

PHYSICAL PLANNING

INSTALLATION MANUAL

IBM 7030

DATA PROCESSING

SYSTEM

This manual contains information necessary for planning the physical installation of a 7030 System.

In addition to technical information needed for physical installation planning, it contains recommendations and suggestions to be used as a guide only in planning an efficient and pleasant installation. The customer should make such arrangements as he shall deem necessary for profession consultants' services in planning his installation. It is important that local and national code requirements be adhered to by the customer.

The material presented is subject to engineering changes. It is advisable, therefore, to consult with the local IBM Physical Planning Engineer to be sure that no changes that affect your installation of the system have occurred.

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IBM 7030 PHYSICAL PLANNING MANUAL

PREINSTALLATION PLANNING

The successful installation of a large data processing system requires long range planning and continuous supervision to see that the plans are followed. The customer assumes the responsibility of providing suitable space for the IBM System that he orders. IBM Physical Planning Engineers are available, at the regional offices, for consultation in planning physical requirements of the installation.

The customer will, in many cases, establish a preinstallation consulting and service group which includes IBM representatives, accounting firms, engineering consultants, and other outside consultants. This group will consult with and advise the customer's data processing manager or executive committee on the course of action, objectives, and progress of the installation. The manager or executive committee will be in charge of the over-all operation and will coordinate the physical planning with the procedures and general planning. By the time the actual order for the system is closed, much preliminary methods and procedures planning will have been completed because such planning often forms the basis for the detailed machine order. The customer's planning and programming staff, which also reports to the data processing manager, will prepare a list of the actual components to be used in the installation. This list should include not only the system components, but also other equipment or furniture, such as tape storage cabinets, work tables, chairs, and desks.

The customer must decide on a suitable location for the 7030 area. Suitable facilities for installation may exist in some customers' offices; in others, minor or major changes to existing space will provide a suitable location. In other instances, the customer may desire a complete new building. The operation should follow a planned schedule so that the machine room will be ready to receive the system when it is delivered.

PLANNING SCHEDULE

Because each data processing machine installation differs in some respects from every other installation, it is not possible to provide a detailed schedule. However, the following suggested schedule should be adhered to as closely as possible:

Twelve months before machine delivery:

1. Determine the machine components desired and review the order.
2. Obtain all necessary physical planning requirements from your local IBM Physical Planning Engineer.
3. Determine the prospective location of the system. Make a preliminary layout of the proposed installation.

4. Request a visit by the IBM Physical Planning Engineer to discuss with the customer's personnel (including the planning staff and consulting group) installation, power, and air conditioning requirements. At this meeting, the proposed room layout, floor construction, and the placement of raceways and power receptacles will be discussed.
5. Advise IBM of security or other restrictions, and advise of any unusual housing requirements as a result of these restrictions.
6. Study local delivery quotations on power and air conditioning equipment to determine when this equipment must be ordered.

Six months before machine delivery, the air conditioning equipment requirements should be reviewed.

At this time, the final layout should be made by the customer and IBM branch office, and submitted to the Data Systems Division's Installation Planning Department for final review and comment. The cable order should then be made at the IBM branch office from this approved layout and forwarded by the Branch Manager to the Order Department at the plant of control. When the customer and the branch office require assistance, the Regional Physical Planning Engineer should be contacted. **THIS IS A CRITICAL POINT IN THE SCHEDULE.** After these cables are ordered, no changes that will affect cable lengths should be made in the layout.

One month before machine delivery, a survey must be made by local IBM representatives to determine specific requirements for moving the machine components from the delivery platform to the machine room. This information should be forwarded directly to the IBM Traffic Department at Kingston, N. Y.

Two weeks before system arrival:

1. Cables will be delivered to the machine room for installation by the customer under the supervision of the IBM Customer Engineers.
2. Customer Engineering furniture and equipment will be delivered.

Components not shipped with the system will have their cables shipped with the individual units.

One week before machine delivery, all air conditioning equipment should be installed, tested, and ready for operation. Electrical facilities, lighting, floor ramps, painting, plastering, and decorating should also be completed at this time.

Every effort should be made to balance the air conditioning system as soon as possible after the IBM 7030 has arrived.

SYSTEM COMPONENTS

The 7030 is a solid-state, high-speed computer. It combines very fast arithmetic and logic operations with the versatile and efficient data handling capabilities needed to sustain them.

An average 7030 system will consist of a central processing unit, exchange, power distribution unit, six core storage units, three tape controls, eight magnetic tape units, card reader, card reader control, printer, printer control, card punch, card punch control, console control, console, disk synchronizer, and a disk storage.

UNIT DESCRIPTION

IBM 7101 Central Processing Unit. This unit performs arithmetic and logic operations on operands taken from storage.

IBM 7619 Exchange. This unit directs information flow between input-output or external storage units and internal storage. Internal processing can proceed simultaneously. The 7619 Exchange has a minimum of eight channels. The channels are independent and may be used concurrently. To each channel can be attached a control unit for a console, a card reader, a card punch, a printer, magnetic tape units, and so on. These units are cable-connected to their respective control units. Additional channels can be added in blocks of eight, up to a total of 32.

IBM 7612 Disk Synchronizer and IBM 353 Disk Storage. The disk synchronizer connects disk storage units to the system. The disk storage supplies vast additional word storage capacity.

IBM 7302 Core Storage. This unit is available in the following models:

Model I - 16,384 words of core storage

Model II - 8,192 words of core storage

IBM 7803 Power Distribution Unit. This unit is the main power distribution point for 60-cycle and 400-cycle power to the system. It also contains circuitry to aid in maintenance of the core storage units.

IBM 729 IV Magnetic Tape Unit. This unit provides high speed, large capacity input-output for data or programs. In the IBM 7030 System, the magnetic tape units must be attached to a 7613 Tape Control.

IBM 7152 Operator's Console. This unit contains the switches, lights, digital displays, and so on, including a console printer that can be used for operator control of the system. The console must be attached to a 7623 Console Control.

IBM 7503 Card Reader. This unit is a 1000 card per minute card reader that is part of the input-output system. There is no control panel on this machine; in all operations using the card reader, it must be attached to a 7614 Card Reader Control.

IBM 7553 Card Punch. This unit is a 250 card per minute card punch that is part of the input-output system. There is no control panel on this machine; in all operations using the card punch, it must be attached to a 7615 Card Punch Control.

IBM 1403-2 Printer. This unit is a 600 line per minute printer that is part of the input-output system. There is no control panel on this machine; in all operations using the printer, it must be attached to a 7616 Printer Control.

IBM 7613 Tape Control. This unit controls up to eight 729 IV Magnetic Tape Units (only one may operate at a time) and contains the buffers and electronic circuits that make the tape units attachable to the 7619 Exchange.

IBM 7623 Console Control. This unit contains the buffers and electronic circuits that control the 7152 Console and make it attachable to the 7619 Exchange.

IBM 7614 Card Reader Control. This unit contains the buffers and electronic circuits that control the card reader and make it attachable to the 7619 Exchange. Included are circuits necessary to check the information read and to provide the 7619 Exchange with information from cards.

IBM 7615 Card Punch Control. This unit contains the buffers and electronic circuits that control the card punch and make it attachable to the 7619 Exchange. Included are circuits necessary to check the information punched and to accept information for punching.

IBM 7616 Printer Control. This unit contains the buffers and electronic circuits that control the printer and make it attachable to the 7619 Exchange. The printer accepts information serially by character and checks the information printed.

BUILDING REQUIREMENTS

A Physical Planning Engineer is available to assist in selecting a suitable area. If the installation of the system requires a new building design, or if the existing space is to be altered radically, a suggested machine layout should be made prior to any building planning.

In selecting a location for the 7030 installation, consideration should be given to the following:

1. Availability and location of proper and adequate power.
2. Space to house air conditioning equipment, (compressor and air handling location, placement of cooling tower or evaporative condenser).
3. Ceiling height, outside wall area and glass area, since these factors will affect the ease of air conditioning the area.
4. Work flow to other areas such as accounting department, etc.
5. Floor loading capacity.

FLOOR CONSTRUCTION

The weight of each unit is listed in the Specification Summary section. A structural engineer should be consulted to be assured that the floor in an installation is capable of supporting the system layout. Factors to be considered in determining floor loading are:

1. If more than three machines are placed side by side, no allowance can be taken for side clearance at the ends of the machines.
2. Regardless of the actual service clearances required, clearances used in floor loading computations cannot be more than 30 inches in any one direction from the machine.
3. Twenty pounds for each square foot of service area used in calculation must be applied as live-load in floor loading computations.
4. Ten pounds for each square foot of service area used in calculation must be applied as false floor load in floor loading computations. For machines or systems not requiring false floors, there is no need to apply the ten pound factor.
5. Cable weight must be considered as part of the machine weight.
6. Most office building floors rated at fifty pounds per square foot have an additional allowance of twenty to twenty-five pounds per square foot for partitions. The local building department should be contacted about using this partition allowance when determining floor loading capacity.

A raised floor will accomplish the following major objectives:

1. Allows future layout change with minimum reconstruction cost.
2. Conceals interconnecting cables and power receptacles.
3. Provides personnel safety.
4. Permits space between the two floors to house air supply ducts or act as an air plenum, if desired.

A raised floor can be constructed of steel, aluminum, or fire-resistant wood. The free-access type floor, which rests on pedestals, is preferred over the raceway type whenever permitted by local building codes. The two general floor types are shown in Figure 1.

When selecting a raised floor covering, consideration should be given to such factors as the frequency of moving machine units, minimum cracking or dusting of the tile, appearance and cost. Experience has shown that a material such as vinyl tile is most applicable due to its resilience and its resistance to cracking and dusting.

If a raised floor utilizing metal panels is used, steps must be taken to insure that no metal is exposed to the walking surface.

SPACE AND LAYOUT REQUIREMENTS

Although space and layout requirements differ for each 7030 system, a few general rules can be given.

Space

The floor area required for the system will be determined by the specific components desired, length-to-width ratio of the room, location of columns, provision for future expansion, and so on. To determine the exact area required for a specific group of components, a machine layout should be made using the room under consideration. An average 7030 system will require between 2500 - 3500 square feet of floor space.

Space should be provided for daily tape storage within the machine room. Space may also be needed for printer forms stands, storage cabinets, card files, work tables, and desks, as well as IBM punched card data processing equipment, such as punches, sorters, or transceivers.

The integration of the 7030 work area with that of other accounting areas and with storage areas should be considered. The work flow from punched card equipment to and from the system should be considered when aisles and intermediate storage locations are planned. Such items as permanent master document files, card files, and magnetic tape files require different types of storage areas and should be carefully planned to minimize both the amount of space necessary and the travel time between areas.

At the option of IBM, a substantial amount of test equipment may be assigned to the installation to maintain the equipment in the machine room. Some machines may be moved to the test area, depending on the type of work to be done. These areas should be on the same floor level whenever possible. If they are not, ramps should be provided for moving test equipment and machine components.

The Customer Engineers' test and storage area for a single installation should contain at least 600 square feet of space, air conditioned to the same specifications as the machine room. The air conditioning should be sized to include the heat load of at least one magnetic tape unit.

Layout of Machine Components

Operational requirements should determine the specific location of the components in the machine room. Because the separate components are connected by cables of restricted length and because of space limitations and the necessity of maintaining clearances between machines for servicing, work space, and aisles, the customer may need to prepare and analyze several tentative layouts before deciding on the final one.

Because each customer has a different room size, a different column spacing, a different combination of machine components, and a different procedure for using auxiliary input-output units, each installation should be considered individually to reach the best arrangement.

The customer should prepare a layout of the 7030 system with the advice of the IBM Salesman and Physical Planning Engineer. This layout must be in final form, reviewed by Data Systems Division Installation Planning and approved by the customer before ordering the system cables. Each IBM branch office is responsible for ordering the correct external system cables four months before the scheduled delivery date. Physical Planning Engineers are available for assistance in cable ordering.

A machine layout can be readily made by considering the following:

1. Obtain an accurate drawing of the proposed area scaled at 1/4 inch equals 1 foot.
2. Cut out the 7030 plastic templates which are available from IBM and locate the units so that the maximum allowable cable length is not exceeded.
3. Maintain the recommended service clearances of each unit.
4. Locate the units for best operating and servicing conditions.

The templates are scaled 1/4 inch equals 1 foot. The solid lines indicate the unit; broken lines adjoining the solid lines indicate extended service gates and covers; exterior broken lines indicate the clearances required for operation and maintenance. Templates can be made by cutting along the exterior broken lines. These templates are then used to properly position the machine equipment on the area drawing. In some cases, clearances shown on the templates may be overlapped as long as the larger clearance is maintained. The gate swing of a unit must not interfere with the gate swing of the corresponding control unit.

The following points should be considered when planning the system layout. They are numbered in the order of importance:

1. The operator's console is the central unit of operation therefore it must be so considered when planning a layout.
2. The reader must be directly to the right or left of the operator's console.
3. (a) The fronts of the magnetic tape units should be visible from the operator's console.
(b) The printer should be near the operator's console and as close as possible to the CPU Maintenance Console.
(c) All control units must be near and visible from the units they control.
(d) The CPU Maintenance Console should be near and visible from the operator's console and Exchange Maintenance Console.
4. The front of the PDU to be within sight of the CPU Maintenance Console. At a close proximity where possible.

Adequate working area is required around the operator's console and magnetic tape units. The machine area should be planned so that expansion is possible. New machines or additional equipment can then be added to the existing layout without radical revisions. (See Figures 2 & 3.)

The 7302 Core Storage is shipped in a cradle. This cradle should be removed at the unit location unless space limitations prevent this action. If space is limited, the cradle is removed at the shipping platform. The shipping cradle weighs about 850 pounds and is 43 inches wide and 84 inches long. The cradle will add 7 inches to the height of the 7302 Core Storage.

The final layout must be reviewed to insure that cable limitations have not been violated and that proper clearances have been maintained. The required copies of this layout must accompany the cable order.

After cables have been ordered any change in the final layout that affects cable lengths must be accompanied by an RPQ.

