IBM 9020 System Installation Manual —

Physical Planning

This manual contains physical information for installing the IBM 9020 System, including floor planning, electrical, environmental, and construction requirements. It lists the physical characteristics of each unit and their effect on installation requirements. Detailed cable and location charts are included, together with illustrations and dimensions of cable connectors used in the system. The material presented is subject to engineering changes. Therefore, it is advisable to consult with IBM Physical Planning to be sure that no changes affecting installation of the system have occurred.
Sixth Edition (June, 1971)
This a major revision of, and obsoletes, ZC22-6878-4. Information is added about the Direct Access Storage Facility (DASF). In addition, this revision corrects minor errors and incorporates latest engineering changes. Changes to the text and small changes to illustrations are indicated by a vertical line to the left of the change. Changed or added illustrations or plan views are denoted by the symbol • to the right of the caption.

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# APPENDIX: 9020 D/E SYSTEM CABLE ORDER FORM

| Order Nomenclature               | 123 |
The successful installation of an IBM 9020 System requires long-range planning and continuous supervision to see that the plans are followed. IBM Installation Planning representatives are available for consultation and planning physical requirements of the installation. The operation should follow a planned schedule so that the computer area will be ready to receive the system when it is delivered. Following is a typical recommended planning schedule:

Twelve months before system delivery:
1. Determine the configuration components required and review the order.
2. Review this physical planning installation manual and schedule an installation planning meeting through the FAA Project Office.
3. Make preliminary layout of the proposed equipment configuration, allowing for any planned future expansion.

Note: Uniform layouts for similar configurations are recommended. Some of the advantages are uniform cable lengths and one-time engineering of equipment locations, cable routing, and sequencing. An advantage will also be evident to the FAA when moving programmers, operators, or maintenance personnel between field locations.

Six months or more before system delivery (allowing sufficient time for review and procurement), air conditioning, power, and machine room design should be completed.

Four months before machine delivery, the final layout should be made and approved by FAA and IBM so that cables can be ordered.

THIS IS A CRITICAL POINT IN THE SCHEDULE. After these cables are ordered, no change should be made in the layout that will affect cable lengths.

One month before system delivery, a survey should be made of unloading and handling conditions at the site to determine specific requirements for moving the components from the delivery platform to the machine room. Also, a final check should be made of power distribution, air conditioning, and location of cable access holes.

Two weeks before system delivery:
1. Delivery of cables to the site and installation will be the responsibility of IBM. Installation of cables between 9020 System and external I/O devices will be the responsibility of the FAA.
2. Maintenance Room furniture, tools, and test equipment will be delivered and the Maintenance Room prepared for use.

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

Every effort should be made to balance the air conditioning system as soon as possible after the 9020 System has been delivered.
BUILDING REQUIREMENTS

When locating the IBM 9020 System, consideration should be given to the following items:

1. Availability and location of proper and adequate power.
2. Space to house air conditioning equipment.
3. Ceiling height, outside wall area, and glass area.
4. Work flow to other areas.
5. Operational considerations in connection with other ATC functions.
6. Floor loading capacity.

The floor area required for this system will be determined by the configuration and allowances for future expansion. Space should be provided in the area of the I/OCE's for storage of FLT documentation which will be constantly referenced during maintenance. Space may also be needed for FSPC Modules, CUE Adapters, teletype equipment, storage cabinets, card files, work tables and desks, and printer form stands as well as other punched card equipment.

Such items as permanent master document files, card files, and magnetic tape and disk 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.

A substantial amount of test equipment will be assigned to the installation to maintain the system. Equipment such as tape drives and 1052's may be moved into the Maintenance Room, depending upon the type of work to be done. These areas should be on the same floor level. The Maintenance Room should contain a minimum of 400 square feet of space, be at least 12 feet wide, and be air conditioned to the same specifications as the machine room. Air conditioning should be sized to include the heat load of at least one oscilloscope and magnetic tape unit.

EQUIPMENT LAYOUT

Included in this manual are plan drawings which show the clearances required to allow working room for the field engineer and his equipment. They also show the swinging radii of the component gates and machine covers, caster and cable hole locations. All dimensions are with covers installed. In some cases, clearances 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.

The units must be located so that the length of connecting cables will not exceed maximum limits.

In the interest of best electrical design, all cable lengths should be kept as short as possible. In the "Cabling" section, the cabling connections between units are illustrated, and the length limitations for the system are given. The limits given are center-to-center lengths between cabling access holes at the floor line; allowances will be necessary for false floor height and cases of indirect cable routing.

The final layout must be reviewed to ensure that cable limitations have not been violated and that proper clearances have been maintained. After the cables have been ordered, any layout changes that affect cable length will require an engineering change and may result in delays. Procurement and installation arrangements for external cables should be made with sufficient lead time to permit the cables to be installed prior to delivery of the computer system.

In laying out a system, the following points should be taken into consideration:

1. There should be visual access between a control unit and at least one of its associated I/O devices.
2. The System Console or Configuration Console is the central unit of operation; this should be considered when planning the layout.
3. The 2540 Card Read Punch and 1403 Printer Model 2 should be convenient to the console operator.
4. The fronts of the magnetic tape units should be visible from the console.
5. The control panels of the 7201 Computing Elements should be visible from the console.
6. Adequate working area is required around the console and magnetic tape units.

IBM will provide a scaled layout of equipment which will be installed in the Maintenance Room to be used as a guide in locating such items as receptacles and lights. The room should contain both 115-volt and 208-volt outlets adequate to repair any unit that can be serviced in the Maintenance Room. Following is a list of typical furniture and fixtures to be located in the Maintenance Room and their dimensions in inches.

<table>
<thead>
<tr>
<th>Item</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desk</td>
<td>45</td>
<td>34</td>
<td>29</td>
</tr>
<tr>
<td>Work bench</td>
<td>72</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Shelf cabinet</td>
<td>36</td>
<td>18</td>
<td>72</td>
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<tr>
<td>Parts cabinet</td>
<td>42</td>
<td>24</td>
<td>87</td>
</tr>
<tr>
<td>File cabinet</td>
<td>18</td>
<td>28</td>
<td>60</td>
</tr>
<tr>
<td>Bookcase</td>
<td>33</td>
<td>15</td>
<td>42</td>
</tr>
<tr>
<td>Study table</td>
<td>60</td>
<td>30</td>
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<tr>
<td>Book cart</td>
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<td>13</td>
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</tr>
<tr>
<td>Card file</td>
<td>17</td>
<td>24</td>
<td>9</td>
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A typical Maintenance Room Layout is shown in Figure 1.

FLOOR CONSTRUCTION

The weight of each unit is listed on its specification page. The structure should be reviewed to determine whether the floor is capable of supporting the system weight load as oriented on your 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. If a false or raised floor is used, 10 pounds for each square foot of total area used in calculation must be applied as false floor load in the floor loading computation.
5. Building floors are normally rated either at 50 pounds per square foot with an additional allowance for partitions or at 75 pounds per square foot including partition allowance.

A raised floor will accomplish the following major objectives:

1. Allow future layout change with minimum reconstruction cost.
2. Protect the interconnecting cables and power receptacles.
3. Provide personnel safety.
4. Permit the space between the two floors to be used to supply air to the equipment and/or area.

A raised floor can be constructed of steel, aluminum, or fire-resistant wood. The two general floor types are shown in Figures 2 and 3.

