IBM

Installation Manual — Physical Planning
IBM 7080 Data Processing System

This manual contains revised information necessary for planning the physical installation of a 7080 System.

In addition to technical information needed for physical installation planning, it contains recommendations and suggestions to be used only as a guide in planning an efficient and pleasant installation. The customer should make such arrangements as he deems necessary for professional 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 and improvements. It is advisable, therefore, to consult the local IBM Physical Planning Engineer to be sure no changes that affect your installation of the system have occurred.

MAJOR REVISION (December, 1961)
This edition, Form C22-6566-2, obsoletes Form C22-6566-1. Major changes are:

Page	Subject
22	Addition of "Special Considerations"
23	Figure 3
29	Cables 27, 27a, 27b, 37, 38
31	Cable 18-18g
33	Dimensions of the 7302
38	Left side service clearance
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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 which he orders. IBM Physical Planning Sales 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, a great deal of 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's 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 7080 area. Suitable facilities for installation may exist in some customers' offices, while in others, minor or major changes to existing space will provide a suitable location. The customer may desire a complete new building, in still other instances. The operation should follow a planned schedule so that the machine room will be ready to receive the system when it is delivered.

SCHEDULE

Because each data processing machine installation will differ in some respects from every other installation, it is not possible to provide a detailed schedule in a manual such as this. 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. Read this Physical Planning Manual.
3. Determine the prospective location of the system. Make a preliminary layout of the proposed installation.
4. Request a visit by the IBM Regional 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 will be discussed. Floor construction and the placement of raceways and power receptacles will also 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 should be reviewed.

Four months before machine delivery, the final layout should be made and approved by the customer and IBM Branch Manager so that all cables can be ordered. The cable order should be made up at the IBM branch office from the final 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 should be made in the layout that will affect cable lengths.

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 Poughkeepsie.

Two weeks before system delivery:

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 individually delivered 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 machine has been delivered.

IBM 7080 SYSTEM COMPONENTS

The following units must be ordered with each system:

Machine No.	Name
7305-1 or 2	Central Storage and I/O Control
7102	Arithmetic and Logical Unit
7302-1 or 2	Core Storage
7153	Console Control Unit
7804	Power Unit

The following input-output units and storage units can be added as required to provide the desired flexibility of entering data into the system and recording results:

Machine No.	Name
7502	Console Card Reader
7621-2	Tape Control
729 II/IV	Magnetic Tape Unit
7622	Signal Control
714	Card Reader
759	Card Reader Control
722	Card Punch
758	Card Punch Control
717	Printer
757	Printer Control (717)
720-2	Printer
760-1	Printer Control and Storage (720-2)
730-2	Printer
735	Printer Control (730-2)
760-2	Printer Control and Storage (730-2)
734	Magnetic Drum Storage
744	Magnetic Drum Power Supply
727	Magnetic Tape Unit
754	Tape Control
*777	Tape Record Coordinator
774	Tape Data Selector
747	TDS Power Supply
407, 408 or 409	Accounting Machine used with TDS
519	Document Originating Machine used with TDS

* The 777 must be modified to operate on the 7080.

Up to four communication channels allow a maximum of two 7621-2's to be attached to the system, thus providing a maximum of four tape channels and forty intermixed 729 II's and IV's.

Along with the 7621-2 and 729 II-IV, a maximum of ten of the above storage and input-output control units can be specified for use in the system, provided that one 7622 is also included.

COMPONENT DESCRIPTION

7102 - The 7102 Arithmetic and Logical Unit (ALU) is housed in two units. One unit contains ALU 1 and the other ALU 2. The 7102 contains the circuits for the arithmetic and logical instructions of the system.

7305-1 or 2 - The 7305 Central Storage and I/O Control contains the accumulator and multiplexor. It is the central control for two communication channels on the Model 1 and four communication channels on the Model 2. The 1.09 microsecond central storage contains an accumulator, auxiliary storage, channel auxiliary storage (for priority processing) and communication storage. Each section of the 1.09 microsecond storage consists of 256 character positions.

7302-1 or 2 - The 7302 Core Storage Model 1 contains 160,000 characters with 2.18 microsecond cycle rate. The 7302 Model 2 contains 80,000 characters with 2.18 microsecond cycle rate.

7153 - The 7153 Console provides centralized control of the 7080 system. The following items are found on this unit:

Both BCD and digital display
705-1/2 compatibility switch
Keyboard for data entry and instruction execution
Key for manually initiated interrupt
Load key for simplified program loading
Typewriter output rate of 600 alphameric characters/minute

7621-2 - The 7621 Model 2 controls up to 20 intermixed 729 II's or IV's connected to two communication channels of the Central Storage and I/O Control. A maximum of ten tape units is permitted on each channel.

7804 - The 7804 Power Unit converts incoming power for a system from 60 cycle AC to 400 cycle AC. Power distribution units will also be packaged in this module. The 7804 replaces the 7800 and 7801.

7502 - The 7502 Console Card Reader handles small volume punched card input when the 7080 is operated as a tape-oriented system. The operation is program-controlled. Punched cards are read serially, from column 1 to 80 at a rate of 60 cards per minute.

7622 - The 7622 Signal Control permits the 705 I and II input-output components to be used with the 7080 system.

729 II/IV - The 729 II or 729 IV Magnetic Tape Unit provides large capacity input-output for storage of data or programs in the 7080 system. Tape can be read or written in a forward direction only. The dual-density feature enables the 729 II to read or write at either 15,000 or 41,667 characters per second under stored program control. Under the same conditions, the 729 IV can read or write at either 22,500 or 62,500 characters per second.

BUILDING REQUIREMENTS

A Physical Planning Engineer is available to assist in selecting a suitable area. Should the installation of the system require 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 7080 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 determine if the floor is capable of supporting the system weight load as oriented on your layout.

Factors to be considered in determining floor loading:

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. (a) Ten pounds for each square foot of total area used in calculation must be applied as false floor load in floor loading computations.
   (b) Machines or systems not requiring false floors need not apply the ten-pound factor.
5. The weight of cables must be considered as part of the machine weight.
6. Most office building floors rated at 50 pounds per square foot have an additional allowance of 20 to 25 pounds per square foot for partitions. The local building department should be contacted in reference to using this partition allowance in determining the floor loading capacity.

A raised floor will accomplish the following major objectives:

1. Allow future layout change with minimum reconstruction cost.
2. Conceal the interconnecting cables and power receptacles.
3. Provide personnel safety.