The IBM CE branch manager will provide a scaled layout of the Customer Engineering equipment that will be installed in the CE room to assist the customer in locating receptacles, lights, and so on. Figure 4 can be used as a recommended guide. The number of outlets shown should be considered a minimum requirement.

RAISED FLOORING

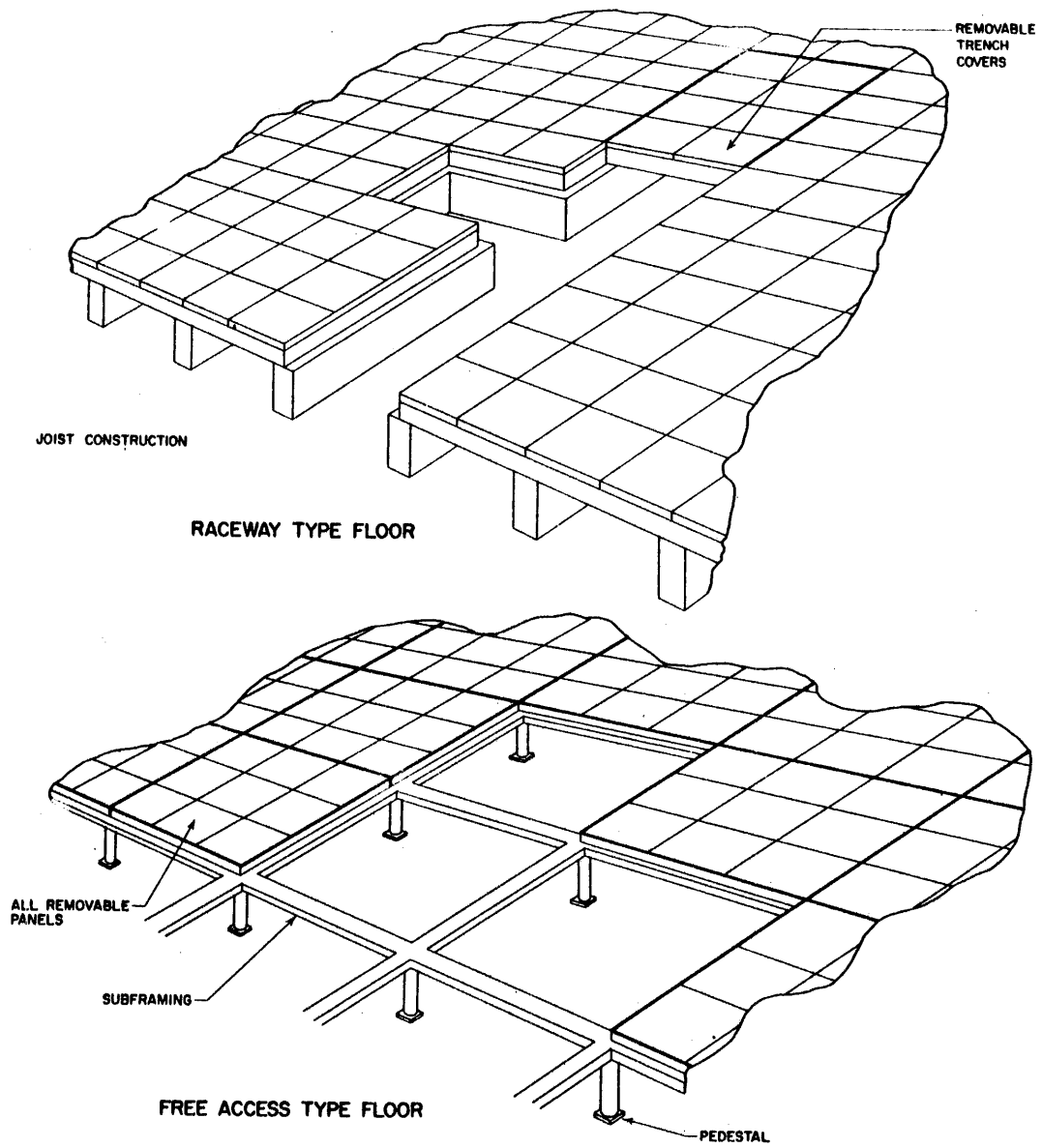


Figure 1. Raceway and Free Access Type Floors

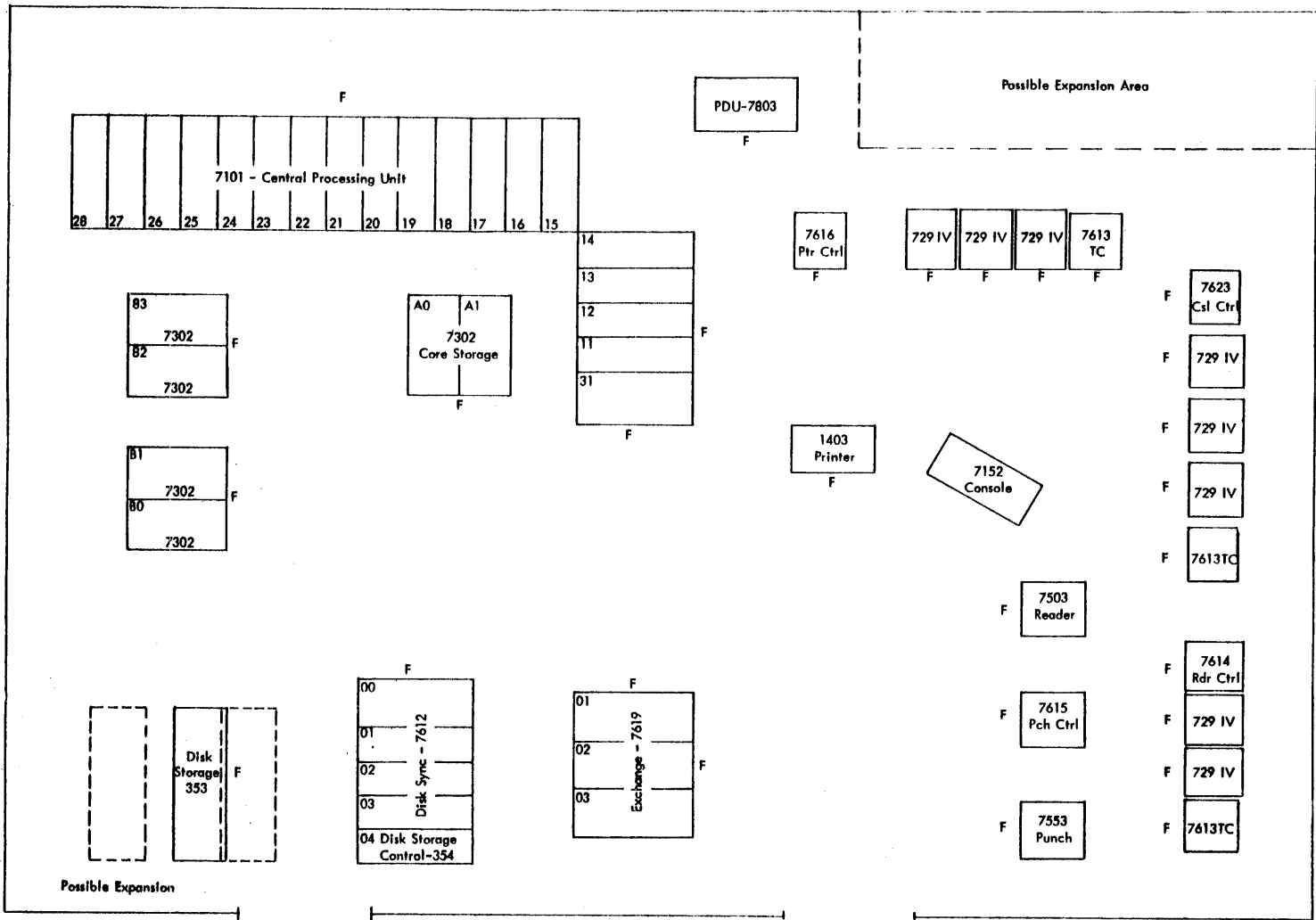


FIGURE 2. 7030 SYSTEM LAYOUT

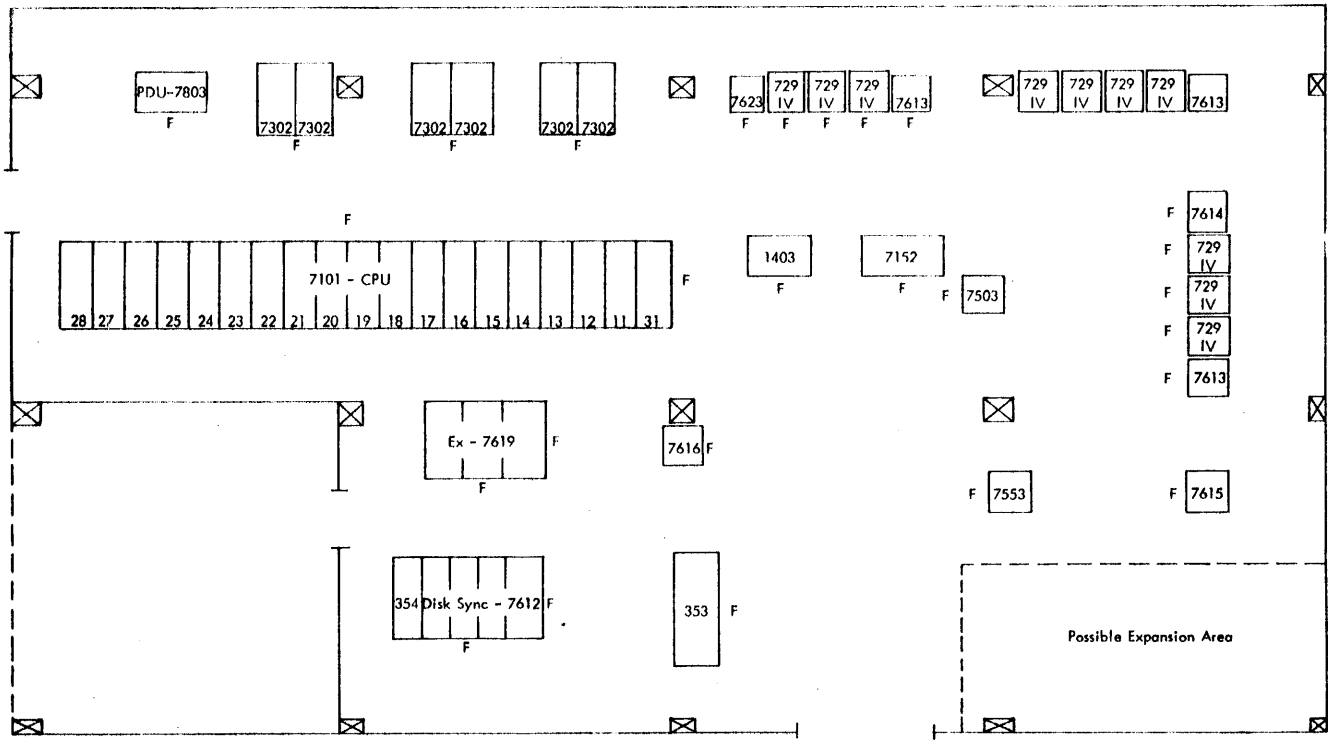


FIGURE 3. 7030 SYSTEM LAYOUT

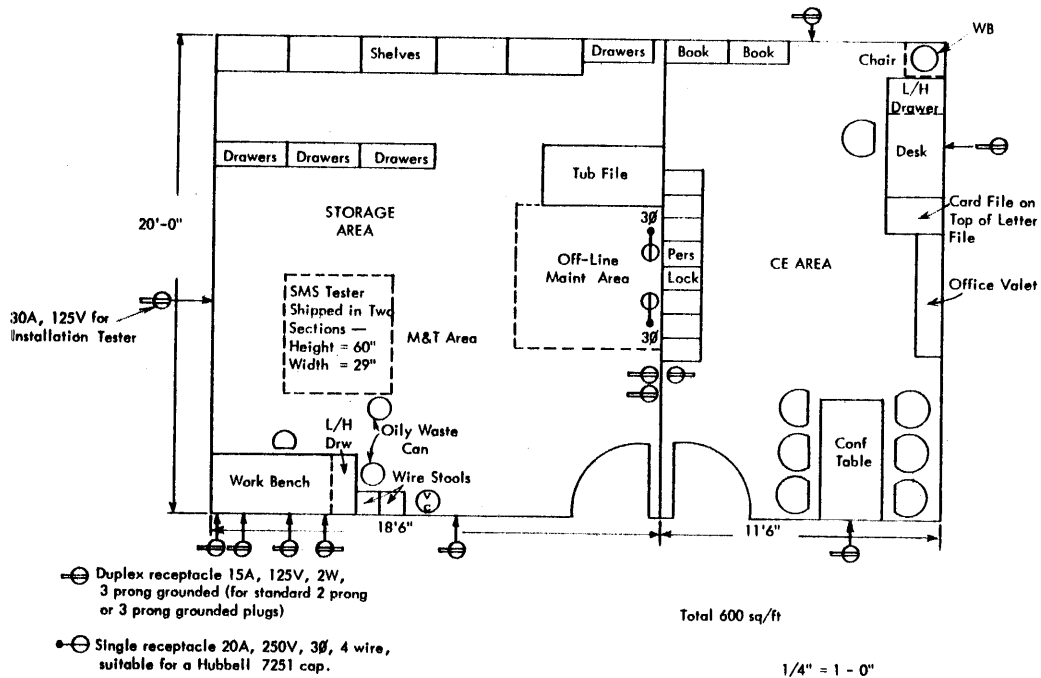


FIGURE 4. CE ROOM LAYOUT

ACOUSTICAL TREATMENT

Accoustical treatment is recommended for a comfortable operation of the system. For best results, an acoustical consultant should be approached. The following is presented as general information.

The principal noise sources in the system are the mechanical units such as card machines, printers, and blowers. Floor construction should be of a nature that will retard vibration to other areas. The walls should be constructed from the floor to the base ceiling and properly sealed. The doors must also have a good seal. The wall surfaces should be made soft to prevent reverberations (the importance of this feature diminishes with the increased size of a room). The greatest sound reduction will be obtained by properly treating the ceiling. Best results can be expected from a dropped porous ceiling. If overhead duct work exists, it is possible that the noise generated in the machine room may be transmitted to other rooms unless proper precautions are taken.