IBM recommends:

1. There be no metal exposed to the walking surface where a raised floor using metal is used. Such exposure is considered an electrical safety hazard. It can also cause static discharge problems.
2. The raised floor height should be at least 12 inches.
3. The vertical clearance between the under side of the raised floor structure and any obstruction such as water piping, conduits, air-conditioning ducts, and additional floor supports must not be less than 4-1/2 inches to properly accommodate the routing of IBM cables and connectors.

4. When a raised floor panel is cut for cable entry, air register, etc., additional panel support may be required to restore the structural integrity of the panel.
5. Protective covering should be used to prevent damage to floor tiles, carpets, and panels while equipment is being moved into or relocated within the installation.

Floor covering material can contribute to the buildup of high static electrical charges as a result of the motion of people, carts, furniture, etc. in contact with the floor material. Abrupt discharge of these static charges to metallic surfaces or other people cause discomfort to personnel and may cause malfunction of electronic equipment.

This static buildup and discharge can be minimized by:

1. Providing a conductive path to ground from metallic raised floor structure including the metal panels.
2. The maximum resistance for floor tile or other floor surface material should be $2 \times 10^{10}$ ohms, measured between floor surface and building (or applicable ground reference). The procedure outlined in NFPA No. 56, Chapter 25, Section 2522, should be used. Floor material with a lower resistance will further decrease static buildup and discharge. The minimum resistance should not be less than $5 \times 10^5$ ohms. (Note: Special attention must be given to floor panels constructed with metal facings and nonconductive core to ensure that the resistance requirements are met.)
3. Maintain the room humidity within control limits of "Design Criteria" as defined under "Temperature and Humidity Design Criteria."

If carpet floor coverings are used, they should be of the variety marketed by carpet manufacturers as "anti-static." Two types are generally available: those with the anti-static properties manufactured into the material and those treated later with anti-static agents. Materials, depending on additives, may have short effective anti-static life without frequent retreatment of the carpet. Maintenance of all anti-static floor coverings (carpet, tile, etc.) should be in agreement with the individual supplier's recommendations.

ACOUSTICAL TREATMENT

Acoustical treatment is recommended for a more comfortable operation of the system. The following is presented as general information.

The principal noise sources in the system are the mechanical units such as card punch machines,
Figure 1. Typical Maintenance Room
Figure 2. Pedestal-Supported Type Floor

Figure 3. Stringer-Supported Type Floor
printers, reader, blowers, etc. The floor construction should be of a nature that will retard vibration to other areas. The walls should be constructed 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 use of absorptive materials will reduce the average sound pressure level throughout an installation. 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 may be possible that noise generated in the computer room will be transmitted to other rooms unless proper precautions are taken. For large rooms, the floor is the second most effective area on which to apply absorptive materials. Wall surfaces should be made soft to prevent reverberations.

LIGHTING

A minimum average illumination of 40 foot-candles measured 30 inches above the floor should be maintained in the computer 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. Lights should not be powered from the computer power panel. See "Power Requirements" for details.

VIBRATION

It may be necessary to install the 9020 System in an area that is subject to minor vibrations. The intensity of vibrations in an office environment will not affect the reliable operation of the 9020 System.

STORAGE OF TAPE AND DISK PACKS

Storage facilities for frequent or infrequent usage of magnetic tape should be maintained within the following limits:

- **IBM Heavy-duty Magnetic Tape**
  - Relative Humidity: 20% to 80%
  - Temperature: 40°F to 90°F
- **Mylar* Tape—Long-term Storage**
  - Relative Humidity: 20% to 80%
  - Temperature: 50°F to 90°F

Tape exposed to atmospheric conditions outside the preceding 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 the storage time (up to maximum reconditioning period of 24 hours).

The tape should be stored in a dustproof container in a vertical position and should never come in contact with magnetic material at any time. Magnetic fields of greater than 50 oersted intensity can cause loss of information or introduction of noise.

When shipping magnetic tape, each reel should be sealed in a plastic bag and packed individually in stiff cardboard shipping boxes. These may be obtained from IBM.

The disk pack is a precision instrument. Storage facilities should be maintained within the following limits:

- **Disk Pack**
  - **Short-term Storage:**
    - Temperature: 60°F to 90°F
    - Relative Humidity: 10% to 80%
  - **Long-term Storage:**
    - Temperature: 40°F to 150°F

Disk packs must be conditioned to the machine operating environment before use. This is accomplished by permitting the device to remain in the correct operating environment for a length of time equal to the time out of the operating environment (up to a maximum conditioning period of 2 hours).

These devices are equipped with dustproof covers which should be left in place, except when installed in the file. Storage should be in fire-resistant cabinets away from magnetic fields. Magnetic fields of greater than 50 oersteds can cause loss of information or introduction of noise.

FURNITURE

Furniture can provide a potential source of high static charge. Precautions should be taken to ensure that seat covers, etc., are made of materials resistant to static buildup. Many plastics will permit the buildup of high static charges. Cloth covered chairs are normally less susceptible to generating static charges. Rubber or other insulating type of feet for equipment should be avoided. If casters, ball bearings, etc., are used, they should be lubricated with a graphite or other conductive grease. Rubber tread casters, wheels, etc., should contain conductive material.

The resistance of furniture hardware which touches the floor (such as casters, feet, etc.) should be below 10^9 ohms from metal in the furniture frame to a metal test surface on which the unloaded furniture sample is placed.

*Trademark of E.I. du Pont de Nemours & Co. (Inc.)
The components of the machines are internally cooled by air circulated by blowers in most units. The air intake varies slightly from one unit to another, but generally, 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 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.

Machine heat dissipation loads are given on the specification page for each unit.

The air conditioning units should not be powered from the computer room power service panel. The riser for the air conditioning system and for the computer room power panel should not be in the same conduit.

TEMPERATURE AND HUMIDITY DESIGN CRITERIA

All components of a 9020 System have been designed for optimum operation at 75°F and 50% relative humidity at altitudes up to 7,000 feet. This design point provides for the largest buffer in terms of system available time. If the air conditioning system fails or malfunctions, the computer will be able to operate until it reaches its specified limits. This increases the possibility of effecting air conditioning repairs prior to computer shutdown. The design point has also been proven to be a generally acceptable personnel comfort level.

In certain geographical areas, a design point of 50% relative humidity is not practical and a value of 45% should be used.

Deviation from the recommended design point, in either direction, if maintained for long periods, will expose the system to malfunction from external conditions. High relative humidity levels may cause improper feeding of cards and paper, as well as operator discomfort and condensation on windows and walls when outside temperatures fall below room dew point. Low relative humidity levels alone will not cause static discharge. However, in combination with certain types of floor construction, floor coverings, furniture, etc., static charges which are generated by moving people, carts, furniture, paper, etc., will be more readily stored on one or more of the objects. These charges may be high enough when discharged by contact with another person or object to be quite objectionable to operating personnel and can cause intermittent interference with operation of computers or other electronic equipment. Since deviations of 24 hours or longer will permit the floors, desks, furniture, cards, tape, and paper to reach steady-state condition, it is recommended that the air conditioning system be automatically controlled and provided with a high/low alarm or a continuously recording device with the appropriate limits marked. In most areas, it will be necessary to add moisture to the room air to meet the design criteria.

Under normal operation, the design conditions can be controlled within limits of ±2°F and ±5% relative humidity with standard air conditioning controls.

