are illustrated with pictures, sketches and floor plans, and a brief explanation of the installation. A study of these pages should give you some good ideas for planning a custom speaker installation in almost any type building.

It is not expected that any situation you encounter will be duplicated in this book. However a good cross-section of the various types of church construction is included to guide you.

THE "A" FRAME CHURCH

This installation includes a Conn Custom Model 901 with Model 902 external Generators, electronic pipes speakers and speaker cabinets. The speaker cabinets are located below the pipe speakers and behind the wood grille.

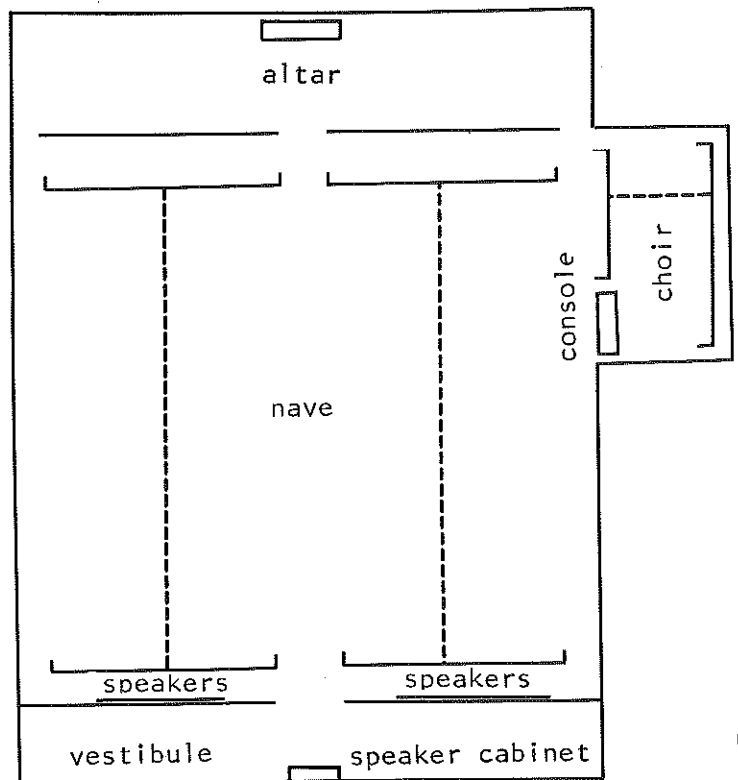
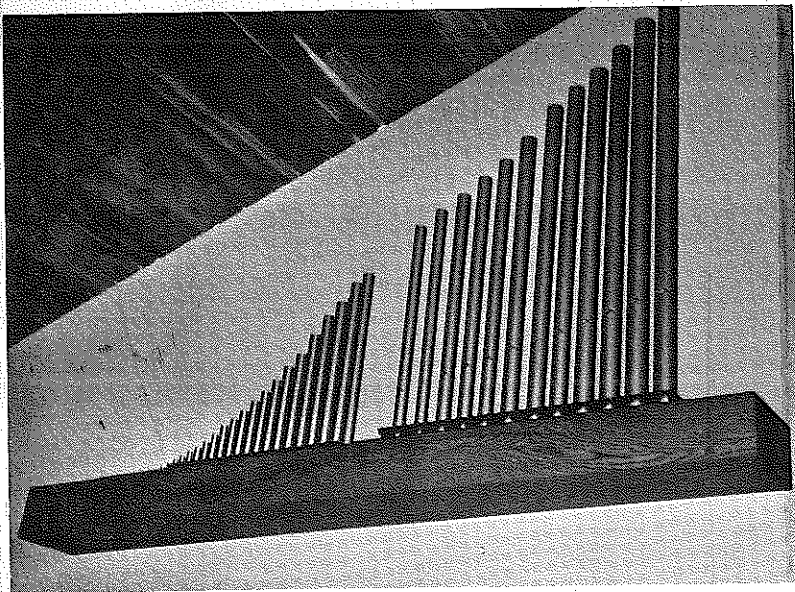
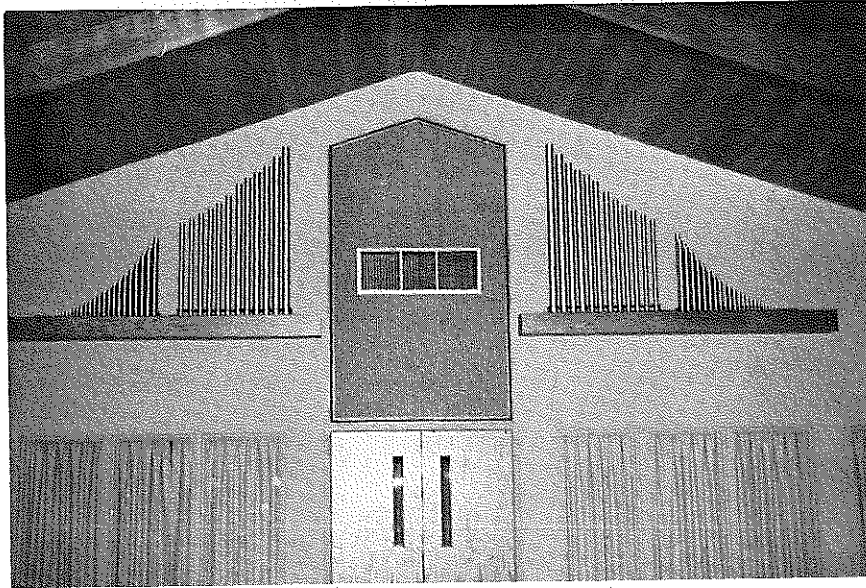