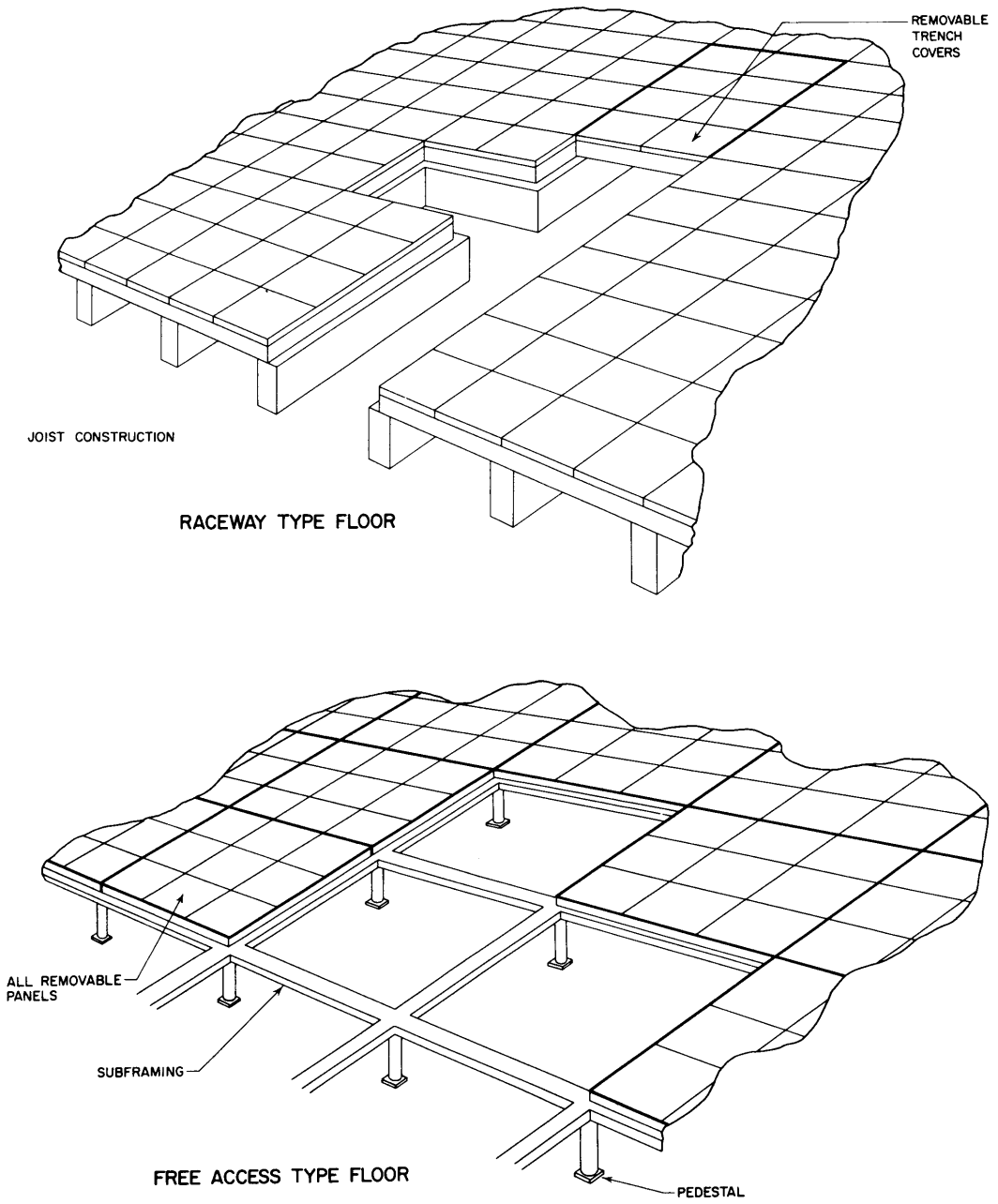


Figure 1. Raceway and Free-Access Type Floors

4. Permit the 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 of floor, in which the floor rests on pedestals, is preferred rather than 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, consider 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 because of 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 there is no metal exposed to the walking surface.

The three-foot area in front of the 7305, 7102, and 7621-2 must be level within 1/16 inch per foot. The floor over the length of the largest number of these units placed side by side must be level within one inch.

SPACE AND LAYOUT REQUIREMENTS

Although space and layout requirements differ for each 7080 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. In order to determine the exact area required for a specific group of components, a machine layout should be made using the room under consideration.

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 equipment, such as punches, sorters, or transceivers.

The integration of the 7080 work area with that of other accounting areas and with storage areas should be considered. The work flow from various 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 upon the type of work to be done. These areas should be, whenever possible, on the same floor level. If they are not, ramps should be provided for moving test equipment and machine components.

The Customer Engineers' test area for a single installation should contain at least 300 square feet of space which is 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.

At least 100 square feet of bulk-storage space should be provided within reasonable distance of the machine room. This space is for the storage of bulky items such as filters, equipment transformers, etc., and does not require air conditioning.

LAYOUT OF MACHINE COMPONENTS

Operational requirements should determine the specific location of the various components in the machine room. However, 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 upon 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 layout shown in Figure 2 can be considered as typical and not as standard.

The customer should prepare a layout of the 7080 system with the advice of the salesman and Physical Planning Engineer. This layout must be finalized and approved by the customer prior to the ordering of the system cables. It is the responsibility of each IBM branch office to be certain that cables are ordered on schedule. Physical Planning Engineers are available for assistance in cable ordering.

To make a layout, it is necessary to have an accurate drawing of the proposed area scaled at 1/4 inch to one foot. Plastic templates, supplied by IBM, show the clearances required to allow working room for the Customer Engineer and his equipment. They also show the swinging radii of the component gates and machine covers, caster and cable hole locations. These templates are then used to position the machine equipment properly 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 an auxiliary unit must not interfere with the gate swing of its corresponding control unit.

Machine components must be located so that the length of connecting cables will not exceed maximum limits. These limits are different for each type of machine. Charts showing the limits may be found in the cable section of this manual.

The following points should be considered when planning the system layout:

1. The fronts of the tape units should be visible from the operator's console.
2. The fronts of the tape units should be visible from the front of their particular control unit.
3. Adequate working area is required around the console and tape unit area.
4. 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.
5. The fronts of the 7102, 7305, 7621-2, and 7302 should be visible from the operator's console. This is beneficial to operating and servicing the system.

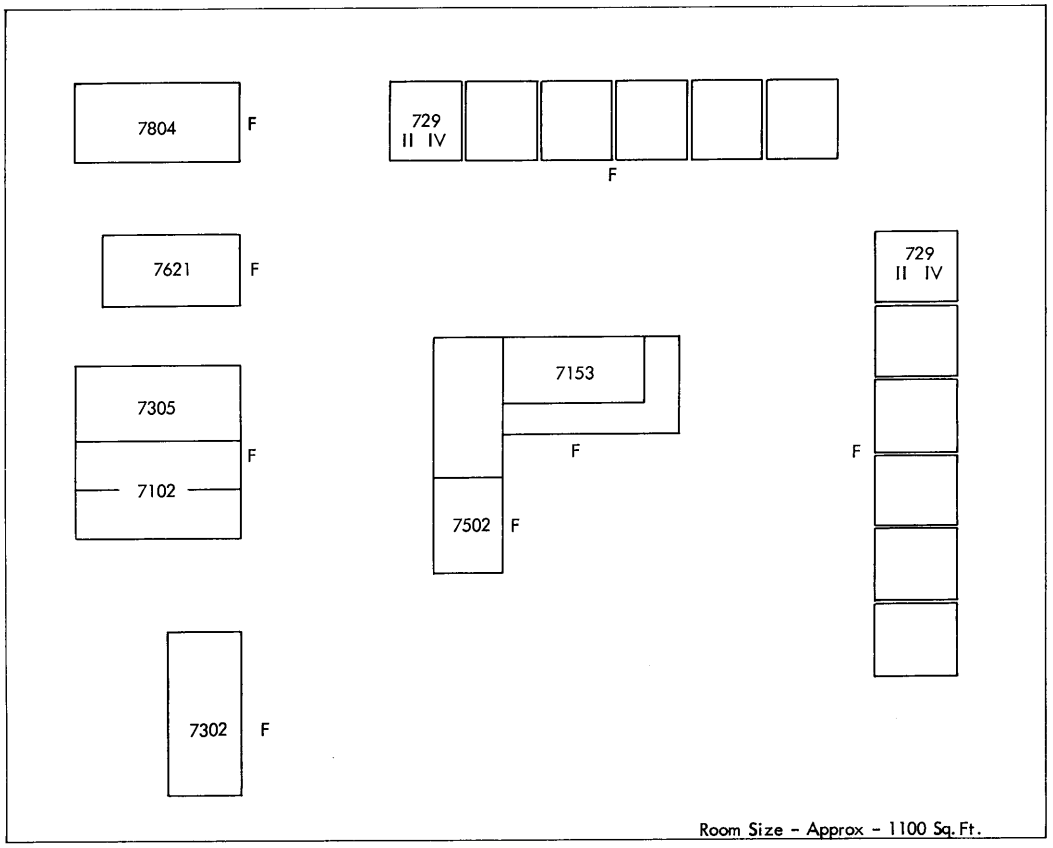


Figure 2. Typical 7080 System Layout

The final layout will 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.

Any changes in the final layout, after the cables have been ordered, that affect cable lengths must be accompanied by an RPQ.

The IBM CE branch manager will provide on a scaled layout the Customer Engineering equipment which will be installed in the CE room to assist the customer in locating receptacles, lights, etc.

The following lists show the size and approximate quantity of CE equipment to be considered in arriving at an adequate space arrangement of the CE room. This equipment is not necessarily that which will be sent with a 7080 system but can be used as a guide for planning purposes.

7080 SYSTEM TEST EQUIPMENT REQUIRING FLOOR SPACE

Quantity	Description	Approximate Dimensions (Inches)
2	Oscilloscope	13 x 24 x 17
2	Dolly - Oscilloscope	20 x 26 x 36
1	Magnetic Tape Unit Tester	6 x 9 x 14

7080 SYSTEM OFFICE AND SHOP EQUIPMENT

Quantity	Description	Approximate Dimensions (Inches)
1	IBM Parts Cabinet	48 x 24 x 87
2	Shelf Cabinets (Parts)	36 x 18 x 72
1	Work Bench and Lamp	72 x 30 x 35
2	System Diagram Book Rack	13 x 31 x 40
1	Bookcase	36 x 12 x 27
1	File Cabinets	18 x 28 x 60
1	Desk (single) with Chair and Lamp	45 x 34 x 29
1	Drafting Chair	
1	Wiring Stools	
1	Card File, Four-Drawer Model	9 x 17 x 24
1	Table and Two Chairs	30 x 60
1	Stock Control Tub File	
1	Office Valet	18 x 30 x 76
1	Oily Waste Can	15 x 15 x 18

ACOUSTICAL TREATMENT

Acoustical treatment is recommended for a more comfortable operation of the system. For best results an acoustical consultant should be approached. However, 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. The floor construction should be of a nature that will retard vibration to other areas. The walls should be constructed so as to prevent the transmission of noise to the adjacent area. It is important that these walls 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. Should overhead duct work exist, it may be possible that the noise generated in the machine room will 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, since lower levels of illumination are needed to observe the various 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 of 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, and
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 Sales Engineer for review.