MACHINE OPERATING LIMITS

Some individual units may require special considerations and have more or less restrictive requirements. See unit specification pages for individual requirements.

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<th>Machine Nonoperating</th>
<th>Design Criteria</th>
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<td>Temperature</td>
<td>60°F to 90°F</td>
<td>50°F to 110°F</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>20% to 80%</td>
<td>8% to 80%</td>
</tr>
<tr>
<td>Max Wet Bulb</td>
<td>70°F</td>
<td>80°F</td>
</tr>
</tbody>
</table>

THE AIR ENTERING THE MACHINE MUST BE AT THE CONDITIONS FOR MACHINE OPERATION BEFORE MACHINE POWER IS TURNED ON.

Under no condition of operation may the machine input air and room air exceed 90°F. This is a maximum operating temperature limit and should not be considered a design condition.

When conditioned air is supplied to the base of any unit by a duct or underfloor air supply, the relative humidity of the air entering a machine unit should not be greater than 80%. This specification is an absolute maximum. Air temperature in this duct or underfloor air supply 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 computer 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 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 must be rated at a minimum of 85-90% efficient by the Bureau of Standard 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.
Even though the heat loads of the computer 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 the most common types of systems in use with a brief description of each. 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 computer system, is absorbed by the air supplied to the computer 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 computer 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.

This 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.

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 with 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 overall 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. Air entering the machine through the cable holes must be within stated machine specifications.

The air conditioning load should not be supplied from the same transformer that supplies the computer 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 computer 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 computer 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 computer area are nearing the maximum limitations stated in this manual. Action can then be taken by the customer's personnel to correct this 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.

For use in monitoring the underfloor air conditions, a remote indicating instrument is recommended. This should also have a 7-day electric-drive chart and can be the wet and dry bulb or electronic type if direct reading is not available. The recording instrument can be located on the wall in the room or in the mechanical equipment room or any other location convenient to the building engineer.
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 resistant 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.
   c. Seal up the windows with masonry.
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 structural 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 the structural 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. An "early warning" detection system should be installed to protect the computer and tape storage areas. This detection system should actuate an audible alarm.
2. Portable carbon dioxide fire extinguishers of suitable size—15 pounds and number should be provided in the machine room. Carbon dioxide is the recommended nonwetting agent for electrical equipment (Class C Hazard). Extinguishers should be readily accessible to individuals in the area and extinguisher locations should be visibly marked overhead. Local codes govern the frequency of inspecting the cylinders.
3. 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.
4. In some cases, local building codes and ordinances, or insurance regulations, require automatic water sprinklers. Pre-action sprinkler systems should be considered if they conform to such codes and ordinances. 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 because of failure or mechanical breakage of the automatic sprinkler heads.

**Data Storage**

1. Any data stored in the computer room—whether in the form of magnetic tape, disk packs, 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 and 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 continuous operation of a customer's computer is dependent on information stored on cards, tape, etc. Duplicate or master records should be maintained from which the necessary information can be taken to resume operation.

2. A reliable stand-by power source should be installed to allow continued Air Traffic Control in cases of commercial power failure.

General Precautions and Personnel Training

1. The computer room, air conditioning equipment room, and data storage room should be monitored.

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.
   h. First aid.
   i. Location of shut-off valves for steam lines, water pipes, sprinkler systems, etc.
The 9020 System is designed to operate from a 208-volt, three-phase, four-wire, 60-Hertz supply. The four wires consist of three phase wires and one equipment ground. The line-to-line voltage tolerances must be maintained within plus or minus 10 percent, measured at the receptacles when the system is operating. The line frequency must be maintained at 60 Hertz plus or minus 2 percent (except 2701, plus or minus 1 cycle).

A separate feeder connected to the main building distribution panel should provide a suitable supply. However, in cases where the building power fluctuates in excess of plus or minus 10 percent, 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 computer system should feed no other loads and should be protected by a main line circuit breaker. (The "Safety and Fire Precautions" section carries additional pertinent details.)

Note: Considering the desired reliability of the 9020 System, it might be advisable to group branch circuits in separate load centers, each fed from the main line circuit breaker. Thus, total outage of the system could be avoided in the case of individual branch circuit CB failure.

The individual branch circuits on the distribution panel should be protected by suitable circuit breakers properly derated according to manufacturer specifications. Three-phase thermomagnetic circuit breakers are used in all of the main 9020 units, except the 2701 and, 7265-03 which are single phase. The ratings are:

- 2314 Storage Control Unit: 40 amps
- 2701 Data Adapter Unit: 15 amps
- 2803 Tape Control Model 1: 50 amps
- 2821 Control Unit Model 1/2: 30 amps
- 7201-01 Computing Element: 30 amps
- 7201-02 Computing Element: 50 amps
- 7231-02 I/O Control Element: 30 amps
- 7251-03/04/08 Storage Element: 30 amps
- 7251-09 Storage Element: 40 amps
- 7265-02 Systems Control Console: 20 amps
- 7265-03 Configuration Console: 25 amps (two)
- 7289-02 Peripheral Adapter Module: 50 amps
- 7289-03 Flight Strip Printer Control Module: 40 amps
- 7289-04 Display Element: 40 amps

The power distribution panel should be located in an unobstructed, well-lighted area in the computer room. Branch circuits should terminate under the raised floor as close as possible to the machine they supply. However, they should not be located directly beneath the cabling access holes because of interference with the installation of the signal cabling. The receptacle or connector should in all cases be within 10 feet of the cable access hole and be under a freely removable cover.

* Receptacle refers to a box type. Connector refers to an in-line type.

**Figure 4. Prime Power Distribution**
PHASE ROTATION

The three-phase power receptacles used with this system must be wired for correct phase rotation. Looking at the face of the receptacle and running counterclockwise from the ground pin, the sequencing will be phase 1, phase 2, and phase 3. See Figure 4.

CONVENIENCE OUTLETS

A suitable number of convenience outlets should be installed in the Computer Room and Maintenance Room for use by building maintenance personnel, porter service, field engineers, etc. Recommendations for the Maintenance Room are shown in Figure 1. Convenience outlets should be on the lighting or other building circuits, not on the computer power panel or riser.

LIGHTNING PROTECTION

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

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

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 FAA.

SYSTEM GROUNDING

A central ground point is required at the power distribution panel. An insulated green (or green with yellow trace) grounding wire should be carried from this point directly back to the service ground or suitable building ground. Conduit must not be used as the only means of grounding. No neutral wire is required. From the central tie point at the power distribution panel, individual grounding wires accompany the phase wires of the branch circuit to each element or to other units requiring primary power of the 9020 system.

There will be an additional equipment bond system between frames. Each 2314, 2701, 2803, 2821, 7289, 7201, 7231, 7251, and 7265 is furnished with a #6 wire 30-foot bonding cable. Element and unit tie points are described in the "Element and Unit Installation" manuals. Each cable from these units must be bolted to a copper (or cadmium finished steel) plate, minimum 36 square inches x 1/2 inch thick. (See Figure 4). The plate, furnished by the customer, must have a sufficient number of holes (drill and tap 1/4-20) to accommodate the number of cables. Additional plates will be installed as needed to reach those units beyond the fixed cable length. The bus connecting the plates in series to the nearest suitable building ground should be at least a #4/0 wire.

Signal ground reference between boxes is accomplished through the coax shielding. When external I/O devices are connected to the 9020 System, signal ground reference will be accomplished through the interconnecting signal cable shielding. As in the case of the 9020 elements, it should be possible to separate or join the power and signal grounds inside the external I/O devices.