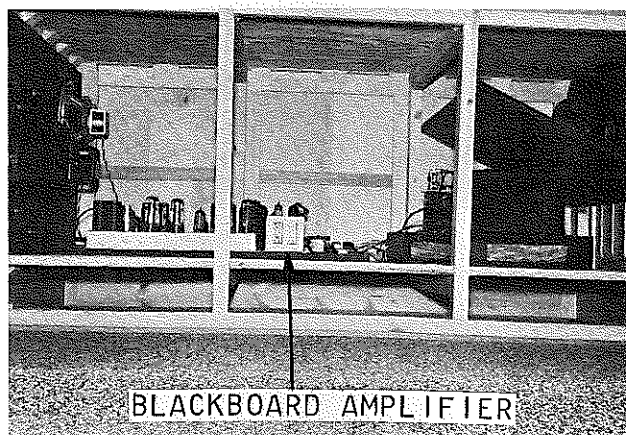
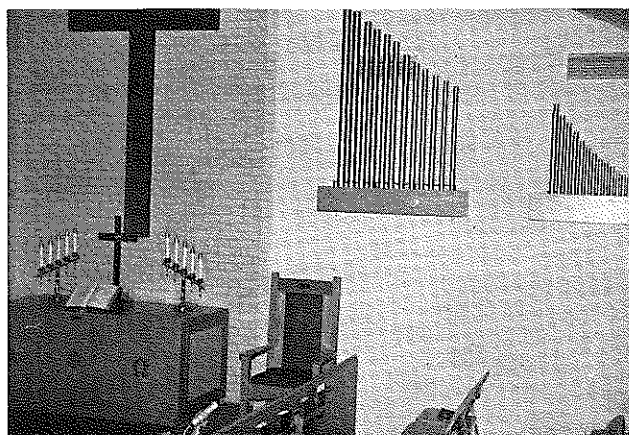
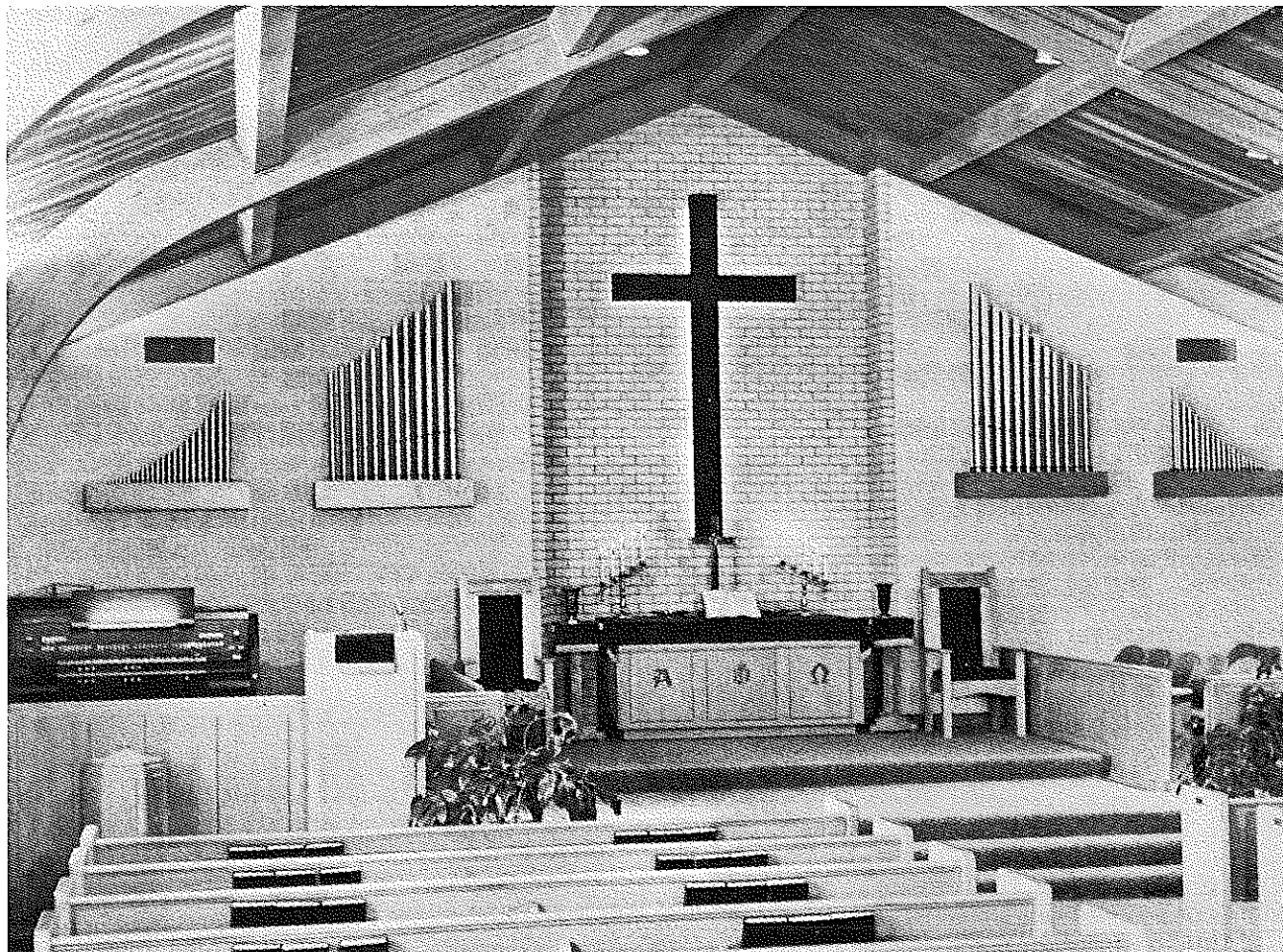
This installation is a good example of what can be done when there are no tone chambers to work with. The beautifully designed cabinets provide a shelf for the pipe speakers and conceal the pedal speakers, Leslie and amplifiers. The console is self-contained and provides choir support.