TAPE STORAGE

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

Heavy Duty 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 being 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 to be shipped, the reel should be placed in a dust-proof container and hermetically sealed. Additional support should be obtained by enclosing it in an individual cardboard box.

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

AIR CONDITIONING

The recommended design condition of a 7080 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.

The components of the machine are internally cooled by air circulated by blowers in most units. The air intake varies slightly from one unit to another but, in general, 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 taken into consideration:

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 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

A. The following specifications apply for the 7621, 7153, 729 II/IV, 7102, 7302, and 7804 using Mylar tape:

1. Machine power ON:	Operational Period
Temperature:	50-80°F
Relative Humidity:	20-80%
2. Machine power OFF:	Non-Operational Period
Temperature:	50-110°F
Relative Humidity:	0-80%

B. When 705 input-output or storage units are used, the following conditions must be maintained:

1. Machine power ON:		
Temperature:	65-80°F	
Relative Humidity:	Acetate tape*:	40-60%
	Mylar	20-60%
2. Machine power OFF:		
Temperature:	50-110°F	
Relative Humidity:	20-80%	

* This tape can be used only on 705 Input-Output tape units.

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

Under all conditions of operation, the calculator input air and room air 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 underfloor 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 7080 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.

1. Mechanical air filter: This type 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.
2. Electrostatic plate type filter: This type 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% efficient 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 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

Even though the heat loads of the 7080 system are considerably reduced from previous systems, the heat load is concentrated in a relatively small area. For this reason careful attention should be given to the method of air distribution to eliminate areas of excessive air motion.

Several different types of air conditioning systems can be designed to satisfy the temperature and humidity requirements. The following are brief descriptions of the most common types of systems in 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, as some localities will not permit the use of the raised floor as an air conditioning plenum as described in the following.

SINGLE DUCT - OVERHEAD SYSTEM

In this system the entire heat load of the room, including the heat generated by the 7080 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 means of 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 a fixed pattern of returns both 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 located 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 regulated before it 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 the single duct 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 means of ceiling registers located directly above the machine units.

A higher return temperature can be used 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 described for the single duct system. In addition, the system must have controls of air temperature in the underfloor supply system to prevent an uncomfortably cold floor.

The air conditioning system should use predominantly recirculated air, with a set minimum for 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 7080 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 indicate whether a drying-out period is required. This may, in some cases, save machine shut-down time.

The record of temperature and humidity can be used:

1. To 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. To 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. To determine if the environment in the area meets the requirements for the machine.

A visual or audible signal device should be incorporated into the instrument. Its purpose is to provide a visual or audible indication that the temperature or humidity conditions in the 7080 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 for 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

The 7080 system operates on a 208 volt, 3 phase, 4 wire, 60 cycle supply. The four wires consist of three phase wires and one equipment ground. 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.

The power distributed within the 7080 system is both 60 and 400 cycle. The 400 cycle power is produced within the 7804 Power Unit and distributed to the Console Control, Arithmetic and Logical Unit, Central Storage and I/O Control, Core Storage and Tape Control. The M/G found in the 7804 is rated at 25 hp and 15 kw.

The line-to-line voltage tolerances must be maintained within 208 volts, plus or minus 8% steady state or transient, at the customer's receptacle. The line frequency must be maintained at 60 cycles, plus or minus 1/2 cycle per second.

A separate feeder connected to the main building distribution panel will usually provide a suitable supply. However, in cases where the building power fluctuates in excess of plus or minus 8%, a separate transformer or motor alternator may be necessary. If a transformer is used, it should be fed from the highest primary source readily available. The feeder for the 7080 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 Sales Engineer.

The power feeder for the 7080 system should be protected by a main line circuit breaker. (See Section on Safety and Fire Precautions for further details.) 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 7080 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, greenfield, or flexible cable depending on local codes and fire regulations.

Suitable convenience outlets should be installed in the 7080 room and CE room for use by the maintenance personnel, Customer Engineers, etc.

One receptacle for every five Magnetic Tape Units should be located adjacent to the tape units and one located in the engineering area. These receptacles should accept a Pass and Seymour #9951, 208 volt, 3 phase, 4 wire, 20 ampere connector.

As a safety precaution, a remote power off device should be provided in the machine room which will remove all power in the 7080 system.

Special Considerations

Should it, at any time, become necessary to install the 400 cycle power distribution cables and conduit, the conduit used must be non-magnetic.

PHASE ROTATION

The three-phase power receptacles for use with the 7080 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.

LIGHTNING PROTECTION

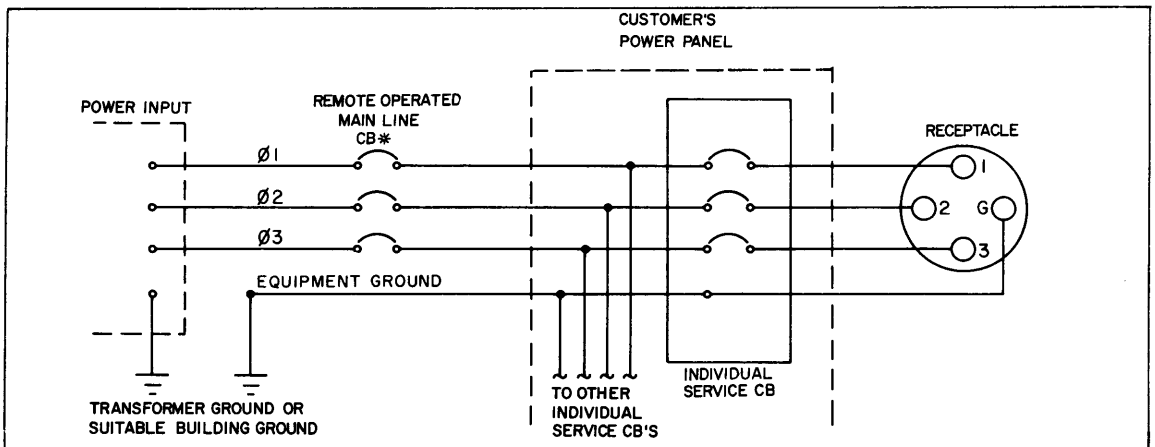
It is recommended that the customer install lightning protection on his secondary power source when:

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 of power surges.

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

TYPICAL POWER SYSTEM



Machine Number	Size (3 Phase)	Circuit Breaker	Plug (Supplied by IBM)	Receptacle**
7804, 754, 777 & 760-2	100 amp	100 amp*	Russell & Stoll #7338	Russell & Stoll #7334 or #7438
774, 757, 758, 759 & 760-1	60 amp	60 amp	Hubbell #7302	Hubbell #7301
7621	30 amp	30 amp	Russell & Stoll #3760	Russell & Stoll #3754 or #3934
7622	20 amp	20 amp	Pass & Seymour #9951	Pass & Seymour #7250

* The 7804 requires a 100 Amp Circuit Breaker with motor-start characteristics
** Those listed or equivalent

Figure 3. Typical Power System

CABLES

External interconnecting cables are supplied by IBM. They are custom-made according to lengths required for each installation. Cables are measured and ordered in accordance with the approved layout. The key number or key number group and part number, along with the cable length, must be submitted for each cable or group in the 7080 System.

All external cables are measured from the base of one unit to the base of the unit to which it connects. When computing cable lengths required between units, measure from center points of cable hole locations and add twice the depth of the false floor, if any. All cable lengths should be as short as possible and under no circumstances may maximum cable lengths be exceeded.

CABLES SUPPLIED

1. Cables necessary to connect standard announced input-output control units to the main processing system.

2. The cables listed below for connecting standard announced components such as punches, readers, printers, storage units, and tape units to the input-output control units or processor.

   a. One tape signal cable for each tape unit plus one tape signal cable for each tape channel in excess of one in the installation. This cable is to be used for the interchange of tape units between tape channels and/or systems.
   b. One signal cable (or set of signal cables) for each punch, printer, reader, or other input-output device.
   c. One signal cable (or set of signal cables) and air hose where required for each storage unit.
   d. One signal cable for each inquiry station.
   e. One tape signal cable with each control unit for punch, printer, reader; or tape data selector; or other control unit for auxiliary operation.
   f. Power cables will be supplied to power each unit as required by the system installation manual.

3. The cable required for new or additional equipment will be supplied in accordance with the above. If components of a system must be moved to permit addition of a new component or system into an existing installation, those cables necessary to permit the move will be replaced at no charge. An explanation of why the cables are required must accompany the cable order. All replaced cables must be returned to the plant.

4. Any cables requested for reasons other than the above (such as a layout revision after installation at the customer's request or cables for special equipment) will be considered only on an RPQ basis.

