

DIMENSION® 2000 AND CUSTOM PBX
INSTALLATION OF CABINETS, CABLE DUCTS,
AC WIRING AND SYSTEM CABLES

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1. GENERAL

- 1.1 This section describes in a general way how to assemble cabinet and cable racks of a 201L PBX System. General comments on the AC power distribution to the system cabinets and system interconnection cables are also included.
- 1.2 There are two ways the system may be configured: in a single lineup against a wall (see restriction in FIG 2) or in two or more lineups arranged in parallel aisles. The wall lineup must have a front-of-cabinet clearance of 48" so the cabinets may be moved far enough forward to gain access to the rear wiring and cabling. The multi-lineup system requires somewhat less front-of-cabinet clearance since the wiring and cabling is accessible without moving the cabinets. An absolute minimum front-of-cabinet clearance for multi-line systems is 34" while a good compromise (if the size of the room allows) is 40" clearance. The figures in this section are typical of both types of lineups. Follow the telephone company floor plan and ED-1E374-01 for measurements peculiar to the job. Regardless of configuration, assembly and cabling described in this section will be similar for all jobs.
- 1.3 It is recognized that the sequence of operations described in this section can be changed without affecting the end result. If a change in sequence is contemplated, be sure adequate attention is given to the consequences before proceeding.

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- 1.4 The 201L System Cable Ducts are so designed that a single-line system may be installed against a wall. The disadvantage of this configuration is the difficulty of access to the cabling and wiring. Ideally, if a single-line system can be placed a minimum of 20" from a wall, the cabinets would not then have to be moved to gain access to the cabling and wiring.
- 1.5 When the system is completely installed, it should be electrically insulated from the frame to the building. To insure this will be so, the floor rail clamping bolts are seated in plastic bushings and the floor rail assembly, after levelling and clamping down, should clear the floor by a minimum of 0.160" measured at the closest point. An 842154361 tie plate (part of horizontal ductwork) is .090" thick and makes a convenient gauge.
- 1.6 To further protect the system from electrical disturbances (power surges of lightning, for example) an ED-1E375-71 and/or 72 Protector Cabinet is provided. The AC mains must be fed through this cabinet and then to the AC module(s). It is not sufficient to merely half tap the protector cabinet onto the AC feeders - the AC feeders must first go to the protectors. See SD-1E481-01 for precautionary notes.
- 1.7 On systems with battery backup, the -48V feeders are run through the DC protector cabinet.

2. TOOLS

- 2.1 The usual common installation tools such as: wrenches, screw drivers, pliers, cutters, etc., will be required plus the following tools not usually supplied:
 - A. A 66A kit (rotor hammer) E/W a 1/2" Chuck Head for drilling and setting 1/2" self-drilling floor shields in concrete floors. (Note: The 1/2" self-drilling floor shields are shipped with ductworks). For those jobs require non-self-drilling floor shields (per options as specified in Fig. 1, 2, and 4 of ED-1E362-70), 3/4" Masonry Drill (procure locally) which fits R4416 Roto-Stop Hammer should be used.
 - B. A 76 kit (1/2" electric drill) required for general use mostly on the AC conduit work.
 - C. Greenlee hole punch (for AC conduit work).
 - D. Crimping tool (for splicing ground system wires and AC power wires).
 - E. A carpenter's level (for levelling the floor rails).

3. DRAWINGS

- 3.1 The following documents should be on site prior to start of any job operations:

Floor Plan Drawing (obtain from Telco)
Customer Order Document (COD)
AC Wiring Drawing (obtain from Telco)

ED-1E362-70 Floor Rail Assembly
 ED-1E366-70 Cable Duct Assembly (MD)
 ED-1E367-11 Cabling Drawing
 ED-1E368-01 Equipment and Notes for DIMENSION 2000
 Power Distribution
 ED-1E374-01 System Arrangement and Installation Document
 ED-1E375-70 AC/DC Protector Cabinet (MD)
 ED-1E375-71 AC Protector Cabinet
 ED-1E375-72 DC Protector Cabinet
 ED-1E376-70 Module AC Box
 ED-1E393-70 Overhead Cable Ductwork
 ED-1E398-70 Cable Duct Assembly
 SD-1E481-01 System AC & DC Power Distribution.

4. ASSEMBLY PROCEDURE

- 4.1 Loosely thread the leveling feet and place 5/16 - 18 plain hex nuts into the floor rails.
- 4.2 Mark the floor with parallel lines (3 for each equipment lineup) measuring carefully between lines to assure proper width of aisles. The System Arrangement and Installation Document (ED-1E374-01) should be used to assure correct measurements. Of the 3 parallel lines per lineup referred to above, one will be used to align the floor rails at the rear brackets. The second line will be the center line of the first floor rail clamping bolts (4 11/16" from the rear bracket line). The third line will be the center line for the second floor rail clamping bolt (14 1/2" from the rear hole line). Refer to Figure 2 or 3 for placing of these lines.
- 4.3 Starting at the end of the first lineup, mark along the rear bracket line, as many spaces as there will be cabinets in the lineup. Be sure to allow 8" gaps for vertical cable ducts or module AC boxes when required. Place one of the center floor rail assemblies (3rd or 4th in a 6 cabinet lineup) align it on the rear bracket line, mark and drill the floor for four clamping bolt floor shields (or lag bolts). In earthquake prone areas, six bolts are required. After drilling, loosely install the floor clamping bolts and level the assembly such that it clears the highest point on the floor by about 450 mils. Now tighten the clamping bolts so the entire assembly moves evenly downward by 120 mils. In this final position, the closest floor to rail assembly clearance should be about 330 mils. (Requirement 160 mils to 330 mils). Convenient gauges are:

<u>Device</u>	<u>Thickness</u>
842154361 Tie Plate	.090
Common 1/2" Iron Washer	.060