LIGHTING

A minimum average illumination of 40-foot candles measured 30 inches above the floor should be maintained in the general machine room area.

Direct sunlight should be avoided, because lower levels of illumination are needed to observe the console and signal lamps. The lights for general illumination should be sectionally controlled by switches so that a portion of the lighting can be turned off as desired.

VIBRATION

It may be necessary to install machines in an area that is subject to minor vibrations. The machines can withstand a sustained vibration to up to 0.25G (G is gravitational acceleration).

G's of acceleration may be computed from vibration readings of amplitude and frequency by the formula:

$$G = .103 AF^2$$

where A is the displacement in inches from the mean,
F is the frequency in cycles per second.

The machines can withstand intermittent vibrations somewhat greater than 0.25G if the frequency is below 25 cycles per second. If the anticipated building vibration is greater than 0.25G, the customer should have it measured and the results should be forwarded to the Physical Planning Engineer for review.

TAPE STORAGE

The following limits must be maintained for frequent and infrequent usage of magnetic tape:

H D Tape

Relative Humidity	20 to 80%
Temperature	40 to 120° F

Mylar* Tape

Relative Humidity	20 to 80%
Temperature	50 to 90° F

Tape exposed to atmospheric conditions outside the above limits will require reconditioning before it is used. This is accomplished by permitting the tape to remain in the correct operating environment for a length of time equal to its exposure (up to a maximum reconditioning period of 24 hours).

General Precautions

1. The tape should not come in contact with magnetic material at any time and should never be subjected to magnetic fields of greater than 50 oersteds intensity. Either of these can cause the loss of information or the introduction of noise.
2. When magnetic tape is shipped, the reel should be placed in a dust proof container and hermetically sealed. Additional support should be obtained by enclosing the container in an individual cardboard box.

*Trademark of E. I. du Pont de Nemours & Co. (Inc.)

AIR CONDITIONING

The recommended design condition of an IBM 7030 installation is 75° F and 50% R.H. In areas where it is not feasible to maintain 50% R.H., a design condition of 40% - 45% should be used.

Components of the 7030 system are internally cooled by air circulated by blowers in most units. The air intake varies slightly from one unit to another but, in general it is through the bottom and also through louvers along the bottom edge. One-inch dust filters are included at each air input. Warm air exhausts from the top of each unit.

To determine the air conditioning capacity necessary for an installation, the following factors must be considered:

Machine heat dissipation, personnel latent load fresh air introduction infiltration of heat through outer walls, ceiling floors, door openings partitions glass wall area and possible reheat.

A separate air conditioning system is recommended for a data processing system installation. Because of the amount of heat dissipated while this machine is in operation it is necessary for the air conditioning system to maintain a cooling cycle year-round.

TEMPERATURE AND HUMIDITY REQUIREMENTS (MYLAR TAPE)

1. Machine power ON: Operational Period
Temperature: 65 - 80° F
Relative Humidity: 20 - 80%
2. Machine power OFF: Nonoperational Periods
Temperature: 50 - 100° F
Relative Humidity: 0 - 80%

The area must be at the conditions for the operational period before the machine power is turned on.

TEMPERATURE AND HUMIDITY CONDITIONS

Under all conditions of operation, the input air and room air at the data processing installation should not exceed 80° F. This is a maximum operating temperature and should not be considered a design condition.

When conditioned air is supplied to the base of any unit by means of an under-floor duct or plenum chamber, the relative humidity in the duct should not be greater than 80%. This specification is an absolute maximum. Air temperature in this duct should be kept above room dew point temperature to prevent

condensation within or on the machines. When it is necessary to add moisture to the system for control of low relative humidity, one of the following methods should be used:

1. Steam grid or jets
2. Steam cup
3. Water atomizers.

Note: In localities where the outside temperature drops below freezing, condensation will form on single-glazed window panes. Also, if outside temperatures are considerably below freezing, the outside walls of the building should be waterproofed or vapor sealed on the inside or, in time structural damage will occur in outside walls.

AIR FILTRATION

A high efficiency filter rated according to the following specifications should be installed to filter all air supplied to the DPM room. (Mechanical and electrostatic air cleaners operate on two entirely different principles. Therefore, it is necessary to specify a different efficiency rating for each type.)

Mechanical Air Filter. This type of filter must be rated at a minimum of 20% efficient by the Bureau of Standards discoloration test using atmospheric dust. This rating applies to a clean filter and must be maintained throughout the life of the filter.

Electrostatic Plate Type Filter. This type of filter must be rated at a minimum of 85% - 90% efficient by the Bureau of Standards discoloration test using atmospheric dust. Electrostatic air cleaners are designed to operate at 85% - 90% efficiency at a given face velocity. As you increase the face velocity through an electrostatic filter, its efficiency decreases. Therefore, an electrostatic filter operated at increased face velocities or below 85% efficiency would allow a greater number of particles charged by the ionizing wires to pass through the plate section and to enter the room. This would increase what is known as space charge. As the space charge increases, a greater voltage differential occurs between the positive charged particles and the negative surfaces in the room. This causes dust to accumulate rapidly on all surfaces, defeating the purpose of a high efficiency filter.

Special air filtration is necessary only where installations are exposed to corrosive gases, salt air or unusual dirt or dust conditions.

AIR DISTRIBUTION AND TYPES OF SYSTEMS

Several different types of air conditioning systems can be designed to satisfy the temperature and humidity requirements. The following are brief descriptions of the types of systems in common use. In no case should these descriptions be considered complete, and the use of an experienced air conditioning design engineer is strongly recommended. All local building codes should be checked including the electrical code; some localities will not permit the use of the raised floor as an air conditioning plenum as described in following text.

SINGLE DUCT - OVERHEAD SYSTEM

In this system the entire heat load of the room, including the heat generated by the 7030 system, is absorbed by the air supplied to the machine room. The air is generally supplied from either an overhead duct and diffuser system or by a ceiling plenum.

The return air to the air conditioning unit is taken from either ceiling return registers located above the heat producing units, or from a fixed pattern of returns in the ceiling or on the walls around the periphery of the room.

The temperature control system would consist of temperature and humidity controls placed in a representative location within the machine room. A temperature and humidity recorder (discussed in detail later) would be mounted adjacent to the controls to monitor the room conditions.

TWO DUCT - TWO-AIR-CONDITIONING-UNIT SYSTEM

One air-handling unit with separate controls supplies conditioned and filtered air to the air inlets on the machines. This air may be supplied to the machines through ducts laid beneath the raised floor or fed to a floor plenum chamber with holes through the floor under the machines. Each machine is supplied with a quantity of air equal to its internal fan capacity. This air absorbs the heat generated by the machine and is discharged from the top of the units into the room. Relative humidity of the air supplied to the units should be maintained below 80% and temperatures should be controlled to prevent condensation on or within the units. To insure a controlled relative humidity it will be necessary to provide for a reheat system to operate in conjunction with the cooling unit. This unit is basically a sensible cooling operation.

The second air-handling unit supplies air directly to the room through a separate duct system and should be large enough to absorb the remaining heat load in the area. It should be capable of maintaining room temperature and relative humidity as specified in this manual and give complete year-round air conditioning, ventilation, and heating.

TWO DUCT - SINGLE-AIR-CONDITIONING-UNIT SYSTEM

This system is similar to the preceding system except in one respect. This system uses only one air-handling unit to supply both air circuits. The air is filtered and the temperature and humidity are regulated before the air is delivered to the room and the individual units through separate ducts.

A split coil with reheat and/or face and bypass dampers can be used to regulate the air to be supplied directly to the individual unit. Relative humidity of this air should be maintained below 80% and temperature should be controlled to prevent condensation on or within the units.

The temperature control system for the air being supplied to the overhead system would be the same as for a single duct overhead system. In addition, a control system would have to be installed in the discharge duct to regulate the air supply to the underfloor system. The controls would operate either the separate cooling and reheat coils or the face and bypass dampers to maintain the required conditions. A remote reading temperature and humidity recorder should be installed with the sensing elements in the discharge air to the underfloor system to monitor the air entering the machine units.

UNDERFLOOR SYSTEM

In this system the space between the regular building floor and the raised floor is used as a supply plenum. All air is discharged into the room through floor registers around the perimeter of the area. The air is returned to the air conditioning unit by ceiling registers located directly above the machine units.

A higher return temperature can be utilized in this system without affecting the design conditions of the over-all room. The design of this system takes into consideration a heat transfer factor through the metal floor. This affords a certain amount of reheat to control R. H. of air before it enters the room.

The temperature control system would consist of the same controls as for a single duct overhead system. In addition, controls will be required in the underfloor supply system to insure that the air temperature is controlled to prevent an uncomfortable condition due to a cold floor.

The air conditioning system should use predominately recirculated air with a set minimum introduction of fresh air for personnel. This minimum fresh air introduction will enable the machine area to be pressurized so that air leakage is always outward. This will help prevent dust entry from adjacent areas.

The air conditioning load should not be supplied from the same transformer that supplies the 7030 System.

TEMPERATURE AND HUMIDITY RECORDING INSTRUMENTS

It is recommended that all customers install temperature and humidity recording instruments. Recording instruments are necessary to provide a continuous record of temperature and humidity conditions in the machine area. Also, if the air conditioning requirements are not met, a record is available to indicate the extent and duration of the undesirable condition and to indicate whether a drying-out period is required. This may, in some cases, save machine downtime.

The record of temperature and humidity can be used to:

1. Assure the customer that his air conditioning installation is continuously performing its job properly. Installation errors and loss of efficiency due to malfunction of some part of the air conditioning system can be quickly detected.
2. Determine if a mandatory drying-out period is necessary when humidity limitations are exceeded. The drying-out may be necessary if the excess humidity occurs either during periods of actual machine operation or during periods when the machine is shut down and unattended. The extent and duration of the excess humidity is used to determine the duration of the drying-out period.
3. Determine if the environment in the area meets the requirements for the data processing system.

A visual or audible signal should be incorporated into the instrument. The purpose of the signal is to provide a visual or audible indication that the temperature or humidity conditions in the 7030 area are nearing the maximum limitations stated in this manual. Action can then be taken by the customer's personnel to correct the situation.

Direct reading instruments with a 7-day electric-drive chart should be used at all installations to monitor the ambient room conditions. The recorder should be located at a representative location within the room and adjacent to the control devices.

POWER REQUIREMENTS

Figure 5 illustrates the required power service for the 7030 system. The computer requires two types of power services which the customer must supply:

1. 415-cycle, 208-volt, 3-phase, 5-wire. The 415 cycle power is generally derived from a motor-generator set supplied by the customer. See Appendix A, Section I.
2. 60-cycle, 208-volt, 3-phase, 5-wire. This power should be obtained from a balanced 208-volt 3-phase source. If a motor-generator is used to supply the 415-cycle power the same 60-cycle source may be used. See Appendix A, Section II.

The five wires for input power consist of three phase wires, one neutral wire and one equipment ground wire. The equipment ground wire from all the units can be tied into one main grounding wire at the main distribution panel. This wire shall be carried directly back to the transformer or building ground.

A separate feeder connected to the main building distribution panel will usually provide a suitable supply. If a transformer is used, it should be fed from the highest primary source readily available. The feeder for the 7030 system should feed no other loads. If there is any question about the suitability of the power service, the customer should consult the IBM Physical Planning Engineer.

The power feeder for the 7030 system should be protected by the main line circuit breaker. (See Section on Safety and Fire Precautions for further details, Appendix B.) The individual branch circuits on the distribution panel should be protected by suitable three-phase circuit breakers properly derated according to manufacturer specifications. The distribution panel should be located in an unobstructed, well lighted area in the 7030 room.

Branch circuits should terminate under the raised floor as close as possible to the machine they supply. The branch circuits can be run in conduit, green-field, or flexible cable depending on local codes and fire regulations. It is recommended that the 415-cycle power cables supplying the power distribution unit be housed in non-ferrous conduit.

Suitable convenience outlets should be installed in the 7030 room and CE room for use by the maintenance personnel, Customer Engineers, and so on.

As a safety precaution, a remote power-off device, that will remove all power from the 7030 system should be provided in the machine room.

PHASE ROTATION

The three-phase power receptacles for the 7030 System must be wired for correct phase rotation. Looking at the face of the receptacle, and running counterclockwise the sequencing will be phase one, phase two and phase three.

LIGHTNING PROTECTION

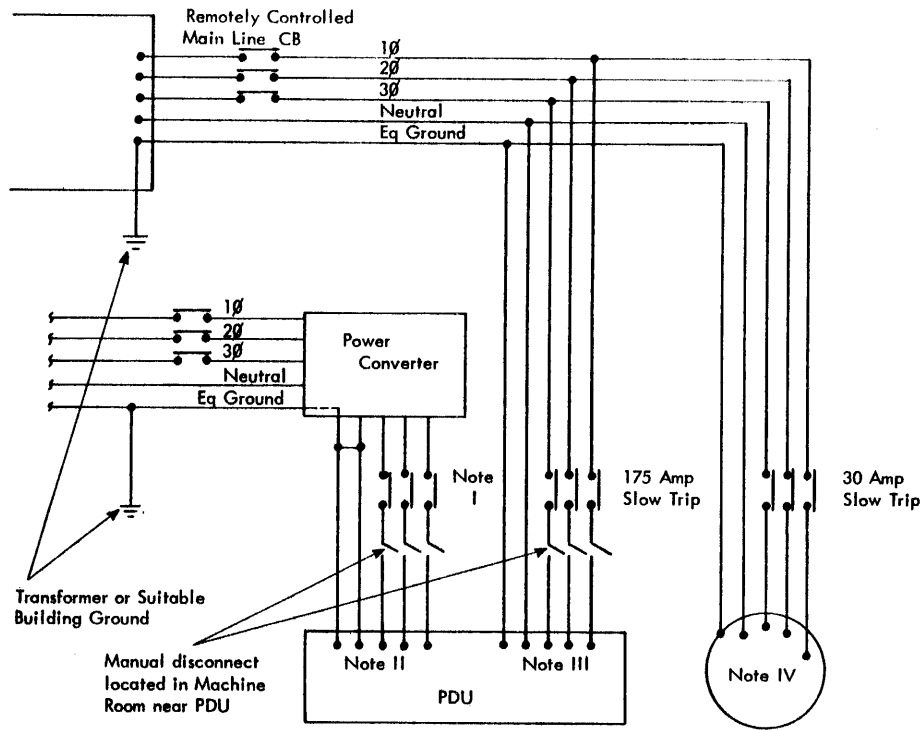
It is recommended that the customer install lightning protection on his secondary power source when:

The utility company installs lightning protectors on the primary.
Primary power is supplied by an overhead power service.
The area is subject to electrical storms or equivalent type power surges.