5. 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.

Cable orders should be placed with the IBM Manufacturing Plant for the system ordered. Improperly placed orders will not be honored by the receiving plant.

External interconnecting cables should be installed under the false floor. When a false floor is not used, these cables should be protected from damage. They should also be protected in a manner that will not present a safety hazard to operating personnel.

A slack of approximately five feet should be provided for the ac power cable (key 33) on the 7804 so that the motor-generator section of the unit can be rolled forward without undue strain on the cable. This slack can rest under the machine or under the false floor.

200-POSITION MULTIPLE CONNECTOR

A convenient feature derived from the use of the 200-Position Multiple Connector is that two properly oriented connectors can be joined together without the use of a junction box. This feature is especially useful when a tape unit is taken out of line and the signal is made continuous to the remaining adjacent tape units by latching the 200-position connectors together.

It is important however, that these connectors be joined together correctly in order to minimize possible damage to their keeper plates. Figure 4 illustrates this procedure. The unlatching must be done in the reverse order.

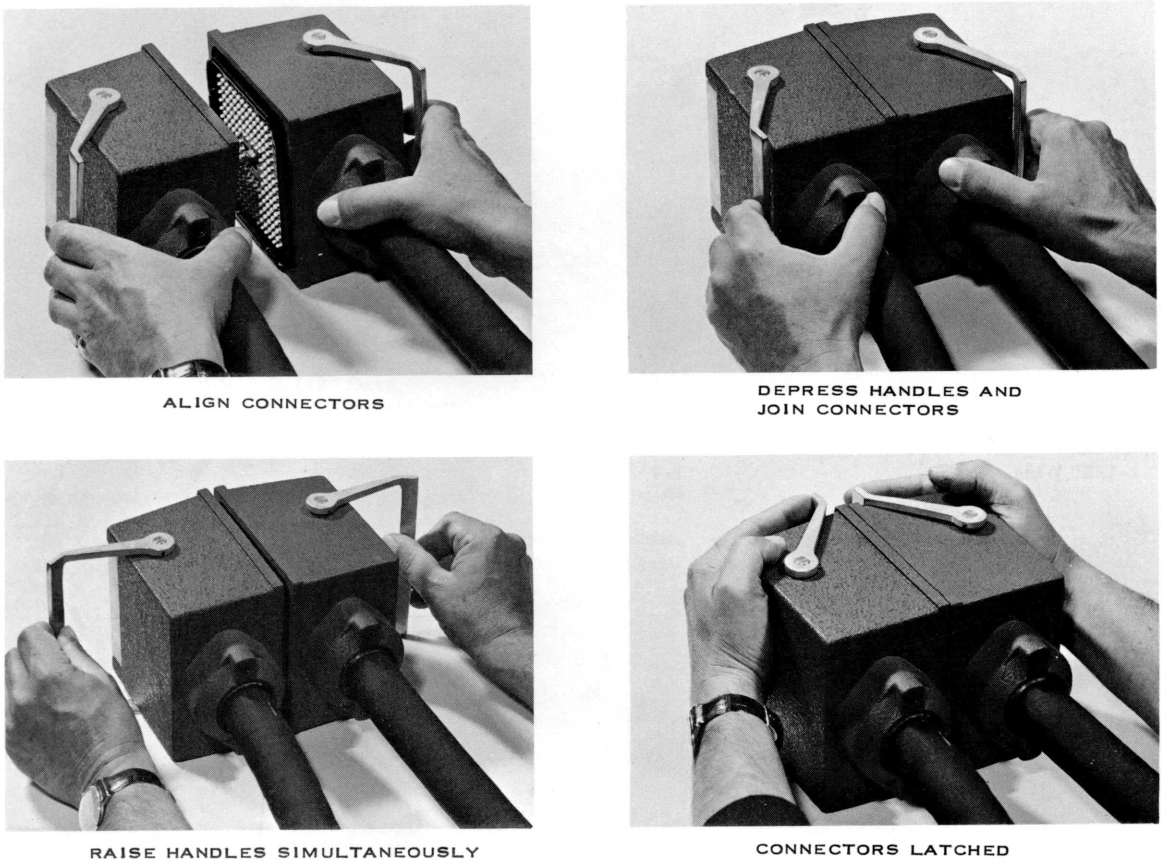


Figure 4. Correct Latching of 200-Position Multiple Connector

POWER AND SIGNAL CONNECTORS

Figures 5 through 15 are representative cable connectors used in the 7080 system. Dimensions given are maximum over-all measurements and may be used in calculations concerning subfloor clearances.