- 4.4 Place the second rail assembly against the first. Mark and drill the floor, level the assembly, and tighten the floor clamping bolts. Continue with the other assemblies working from the center out until all floor rail assemblies have been levelled and clamped to the floor. Note that each assembly is levelled individually. Do not try to level the lineup end to end as the floor will likely not be level enough for all the levelling feet to rest on the floor.
- 4.5 If a vertical cable duct is shown on the floor plan (such as in Figure 3) the sequence of operations should be as follows:
1. Place and clamp to the floor, one of the floor rail assemblies adjacent to the vertical cable duct.
 2. Bolt the bottom plate of the vertical cable duct to this first assembly.
 3. Place and clamp to the floor, the other adjacent floor rail assembly.
 4. Bolt the second assembly to the bottom plate.
 5. Continue with the other floor rail assemblies working in both directions away from the vertical cable ducts.
- 4.6 Continue with assembly of the right and left ramp moldings to the floor rails and the horizontal cable ducts to the floor rail rear bracket. Use Figure 4 and ED-1E398-70 as a guide. Additionally, read Section 101, paragraph 4.6 since the horizontal cable duct is a part of the ductwork ground system.
- 4.7 If vertical cable ducts are required, assemble using ED-1E398-70, ED-1E374-01 and Figures 5 and 6 as guides.
- 4.8 Continue on with assembly of the overhead cable troughs if required. Use Figure 7 and ED-1E374-01 as guides. Do not place the duct covers on the system at this time since the cables must still be laid in. Store the covers in a secure place where they will not be scratched or otherwise damaged.
- 4.9 The last operation, placing the cabinets on the floor rails, should be deferred until the AC primary power and ground arrays have been installed and the system interconnection cables have been laid into the cable ducts. After these two operations (described in Subsections 5 and 6 and in Section 101) the cabinets can be rolled onto their rails and locked in place. Be sure the latching mechanism engages properly so the cabinet cannot roll free. This is particularly important in earthquake prone areas.

5. AC POWER WIRING

- 5.1 There are at least two ways the AC power boxes may be mounted to power the system: on the wall in single-line systems or on the vertical cable ducts in multi-line systems. In either case the ED-1E376-70 Module AC Box will be used. This box is fed with two 115 VAC, 2-wire + ground primary circuits which have first been looped through an ED-1E375-71 Protector Cabinet. Three of the 6 breaker/receptacle pairs are fed from one of the 115 volt lines while the others are fed from the other 115 volt circuit. An ED-1E376-70 Module AC Box is shown in Figure 8.
- 5.2 Install the power boxes and protector cabinet according to the Telco drawings, SD-1E481-01 and the local electrical code. If overhead cable troughs are used as in a multi-line system, the AC wiring (NOTE: AC wiring and Square-D conduit must be procured locally) is to be run in Square-D conduit located in the center trough. This is the same trough that the tip/ring cables lay in. Any conduit required to connect it to the protector cabinet must be procured locally. Installer should cut out part of the crown assembly of the vertical cable duct to allow cables to pass from horizontal duct to vertical duct.
- 5.3 In all cases, it will be advantageous to use rigid conduit for the AC wiring (it will be mandatory in some electrical codes). Rigid conduit makes a very neat installation and will add some measure of extra rigidity to systems equipped with overhead cable racks.
- 5.4 If rigid conduit is used, 2 of the ground array leads that fan out from the protector cabinet may be run in the same conduit with the AC feeders. These ground leads are: telephone power ground (a #4 lead), and utility outlet ground (a #12 lead). Do not place any other ground array leads in the AC power conduit. The AC power conduit may make metallic contact at the protector cabinet and at the overhead cable rack. It must not make metallic contact with any building steel, water pipes, other conduit, etc. Fiber insulation must be placed between the conduit and any conduit supporting devices. This rigid restriction is absolutely necessary to assure the integrity of the machine's grounding system.
- 5.5 The system ground arrays are quite elaborate and should be run very carefully and strictly according to the rules spelled out in SD-1E481-01 or the local electrical code (whichever is the more stringent). Ground arrays for electronic systems are critical and must be properly installed to assure a trouble free machine. The power ground is only 1 of 7 possible ground arrays in the DIMENSION 2000 system. The 7 ground arrays and comments on how they

should be installed are covered in Section 101 of this handbook. At this point, refer to Section 101 and install all the necessary grounds. Non-reserve power systems will use 5 or 6 of the possible 7 arrays while battery reserve systems will have 6 and possibly all 7 arrays (in large systems).

- 5.6 In the interest of gaining maximum AC power reliability, the AC module box receptacles should be used in top-to-bottom order rather than side-to-side. To illustrate: assume 4 cabinets are to be plugged into a 6 receptacle ED-1E376-70 box. Two cabinets should be plugged into 2 of the 3 receptacles in the top horizontal row while the other 2 cabinets are plugged into 2 of the 3 lower row receptacles.
- 5.7 Even if all the receptacles are not used in the ED-1E376-70 boxes, the vacant receptacles should not be used as utility outlets. These breakers are dedicated to telephone power only - 20 amperes per cabinet. Furthermore, in systems having dual common controls, one control should be powered from one 115 volt line while the other is powered from the other 115 volt circuit. In the event one of the feeder fuses should blow, only half of the system would be crippled - the other half should continue to function. Restriction on the power distribution system (both AC and DC) are explained in the power cabling notes of SD-1E481-01.
- 5.8 Figure 10 shows a typical single-line system assembled and wired for AC power. This system is ready for start of the system interconnection cable operation (next subsection).

6. SYSTEM INTERCONNECTION CABLING

- 6.1 When all ground arrays are in place, the job is ready to begin installation of the system interconnect cables. Look over the system carefully before starting this operation to assure the installation is complete and properly done up to this point. There will never be a better time to correct any inadvertent omissions or mistakes.
- 6.2 There are 5 troughs in the horizontal cable ducts which mate with 5 troughs in the vertical ducts (when used). Additionally, there are 5 troughs in the overhead cable racks. It is very important that the various interframe cables be dressed into the proper ducts and that they be held there by strategic placement of clip-in restrainers and duct cover plates. The assignment of cables to certain troughs is shown in Figure 1 for both horizontal and overhead ducts.