A recommended type of service protector to be installed is the G. E. Pellet-Type Model 9LA15A1 or Model 9LA15A4, or equivalent.

One of either model is required for single-phase and two of either model are required for three-phase.

The determination as to whether lightning protection is desirable, the selection of the service protector needed and its proper installation are to be made by the customer.



Notes:

- I. 300 amp slow trip or 350 amp instantaneous trip. Remotely operated from machine room for emergency power off. Must trip at same time as main line CB.
- II. Specifications at PDU must be: 415 cycles \pm 25 cps; 208 volts \pm 0.5%; 3 phase; 5 wire.
- III. Specifications at PDU must be 60 cycles \pm 1/2 cps; 208 volts \pm 8%; 3 phase; 5 wire.
- IV. Specifications at receptacle must be: 60 cycles \pm 1/2 cps; 208 volts \pm 8%; 3 phase; 5 wire.

Receptacles Required:
 Russell & Stoll JRS 344F
 or JCS 344F or equivalent.
 One separate 30 amp
 service must be supplied
 for each printer, punch,
 reader and console
 control unit. Two separate
 30 amp services are required
 for each tape control.

FIGURE 5. SCHEMATIC OF 60 AND 400 CYCLE POWER SERVICE (SUPPLIED BY CUSTOMER)

CABLES

The cables are supplied by IBM and are custom-made based on lengths required for each installation. Cables are measured and ordered in accordance with the approved layout. The key number, part number, and the required cable length must be submitted for each cable or group in the 7030 system. All external cables are measured from the base of one machine to the base of the machine it connects. When computing the cable length required between units, measure from the center points of the cable hole locations and add twice the depth of the flase floor. In the interest of best electrical design, all cable lengths should be kept as short as possible. Under no circumstances should any of the maximum lengths be exceeded.

Cables for an installation are supplied to connect the various components of the system. Cables for new or additional equipment will also be supplied. If components of the system must be moved to fit the new component in the system, only cables necessary to do this will be supplied at no charge. All replaced cables must be returned to the factory.

Cables requested for any reason other than the above, such as a layout revision at the customer's request, will be considered only on an RPQ basis.

After cables have been ordered, any changes in an approved layout, that would affect cable lengths must be accompanied by an RPQ giving complete reasons for the requested change.

The customer must supply the required A. C. power cables to the 7803 Power Distribution Unit. Figure 6 illustrates the approximate location where these cables tie into the P. D. U. Figure 7 illustrates the terminal lugs that will be provided for the 60 and 400 cycle A. C. input cables and Figure 8 shows those for the neutral and bond cables.

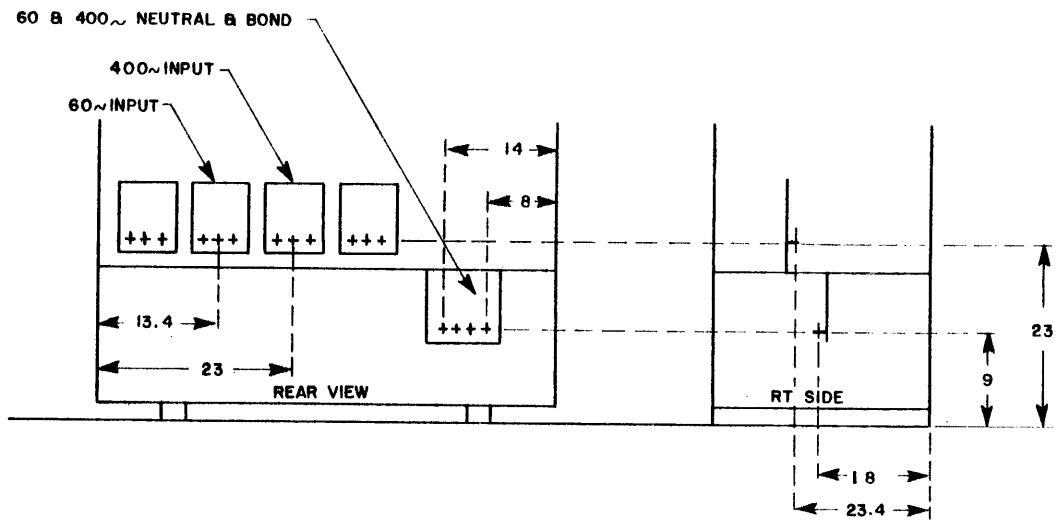


FIGURE 6. AC POWER SERVICE CONNECTIONS TO 7803

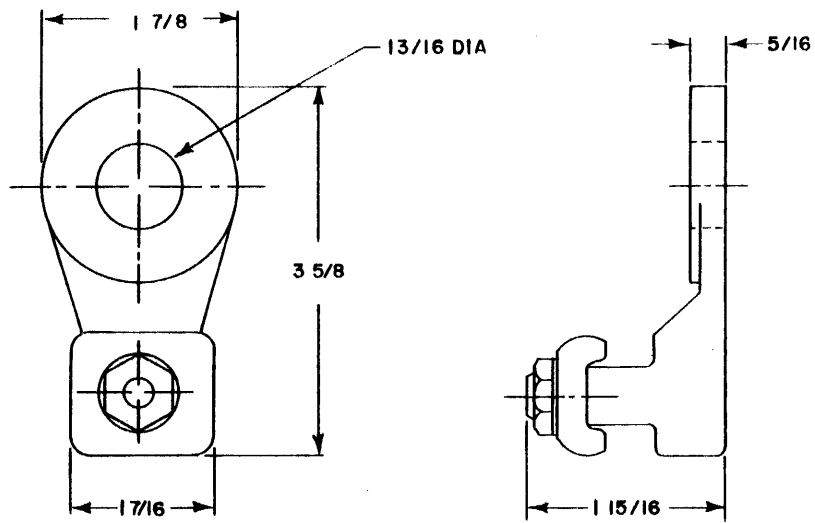


FIGURE 7. TERMINAL LUG 400-500 MCM CABLE

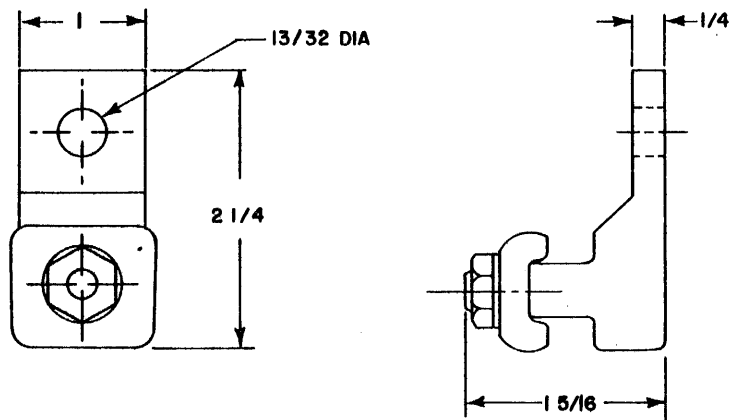
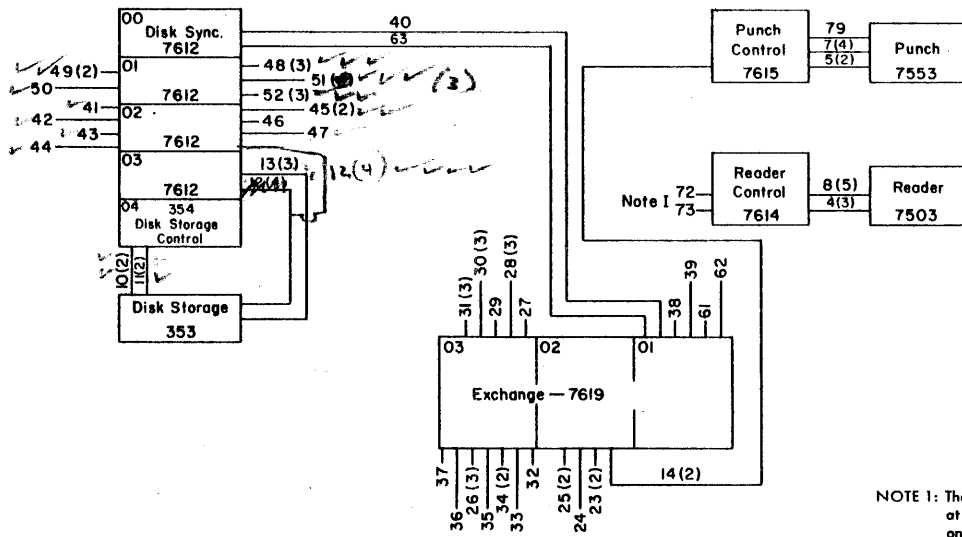
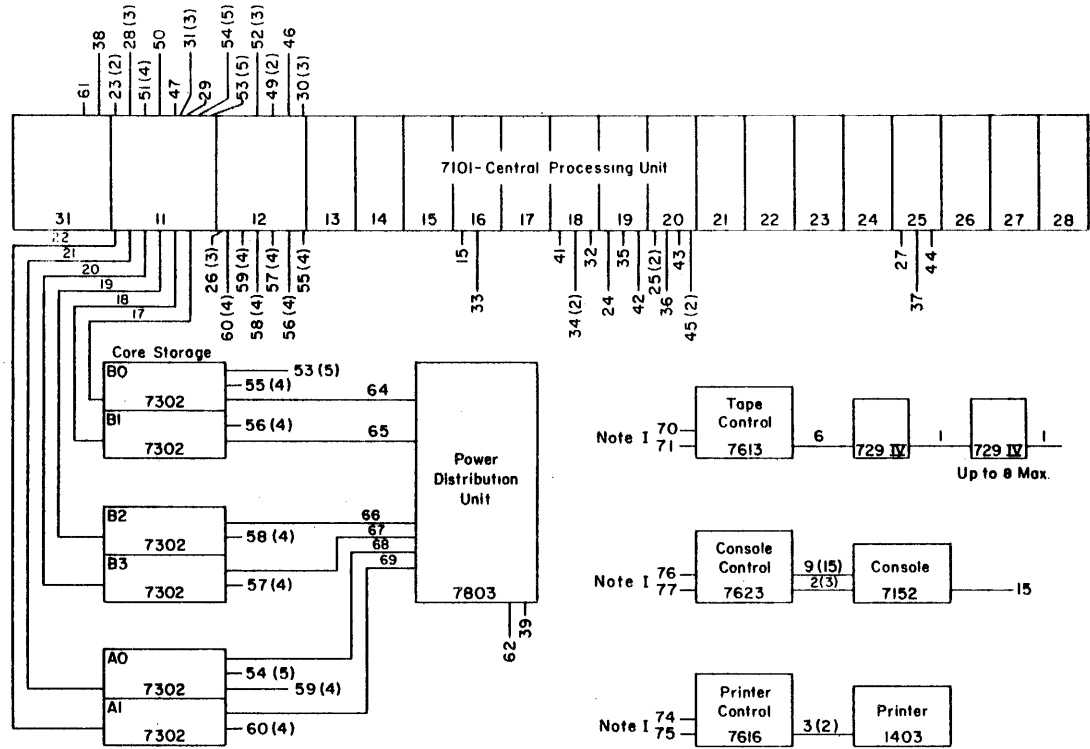


FIGURE 8. TERMINAL LUG 3/0 - 4/0 CABLE

IBM 7030 SIGNAL CABLING SCHEMATIC



NOTE 1: The termination of cables at the Exchange depends on channel assignment used.