SURGE CURRENTS

To minimize the effects of system surge currents, each of the following elements contains a time-delay relay:

- 7201-01/02 Computing Element
- 7231-02 I/O Control Element
- 7251-03/04/08/09 Storage Element
- 7265-02 Systems Control Console
- 7289-02 Peripheral Adapter Module
- 7289-04 Display Element

The purpose of the time-delay relay is to provide a sequencing of main line power to the elements. The time-delay relays, adjustable from 5 to 30 seconds, will be set to a value to obtain a staggered power-on sequence of the various system elements.

The following is a listing of approximate element and unit power factors:

<table>
<thead>
<tr>
<th>Element/Unit Description</th>
<th>Power Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2314 Storage Control Unit</td>
<td>0.70</td>
</tr>
<tr>
<td>2701 Data Adapter Unit</td>
<td>0.86</td>
</tr>
<tr>
<td>2803 Tape Control Model 1</td>
<td>0.77</td>
</tr>
<tr>
<td>2821 Control Unit Model 1/2</td>
<td>0.71</td>
</tr>
<tr>
<td>7201-01 Computing Element</td>
<td>0.77</td>
</tr>
<tr>
<td>7201-02 Computing Element</td>
<td>0.81</td>
</tr>
<tr>
<td>7231-02 I/O Control Element</td>
<td>0.81</td>
</tr>
<tr>
<td>7251-03/04 Storage Element</td>
<td>0.73</td>
</tr>
<tr>
<td>7251-08 Storage Element</td>
<td>0.80</td>
</tr>
<tr>
<td>7251-09 Storage Element</td>
<td>0.92</td>
</tr>
<tr>
<td>7265-02 Systems Control Console</td>
<td>0.70</td>
</tr>
<tr>
<td>7265-03 Configuration Console</td>
<td>0.95</td>
</tr>
<tr>
<td>7289-02 Peripheral Adapter Module</td>
<td>0.94</td>
</tr>
<tr>
<td>7289-03 Flight Strip Printer Control Module</td>
<td>0.77</td>
</tr>
<tr>
<td>7289-04 Display Element</td>
<td>0.90</td>
</tr>
</tbody>
</table>
The maximum harmonic content of the phase voltage waveforms is not to be in excess of 5 percent with the equipment not operating.

The following table supplies information about attachment cord plugs and their mating branch circuit connectors or receptacles used for supplying 208V to the 9020 systems. The number of wires includes one insulated grounding conductor (green or green with yellow trace).

<table>
<thead>
<tr>
<th>Plug</th>
<th>Connector</th>
<th>Receptacle</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russell and Stoll, FS3720</td>
<td>FS3913</td>
<td>FS3743</td>
<td>15 amp, 1 phase, 3 wire</td>
</tr>
<tr>
<td>Russell and Stoll, FS3750</td>
<td>FS3933</td>
<td>FS3753</td>
<td>30 amp, 1 phase, 3 wire</td>
</tr>
<tr>
<td>Russell and Stoll, FS3760</td>
<td>FS3934</td>
<td>FS3754</td>
<td>30 amp, 3 phase, 4 wire</td>
</tr>
<tr>
<td>Russell and Stoll, SC7328</td>
<td>SC7428</td>
<td>SC7324</td>
<td>60 amp, 3 phase, 4 wire</td>
</tr>
</tbody>
</table>
UNIT SPECIFICATIONS

STANDARD SYMBOLS

In Plan Views

- Cable Entry and Exit
- Power Cord Exit (Power cord length is measured from this symbol)
- Gate Swings
- Optional Equipment
- Customer Engineer Service Panel
- Service Area Boundary
+ Casters
○ Leveling Pads or Glides
□ Legs
↑ Non-Raised Floor Cable Exit

In Cabling Schematics

- Cable Groups from a Unit
- Cable Groups to a Unit

Unless otherwise noted on individual unit specification pages, the following statement applies: All systems components can be reduced to 29-1/2 inches by 60 inches or smaller sections for shipment.

Unless otherwise noted on individual unit specification pages, the environmental specifications are:

Environment Operating:
- Temperature 60°-90°F
- Rel Humidity 20-80%
- Max Wet Bulb 78°F

Environment Nonoperating:
- Temperature 50°-110°F
- Rel Humidity 8-80%
- Max Wet Bulb 80°F

Environment Shipping:
- Temperature -40° to 140°F
- Rel Humidity 5-100% (no condensation)
- Wet Bulb Range 33°-65°F
1052 PRINTER-KEYBOARD MODEL 7

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>23*</td>
<td>19-3/4</td>
<td>9</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Weight: 65 pounds

BTU/Hr: 570

CFM: 0

Power: 0.17 kVA**

Environment Operating:

Temperature 50-110°F
Rel Humidity 10-80%
Max Wet Bulb 80°F

Environment Nonoperating:

Temperature 50-110°F
Rel Humidity 10-80%
Max Wet Bulb 80°F

Notes:

* Includes 1-1/2 inches for knobs on ends of platen.
** 9020A/D—powered from System Console.
9020E—powered from 7201-02.
1403 PRINTER MODEL 2

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>47-3/4</td>
<td>28-1/2</td>
<td>53-1/4</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36</td>
<td>36</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Weight: 750 pounds

BTU/Hr: 3,000

CFM: 310

Power: 1.0 kVA*

Cable Limitations:

See section on cabling.

Note:

*Powered from 2821.
2401 MAGNETIC TAPE UNIT MODELS 2 AND 3

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-3/4</td>
<td>29</td>
<td>67</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>36</td>
<td>30*</td>
<td>30*</td>
</tr>
</tbody>
</table>

Weight: 800 pounds
BTU/Hr: 3,500
CFM: 500
Power: 1.6 kVA**

Cable Limitations:
See section on cabling.

Notes:
*When not abutted to another tape unit or tape control unit.
**Powered from control unit.
2540 CARD READ PUNCH

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>57-1/2</td>
<td>29-1/4</td>
<td>45-1/4*</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

Weight: 1,050 pounds

BTU/Hr: 3,000

CFM: 50

Power: 1.2 kVA**

Cable Limitations:

See section on cabling.

Notes:

*Add 20-1/4 inches for read file feed.

**Powered from 2821.
2314 DIRECT ACCESS STORAGE FACILITY - A SERIES

PLAN VIEW

[Diagram showing dimensions and layout of a direct access storage facility.]
2314 DIRECT ACCESS STORAGE FACILITY - A SERIES

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(See Plan View.) 60</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
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</thead>
<tbody>
<tr>
<td>36</td>
<td>48</td>
<td>42</td>
<td>24</td>
</tr>
</tbody>
</table>

Weight: See Table

Power Requirements:

<table>
<thead>
<tr>
<th>Phases</th>
<th>Plug</th>
<th>Connector</th>
<th>Receptacle</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>R &amp; S FS3760</td>
<td>R &amp; S FS3934</td>
<td>R &amp; S FS3754</td>
</tr>
</tbody>
</table>

INDIVIDUAL UNIT SPECIFICATIONS

<table>
<thead>
<tr>
<th>UNIT</th>
<th>BTU/hr</th>
<th>KVA*</th>
<th>CFM</th>
<th>Length</th>
<th>Width</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2314-A1</td>
<td>3,100</td>
<td>1.1</td>
<td>1,000</td>
<td>47</td>
<td>32</td>
<td>950 LBS</td>
</tr>
<tr>
<td>2312-A1</td>
<td>1,900</td>
<td>0.7</td>
<td>200</td>
<td>28</td>
<td>32</td>
<td>500 LBS</td>
</tr>
<tr>
<td>2318-A1</td>
<td>3,800</td>
<td>1.4</td>
<td>200</td>
<td>28</td>
<td>32</td>
<td>690 LBS</td>
</tr>
</tbody>
</table>

Cable Limitations:
See section on cabling.