- 6.3 The tip/ring cables should be run first - before the cabinets are moved to the job if possible. It is advantageous to have the floor as clear of obstructions as possible while laying in the tip/ring cables so accurate drape measurements (specified in ED-1E367-10) can be made. The flat and coax cables are best run after the cabinets are partially in place; connecting each cable at both ends as each is laid in.
- 6.4 When cables to each cabinet are complete, group and secure them to the ductwork and cabinet framework as specified in ED-1E367-10. Be especially careful to measure drapes so the cabinets may be maneuvered if necessary without stressing the connectors.
- 6.5 Use the job COD and ED-1E367-10 to cable the machine. The COD will show the cables to peripheral equipment (consoles, SMDR, etc.) as well as all of the interframe and cross connect field cables.
- 6.6 When cabling is complete, roll the cabinets back into latching position. As each clicks into place, carefully inspect the cable droop, dressing the cables away from power transistor heat sinks. Be sure no cables are pinched between the cabinet framework and the ductwork.
- 6.7 Laying down the tip/ring cables on the cross connecting blocks should be the last operation. Line circuits, trunk circuits and link circuits will constitute the majority of these cables.
- 6.8 This completes the job operation in this section. The system should now be ready to start preliminary testing prior to full operation.

ATTACHMENT:

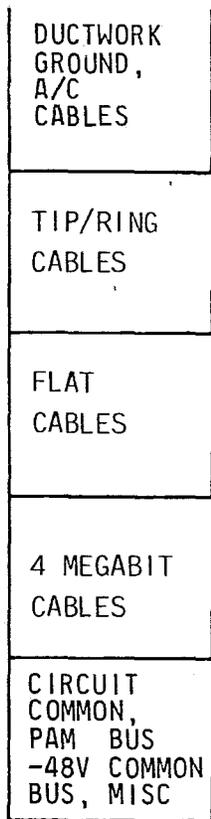
Fig. 1-10 on pages 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18.

Reserved for future use.

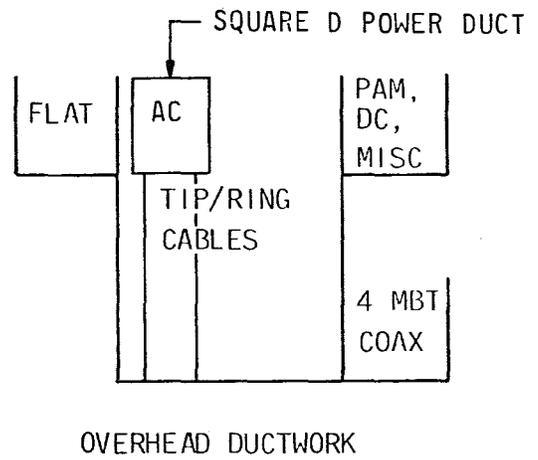
No arrows shown due to extensive revisions.