Power Connectors between Machines

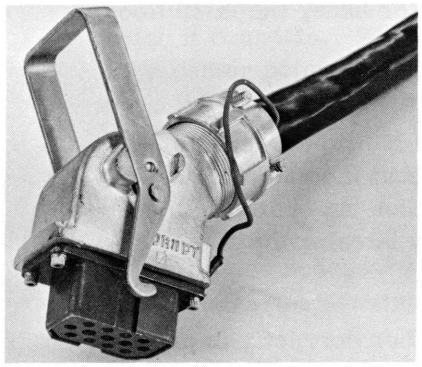


Figure 5. 3-5/8" High, 4-1/2" Deep, 2-1/16" Wide

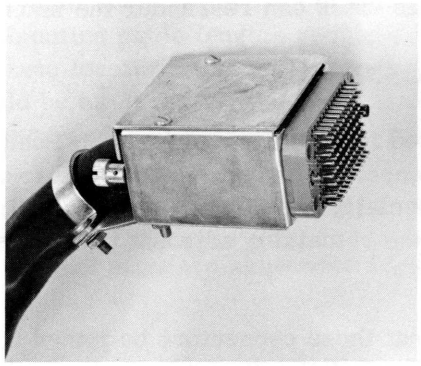


Figure 6. 2-1/2" High, 4" Deep, 2-3/4" Wide

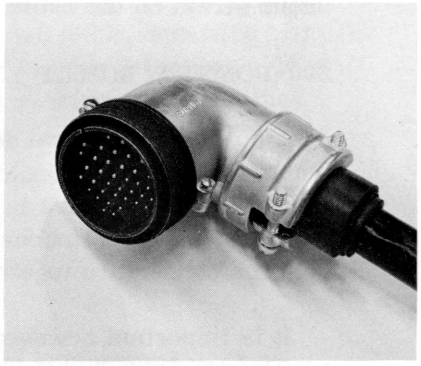


Figure 7. 6-1/4" High, 4-1/2" Deep, 2-3/4" Wide

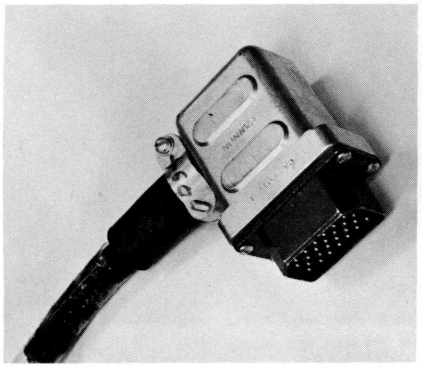


Figure 8. 3" High, 2-3/4" Deep, 1-1/2" Wide

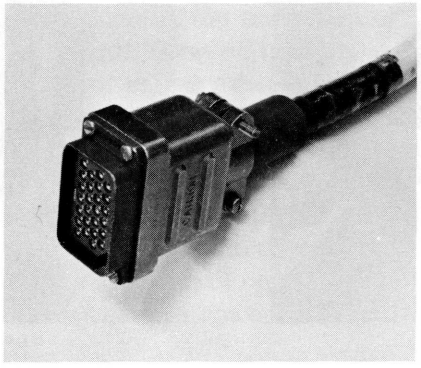


Figure 9. 3" High, 2-3/4" Deep, 1-1/2" Wide

Power Connectors to Customer Service

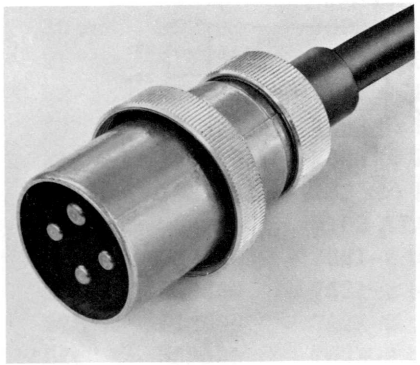


Figure 10. 3Ø, 30amp, 4 Wire; O.D. 2-1/4", 4-1/2" Long

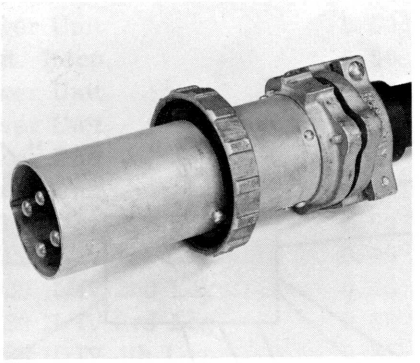


Figure 11. O.D. 4-1/8", 10-1/2" Long

Signal Connectors

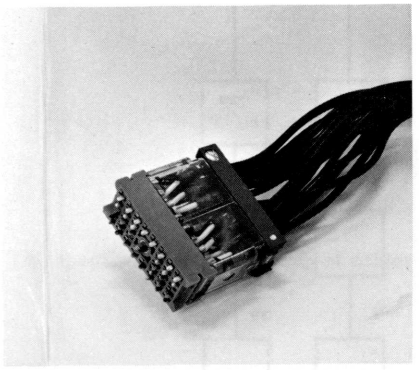


Figure 12. 2-3/4" High, 2-1/2" Deep, 1" Wide

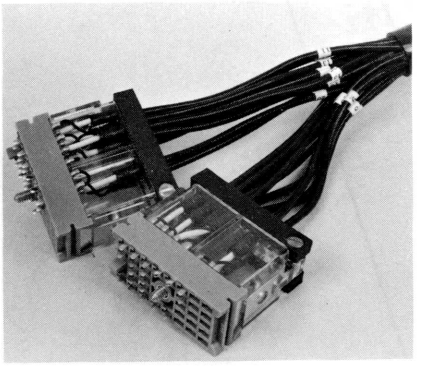


Figure 13. 2-3/4" High, 2-1/2" Deep, 1" Wide

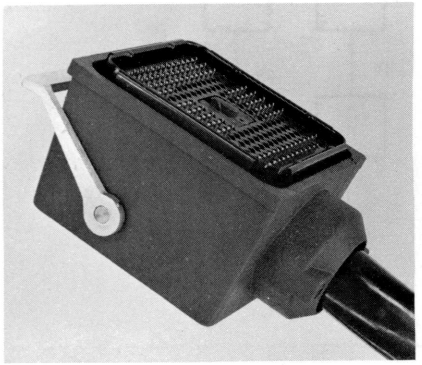


Figure 14. 7-11/16" High, 3-1/2" Deep, 5-15/16" Wide.

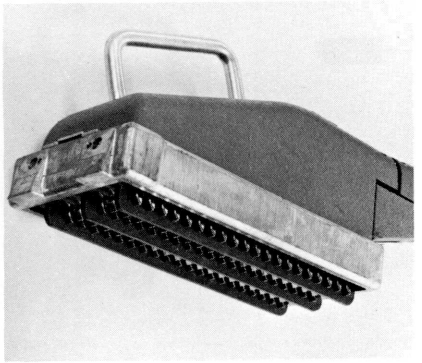


Figure 15. 8-1/4" High, 4-1/2" Deep, 3" Wide

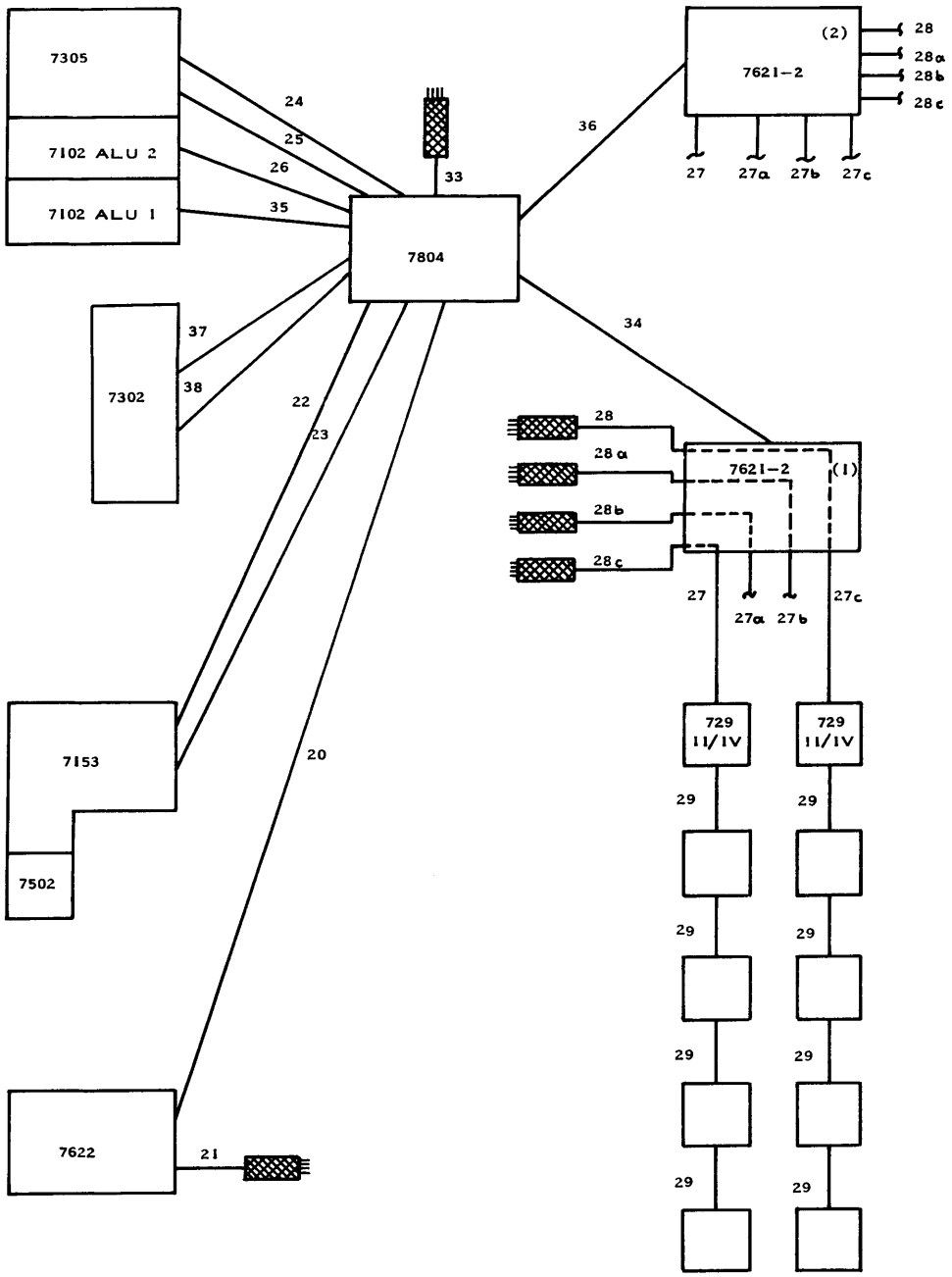


Figure 16. IBM 7080 Power Cabling Schematic

7080 POWER CABLES

Key No.	Part No.	Description	Diam. (Inches)	Max. Length(Ft)	Notes
20	352303	7622 to Power Unit	0.50	75	--
21	511756	7622 to Cust. Recp.	0.50	14	V,VII
22	352292	7153 to Power Unit	1.00	75	--
23	532553	7153 to Power Unit	1.25	75	--
24	352293	7305 to Power Unit	1.00	75	--
25	352298	7305 to Power Unit	0.65	75	--
26	352293	7102 ALU 2 to Power Unit	1.00	75	--
27	532536	7621-2 to 729 II/IV 1st Leg	0.85	85	I
27a	532536	7621-2 to 729 II/IV 2nd Leg	0.85	85	I
27b	532536	7621-2 to 729 II/IV 3rd Leg	0.85	85	I
27c	532536	7621-2 to 729 II/IV 4th Leg	0.85	85	I
*28-28c	532953	7621-2 to Cust. Recp.	0.60	14	V, VII
29	535098	Tape Unit to Tape Unit	0.85	85	I
33	352169	Power Unit to Cust. Recp.	1.24	14	V, VII, VIII
34	352292	1st 7621-2 to Power Unit	1.25	75	--
35	352293	7102 ALU-1 to Power Unit	1.00	75	--
36	352293	2nd 7621-2 to Power Unit	1.25	75	--
37	352294	7302 to Power Unit	1.00	75	--
38	352299	7302 to Power Unit	0.65	75	--

* This specifies a multiple group of cables 28, 28a, 28b, and 28c.