Note:
* 2312 and 2318 powered from the 2314 Control Unit.
2701 DATA ADAPTER UNIT

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>25-1/2</td>
<td>40</td>
</tr>
</tbody>
</table>

Service Clearances (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>42</td>
<td>42</td>
<td>6*</td>
</tr>
</tbody>
</table>

Weight: 600 pounds

BTU/hr: 3,000

CFM: 120

Power: 1.0 kVA

Phases: 1
Plug: R&S FS3720
Connector: R&S FS3913
Receptacle: R&S FS3743

Cable Limitations:
See section on Cabling.

Note:
* For air circulation.
2803 TAPE CONTROL MODEL 1

SPECIFICATIONS

Dimensions (Inches)

\[
\begin{array}{ccc}
F & S & H \\
60 & 29 & 60 \\
\end{array}
\]

Service Clearances (Inches)

\[
\begin{array}{cccc}
F & R & Rt & L \\
42 & 42 & 30* & 30 \\
\end{array}
\]

Weight: 1,400 pounds

BTU/Hr: 2,500

CFM: 500

Power: 1.0 kVA

Phases 3

Plug R&S SC7328

Connector R&S SC7428

Receptacle R&S SC7324

Cable Limitations:

See section on cabling.

Note:

* Can abut tape unit this side only.

** Secondary Interface and Tape Drive Signal Cables.

*** Primary Interface; Indicator; SCON; EPO and Power Cables.
2803A TAPE CONTROL MODEL 1*

• PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
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<tbody>
<tr>
<td>60</td>
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<td>60</td>
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Service Clearances (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
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<tbody>
<tr>
<td>42</td>
<td>42</td>
<td>30**</td>
<td>30</td>
</tr>
</tbody>
</table>

Weight: 1,130 pounds

BTU/hr: 3,000

CFM: 500

Power: 1.2 kVA

Phases 3

Plug R&S SC7328

Connector R&S SC7428

Receptacle R&S SC7324

Cable Limitations:

See section on Cabling.

Note:

* A is a designation to identify SLT version—serial numbers from 11,001 - 13,999.

** Can abut tape unit this side only.

*** Primary and Secondary Interface; Tape Drive Signal Cables.

**** Indicator and SCON Cables.

***** EPO and Power Cables.
2821 CONTROL UNIT MODELS 1 AND 2

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
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Service Clearances (Inches)

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<tr>
<td></td>
<td>30</td>
<td>18</td>
<td>48</td>
<td>30</td>
</tr>
</tbody>
</table>

Model 1 | Model 2
---|---
Weight: | 1,000 lbs | 1,000 lbs
BTU/Hr: | 7,500 | 6,000
CFM: | 500 | 400
Power: | 3.2 kVA | 2.4 kVA

Phases: 3
Plug: R&S FS3760
Connector: R&S FS3934
Receptacle: R&S FS3754

Environment Operating:

- Temperature: 60-90°F
- Rel Humidity: 8-80%
- Max Wet Bulb: 78°F

Cable Limitations:

See section on cabling.
7201-01 COMPUTING ELEMENT

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
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<th>H</th>
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<tbody>
<tr>
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<td>84-3/4</td>
<td>70</td>
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<tr>
<td>2</td>
<td>61</td>
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<td>72</td>
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Service Clearances (Inches)

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<tr>
<td></td>
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<td>42</td>
<td>42</td>
<td>42</td>
</tr>
</tbody>
</table>

Weight: 4,000 pounds

BTU/Hr: 10,240

CFM: 1,800

Power: 3.82-kVA

Phases: 3

Plug: R&S FS3760

Connector: R&S FS3934

Receptacle: R&S FS3754

Cable Limitations:

See section on cabling.

Note:

*Line 1 is for main frame and line 2 for power wall.
7201-02 COMPUTING ELEMENT

PLAN VIEW

[Diagram of a computing element with dimensions and annotations.]

Panel Reading Board (right or left optional)
SPECIFICATIONS

Dimensions (Inches)

F  S  H
* * 72-1/2

Service Clearances (Inches)

F  R  Rt  L
48  30  * *

Weight: 3,647 pounds

BTU/hr: 19,600

CFM: 4,620

Power: 6.0 kVA

Phases 3

Plug R&S SC7328

Connector R&S SC7428

Receptacle R&S SC7324

Cable Limitations:
See section on cabling.

Notes:
* See plan view.

Logic Frame Shipping Dimensions:

Length: 78 inches

Width: 30 inches
SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
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Service Clearances (Inches)

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<tr>
<td></td>
<td>30</td>
<td>57</td>
<td>30**</td>
<td>30**</td>
</tr>
</tbody>
</table>

Weight: 5,200 pounds

BTU/HR: 13,200

CFM: 2,550

Power: 4.75 kVA

Phases: 3
Plug: R&S FS3760
Connector: R&S FS3934
Receptacle: R&S FS3754

Cable Limitations:

See section on cabling.

Notes:

*Line 1 is for main frame and line 2 for power wall.
**Power walls can be butted to reduce floor space and cable length.
** Includes 30" service clearance and 45" for expansion.
**SPECIFICATIONS**

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
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<th>H</th>
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<td>(2)*</td>
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Service Clearances (Inches)

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<th>L</th>
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<tbody>
<tr>
<td>30</td>
<td>36</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Weight: 1,500 pounds

BTU/Hr: 5,600

CFM: 1,000

Power: 2.15 kVA

Phases: 3

Plug: R&S FS3760

Connector: R&S FS3934

Receptacle: R&S FS3754

Cable Limitations:

See section on cabling.

**Note:**

*Line 1 is for main frame and line 2 for power wall.*
7251-04 STORAGE ELEMENT

PLAN VIEW
7251-04 STORAGE ELEMENT

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
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<th>S</th>
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<tr>
<td>(2)*</td>
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Service Clearances (Inches)

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<th>Rt</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>30</td>
<td>36</td>
<td>30**</td>
<td>30**</td>
</tr>
</tbody>
</table>

Weight: 2,650 pounds

BTU/Hr: 11,200

CFM: 1,500

Power (Total): 4.3 kVA

Phases 3

Plugs (2) R&S FS3760

Connectors R&S FS3934

Receptacles R&S FS3754

Cable Limitations:

See section on cabling.

Notes:

*Line 1 is for main frame and line 2 for power wall.

**Power walls can be butted to reduce floor space and cable length.
7251-08 STORAGE ELEMENT (PLAN VIEW 1)

TWO 7251-08 STORAGE ELEMENTS ABUTTED (PLAN VIEW 2)
7251-08 STORAGE ELEMENT

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
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<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
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<tr>
<td>**</td>
<td>77-1/4</td>
<td>26</td>
<td>72</td>
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Service Clearances (Inches)

<table>
<thead>
<tr>
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<th>F</th>
<th>R</th>
<th>Rt</th>
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<tr>
<td>(2)</td>
<td>30</td>
<td>30</td>
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<td>30</td>
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</tbody>
</table>

Weight: 1,750 pounds

BTU/Hr: 8,000

CFM: 1,250

Power: 3.80 kVA

Phases 3
Plug R&S FS3760
Connector R&S FS3934
Receptacle R&S FS3754

Cable Limitations:
See section on cabling.