Manager, Denver PBX PECC

FIGURE 1
ASSIGNMENT OF DUCTWORK TROUGHS

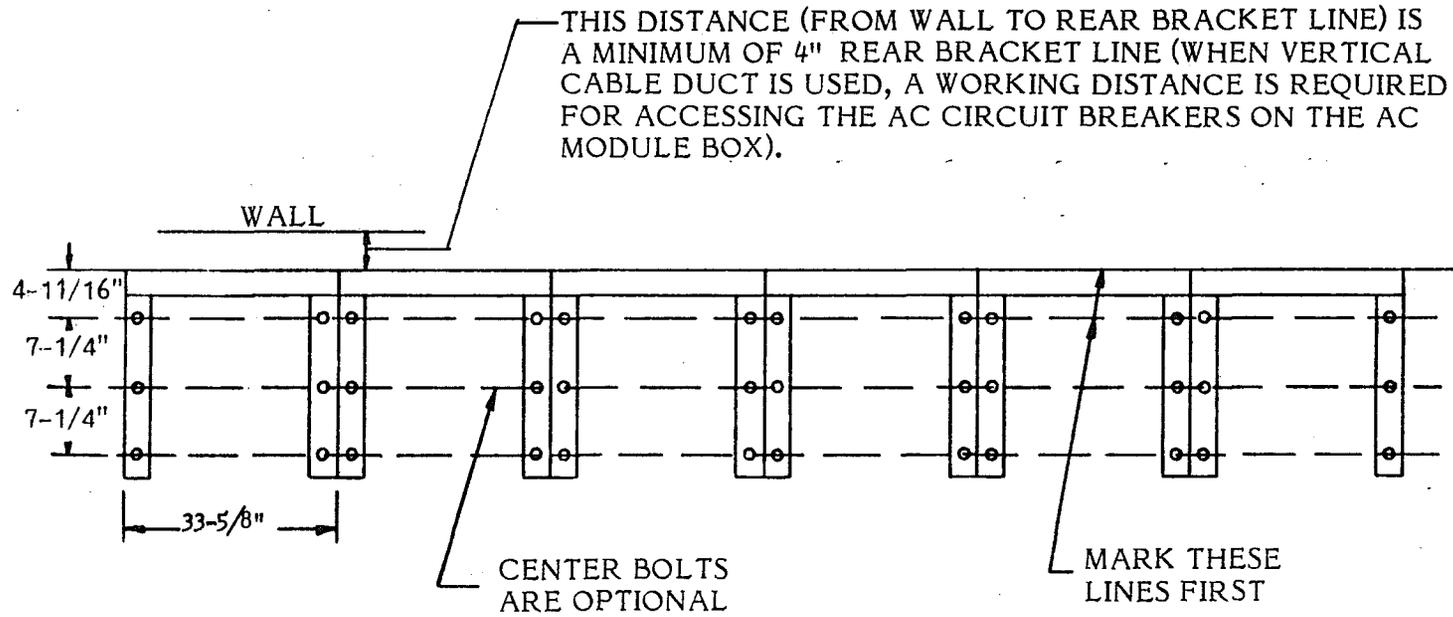


HORIZONTAL (REAR OF CABINETS) DUCTWORK



NOT TO SCALE

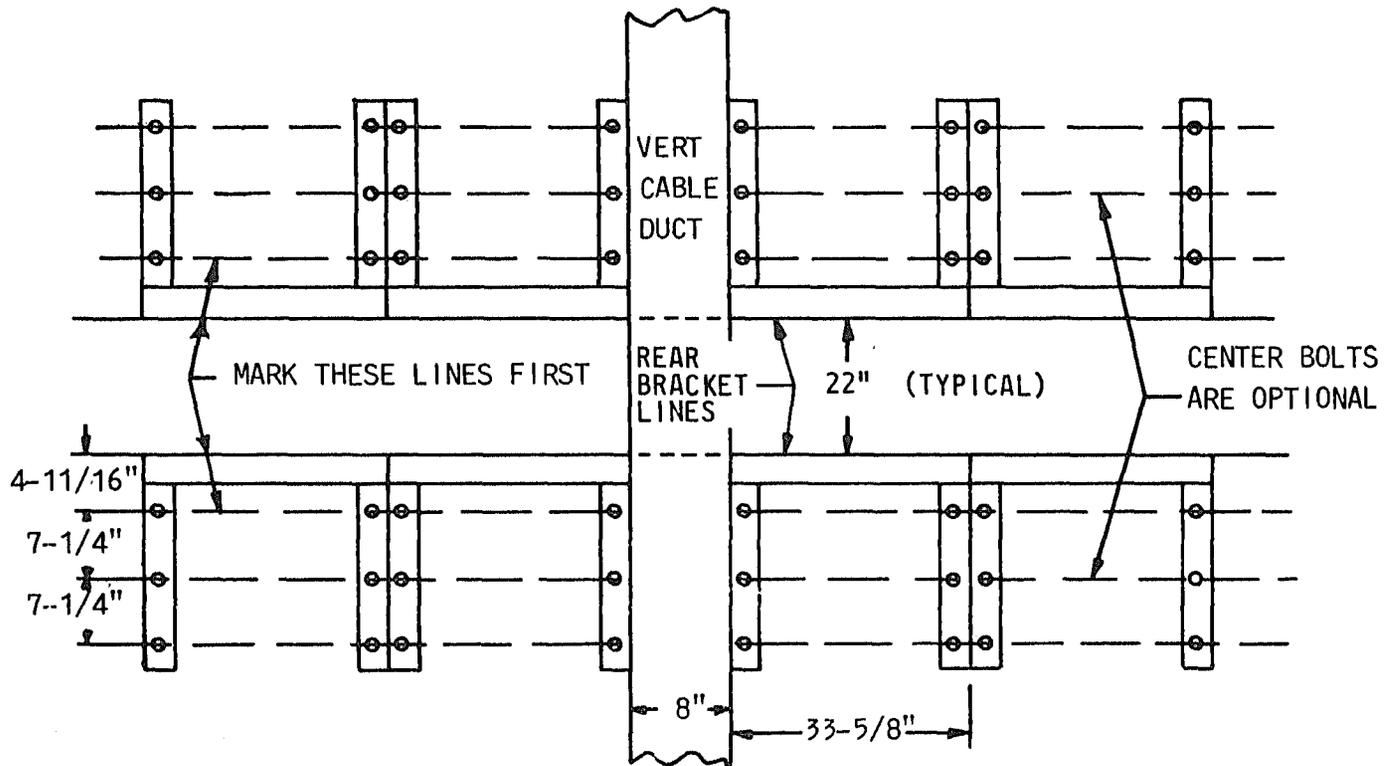
FIGURE 2
TYPICAL FLOOR LAYOUT FOR SINGLE LINE SYSTEM