In this church the organ console is located in a side room with a low ceiling. The speakers in the console are used for choir support only, and have been turned down so the organist can hear the external speakers when they are added.

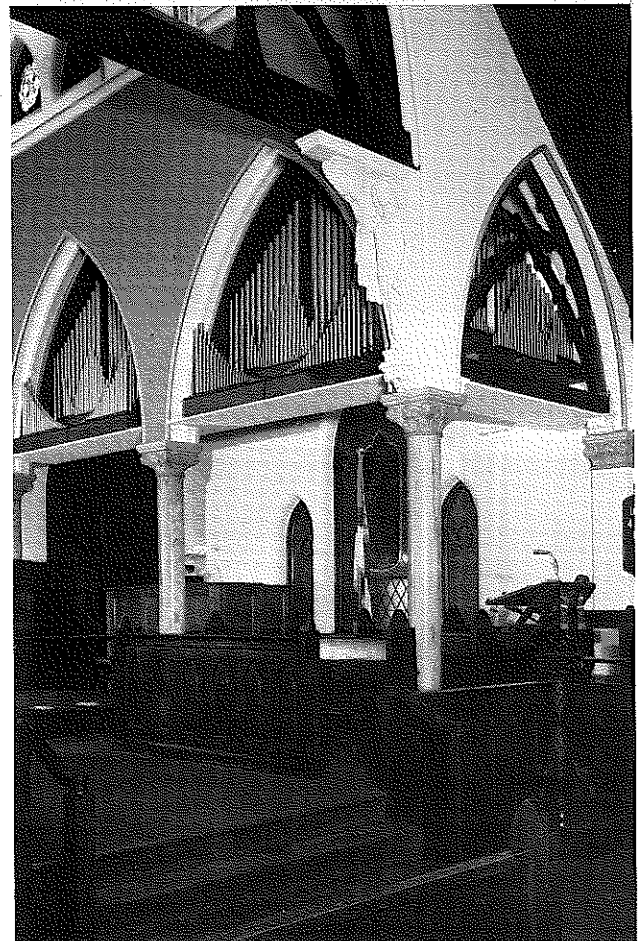
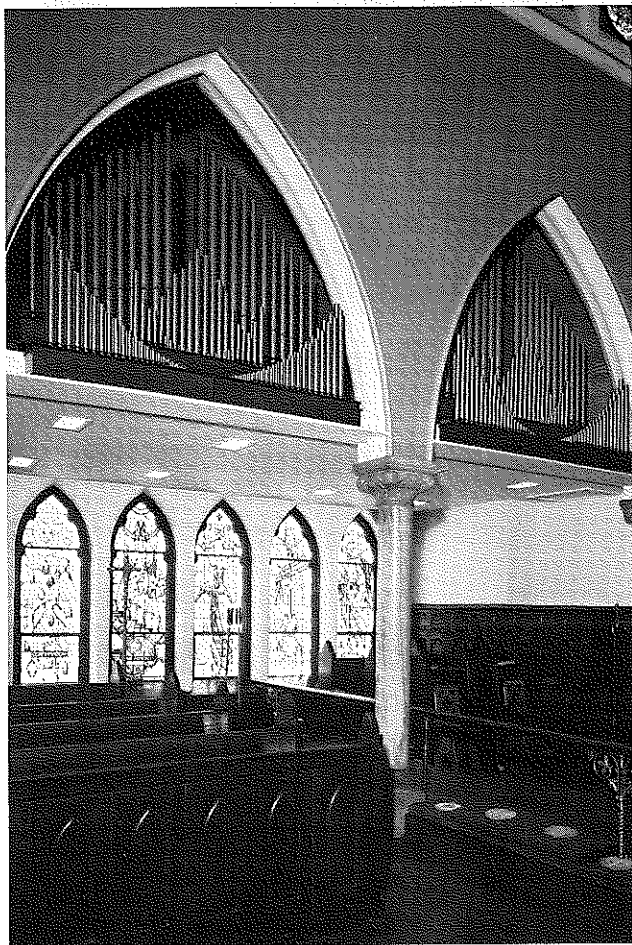
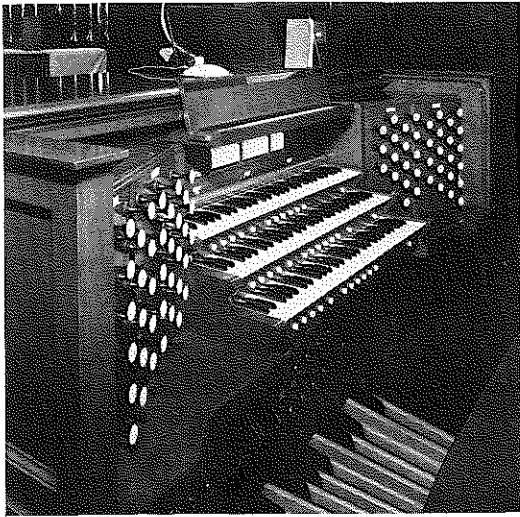
The flute and pedal speakers for the external speakers are mounted behind the grille between the pipe speakers.