Notes:
*For main frame.
**For power wall.
7251-09 STORAGE ELEMENT

- PLAN VIEW

Main Wall Spacer Frame required between two SE's not separated by a CE or a CE Battery Frame
7251-09 STORAGE ELEMENT

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
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<th>S</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>209</td>
<td>72-1/2</td>
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</table>

Service Clearances (Inches)

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<th>R</th>
<th>Rt</th>
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<tr>
<td></td>
<td>50</td>
<td>36</td>
<td>49</td>
<td>49</td>
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</tbody>
</table>

Weight: 4,620 pounds

<table>
<thead>
<tr>
<th></th>
<th>BTU/hr</th>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>CFM</th>
<th>4,000</th>
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<table>
<thead>
<tr>
<th></th>
<th>Power</th>
<th>6.7 kVA</th>
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<tbody>
<tr>
<td></td>
<td>Phases</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Plug</td>
<td>R&amp;S SC7328</td>
</tr>
<tr>
<td></td>
<td>Connector</td>
<td>R&amp;S SC7428</td>
</tr>
<tr>
<td></td>
<td>Receptacle</td>
<td>R&amp;S SC7324</td>
</tr>
</tbody>
</table>

Cable Limitations:
See section on cabling.
7265-02 SYSTEMS CONTROL CONSOLE

*PLAN VIEW*

---

Dimensions and measurements are indicated on the plan view diagram.
SPECIFICATIONS

Dimensions (Inches)

F     S     H
(See Plan View.)  70-3/4

Service Clearances (Inches)

F  R  Rt  L
30 43 39 34

Weight: 1,850 pounds
BTU/Hr: 3,450
CFM: 350
Power: 1.4 kVA

Phases 3
Plug R&S FS3760
Connector R&S FS3934
Receptacle R&S FS3754

Cable Limitations:
See section on cabling.

Note:
1 * 1052 Cables
7265-03 CONFIGURATION CONSOLE

PLAN VIEW
## Dimensions (Inches)

<table>
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<tr>
<th>F</th>
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<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>72-1/2</td>
</tr>
</tbody>
</table>

## Service Clearances (Inches)

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<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>41-3/4</td>
<td>47-1/2</td>
<td>34</td>
</tr>
</tbody>
</table>

- **Weight:** 3,300 pounds
- **BTU/hr:** 11,300
- **CFM:** 1,750

### Power:

- **Line 1**
  - kVA: 2.05 (avg)
  - Phases: 1
  - Plug: R&S FS3750 (two)
  - Connector: R&S FS3933 (two)
  - Receptacle: R&S FS3753 (two)

- **Line 2**
  - kVA: 2.05 (avg)

### Cable Limitations:

- See section on cabling.

**Notes:**

- * See plan view.
- ** Two individual branch circuits are required for this unit. Power requirements will be either 1.6 or 2.5 kVA per line, depending on the power source selected for the System Console control portion of the Configuration Console.

### Logic Frame Shipping Dimensions:

- **Length:** 68-1/2 inches
- **Width:** 30 inches

---

*** 1052 Cables

**** EPO Cables
7289-02 PERIPHERAL ADAPTER MODULE

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th></th>
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<th>H</th>
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<tbody>
<tr>
<td></td>
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Service Clearances (Inches)

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<tr>
<td></td>
<td>30</td>
<td>30</td>
<td>60</td>
<td>60</td>
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</tbody>
</table>

Weight (lb.): 3,850*

BTU/Hr: 14,300*

CFM: 2,760 *

Power: 6.0kVA*

Phases 3
Plug R&S SC7328
Connector R&S SC7428
Receptacle R&S SC7324

Cable Limitations:

See section on cabling.

Note:
* Maximum value given.
Requirements vary according to the quantity of adapters contained in the unit.
7289-03 FLIGHT STRIP PRINTER CONTROL MODULE

Specifications

Dimensions (Inches)

<table>
<thead>
<tr>
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<td>*(1) 32-1/4</td>
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<td>*(2) 61-1/2</td>
<td>72</td>
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Service Clearances (Inches)

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<tbody>
<tr>
<td>30</td>
<td>42</td>
<td>45</td>
<td>45</td>
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</tbody>
</table>

Weight: 2,940 pounds

BTU/Hr: 12,000

CFM: 1,560

Power: 4.0 kVA

Phases: 3
Plug: R&S SC7328
Connector: R&S SC7428
Receptacle: R&S SC7324

Cable Limitations:
See section on cabling.

Note:
*Line 1 is for main frame and line 2 for power wall.
7289-04 DISPLAY ELEMENT

• PLAN VIEW

Main Wall Spacer Frame required between two DE's not separated by a CE or a CE Battery Frame.
7289-04 DISPLAY ELEMENT

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
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<tbody>
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Service Clearances (Inches)

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</thead>
<tbody>
<tr>
<td>50</td>
<td>36</td>
<td>49</td>
<td>49</td>
</tr>
</tbody>
</table>

Weight: 3,500 pounds

| BTU/hr: | 18,150 |

| CFM:    | 3,300  |

| Power:  | 5.9 kVA |
| Phases | 3       |

Plug  R&S SC7328
Connector R&S SC7428
Receptacle R&S SC7324

Cable Limitations:
See section on cabling.
ELEMENT NUMBERING AND ORDER OF EXPANSION (9020D SYSTEM)

One minimum 9020D (triplex) wall configuration and the maximum system expansion is shown in Figure 5.

The Computing and Storage Elements are assigned numbers (Figure 5) which define the physical location and the (sequential) order of expansion for each type of element. The I/O Control Element is a stand-alone unit and does not require a special numbering scheme.

Main Wall Spacer Frames are used for Storage Element (SE) expansion. See "CE (7201-02) Main Wall Spacer Frame".

Because of cable limitations, it is essential to physically locate Storage Elements 1 and 2 as close together as practical. In no case should the distance between the I/O cable entry holes exceed 30 feet.

Notes:
1. The CE Battery Frame contains battery backup for CE(s).
2. The Main Wall Spacer Frame is required between two SE's when they are not separated by a CE or a CE Battery Frame.
3. The reading boards are optionally right- or left-handed.

Figure 5. Numeric Sequence for CE and SE Expansion
ELEMENT NUMBERING AND ORDER OF EXPANSION (9020E SYSTEM)

One minimum 9020E (triplex) wall configuration and the maximum system expansion is shown in Figure 6.

The Computing, Storage, and Display Elements are assigned numbers (Figure 6) which define the physical location and the (sequential) order of expansion for each type of element. The I/O Control Element is a stand-alone unit and does not require a special numbering scheme.

Main Wall Spacer Frames are used for Storage Element (SE) and display Element (DE) expansion. See "CE (7201-02) Main Wall Spacer Frame".

Because of cable limitations, it is essential to physically locate Storage Element 1 and Display Element 1 as close together as practical. In no case should the distance between the I/O cable entry holes exceed 30 feet.

---

Notes:
1. The CE Battery Frame contains battery backup for CE(s).
2. The Main Wall Spacer Frame is required between two SE's or DE's when they are not separated by a CE or a CE Battery Frame.
3. The reading boards are optionally right- or left-handed.