NOT TO SCALE

FIGURE 3

TYPICAL FLOOR LAYOUT FOR MULTI LINE SYSTEM



NOT TO SCALE

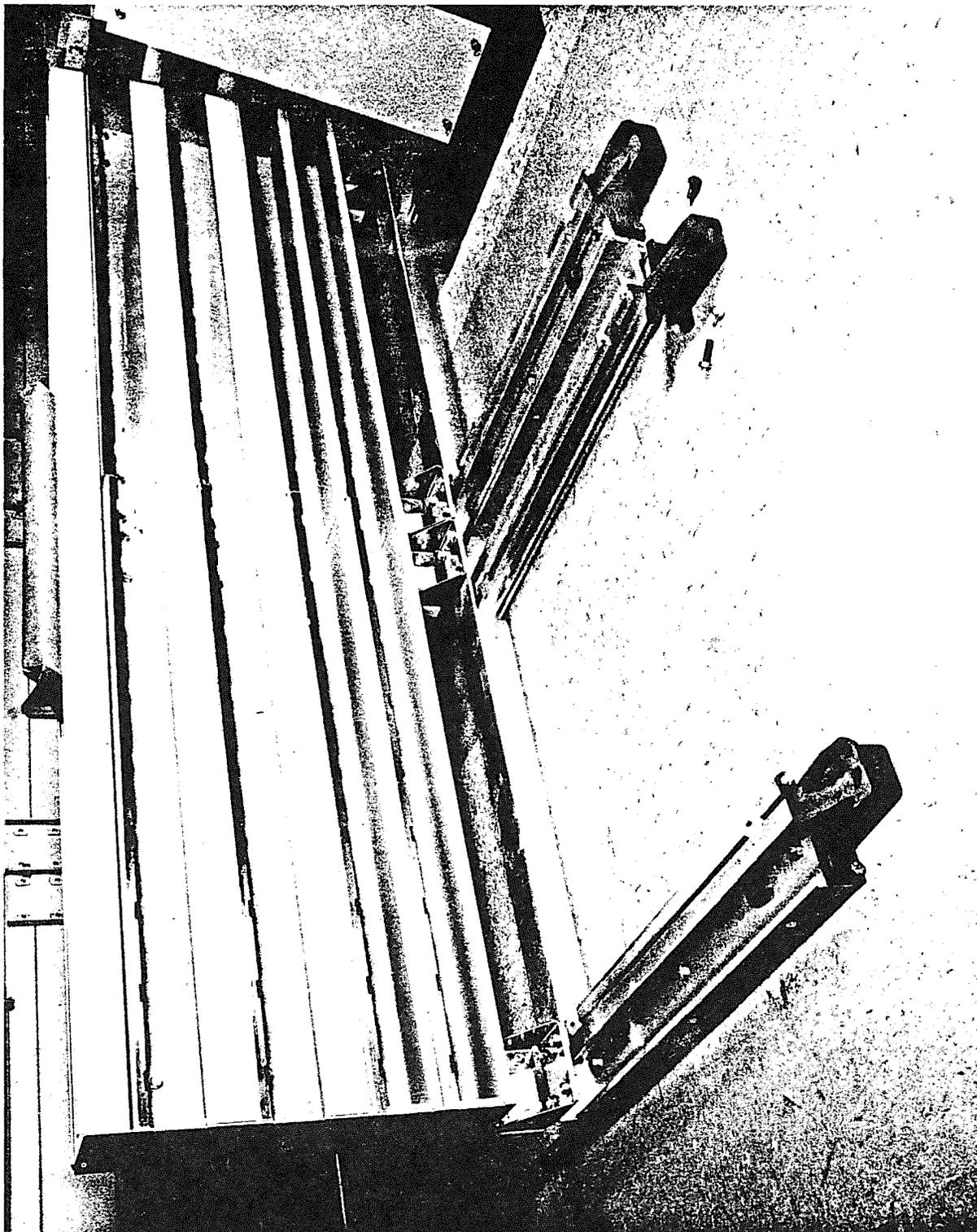


FIGURE 4

FLOOR RAILS AND CABLE DUCTS - MULTI LINEUP SYSTEM