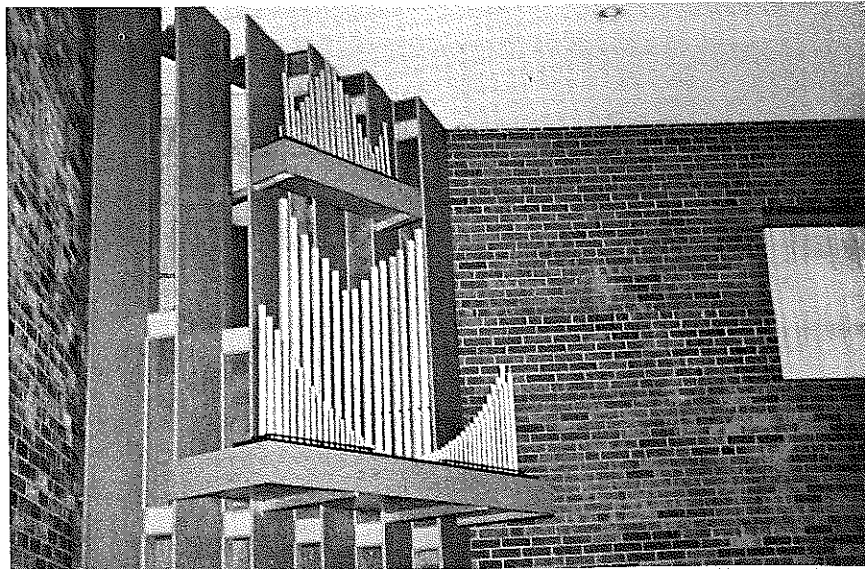
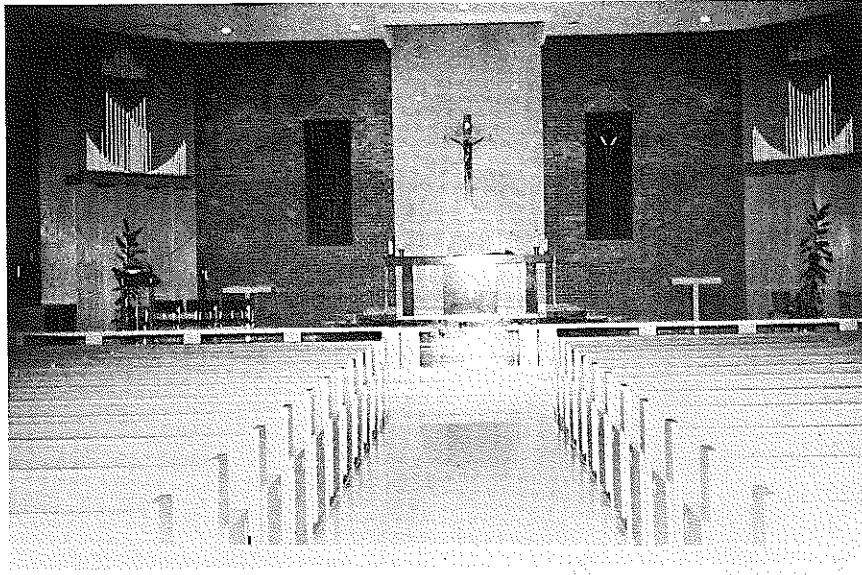
These photos show what can be done with a church where no provisions have been made for organ speakers. Electronic pipes are the ideal solution for the string, reed and diapasons; and their addition to the front wall of the church actually adds to the appearance. The flute and pedal channel speakers are in the altar speaking out both ends. The rear of the altar was left open, and the best pedal tone resulted by placing the altar eight inches from the back wall.



This church chose to replace their old pipe organ with a Conn Custom Organ. The six arches once covered by grille cloth are now enhanced by the beautiful array of electronic pipe speakers. The speaker cabinets are in the chambers in back of the pipe speakers.