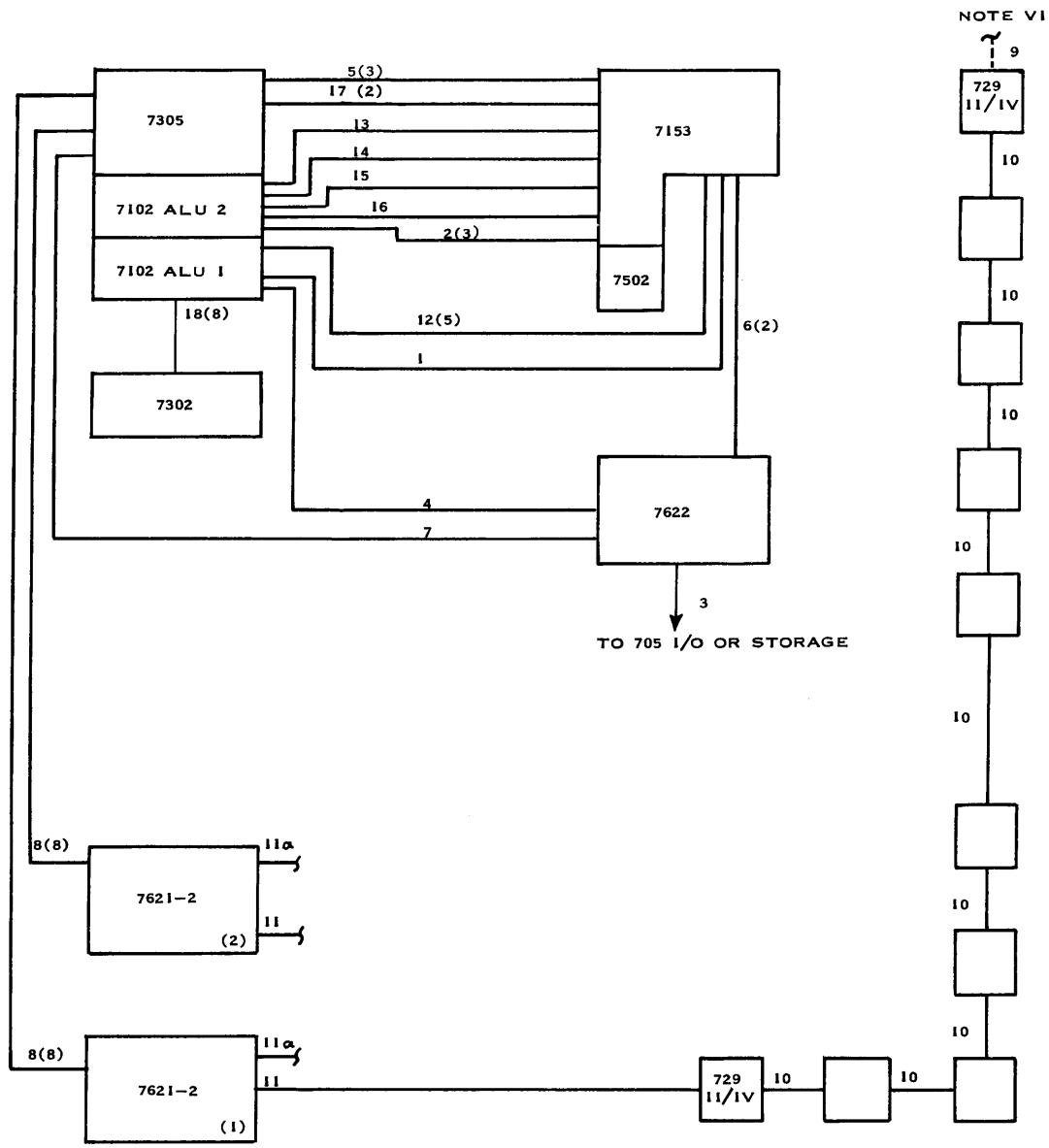


Figure 17. IBM 7080 Signal Cabling Schematic

7080 SIGNAL CABLES

Key No.	Part No.	Description	Diam. (Inches)	Max. Length(Ft)	Notes
1	556363	7102 ALU 1 to Console Control	.80	50	--
*2-2b	587387	7102 ALU 2 to Console Control	.80	50	--
3	335021	7622 to 705 System	--	--	--
4	587387	7102 ALU 1 to Signal Control	.80	75	--
*5-5b	587387	7305 to Console Control	.80	50	--
*6-6a	587387	7153 to Signal Control	.80	75	--
7	587387	7305 to Signal Control	.80	75	--
*8-8g	587387	7305 to 1st Tape Control	.80	65	III
**8h-8q	587387	7305 to 2nd Tape Control	.80	65	III
9	352464		1.45	--	VI
10	535099	Tape Unit to Tape Unit	1.45	100	II
11	556391	7621-2 to 1st Signal Leg of Tape Drive	1.50	100	II
11a	556391	7621-2 to 2nd Signal Leg of Tape Drive	1.50	100	II
*12-12d	587387	7102 ALU 1 to Console Control	.80	50	--
13	556433	7102 ALU 2 to Console Control	.90	50	--
14	556434	7102 ALU 2 to Console Control	.90	50	--
15	556435	7102 ALU 2 to Console Control	.90	50	--
16	556436	7102 ALU 2 to Console Control	.90	50	--
*17-17a	556363	7305 to Console Control	.80	50	--
18-18g	556494	7302 to 7102 ALU 1	.94	18	--

CABLE NOTES

I. Each 7621 Model 2 can power four legs of intermixed 729 II's or 729 IV's attached with a maximum of five tape drives per leg. It will possess one 30 ampere plug for each tape unit leg. The maximum combined power cable length between a tape control unit and the furthest tape unit in that leg is 85 feet.

II. A maximum of ten tape units may be connected in one signal group (not required to be in the same power group). Two signal groups are available in each 7621-2 Tape Control Unit. The maximum allowed signal cabling from tape control unit to the furthest tape unit in a signal group is 100 feet.

III. The 7305 may be specified with up to four communication channels. A corresponding number of signal cable legs are then available, each cable leg connecting to one channel of a tape control unit. Each 7621-2 tape control unit contains two channels. The maximum allowed signal cabling from the 7305 to a tape control unit channel is 65 feet.

IV. The 7804 Power Unit houses the power distribution cables to the 7153, 7305, 7102's, 7302 and 7621-2's. It also houses the power converter for the system. This converter receives 208 volts, 60 cycle, 3 phase power from the customer's source and converts it to 208 volts, 400 cycle, 3 phase power. The 7804 distributes this 400 cycle power as well as the 60 cycle to the units mentioned above.

*This specifies a multiple group of cables. Example: Key No. 2-2b represents cables 2, 2a and 2b.
**Suffix "i" and "o" not included.

V. Power Connector Specifications:

Machine Number	Size (3 Phase)	Plug (Supplied by IBM)
7804, 754, 777 & 760-2	100 amp	Russel & Stoll No. 7338
744, 757, 758, 759 & 760-1	60 amp	Hubbell No. 7302
7621-2	30 amp	Russell & Stoll No. 3760
7622	20 amp	Pass & Seymour No. 9951

VI. This cable is provided when tape units are to be interconnected between tape controls and/or systems. (This cable differs from the normal tape signal cables in that the same type of connector face is required at each end.) One such cable will be supplied for every tape channel in excess of one. Care should be exercised to prevent exceeding the maximum number of tape units or cable limitations of any channel or system.

VII. This is a standard 14-foot cable which is automatically shipped with the system.

VIII. This is the only cable that uses the front cable hole location of the 7804.

SPECIFICATION SUMMARY

Machine No.	Name	400 KW	60 KVA	60 & 400 KVA	BTU/Hr.	CFM	Plug*
7305	Central Storage and I/O Control	2.00	1.04	3.67	9,850	900	--
7102	Arithmetic and Logical Unit						
	ALU 1	0.87	0.43	1.58	4,140	400	--
	ALU 2	0.94	0.43	1.67	3,210	460	--
7302-1 or 2	Core Storage	2.80	2.15	5.83	15,420	1,100	--
7153	Console Control Unit	0.30	0.09	0.48	1,270	400	--
7621-2	Tape Control	0.50	0.29	0.95	2,500	400	C
**7804	Power Unit	--	5.80	##	15,600	800	A
729 II/IV	Magnetic Tape Unit	--	1.62	1.62	3,900	550	--
7622	Signal Control	--	1.84	1.84	4,500	520	B
7502	Console Card Reader	0.11	--	0.14	740	--	--

Machine No.	Weight (lb.)	Dimensions L	W	H
7305	2200	68	30	69
7102 ALU 1	1300	68	20	69
ALU 2	1300	68	20	69
7302-1 or 2	2450	80	36	70
7153#	1100	101	58	44
7621-2	2200	56	30	69
7804	1850	68	30	69
729 II/IV	1100	34	29	69
7622	800	35	33	59
7502	200	40	27	41

* Plugs supplied by IBM: A - Russell & Stoll #7338
B - Pass & Seymour #9951
C - Russell & Stoll #3760

** This unit houses a M/G rated at 25 hp and 15 KW. The 5.8 KVA figure represents the load loss of the M/G for an average 7080 system load of 7.52 KW. The 15,600 BTU/hr figure represents 15,100 BTU/hr M/G load loss plus 500 BTU/hr for other circuitry housed in the 7804.