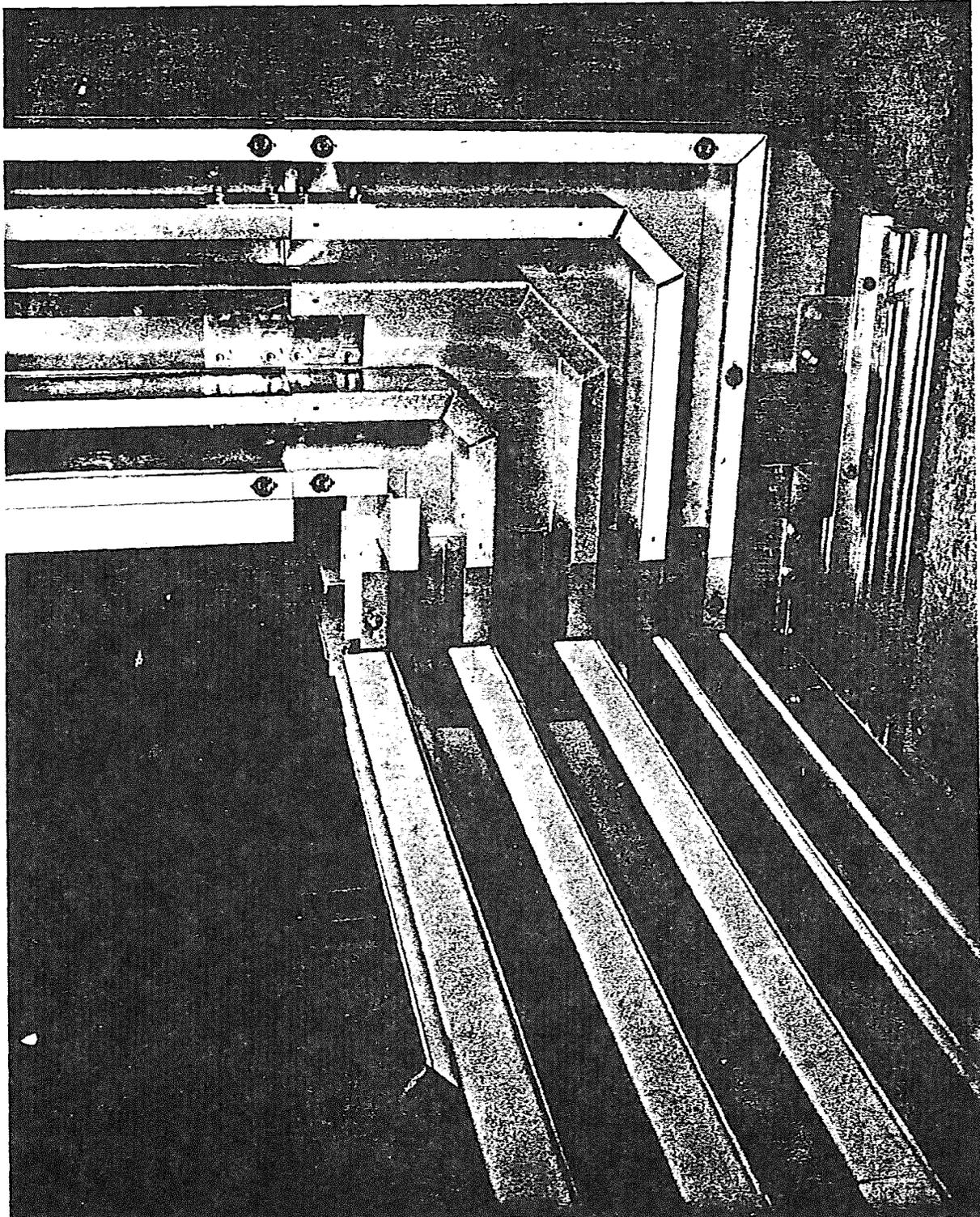


FIGURE 5

VERTICAL CABLE DUCT MATING WITH HORIZONTAL RUNS

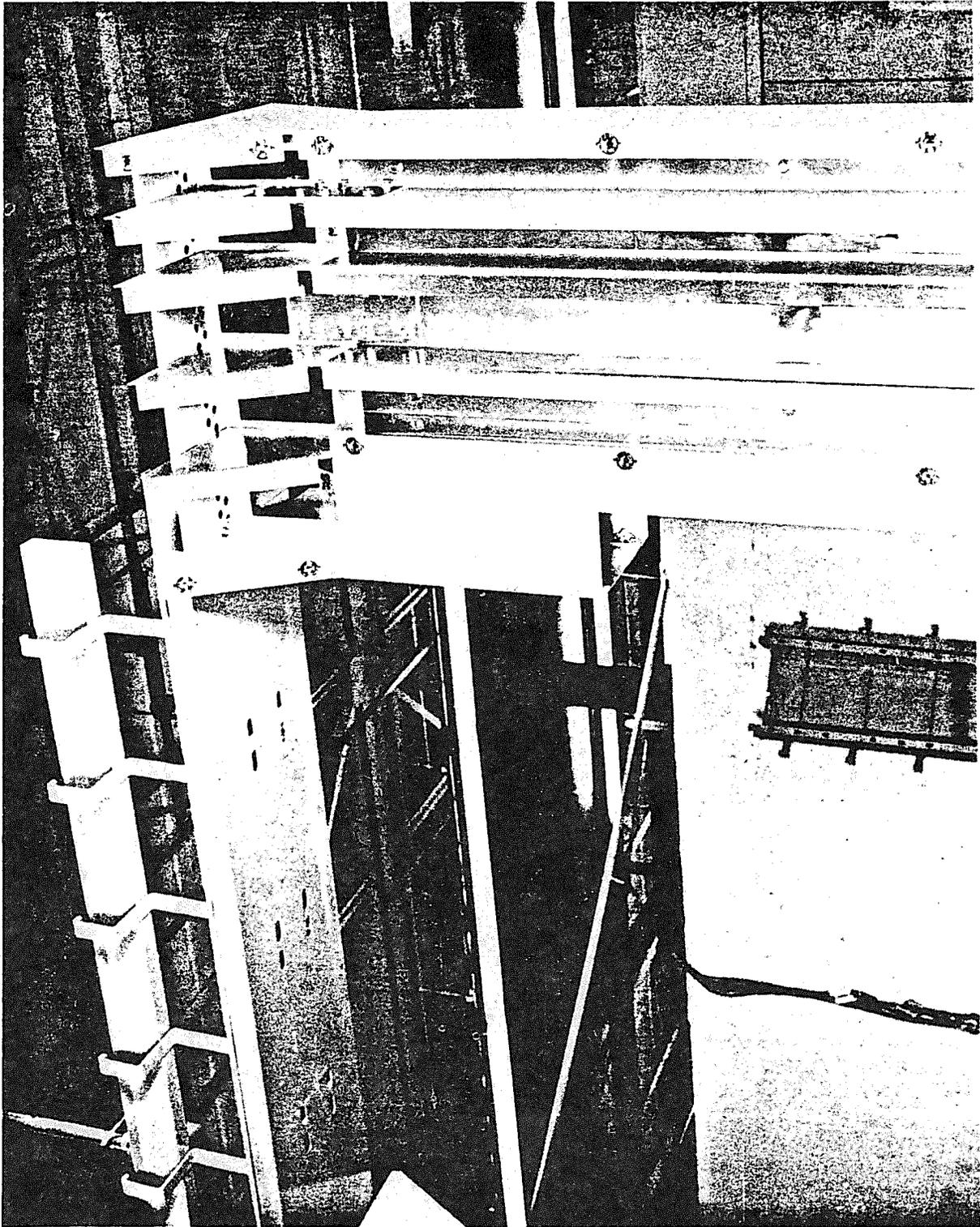


FIGURE 6

VERTICAL CABLE DUCT JUNCTIONING TO OVERHEAD RACK