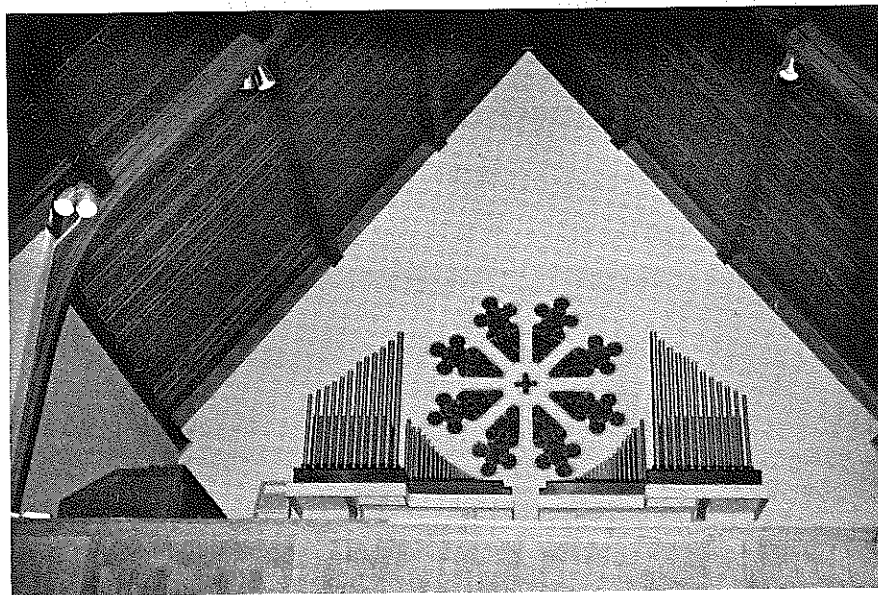
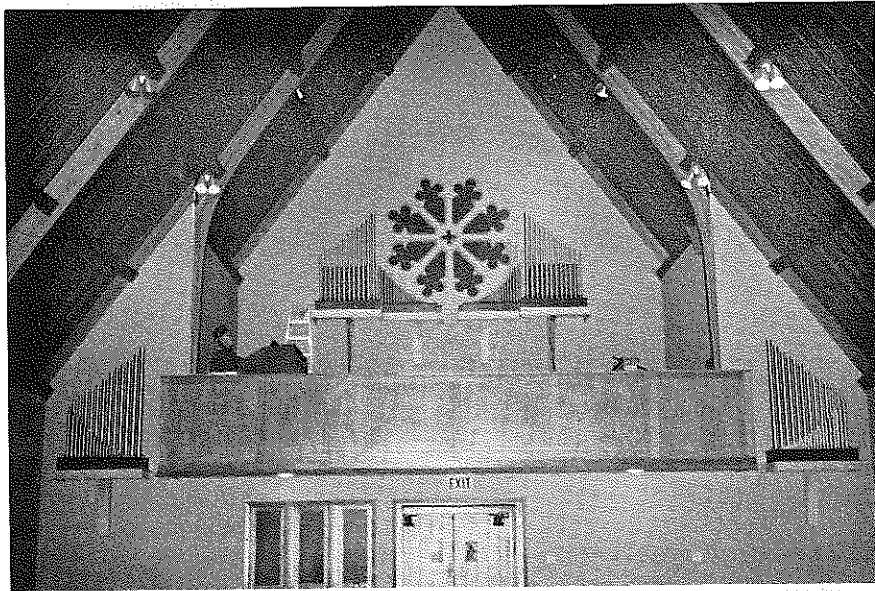


In this installation the organ and choir are located to the left of the altar in a low ceiling side room. If the church has poor acoustics, more speakers should be added for choir support. The speaker cabinets are behind the pipe speakers.

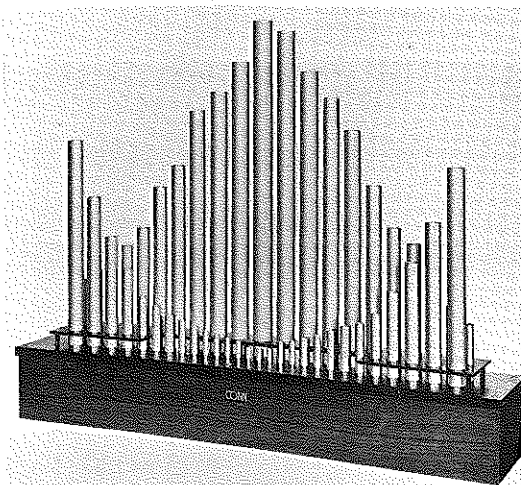
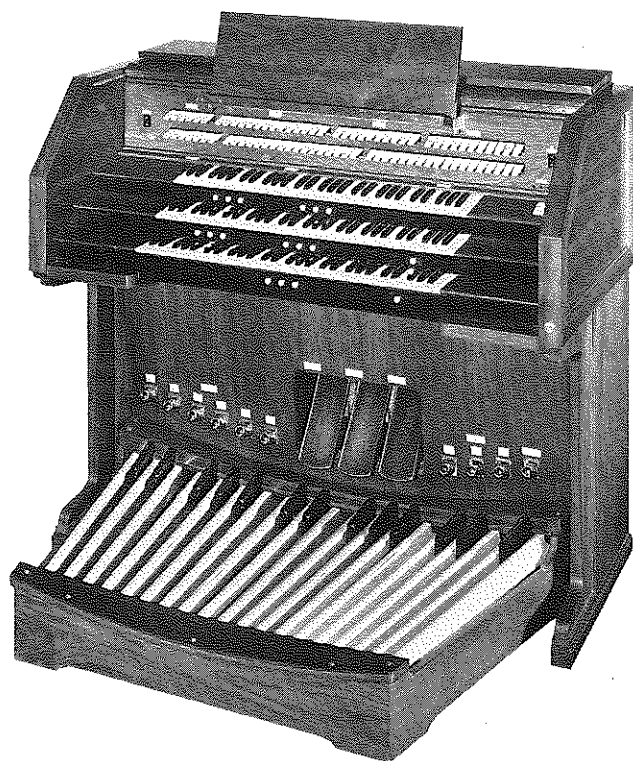


BALCONY INSTALLATIONS

In this installation the choir, organ and all speakers are located at the rear of the church. This is a small church and requires no speakers near the altar. The speaker platforms are offset and painted to blend with the wall. The electronic pipe speakers create a three dimensional view and enhance the beauty of the stained glass window. Notice the speaker cabinets partially hidden behind the larger pipe speakers.