Figure 6. Numeric Sequence for CE, DE, and SE Expansion (DE Expansion Independent of SE Expansion)
CE (7201-02) BATTERY FRAME

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
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Service Clearances (Inches)

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<tbody>
<tr>
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<td>30</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Weight:

- with 1 battery pack 350 pounds
- with 2 battery packs 450 pounds

Notes:

Contains battery backup for one or two CE’s.
Front access required to service batteries; rear access required for interframe cabling.

CE (7201-02) MAIN WALL SPACER FRAME

PLAN VIEW

SPECIFICATIONS

Dimensions (Inches)

<table>
<thead>
<tr>
<th>F</th>
<th>S</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
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<td>25-1/2</td>
<td>72-1/2</td>
</tr>
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</table>

Service Clearances (Inches)

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<thead>
<tr>
<th>F</th>
<th>R</th>
<th>Rt</th>
<th>L</th>
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<tr>
<td>30</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Weight: 250 pounds

Notes:

Required between two SE’s or DE’s on the main wall, when they are not separated by a CE or a CE Battery Frame.
Front and rear access required for interframe cabling.
CABLE CONNECTOR ILLUSTRATIONS

Figures 7-12 are representative of cable connectors used in the 9020 Computer System. The dimensions given for plugs are maximum overall measurements and may be used in calculations concerning subfloor clearances.

Figure 7. System/360 Interface Connector (4 inches wide, 1 inch high)

Figure 8. System/360 Card Connector (1-5/8 inches wide, 7/16 inches high)

Figure 9. Power Cord Plug, R&S FS3760 (3-phase, 30-ampere, 4-wire; O D 2-1/4 inches, 4-1/2 inches long)

Figure 10. Power Cord Plug, R&S, SC7328 (3-phase, 60-ampere, 4-wire; O D 3-3/4 inches, 9 inches long)

Figure 11. 200-Pin Signal Connector (7-11/16 inches high, 4-1/8 inches deep, 5-15/16 inches wide)

Figure 12. Tape Power Cable Connector (3-5/8 inches high, 4-1/2 inches deep, 2-1/16 inches wide)
CABLING

9020A SYSTEM ONLY

The following list of cables represents all combinations of external cables required to interconnect the units in the 9020A System. Limitations in cable lengths are in subsequent figures.

These cables are identified at each end with a label containing information as shown in each column. The abbreviations represent card socket (S), socket location (LC), block type (BT), vertical height above the floor in inches (Y) for the "from" machine, and (Z) vertical height for the "to" machine.

Notes are provided where necessary to clarify special cable usage and various assignments.

---

<table>
<thead>
<tr>
<th>GROUP NO</th>
<th>KEY NO</th>
<th>PART NO</th>
<th>MACH</th>
<th>FROM S LC BT Y</th>
<th>TO MACH</th>
<th>S LC BT Z</th>
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<td>H1 B 72</td>
<td>7201-1</td>
<td>G K8 B 24</td>
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<td></td>
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<tr>
<td>5F-10B 5372931 7251-</td>
<td>H7 B 30</td>
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NOTE: Y AND Z IN INCHES
### 9020A System External Cable Listing

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### SE Distributed Simplex Bus 3 to CE and IDCE - Ref. Chart K1-7

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TABLE 1

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<td>C</td>
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Table continues with similar entries for E, F, G, H, J, K, L, M.

Data Bus from CE or IOCE.
Cable Group SF-10 or SF-12
These Cable Groups Are Independent Of Bus Configuration.

Figure 13. Distributed Simplex IOCE/CE to Storage Bus
GROUP 5F-14

FOR CE 1
5F-14A 5372931 7251- D1 B 72 7251- H1 B 72
5F-14B 5372931 7251- D7 B 30 7251- H7 B 30

FOR CE 2
5F-14A 5372931 7251- C1 B 72 7251- G1 B 72
5F-14B 5372931 7251- C7 B 30 7251- G7 B 30

FOR CE 3
5F-14A 5372931 7251- B1 B 72 7251- F1 B 72
5F-14B 5372931 7251- B7 B 30 7251- F7 B 30

FOR CE 4
5F-14A 5372931 7251- A1 B 72 7251- E1 B 72
5F-14B 5372931 7251- A7 B 30 7251- E7 B 30

FOR IOCE 1
5F-14A 5372931 7251- D2 B 66 7251- G2 B 66
5F-14B 5372931 7251- D8 B 24 7251- G8 B 24

FOR IOCE 2
5F-14A 5372931 7251- C2 B 66 7251- F2 B 66
5F-14B 5372931 7251- C8 B 24 7251- F8 B 24

FOR IOCE 3
5F-14A 5372931 7251- B2 B 66 7251- E2 B 66
5F-14B 5372931 7251- B8 B 24 7251- E8 B 24

NOTE 1: THE USAGE OF THIS CABLE GROUP IS DETERMINED ON A DISTRIBUTED SIMPLEX BUS BASIS DEPENDING ON CONFIGURATION OF THAT BUS.
FOR EXAMPLE: REFERING TO FIGURE 13, ASSUME FOUR (4) MOB ON BUS NUMBER 1, NONE BUTTED.
THIS IS TOP LINE OF FIGURE 13. GROUP 5F-14 IS NEEDED THREE (3) TIMES FOR BUS NUMBER 1.
ONCE BETWEEN SE-A AND SE-B; ONCE BETWEEN SE-B AND SE-C; AND ONCE BETWEEN SE-C AND SE-D.
BUS NUMBERS 2 AND 3 ARE LIKewise; AND INDEPENDENTLY EVALUATED.
**9020A SYSTEM EXTERNAL CABLE LISTING**

<table>
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<th>GROUP NO</th>
<th>KEY NO</th>
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<th>SL TO MACH S LC BT</th>
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| SE TO SE DISTRIBUTED SIMPLEX CABLES FOR CE AND IOCE,
ORDER AS NEEDED PER BUS CONFIGURATION. SEE FIGURE 13. |

**GROUP 5F-53 FOR BUTTED 7251-MOB ONLY:**

**GROUP 5F-53**

**FOR CE 1**

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<th>5F-53</th>
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**FOR CE 2**

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**FOR CE 3**

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**FOR IOCE 3**

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</table>

**NOTE 2:** THE USAGE OF THIS CABLE GROUP IS DETERMINED ON A DISTRIBUTED SIMPLEX BUS BASIS DEPENDING ON CONFIGURATION OF THAT BUS AND IS NEED ONLY IF BUTTED MOB EXIST.

FOR EXAMPLE: REFERING TO FIGURE 13. ASSUME FOUR (4) MOB ON BUS NUMBER 2, FIRST TWO BUTTED. THIS IS THE SECOND LINE OF FIGURE 13. GROUP 5F-53 IS NEEDED ONCE BETWEEN SE-E AND SE-F ON BUS NUMBER 2. BUS NUMBERS 1 AND 3 ARE LIKewise, AND INDEPENDENTLY EVALUATED.

ALSO NOTE THAT THIS EXAMPLE REQUIRES ONE (1) GROUP 5F-54 AND ONE (1) GROUP 5F-14 ON BUS NUMBER 2.
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<th>S LC BT</th>
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| SE TO SE DISTRIBUTED SIMPLEX CABLES FOR CE AND IOCE, ORDER AS NEEDED PER BUS CONFIGURATION. SEE FIGURE 13. GROUP SF-54 NEEDED WITH BUTTED 7251-MO8 ONLY.