7030 SYSTEM SIGNAL CABLES

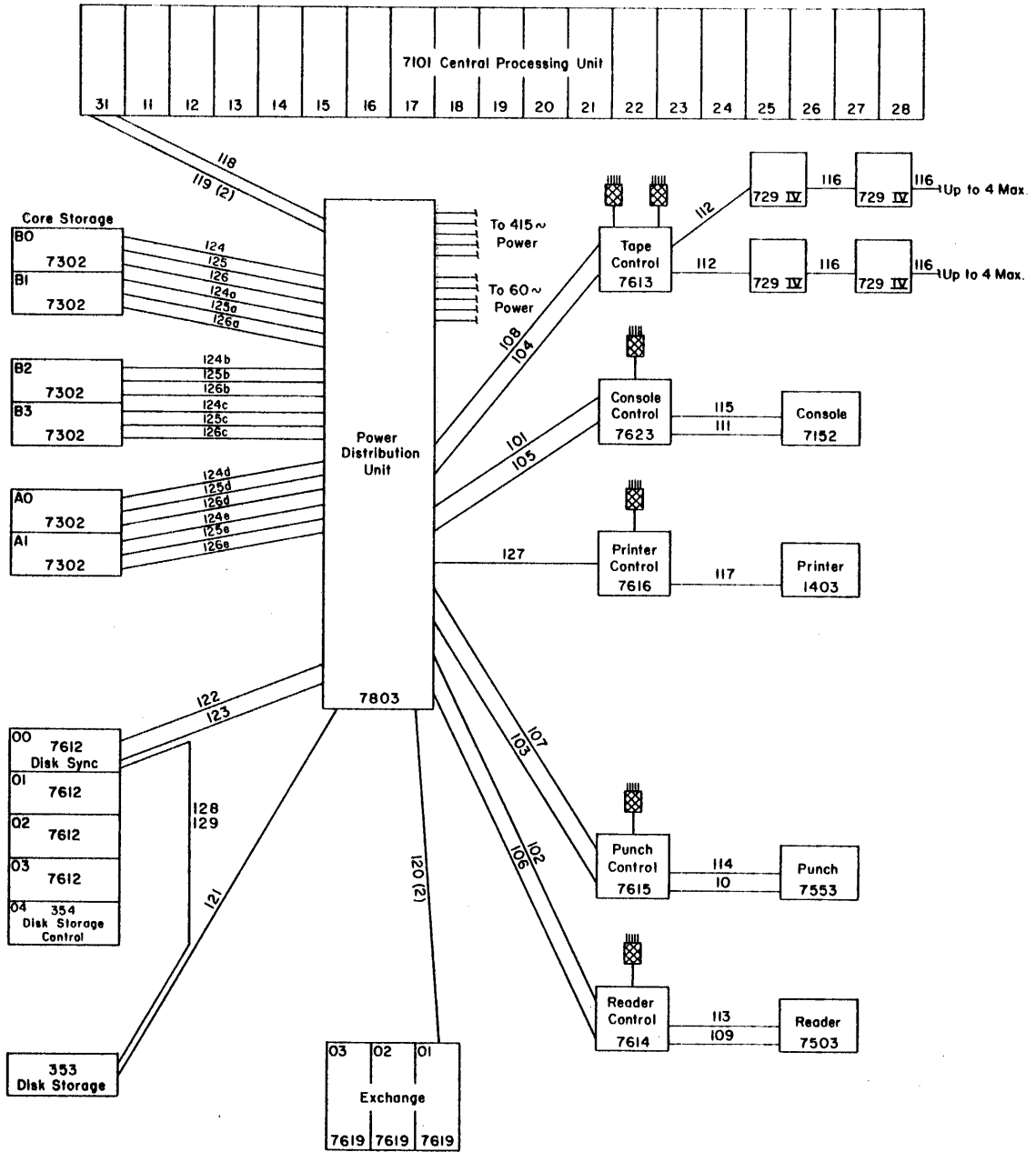
Key No.	Part No.	Description	Dia. Inches	Max. Length (ft.)
1	530978	729 IV to 729 IV	1.680	*
2	5218194	7623 to 7152	.830	50
3	552285	7616 to 1403	1.680	20
4	5218199	7614 to 7503	.932	50
5	5218199	7615 to 7553	.932	50
6	5218197	7613 to 729	1.680	*
7	5218198	7615 to 7553	.830	50
8	5218198	7614 to 7503	.830	50
9	5218198	7623 to 7152	.830	50
10	5218188	354 to 353	.830	40
11	5218187	354 to 353	.830	40
12	5218188	7612 - 03 to 353	.830	40
13	5218187	7612 - 03 to 353	.830	40
14	5218195	7619 - 01 to 7615	.932	100
15	5218185	7101 - 16 to 7152	.830	40
17	5218185	7101 - 11 to 7302 - B0	.830	25
18	5218185	7101 - 11 to 7302 - B1	.830	25
19	5218185	7101 - 11 to 7302 - B2	.830	25
20	5218185	7101 - 11 to 7302 - B3	.830	25
21	5218185	7101 - 11 to 7302 - A0	.830	25
22	5218185	7101 - 11 to 7302 - A1	.830	25
23	5218184	7101 - 11 to 7619 - 02	.830	40
24	5218184	7101 - 19 to 7619 - 02	.830	40
25	5218184	7101 - 20 to 7619 - 02	.830	40
26	5218184	7101 - 12 to 7619 - 03	.830	40
27	5218185	7101 - 25 to 7619 - 03	.830	40
28	5218185	7101 - 11 to 7619 - 03	.830	40
29	5218184	7101 - 11 to 7619 - 03	.830	40
30	5218185	7101 - 12 to 7619 - 03	.830	40
31	5218186	7101 - 11 to 7619 - 03	.830	40
32	5218184	7101 - 18 to 7619 - 03	.830	40
33	5218185	7101 - 16 to 7619 - 03	.830	40
34	5218185	7101 - 18 to 7619 - 03	.830	40
35	5218185	7101 - 19 to 7619 - 03	.830	40
36	5218185	7101 - 20 to 7619 - 03	.830	40
37	5218185	7101 - 25 to 7619 - 03	.830	40
38	5218187	7101 - 31 to 7619 - 01	.830	40
39	5218187	7803 to 7619 - 01	.830	30
40	5218187	7612 - 00 to 7619 - 01	.830	30
41	5218187	7101 - 18 to 7612 - 02	.830	50
42	5218187	7101 - 19 to 7612 - 02	.830	50
43	5218187	7101 - 20 to 7612 - 02	.830	50
44	5218187	7101 - 25 to 7612 - 02	.830	50

7030 SYSTEM SIGNAL CABLES (cont'd.)

Key No.	Part No.	Description	Dia. Inches	Max. Length (ft.)
45	5218188	7101 - 20 to 7612 - 02	.830	50
46	5218189	7101 - 12 to 7612 - 02	.830	50
47	5218189	7101 - 11 to 7612 - 02	.830	50
48	5218188	7101 - 11 to 7612 - 01	.830	50
49	5218188	7101 - 12 to 7612 - 01	.830	50
50	5218187	7101 - 11 to 7612 - 01	.830	50
51	5218189	7101 - 11 to 7612 - 01	.830	50
52	5218189	7101 - 12 to 7612 - 01	.830	50
53	5218190	7101 - 11 to 7302 - B0	.932	25
54	5218190	7101 - 11 to 7302 - A0	.932	25
55	5218190	7101 - 12 to 7302 - B0	.932	35
56	5218190	7101 - 12 to 7302 - B1	.932	35
57	5218190	7101 - 12 to 7302 - B3	.932	35
58	5218190	7101 - 12 to 7302 - B2	.932	35
59	5218190	7101 - 12 to 7302 - A0	.932	35
60	5218190	7101 - 12 to 7302 - A1	.932	35
61	5218191	7101 - 31 to 7619 - 01	.578	40
62	5218191	7803 to 7619 - 01	.578	30
63	5218191	7612 - 00 to 7619 - 01	.578	30
64	5218192	7803 to 7302 - B0	1.500	50
65	5218192	7803 to 7302 - B1	1.500	50
66	5218192	7803 to 7302 - B2	1.500	50
67	5218192	7803 to 7302 - B3	1.500	50
68	5218192	7803 to 7302 - A0	1.500	50
69	5218192	7803 to 7302 - A1	1.500	50
70	5218196	7613 to 7619 - 03 or 7620 - 04	.932	100
71	5218195	7613 to 7619 - 03 or 7620 - 04	.932	100
72	5218196	7614 to 7619 - 03 or 7620 - 04	.932	100
73	5218195	7614 to 7619 - 03 or 7620 - 04	.932	100
74	5218196	7616 to 7619 - 03 or 7620 - 04	.932	100
75	5218195	7616 to 7619 - 03 or 7620 - 04	.932	100
76	5218196	7623 to 7619 - 03 or 7620 - 04	.932	100
77	5218195	7623 to 7619 - 03 or 7620 - 04	.932	100
79	5220943	7615 to 7553	1.150	50

*A maximum of eight 729IV Magnetic Tape Units can be serially connected with signal cables to one 7613 Tape Control Unit. The maximum combined cable length for this hook-up is 80 feet.

IBM 7030 - POWER CABLING SCHEMATIC



7030 SYSTEM POWER CABLES

Key No.	Part No.	Description	Dia. Inches	Max. Length (ft.)
101	5218143	7803 to 7623	1.000	75
102	5218143	7803 to 7614	1.000	75
103	5218143	7803 to 7615	1.000	75
104	5218143	7803 to 7613	1.000	75
105	5218145	7803 to 7623	.740	75
106	5218145	7803 to 7614	.740	75
107	5218145	7803 to 7615	.740	75
108	5218145	7803 to 7613	.740	75
109	5218144	7614 to 7503	1.000	75
110	5218144	7615 to 7553	1.000	75
111	5218143	7623 to 7152	1.000	75
112	5218147	7613 to 729	.915	**
113	5218146	7614 to 7503	.740	75
114	5218146	7615 to 7553	.740	75
115	5218145	7623 to 7152	.740	75
116	535098	729 to 729	.915	**
117	552286	7616 to 1403	.915	50
118	5218148	7803 to 7101 - 31	.915	75
119	5218150	7803 to 7101 - 31	1.710	75
120	5218353	7803 to 7619 - 01	.750	75
121	5218150	7803 to 353	1.710	75
122	5218148	7803 to 7612 - 00	.915	75
123	5218150	7803 to 7612 - 00	1.710	75
124	5218236	7803 to 7302 - B0	.560	75
124a	5218236	7803 to 7302 - B1	.560	75
124b	5218236	7803 to 7302 - B2	.560	75
124c	5218236	7803 to 7302 - B3	.560	75
124d	5218236	7803 to 7302 - A0	.560	75
124e	5218236	7803 to 7302 - A1	.560	75
125	5218237	7803 to 7302 - B0	.970	75
125a	5218237	7803 to 7302 - B1	.970	75
125b	5218237	7803 to 7302 - B2	.970	75
125c	5218237	7803 to 7302 - B3	.970	75
125d	5218237	7803 to 7302 - A0	.970	75
125e	5218237	7803 to 7302 - A1	.970	75
126	5218238	7803 to 7302 - B0	1.205	75
126a	5218238	7803 to 7302 - B1	1.205	75
126b	5218238	7803 to 7302 - B2	1.205	75
126c	5218238	7803 to 7302 - B3	1.205	75
126d	5218238	7803 to 7302 - A0	1.205	75
126e	5218238	7803 to 7302 - A1	1.205	75

7030 SYSTEM POWER CABLES (cont'd.)

Key No.	Part No.	Description	Dia. Inches	Max. Length (ft.)
127	5218279	7803 to 7616	1.000	75
128	5220985	7612 - 00 to 353	.750	50
129	5220986	7612 - 00 to 353	.880	50

**The maximum combined power cable length between the 7613 Tape Control and the furthest 729 IV Magnetic Tape Unit in a group is 75 feet. There are two tape unit groups available from each tape control. A maximum of four tape units can be connected serially in each group.

SPECIFICATION SUMMARY

Frame Description	No. of Frames	*	*	Total BTU/hr	Total CFM	Total Wgt. (lbs.)
		400 Cycle KW	60 Cycle KVA			
Central Processing Unit	19	28.5	.16	98,000	11,200	26,200
Exchange	4	3.01	.66	12,320	1,950	7,100
Disk Synchronizer						
7612	4	4.08	.10	14,320	2,150	5,400
354	1	1.3	--	4,430	600	1,900
353 Disk Storage	1	1.05	9.23	24,000	1,800	3,255
7302 Core Storage	1	2.8	3.65	19,400	1,100	2,650
Power Dist. Unit	1	.85	.09	2,900	50	2,000
Reader Control	1	.70	.13	2,660	150	900
Punch Control	1	.46	.14	1,950	300	450
Printer Control	1	--	1.16	3,170	300	450
Console Control	1	.38	.21	1,860	450	900
Tape Control	1	.74	.10	2,800	---	900
Magnetic Tape Unit	1	--	1.62	3,900	550	1,100
Card Punch	1	--	.58	1,570	350	800
Printer	1	--	1.14	3,100	---	750
Console	1	--	.06	170	---	400
Card Reader	1	--	.58	1,570	---	1,000

*The power consumption listed represents the amount of 400 and 60 cycle power required for the unit or units in question.

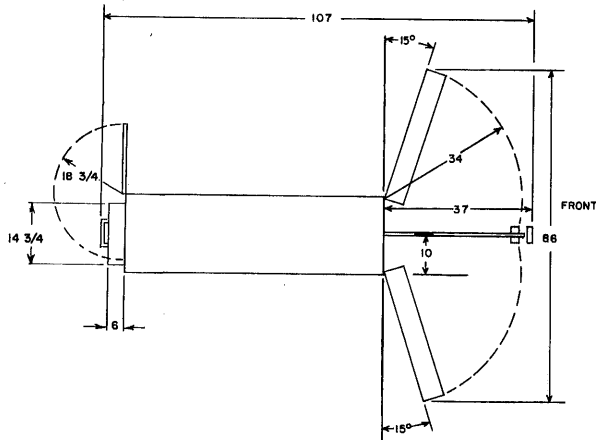
Service Clearance requirements are found in the individual machine drawings.

MACHINE DRAWINGS

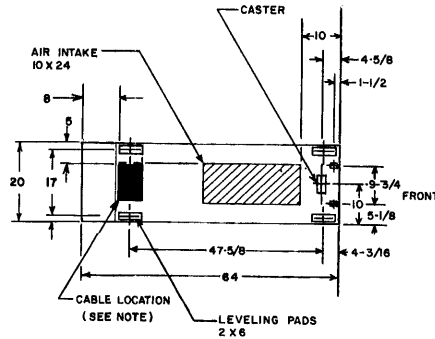
The drawings on the following pages are not to scale. They are dimensioned plan views of the units they represent. The cable locations as shown by the darkened areas are the recommended cable hole sizes and locations to cut out of a false floor. The air intake locations show the recommended area from which an air intake hole can be cut. The size of the opening is determined by the quantity of air required. (Note: All dimensions are in inches.)

20" FRAME

Top View



Plan View



Notes

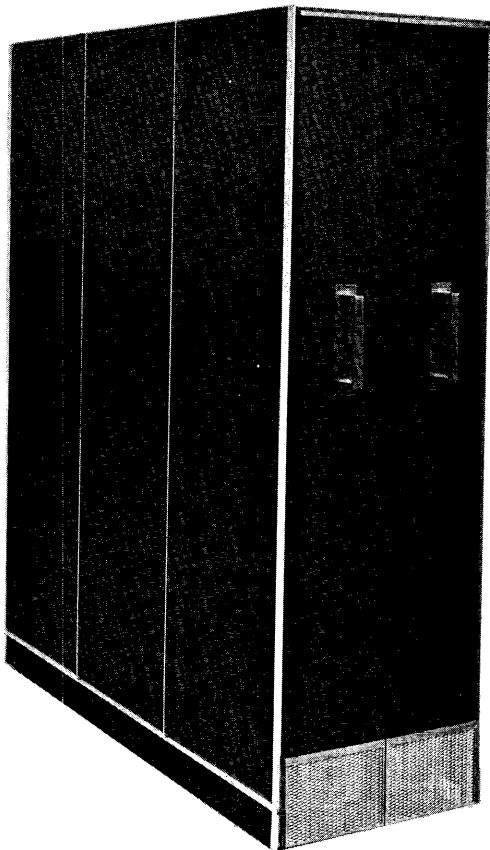
Height: 69

Service Clearance: Front 60 Rear 36 Sides *

* No service clearance required unless unit is last one in a row; then 36 inches are required on the exposed side.