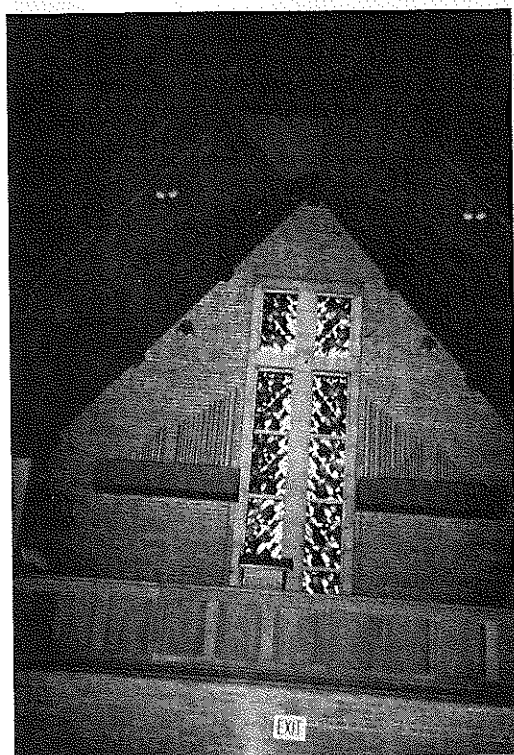
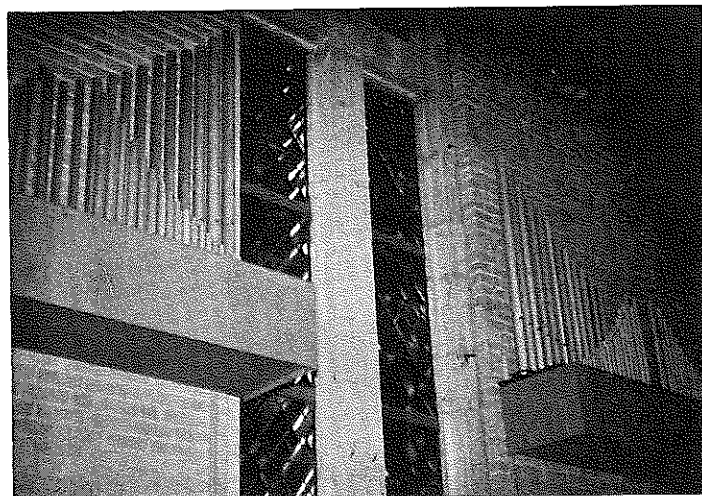
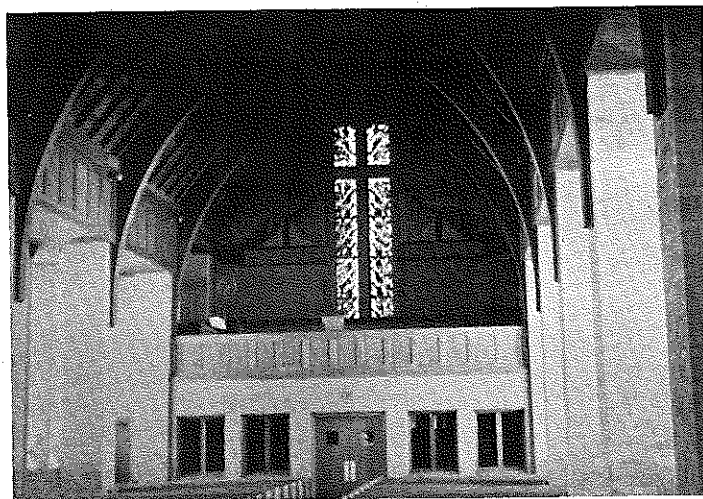


A Conn Model 901 with Model 902 external generators replaced a pipe organ in this church. The choir, organ console and speakers are in the balcony. The electronic pipe speakers are mounted to the face of the balcony rail, the external generators and the speaker cabinets are in the chambers.



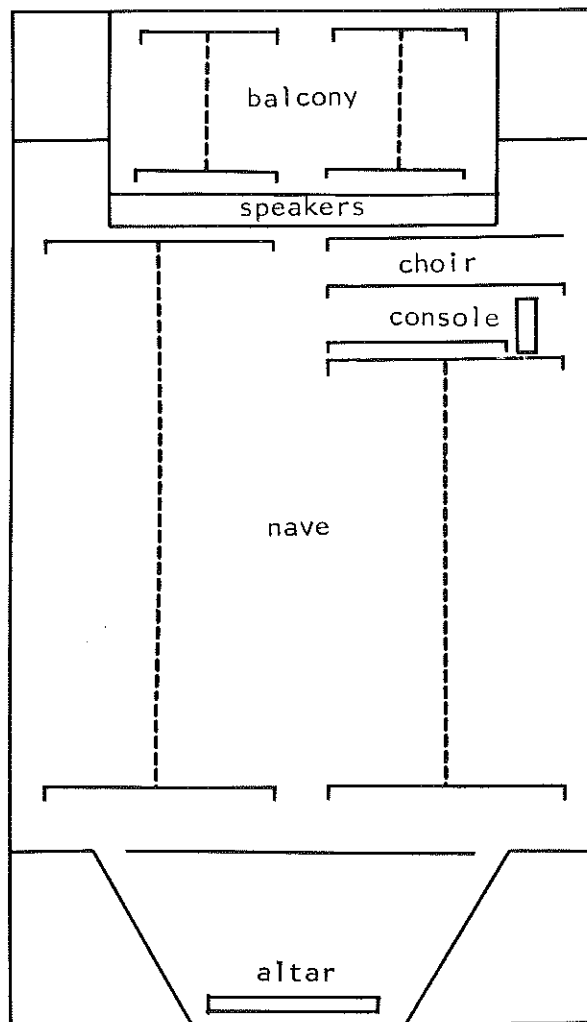
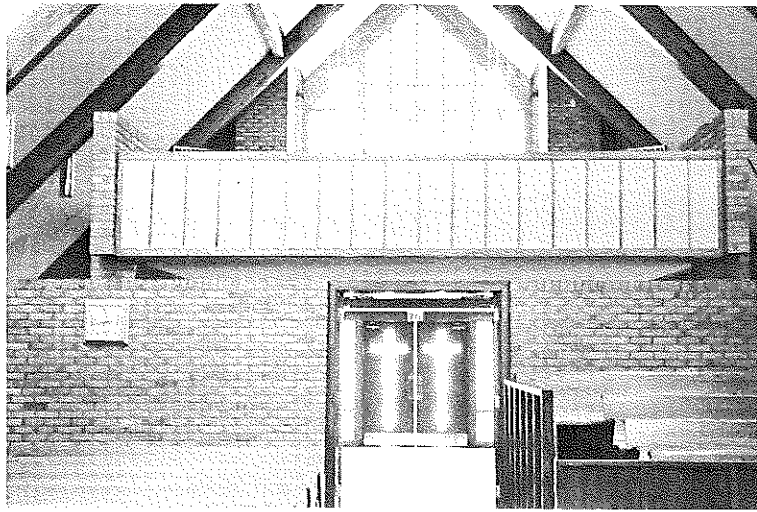
145 type 1