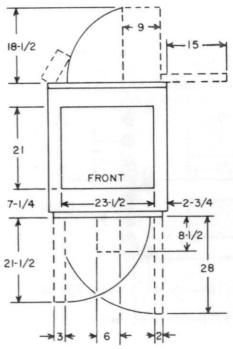
The console width can be reduced to 30 for shipping. Also, this unit has an "L" shape that can be shipped in three sections. The largest section being approximately 60 inches.

The power consumption from the M/G, when a 7305, 7102, 7302, 7153, 7621-2, and 7502 are included in the system, is approximately 15.7 KVA. This figure is increased by 0.66 KVA when two 7621-2 tape controls are used.

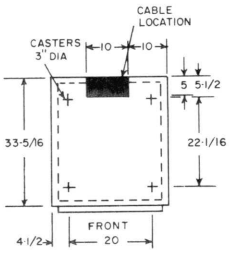
MACHINE DRAWINGS

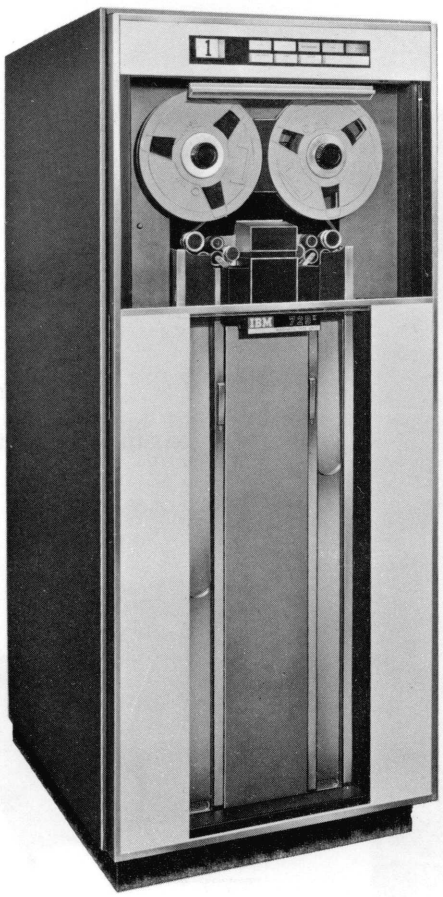
The drawings on the following pages are not to scale. They are dimensioned plan views of the units they represent. The cable locations as shown by the darkened areas are the recommended cable hole sizes and locations to cut out of a false floor. The air intake locations show the recommended area from 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.)

Top View



Plan View





Notes

Height: 69

Service Clearance:

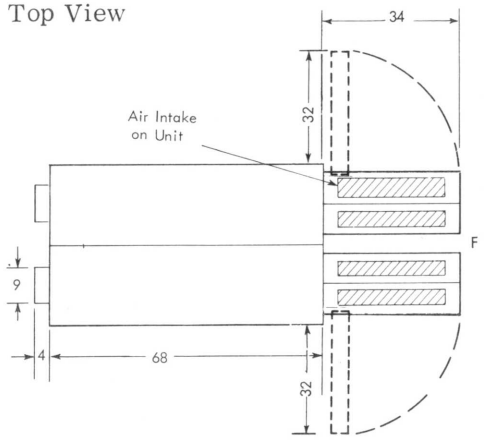
Front	Rear	Sides
30	30	*

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

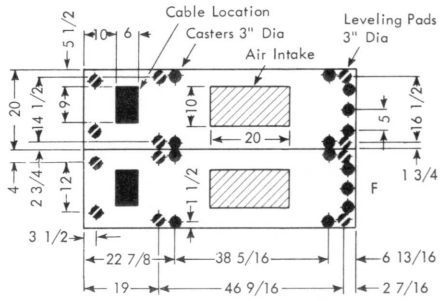
All covers except the two side covers are self-storing.

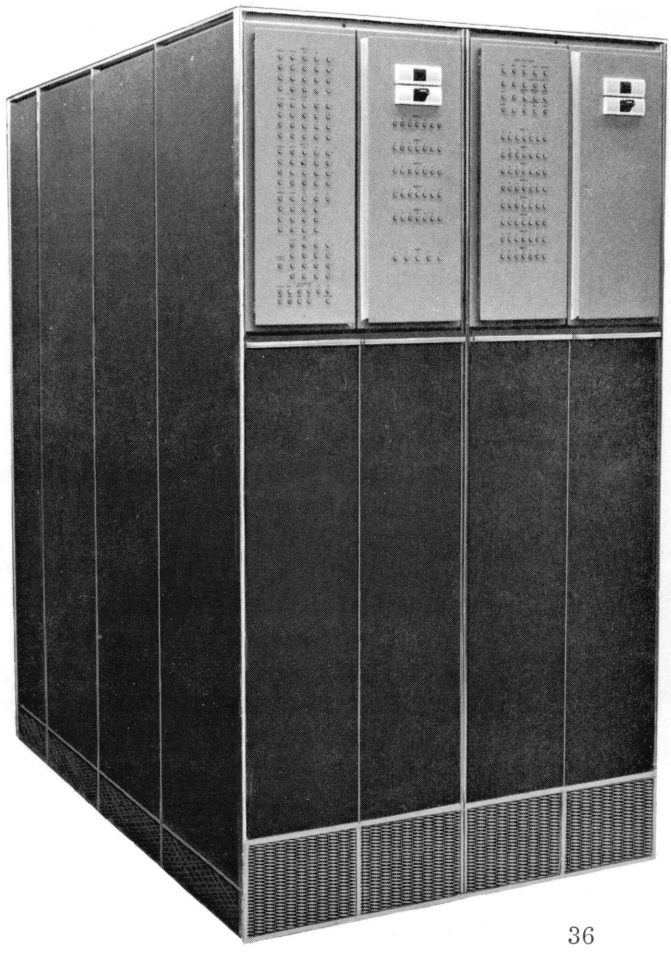
The top opening is perforated metal, 51% opening, 9/64 dia holes staggered on 3/16 centers.

Top View



Plan View





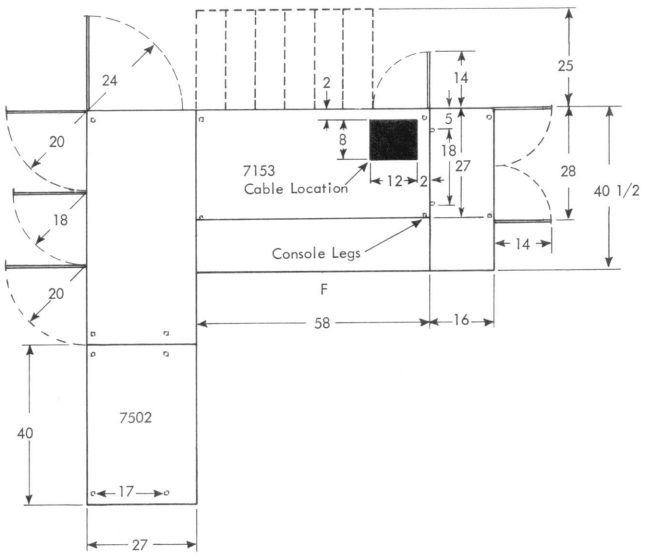
Notes

Height: 69

Service Clearance:	Front	Rear	Sides
	60	30	—

7153 CONSOLE CONTROL UNIT WITH
7502 CONSOLE CARD READER

Plan View



Notes

Height: 44

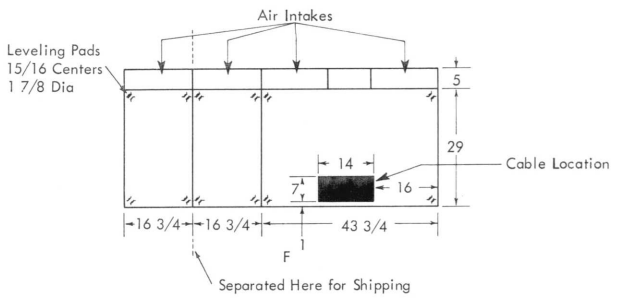
Service Clearance:

	Front	Rear	R. Side	L. Side
7153:	36*	36	36	36
7502:	36	36	—	—

* No service clearance is required where the 7153 joins the 7502.

** The console legs are not to scale. They are located approximately 2" in from the rear and sides, unless otherwise indicated. They are approximately 1" square.