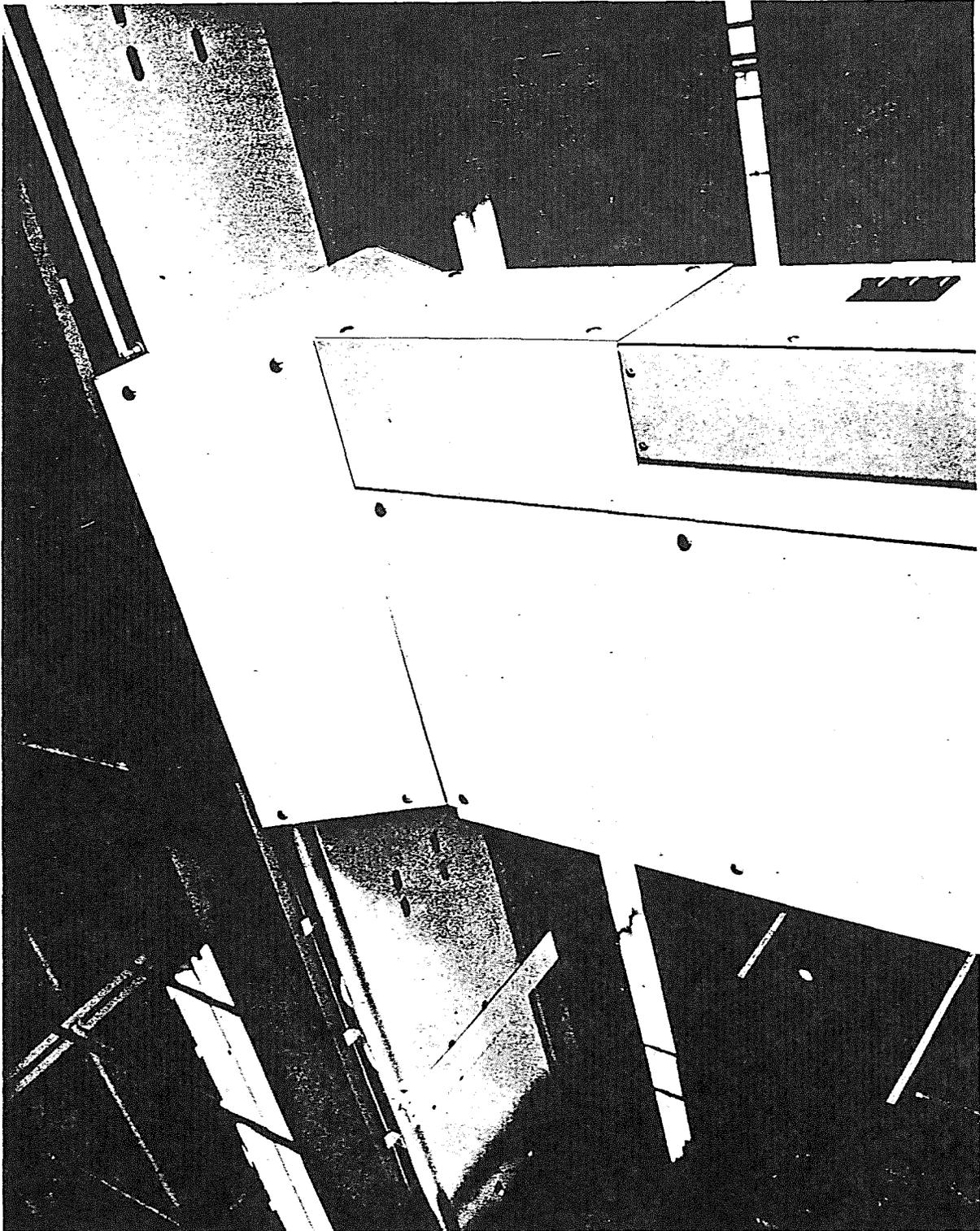


FIGURE 7

VERTICAL AND OVERHEAD CABLE DUCTS WITH COVERS IN PLACE

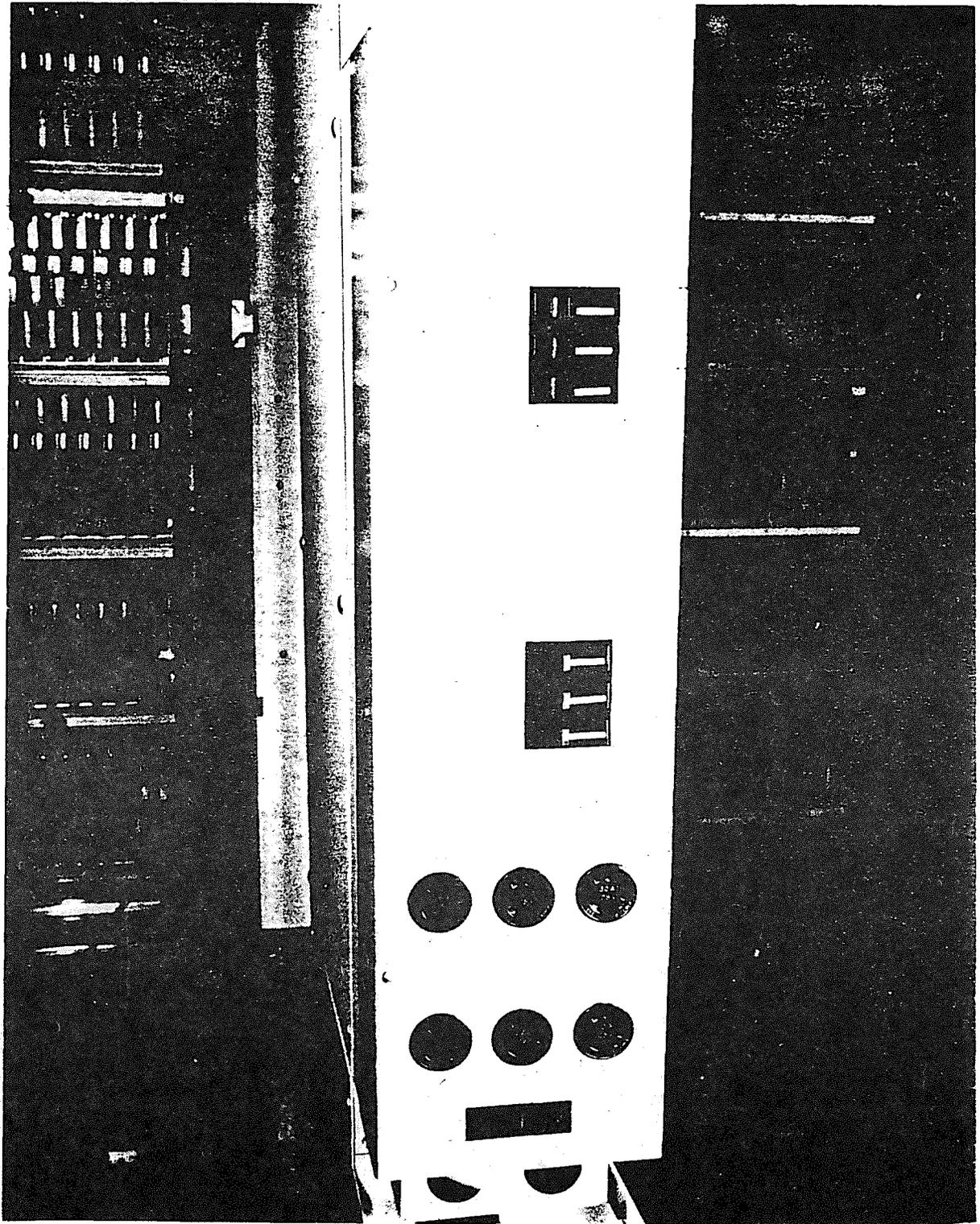


FIGURE 8

AC MODULE POWER BOX

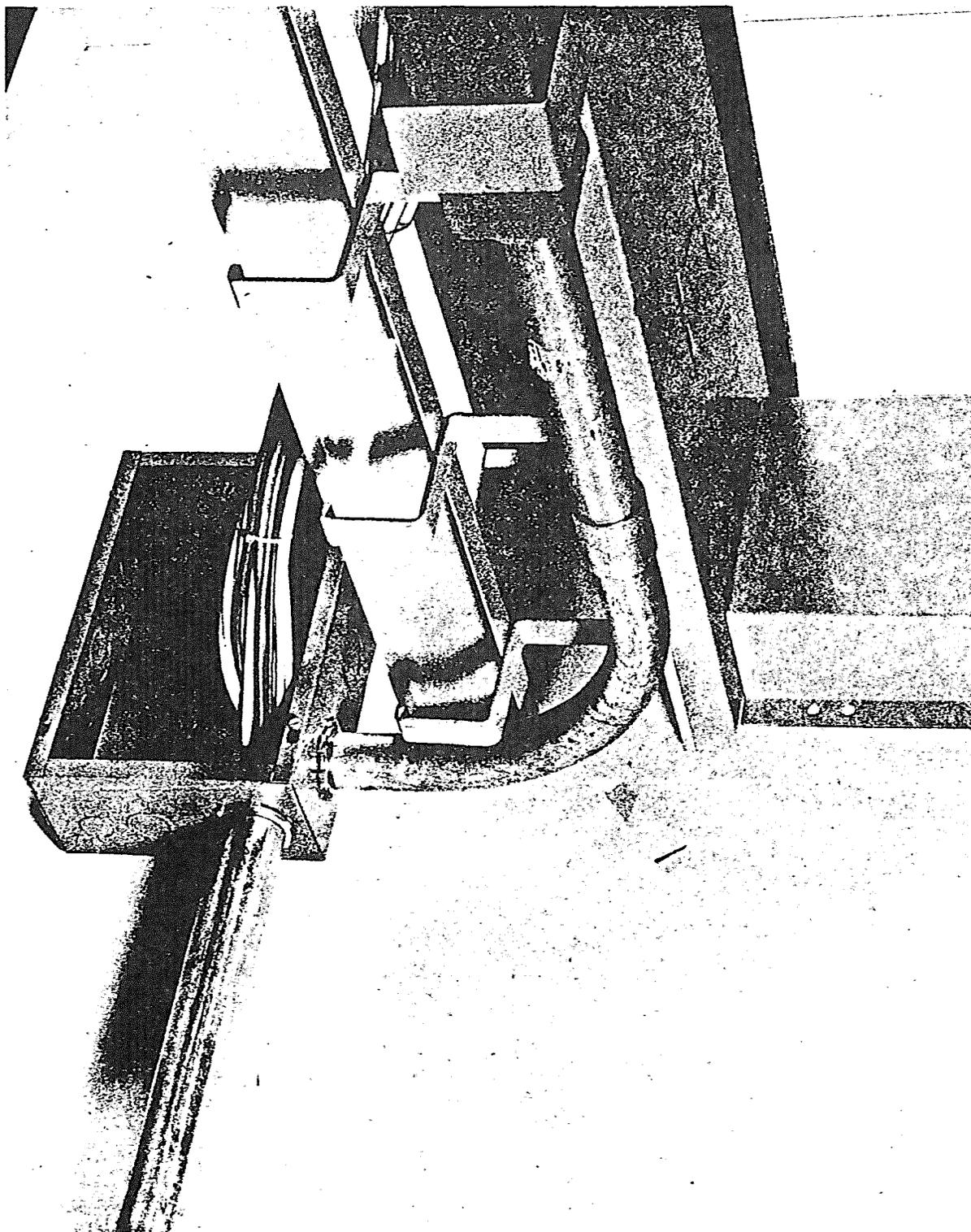