Notice the speaker installation in the "A" frame at the peak in the ceiling. Installed here is a double complement of flute and pedal speakers plus a reed horn. (Lower left photo).

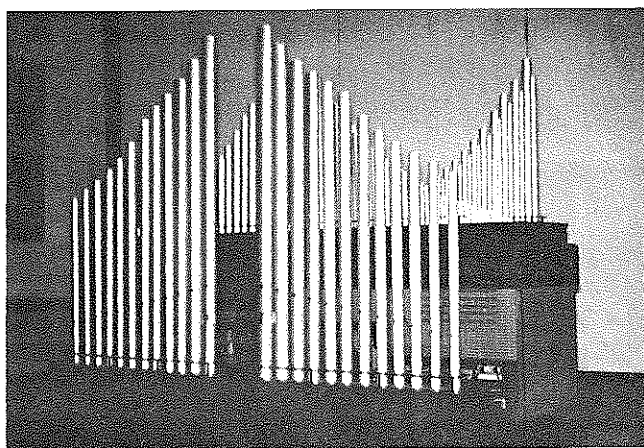
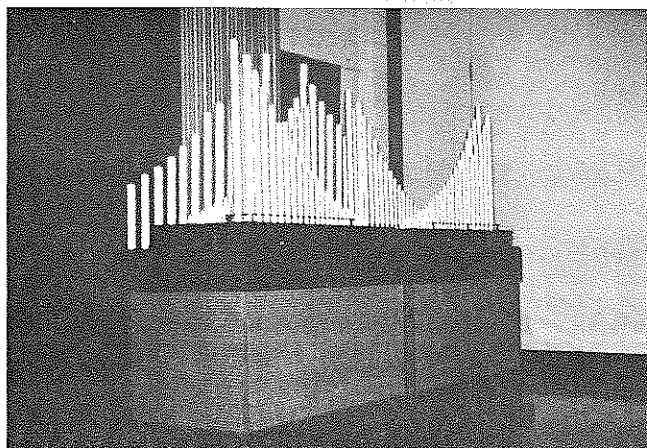
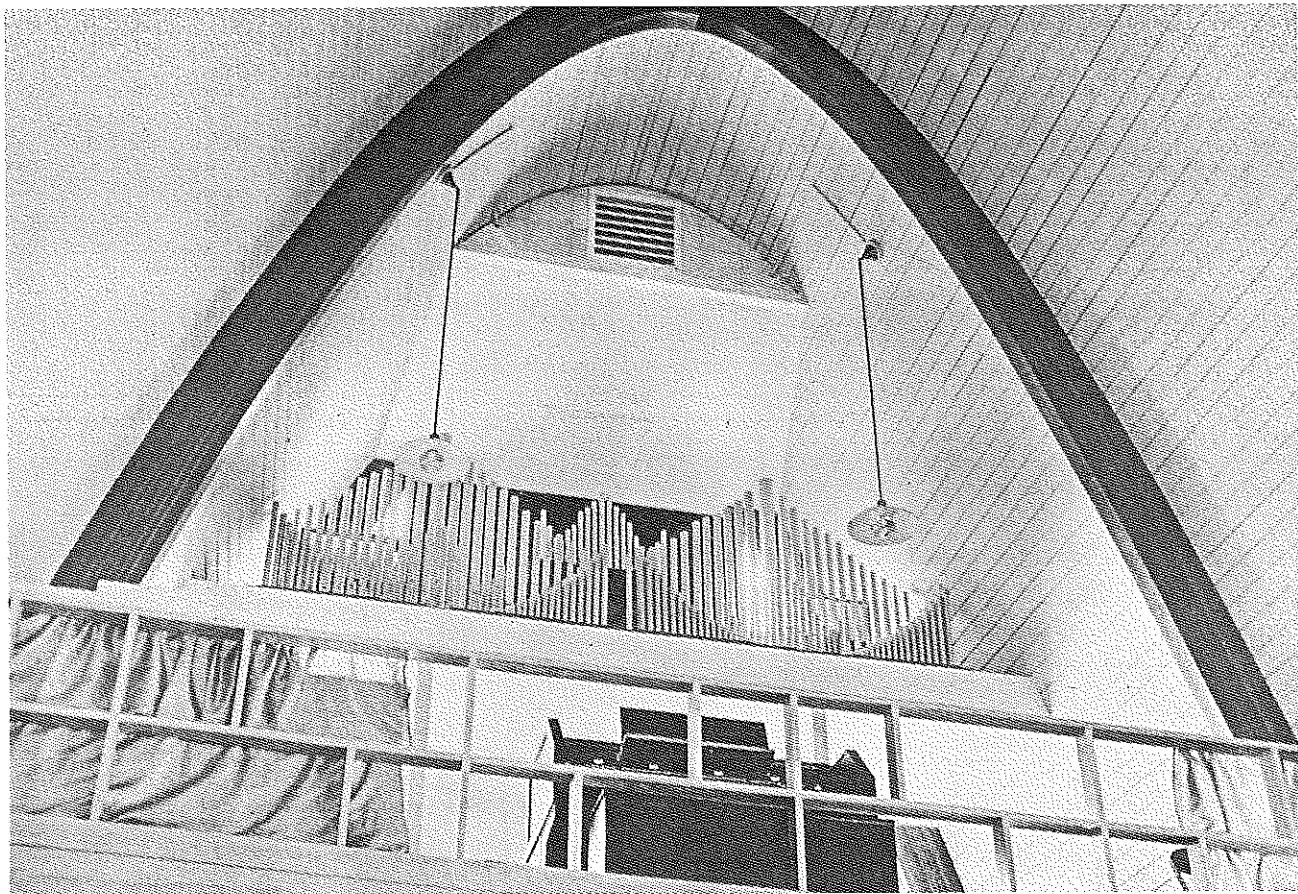