The following list itemizes the units packaged in the 20" frame and their corresponding recommended cable hole cut-out size. The general location of the cut-out illustrated in the plan view shows it to be 8 inches from the rear cover and centrally located between the sides. The long dimension is parallel to the rear of the frame.

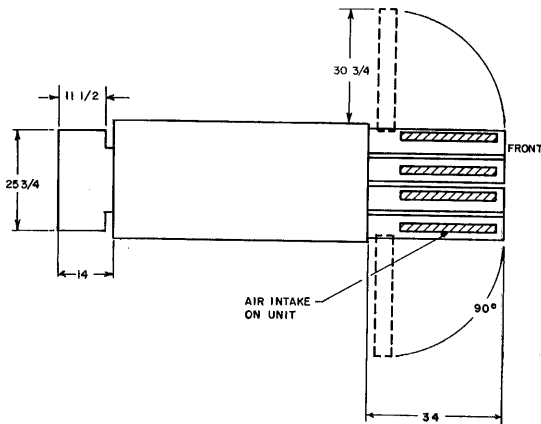
7101 CPU		7612 Disk Sync	
Frame	Hole Size (in)	Frame	Hole Size (in)
25	6 x 6	01	6 x 12
20	6 x 8	02	6 x 8
19	6 x 6	03	6 x 6
18	6 x 6	354	6 x 6
16	6 x 6		
12	8 x 12		
11	8 x 12		



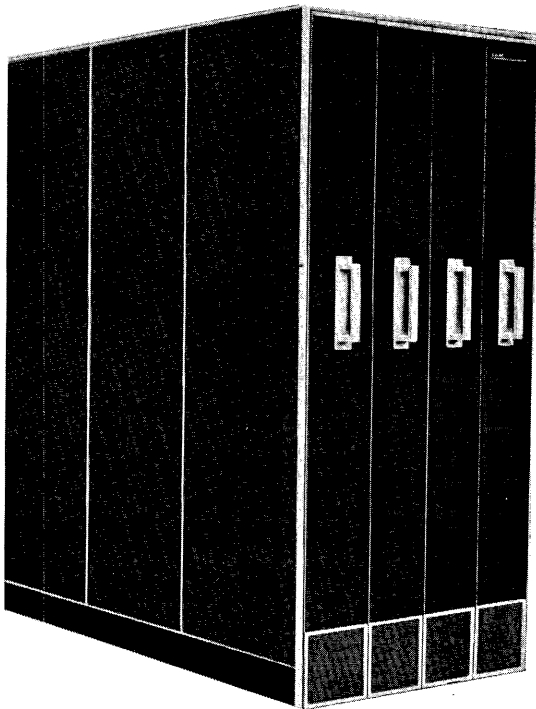
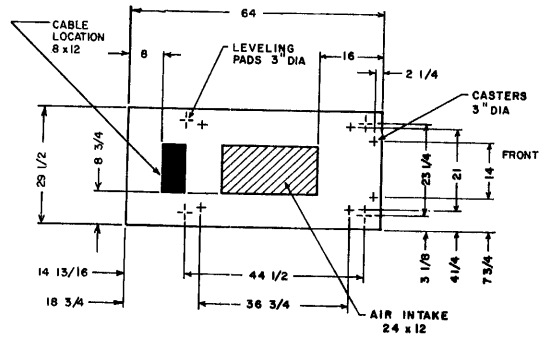
Eight-inch rear extension is not shown on photo.

29 1/2" FRAME

Top View



Plan View



Notes

Height: 69

Service Clearance:	Front	Rear	Sides
	60	36	*

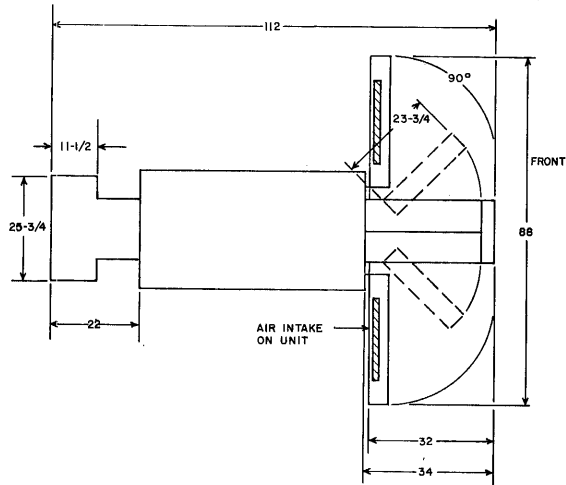
* No service clearance required unless unit is last one in a row; then 36 inches are required on the exposed side.

This frame is used for the Exchange units 02 and 03.

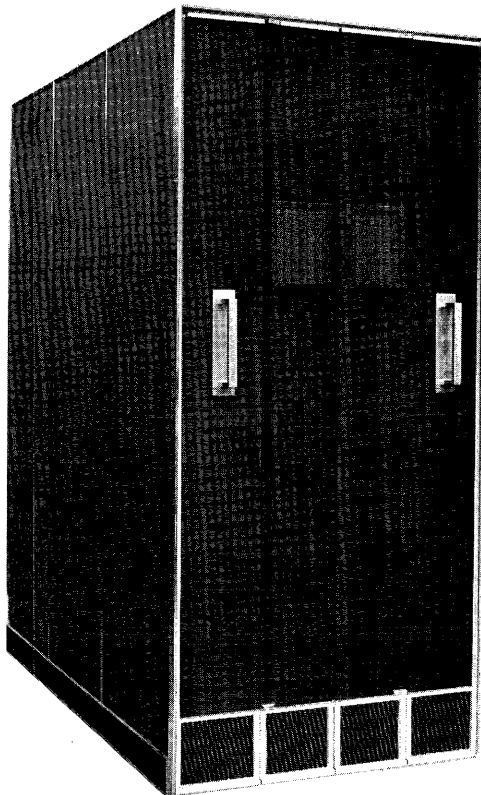
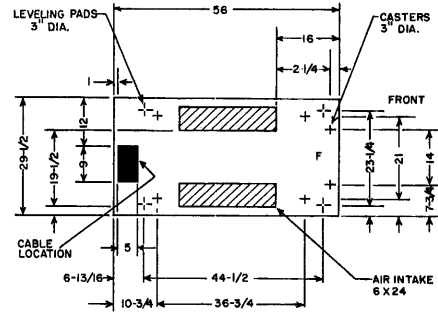
Eight-inch rear extension is not shown on photo.

7302 CORE STORAGE

Top View



Plan View



Notes

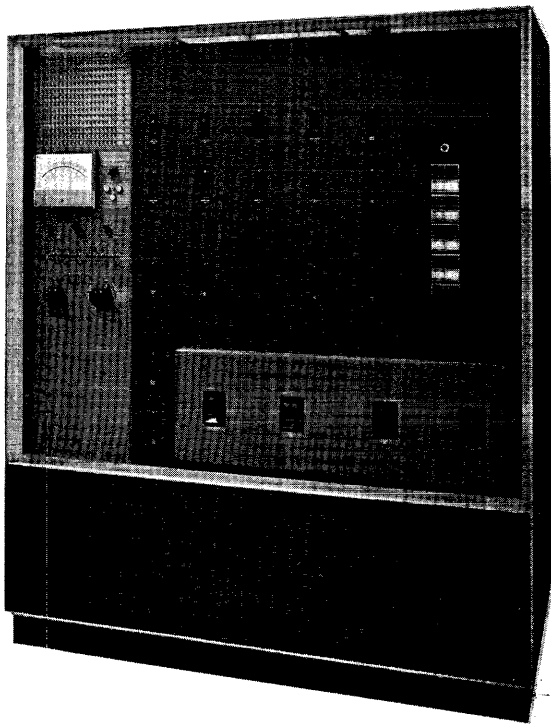
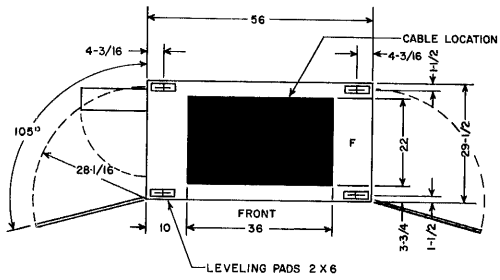
Height: 69

Service Clearance: Front 96 Rear 42 Sides *

* No service clearance required unless unit is last one in a row; then 36 inches are required on the exposed side.

7803 POWER DISTRIBUTION

Plan View



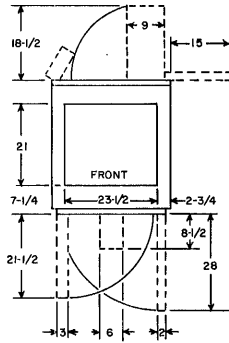
Notes

Height: 69

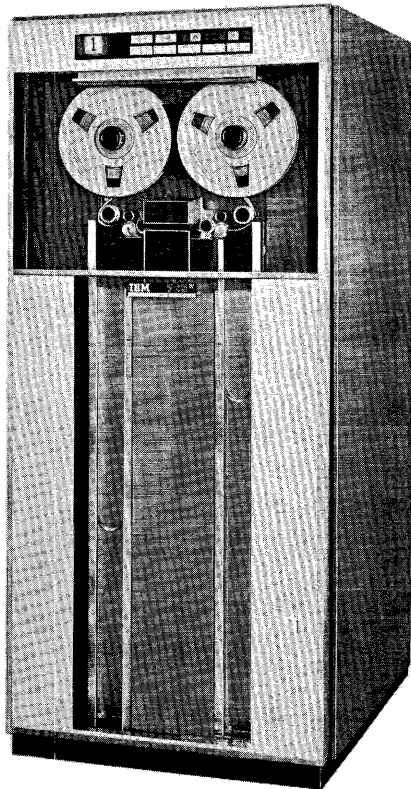
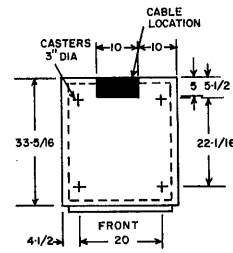
Service Clearance: 36 on all sides

729 IV MAGNETIC TAPE UNIT

Top View



Plan View



Notes

Height: 69

Service Clearance:	Front	Rear	Sides
	30	30	*

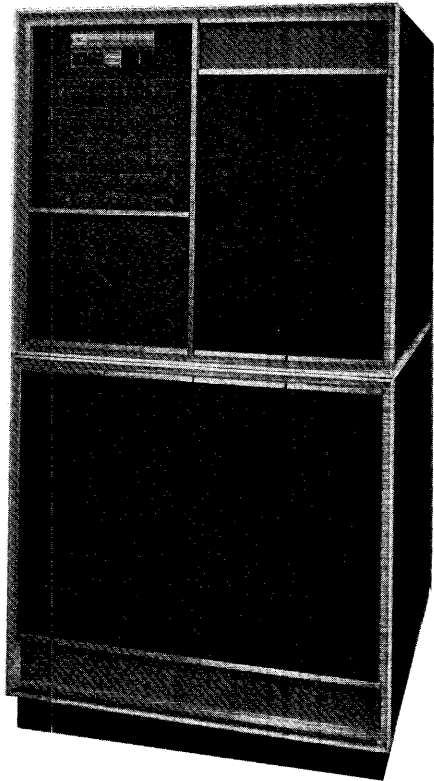
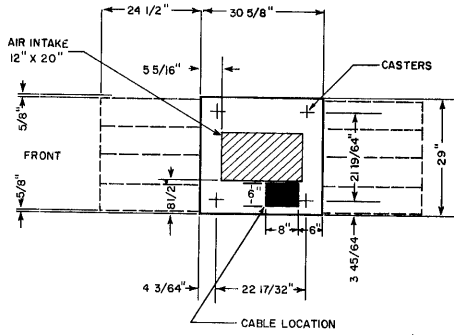
* Minimum clearance between tape units of 2 inches; 30 inches between a tape unit and any other unit.

All covers except the two side covers are self-storing.

The top opening is perforated metal, 51% opening, 9/64 dia holes staggered on 3/16 centers.