FIGURE 9

AC CONDUIT FEEDING INTO OVERHEAD CABLE DUCT

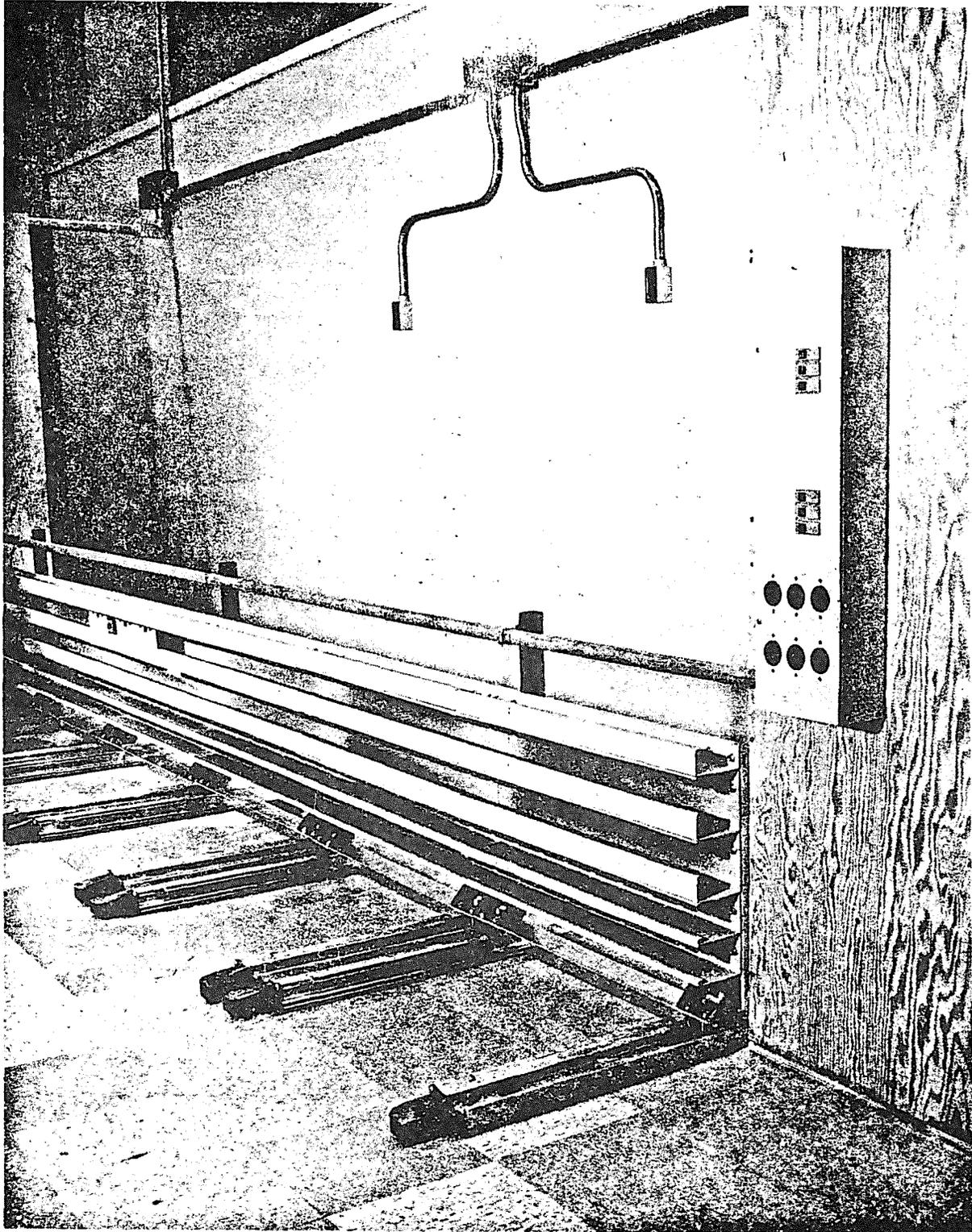


FIGURE 10

TYPICAL SINGLE LINE DIMENSION 2000 SYSTEM - FLOOR
RAILS AND HORIZONTAL CABLE DUCTS