Plan View



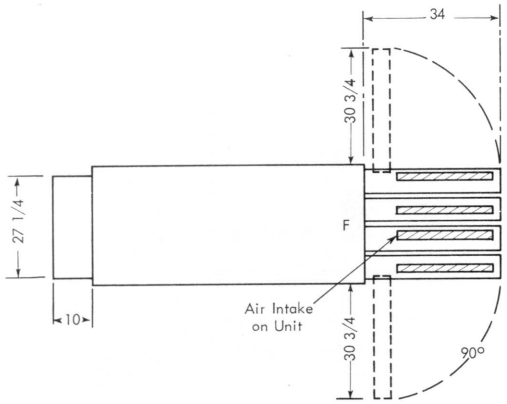
Notes

Height: 70

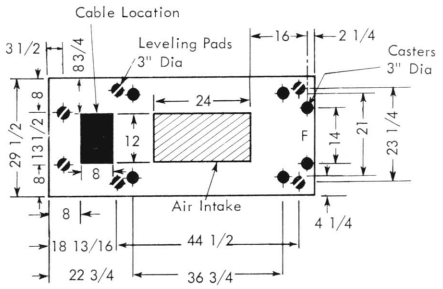
Service Clearance:	Front	Rear
	36	36
	L. S.	R. S.
	30	30

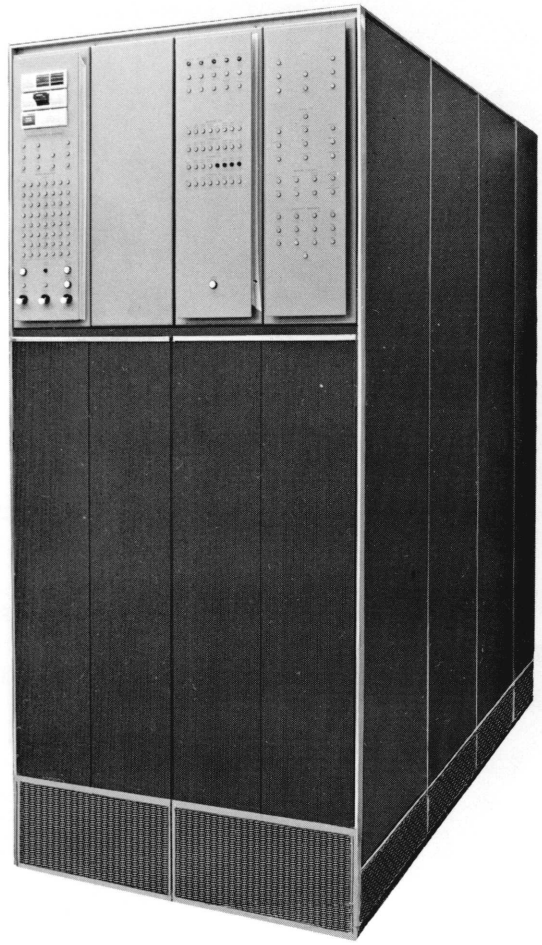
The plan view does not include covers. One inch must be added all around to include them. The air intakes receive room air from the rear. Casters are mounted opposite the leveling pads at the four corners of each separated section for shipping; these casters are removed when the units are in position.

Top View



Plan View





Notes

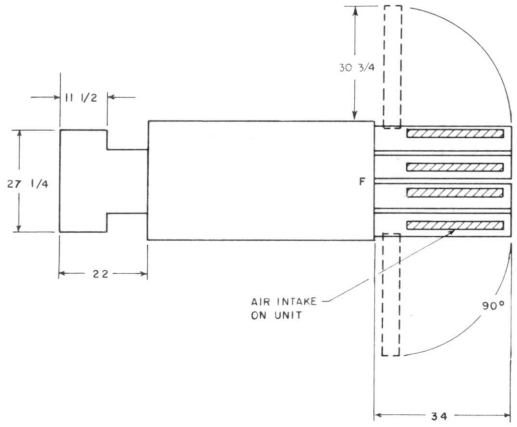
Height: 69

Service Clearance:

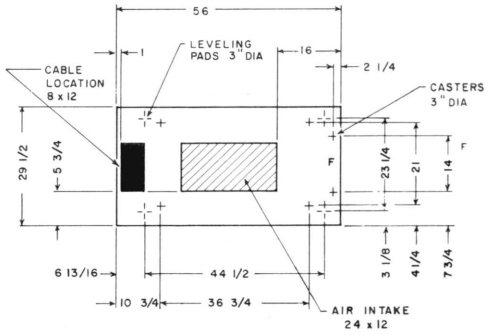
Front	Rear	Sides
60	30	*

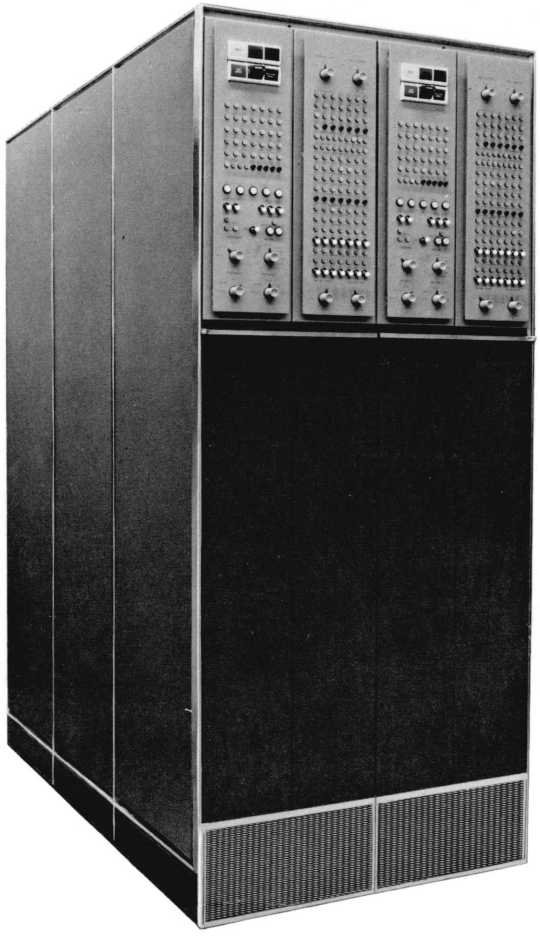
* No service required unless unit is last one in a row; then 36 inches are required on the exposed side.

Top View



Plan View





Notes

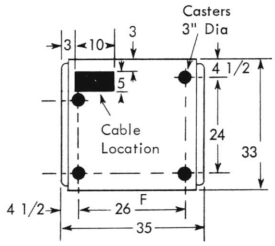
Height: 69

Service Clearance:

Front	Rear	Sides
60	42	*

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

Plan View



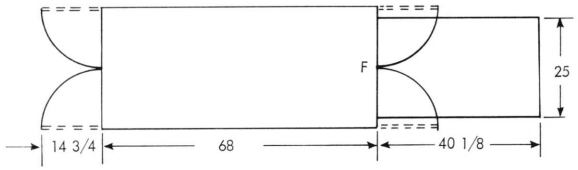
Notes

Height: 59

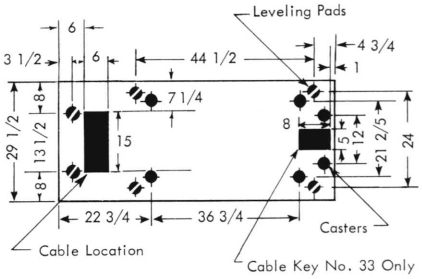
Service Clearance:	Front	Rear	Sides
	30	30	30

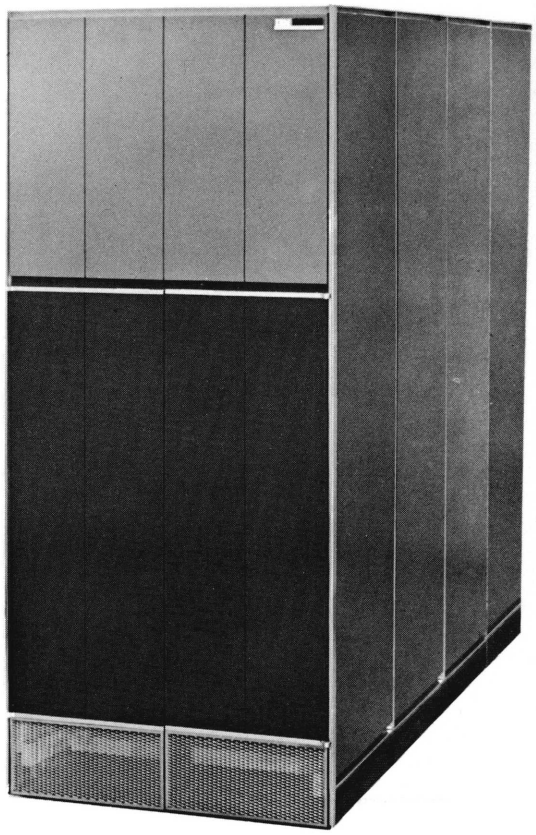
7804 POWER UNIT

Top View



Plan View





Notes

Height: 69

Service Clearances:

Front	Rear	Sides
60	30	—

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 wherever 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 or fire-resistant material. All ducts and insulating materials should be 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 watertight 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^{o} 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 non-combustible 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.