7613 TAPE CONTROL

Plan View



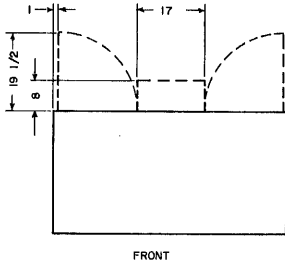
Notes

Height: 58

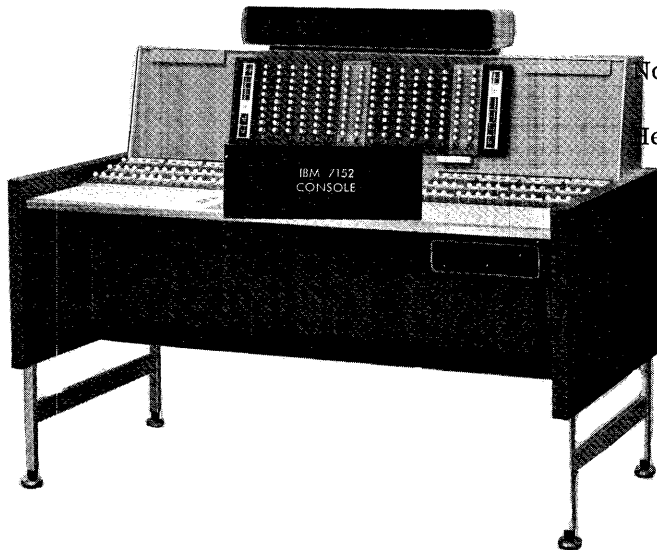
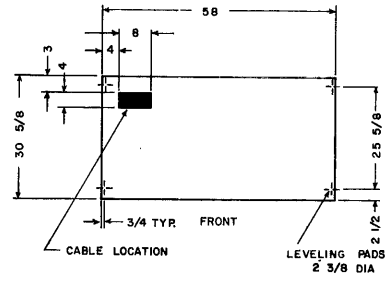
Service Clearance: Front Rear LS RS
 48 48 0 36

7152 CONSOLE

Top View



Plan View



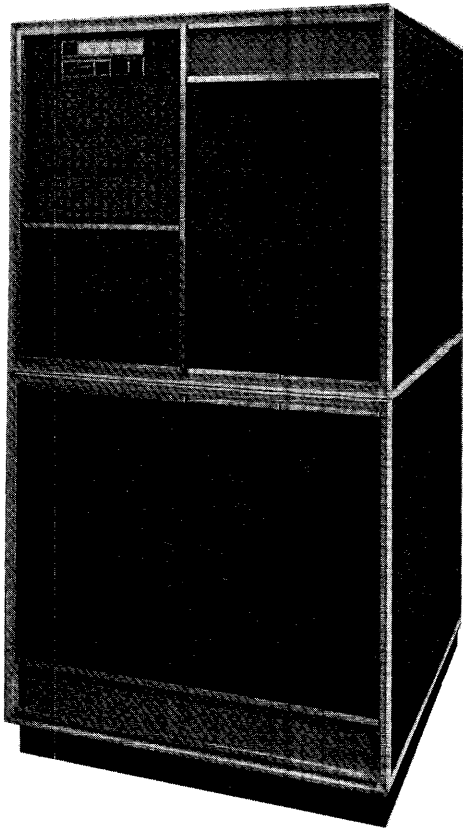
Notes

Height: 48

Service Clearance:	Front	Rear	Sides
	48	36	36

7623 CONSOLE CONTROL
7614 CARD READER CONTROL

Plan View



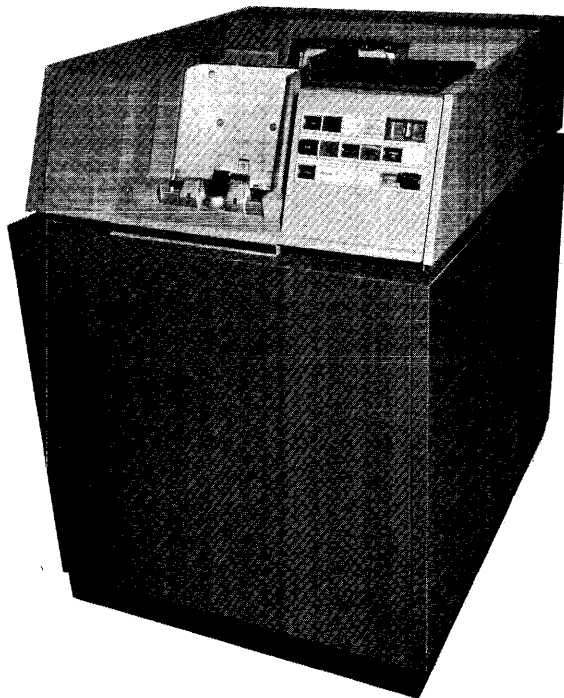
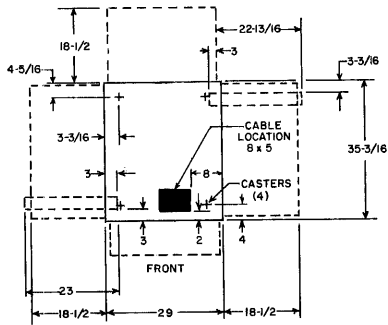
Notes

Height: 58

Service Clearance: Front Rear LS RS
48 48 36 0

7503 CARD READER
7553 CARD PUNCH

Plan View



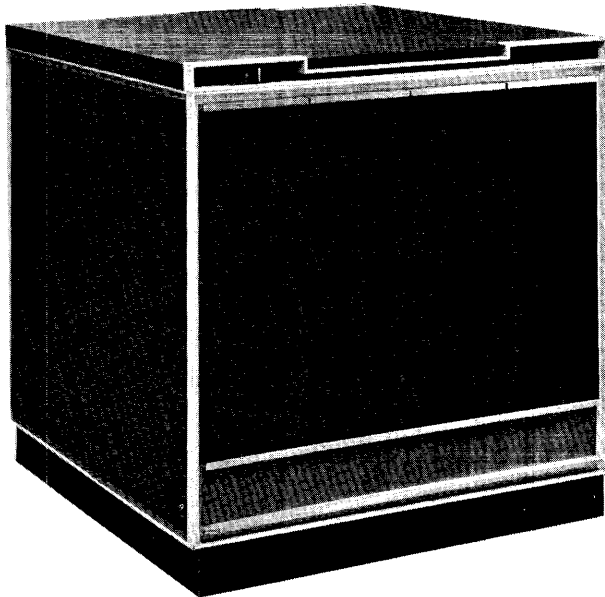
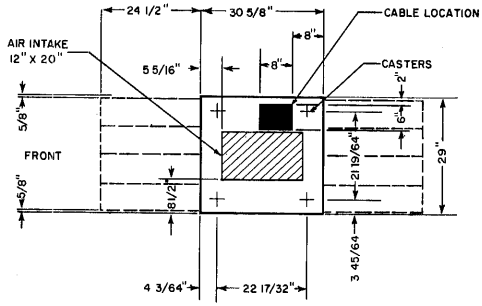
Notes

Height: 43

Service Clearance: 36 for all sides.

7615 CARD PUNCH CONTROL

Plan View



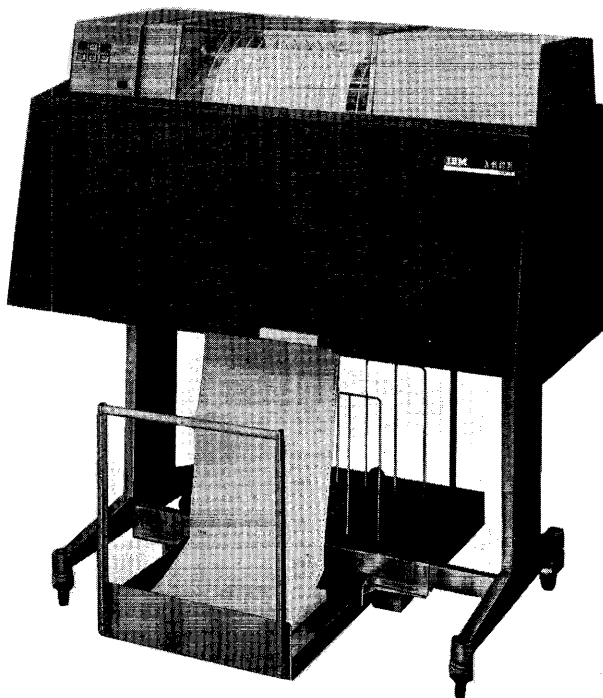
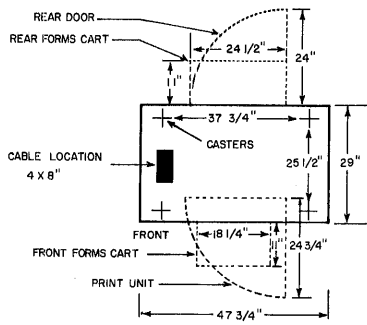
Notes

Height: 33

Service Clearance: Front Rear LS RS
48 48 36 0

1403-2 PRINTER

Plan View



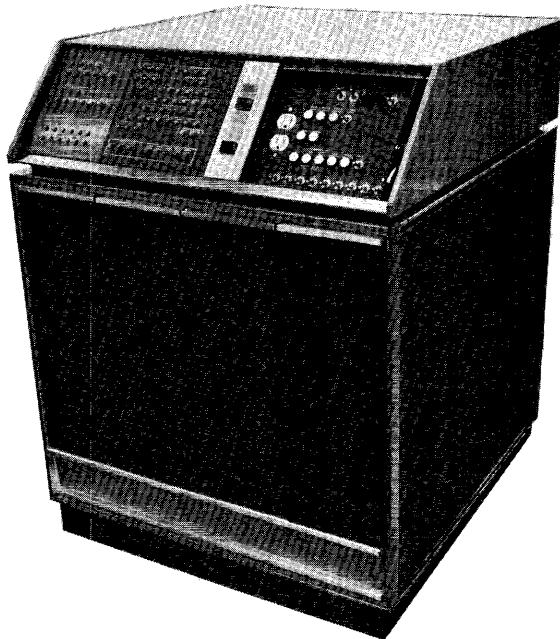
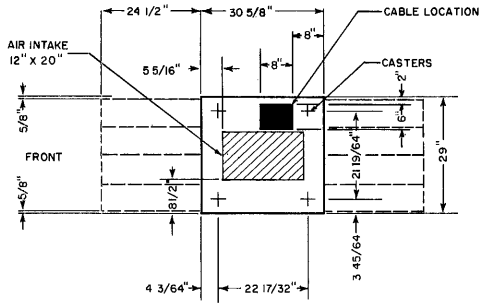
Notes

Height: 54

Service Clearance: Front Rear Sides
48 36 36

7616 PRINTER CONTROL

Plan View



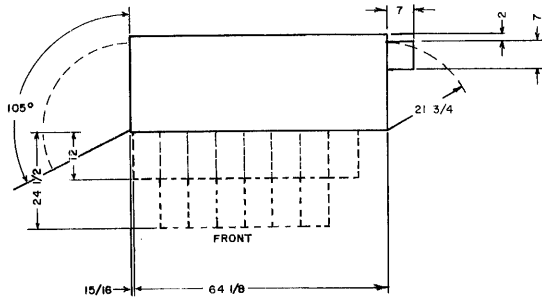
Notes

Height: 33

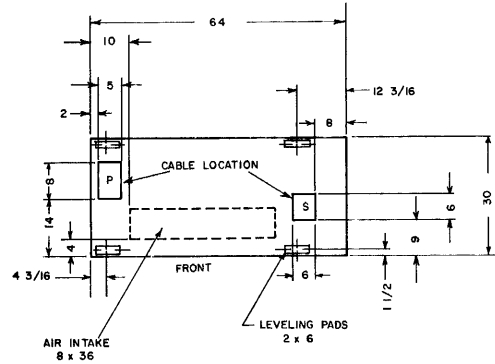
Service Clearance: Front Rear LS RS
48 48 36 0

EXCHANGE MAINTENANCE CONSOLE
DISK SYNCHRONIZER MAINTENANCE CONSOLE

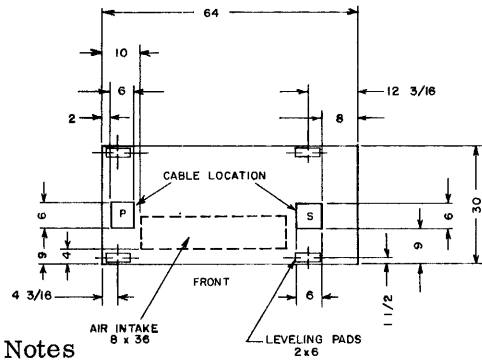
Top View, Both Units



Plan View, Exchange Maintenance Console



Plan View, Disk Sync Maintenance Console



Notes

Height: 69

Service Clearance: Front Rear
60 --

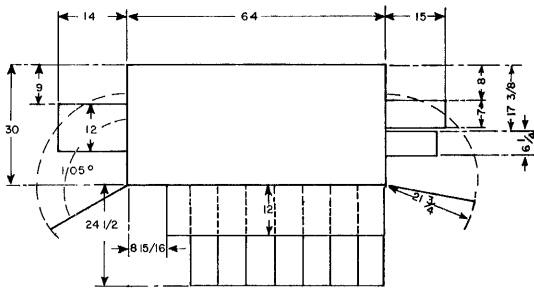
Left Side Right Side
60 36

The photo does not show the 8-inch extension on the right side of these units



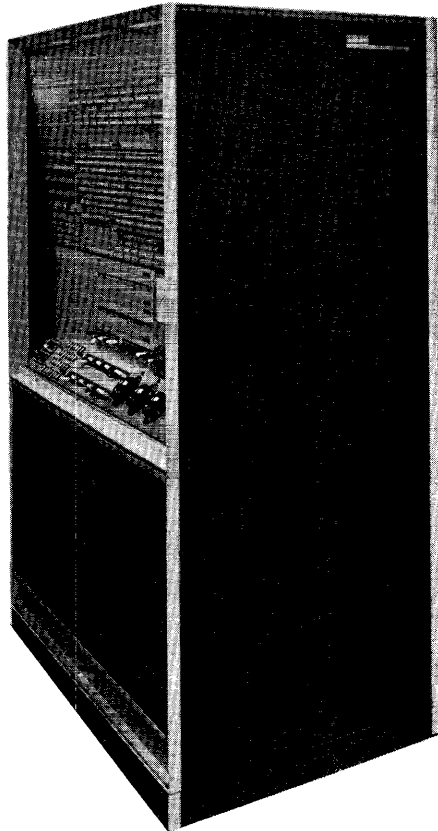
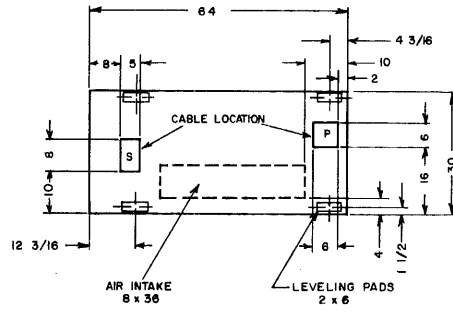
CPU MAINTENANCE CONSOLE