A typical Model 830 Classic balcony installation.

With the choir located on the main floor, the balcony railing proved to be the ideal location for the speaker installation. The railing is actually a long cabinet, and the components are servicable from the back side.

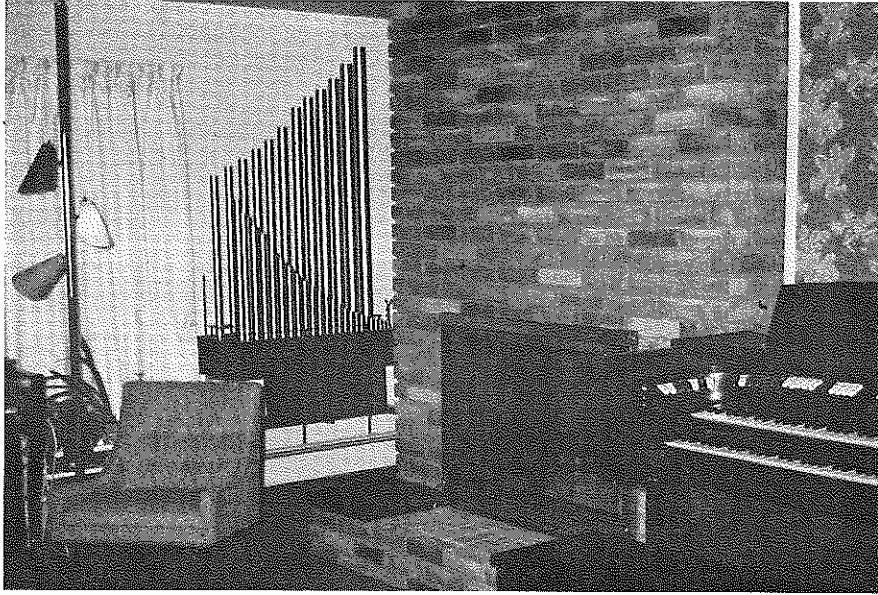


In this installation the console, speakers, and choir are in the balcony.
The speaker cabinets are behind the pipe speakers.

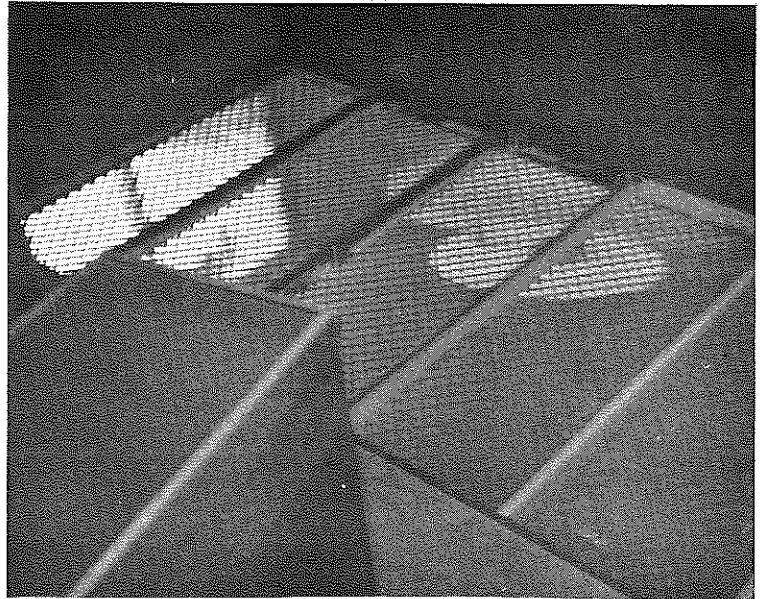


This speaker unit was constructed for the auditorium where the speakers
and console must be portable.

Installed in this home is a Conn Organ equipped with a pipe connector switch, and models 145 and 146 electronic pipe speakers.



In this installation, a tone chamber was constructed in the attic. Sound from the speaker boxes enters the living room through a grille in the ceiling.



These pictures show different pipe configurations and installations.