Top View



FRONT

Plan View



Notes

Height: 69

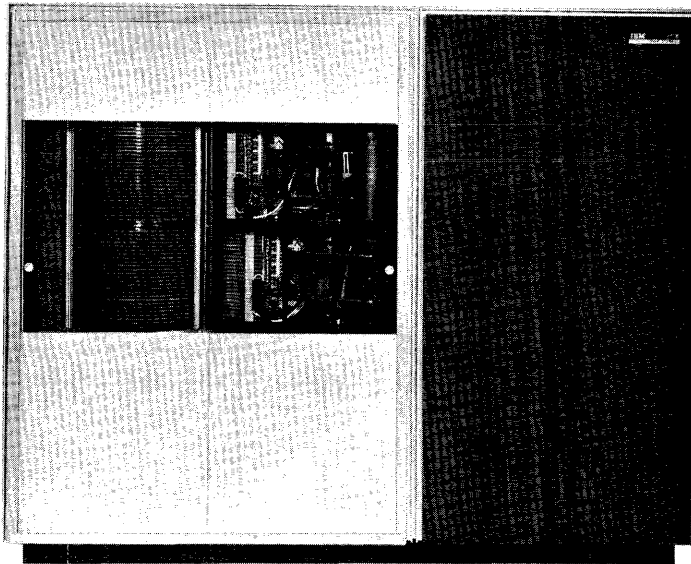
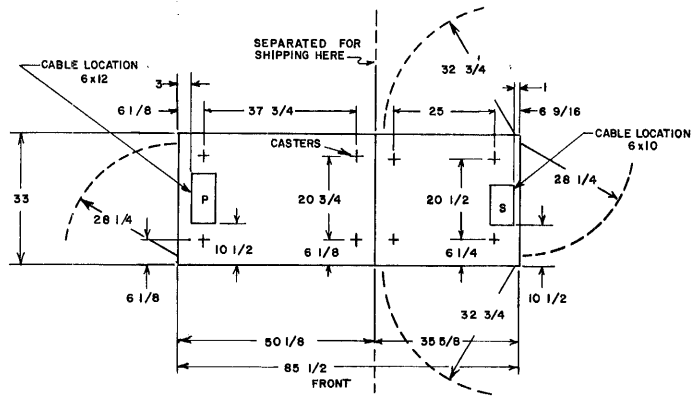
Service Clearance: Front Rear
 60 --

 Left Side Right Side
 36 60

The photo does not show the 8-inch extension on the left side of this unit

353 DISK STORAGE

Plan View



Notes

Height: 69

Service Clearance: Front Rear

	44	44
LS		RS
40		40

APPENDIX A: PRIME POWER SPECIFICATIONS
FOR THE IBM 7030 SYSTEM

SECTION I - 415 CYCLE POWER

1.0 Scope

The following defines the requirements for 415 cycle (nominal) power, as measured at the input terminals of the Power Distribution Unit.

2.0 Source Characteristics

2.1 Output

The source shall be a wye connected system capable of adequately supplying 415 cps power to the 7030 system. The output frequency shall be 415 cps \pm 25 cps. Further, the source shall be capable of maintaining output voltage in accordance with section 2.3.3 for the following abnormal input conditions at a minimum frequency of 330 cps:

- a) Loss of input power for 0.25 seconds as occurs with utility fault clearing and reclosing equipment.
- b) A reduction of 25% of input voltage at nominal frequency for three seconds or 20% reduction for two minutes.

2.2 Voltage Modulation

The voltage modulation of the output wave shall be less than 0.5%.

$$\text{Percent Modulation} = \frac{E_{\text{modulation maximum}} - E_{\text{modulation minimum}}}{E_{\text{modulation maximum}} + E_{\text{modulation minimum}}} \times 100$$

Voltage modulation shall be measured with a calibrated oscilloscope in conjunction with a clipping circuit and voltage bucking source so arranged to display the peak voltage and assure linear measurement, or equivalent.

2.3 Performance Requirement

2.3.1 Load Range and Load Variation

The source shall operate at any load between 10 KW and full load. At any operating load within the load range the load variation may be 20 KW (ramp function over a period of five seconds) and a 10 KW step function applied at any time during the ramp function.

2.3.2 Power Factor of the Load

The power factor of the load shall be no less than .8 as measured with conventional power instruments; however, the load current is not sinusoidal but is peaked as the result of commutation between rectifiers as occurs with six-phase rectifiers.

2.3.3 Voltage Regulation

The voltage at the PDU shall be regulated so that the average of the peak value of the three-phase output with harmonics will be 295 volts with $\pm 0.5\%$ for any combination of the following:

- a) Any load within the load range as defined in 2.3.1.
- b) Any combination of steady state load and 20 KW ramp function load per section 2.3.1.

2.3.4 The peak DC transient excursion as measured on an external power supply with characteristics in accordance with Section 3.0 or on the sensing voltage within the regulator circuit shall not exceed 1.0% for a 10 KW step load variation per Section 2.3.1.

2.3.5 All tests are to be conducted using a three phase, bridge connected rectifier load.

2.4 Phase Voltage Unbalance

The variation between the three-phase peak voltage shall not exceed 0.5% as measured with a suitable peak reading instrument. The reading shall be taken under conditions of balanced load and will include any load unbalance due to the source regulator or its associated components. Phase voltage unbalance is defined as:

$$\frac{3 (E_{\text{peak maximum}} - E_{\text{peak minimum}})}{E_{\text{peak } \phi 1} + E_{\text{peak } \phi 2} + E_{\text{peak } \phi 3}} \leq 0.005$$

3.0 Control

The source shall include a means of continuously monitoring the output voltage which will trip the input breaker for plus or minus 10% (max.) variation from nominal output voltage. The circuit and components used for converting the 415 cps generator output voltage to DC, as usually employed in regulating circuits of this type, shall be of low impedance and respond to the peak of the waveform, regardless of variations in waveform due to generator loading. The circuit shall consist of three-phase transformer with delta connected primary and six-phase delta-connected secondary and bridge connected rectifiers with capacitor filter. The time constant of the capacitor and the equivalent load on the circuit shall not exceed 0.05 seconds. The impedance of the total circuit shall be such that, at nominal input, the difference between the no load output voltage and the full load output voltage will not be more than 8%. (The intent of this requirement is to effectively duplicate the average conversion characteristics of the multiplicity of power supplies used in the computer system.)

4.0 Distribution

4.1 The source power shall be distributed to the PDU via five wires. These wires shall consist of three phase wires, one neutral wire, and one equipment (bond) ground wire. The neutral of the 415 cps shall be grounded at or near

the output of the converter. The (bond) ground wire shall be common to the ground of the converter unit which shall be carried back to the transformer or building ground.

4.2 The minimum grounding and distribution requirements shall comply with the latest National Electrical Codes.

4.3 The available short circuit current at the Power Distribution Unit must not exceed the rating of the 7030 system input circuit breakers which is 25,000 asymmetrical amperes at 240 VAC.

SECTION II - 60 CYCLE POWER

1.0 Scope

The following defines the requirements for 60 cycle power for the 7030 System as measured at the Power Distribution Unit.

2.0 Source Characteristics

2.1 The source rating shall provide $208 \pm 8\%$ RMS volts steady state or transient at the PDU and at the receptacles for the I/O Control Units. The line frequency must be maintained at 60 cycles plus or minus 1/2 cycle per second. The available short circuit current at the Power Distribution Unit must not exceed the rating of the 7030 system input circuit breakers which is 25,000 asymmetrical amperes at 240 VAC.

2.2 The source power should be obtained from a balanced 208V, 3-phase source and distributed via five wires. These wires shall consist of three phase wires, one neutral wire and one equipment ground wire. The equipment ground wire from all the units can be tied into one main grounding wire at the distribution panel. This wire shall be carried directly back to the transformer or building ground.

2.3 The minimum grounding and distribution requirements shall comply with the latest National Electric Codes.

2.4 The mainline circuit breaker for the 7030 system should be pushbutton operated. This pushbutton control should be in a convenient location, preferably near the operating console and/or next to the main exit door. A light should be installed to indicate when power is on.

3.0 Branch Circuits

3.1 The individual branch circuits on the distribution panel should be protected by suitable three-phase circuit breakers properly derated according to manufacturer specifications.

3.2 Branch circuits should terminate as close as possible to the machine they supply. The branch circuits can be run in conduit, greenfield, or flexible cable, depending on local codes and fire regulations.

3.3 Suitable convenience outlets should be installed in the 7030 room and CE room for use by the maintenance personnel, customer engineers, and so on.

3.4 The three-phase power receptacles for the 7030 system must be wired for correct phase rotation. Looking at the face of the receptacle, and running counter-clockwise, the sequencing will be phase one, phase two and phase three.

4.0 Emergency OFF

Remote power off devices that will instantaneously remove all power (60 and 415v) from the 7030 system shall be strategically located in the machine room.

APPENDIX B: SAFETY AND FIRE PRECAUTIONS

Safety is a vital factor in planning for a large computer installation. This consideration is reflected in the choice of a computer location, building materials used, fire prevention equipment, air conditioning and electrical systems, and personnel training.

Locating a Computer Area

1. The computer area should be in a noncombustible or fire resistive building or room.
2. The computer room should not be located above, below, or adjacent to areas where inflammable or explosive materials or gases are stored, manufactured, or processed. If the customer must locate near such an area, he should take precautions to safeguard the area.

Structural Safety

1. Walls enclosing a computer area should be of noncombustible materials where ever possible. These walls should extend from floor to ceiling. If walls are made of combustible material they should be protected as prescribed by code.
2. If a computer area has one or more outside walls adjacent to a building that is susceptible to fire:
 - a. Installation of shatterproof windows in the computer room would improve the safety of personnel and equipment from flying debris and water damage.
 - b. Sprinklers could be installed externally over the windows to protect them with a blanket of water in case of fire in the adjacent area.
3. Where a false (or hung) ceiling is to be added it should be of noncombustible and nondusting. If combustible materials are used in the space between the regular ceiling and the false ceiling, proper protection should be provided.
4. A raised floor, installed over the regular floor, should be constructed of noncombustible or fire-retardant materials. If the regular floor is of combustible material, it should be properly protected from the ceiling below, preferably by water sprinklers. (Note: Before the computer is installed, the space between the raised and regular floors should be cleared of debris. Also, this space should be periodically checked after installation, to keep it free of accumulated dust and possible debris.)

5. The roof or floor above the computer and tape storage areas should be a water-tight slab. If practical, the walls of the room should be sealed to the slab in such a manner as to prevent water entering from above.

Type of Fire Prevention Equipment in a Computer Area

1. Portable carbon dioxide fire extinguishers of suitable size (15 pounds) and number should be provided in the machine room. This is the recommended nonwetting agent for electrical equipment (Class C Hazard). Extinguishers should be overhead, marked, and readily accessible to individuals in the immediate area. Local codes govern the frequency of inspecting the cylinders, which is done by weighing for dissipation of contents.

2. Where portable carbon dioxide cylinders are used as the primary extinguishing agent, it is advisable to locate a standpipe or hose unit within effective range of the computer area as a secondary extinguishing agent for a Class A Hazard.

3. In some cases, local building codes and ordinances, or insurance regulations, require automatic water sprinklers. One of the following should be used, if it conforms to such codes and ordinances:

- a. Pre-action sprinkler system. High temperatures actuate heat-sensitive devices, which open a control valve. This valve, located outside the room, admits water into the sprinkler piping before the sprinkler heads operate. This type of system minimizes the possibility of accidental discharge of water due to failure or mechanical breakage of the automatic sprinkler heads.
- b. Higher temperature sprinkler heads. Replace the sprinkler heads with high-rated ones (preferably in the intermediate range of 175° F. rating).

4. A fire detection system should be installed to protect the computer and tape storage areas. This detection system should actuate an alarm and shut down the air conditioning system.

Data Storage

1. Any data stored in the computer room--whether in the form of magnetic tape, paper tape, cards, or paper forms--should be in enclosed metal cabinets or fire-resistant containers.

2. For security purposes or for maintaining duplicates of master records, a separate storage room should be used. This room should be of fire-resistant material and contain the same type of fire prevention equipment as described in "Type of Fire Prevention Equipment in a Computer Area."

Supporting Facilities

Air Conditioning Systems

1. In most installations, the computer area is controlled by a completely separate air conditioning system. In these cases, an emergency power-off switch should be placed in a convenient location, preferably near the operating console or next to the main exit door. Fusible-link dampers should be located at fire walls and at places as prescribed by local code.

2. Where the regular building air conditioning system is used, with supplemental units in the computer area, the supplemental units would then be handled as stated above. The regular building air conditioning system should have an alarm in the regular building maintenance area to alert the maintenance personnel of an emergency. Air ducts serving other areas but passing through the computer room should contain fusible-link dampers at each wall of the computer room.

3. The air filters used as part of the air conditioning system should contain noncombustible material.

Electric Systems

1. The main line breaker for the computer equipment should be pushbutton operated. This pushbutton control should be in a convenient location, preferably near the operating console or next to the main exit door. A light should be installed to indicate when power is on.

2. Some local codes require a special battery operated lighting unit that will automatically illuminate an area in case of power or lighting circuit failure. These units are wired to and controlled by the lighting circuit. Even when not required by code it is recommended that such lights be installed.

3. Protection against lightning surges can be obtained by installing lightning arresters on the secondary power source, especially when:

- a. The utility company installs lightning protectors on the primary power source.
- b. Primary power is supplied by an overhead power service.

4. If power receptacles are located under the false floor which could be susceptible to excessive water, waterproof connectors should be used. Proper drainage will guard against flooding or trapping water under the false floor in the computer room. This is important in certain new buildings where the regular floor is depressed and the raised surface is on the level of the adjacent areas.

Preplanning to Continue Operation in an Emergency

1. The continued operation of a customer's computer is dependent on information stored on cards, tape, disks, drums, and so on. Also, there must be equipment available to process the information. Arrangements should be made for emergency use of other equipment, transportation of personnel, data, and supplies to temporary location. Duplicate or master records should be maintained from which the necessary information can be taken to resume operation. These records should be stored in a remote area.

2. Where continuity of operation is essential, a stand-by power source should be installed.

General Precautions and Personnel Training

1. The computer room, air conditioning equipment room, and data storage room should be monitored during non-operating hours.

2. Steampipes and waterpipes running above the false ceiling should be inspected to guard against possible damage due to accidental breakage, leakage, or condensation.

3. Emergency exit doors should be located in the computer area. The number of doors depends on the size and location of the area.

4. Personnel should be trained in emergency measures such as:

- a. Proper method and sequence of shutting off all electrical power.
- b. Shutting off air conditioning system.
- c. Handling fire extinguishers in the approved manner.
- d. Properly operating a small-diameter fire hose.
- e. Evacuating records.
- f. Evacuating personnel.
- g. Calling fire company.

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