GROUP SF-54

FOR CE 1

| SF-54 | SF-54A 5372931 7251- | H1 B 72 | 7251- | H1 B 72 |
| SF-54B 5372931 7251- | H7 B 30 | 7251- | H7 B 30 |

FOR CE 2

| SF-54A 5372931 7251- | G1 B 72 | 7251- | G1 B 72 |
| SF-54B 5372931 7251- | G7 B 30 | 7251- | G7 B 30 |

FOR CE 3

| SF-54A 5372931 7251- | F1 B 72 | 7251- | F1 B 72 |
| SF-54B 5372931 7251- | F7 B 30 | 7251- | F7 B 30 |

FOR CE 4

| SF-54A 5372931 7251- | E1 B 72 | 7251- | E1 B 72 |
| SF-54B 5372931 7251- | E7 B 30 | 7251- | E7 B 30 |

FOR IOCE 1

| SF-54A 5372931 7251- | G2 B 66 | 7251- | G2 B 66 |
| SF-54B 5372931 7251- | G8 B 24 | 7251- | G8 B 24 |

FOR IOCE 2

| SF-54A 5372931 7251- | F2 B 66 | 7251- | F2 B 66 |
| SF-54B 5372931 7251- | F8 B 24 | 7251- | F8 B 24 |

FOR IOCE 3

| SF-54A 5372931 7251- | E2 B 66 | 7251- | E2 B 66 |
| SF-54B 5372931 7251- | E8 B 24 | 7251- | E8 B 24 |

NOTE 3: THE USAGE OF THIS CABLE GROUP IS DETERMINED ON A DISTRIBUTED SIMPLEX BUS BASIS DEPENDING ON CONFIGURATION OF THAT BUS AND IS NEEDED ONLY IF BUTTED MO8 EXIST.

FOR EXAMPLE: REFERING TO FIGURE 13. ASSUME TWO (2) MO8 BUTTED AND ONE (1) MO4 ON BUS NUMBER 3 (MO8 FIRST). THIS IS THE SIXTH LINE OF FIGURE 13. GROUP SF-54 IS NEEDED ONCE BETWEEN SE-K AND SE-L ON BUS NUMBER 3. BUS NUMBERS 1 AND 2 ARE LIKewise, AND INDEPENDENTLY EVALUATED. ALSO NOTE THAT THIS EXAMPLE REQUIRES ONE (1) GROUP SF-53 ON BUS NUMBER 3.
### 9020A SYSTEM EXTERNAL CABLE LISTING

#### SIMPLEX CABLES

SE TO CE/IOCE

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<th>S</th>
<th>LC</th>
<th>BT</th>
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SE-2 (MOD 4) TO CE - REF. CHART L1-4

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| SF-11B 5372932 7251-2 | C5 B 44 | 7201-2 | G P7 B 30 |
| SF-11A 5372932 7251-2 | B3 B 60 | 7201-3 | G S6 B 37 |
| SF-11B 5372932 7251-2 | B5 B 44 | 7201-3 | G P7 B 30 |
| SF-11A 5372932 7251-2 | A3 B 60 | 7201-4 | G S6 B 37 |
| SF-11B 5372932 7251-2 | A5 B 44 | 7201-4 | G P7 B 30 |

SE-2 (MOD 8) TO CE - REF. CHART N1-4

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| SF-11B 5372932 7251-2 | H5 B 44 | 7201-1 | G P7 B 30 |
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| SF-11B 5372932 7251-2 | G5 B 44 | 7201-2 | G P7 B 30 |
| SF-11A 5372932 7251-2 | F3 B 60 | 7201-3 | G S6 B 37 |
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| SF-11B 5372932 7251-3 | G5 B 44 | 7201-2 | G R7 B 30 |
| SF-11A 5372932 7251-3 | F3 B 60 | 7201-3 | G R6 B 37 |
| SF-11B 5372932 7251-3 | F5 B 44 | 7201-3 | G R7 B 30 |
| SF-11A 5372932 7251-3 | E3 B 60 | 7201-4 | G R6 B 37 |
| SF-11B 5372932 7251-3 | E5 B 44 | 7201-4 | G R7 B 30 |

### SE-4 (MOD 4) TO CE - REF*, CHART L1-4

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| SF-11A 5372932 7251-4 | C3 B 60 | 7201-2 | G Q6 B 37 |
| SF-11B 5372932 7251-4 | C5 B 44 | 7201-2 | G R7 B 30 |
| SF-11A 5372932 7251-4 | B3 B 60 | 7201-3 | G Q6 B 37 |
| SF-11B 5372932 7251-4 | B5 B 44 | 7201-3 | G R7 B 30 |
| SF-11A 5372932 7251-4 | A3 B 60 | 7201-4 | G Q6 B 37 |
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### SE-4 (MOD 8) TO CE - REF*, CHART N1-4

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| SF-11B 5372932 7251-4 | G5 B 44 | 7201-2 | G R7 B 30 |
| SF-11A 5372932 7251-4 | F3 B 60 | 7201-3 | G Q6 B 37 |
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### 9020A System External Cable Listing

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| SF-11B 5372932 7251-12 | H5 B 44 | 7201-1 | G T8 B 24 |
| SF-11A 5372932 7251-12 | G3 B 60 | 7201-2 | G N5 B 44 |
| SF-11B 5372932 7251-12 | G5 B 44 | 7201-2 | G T8 B 24 |
| SF-11A 5372932 7251-12 | F3 B 60 | 7201-3 | G N5 B 44 |
| SF-11B 5372932 7251-12 | F5 B 44 | 7201-3 | G T8 B 24 |
| SF-11A 5372932 7251-12 | E3 B 60 | 7201-4 | G N5 B 44 |
| SF-11B 5372932 7251-12 | E5 B 44 | 7201-4 | G T8 B 24 |

| SE-1 (MOD 4 OR MOD 8) TO IOCE - REF. CHART L5-7 OR N5-7 | | | | | |
| SF-13 SF-13A 5372932 7251-1 | G4 B 52 | 7231-1 | G M5 B 44 |
| SF-13B 5372932 7251-1 | G6 B 37 | 7231-1 | G M7 B 30 |
| SF-13A 5372932 7251-1 | F4 B 52 | 7231-2 | G M5 B 44 |
| SF-13B 5372932 7251-1 | F6 B 37 | 7231-2 | G M7 B 30 |
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| SF-13B 5372932 7251-1 | E6 B 37 | 7231-3 | G M7 B 30 |

<p>| SE-2 (MOD 4) TO IOCE - REF. CHART L5-7 | | | | | |
| SF-13 SF-13A 5372932 7251-2 | D4 B 52 | 7231-1 | G L5 B 44 |
| SF-13B 5372932 7251-2 | D6 B 37 | 7231-1 | G L7 B 30 |
| SF-13A 5372932 7251-2 | C4 B 52 | 7231-2 | G L5 B 44 |
| SF-13B 5372932 7251-2 | C6 B 37 | 7231-2 | G L7 B 30 |
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| SF-13B | 5372932 7251-2 | F6 B 37 | 7231-2 | G L7 B 30 |
| SF-13A | 5372932 7251-2 | E4 B 52 | 7231-3 | G L5 B 44 |
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| SF-13 | SF-13A | 5372932 7251-3 | G4 B 52 | 7231-1 | G K5 B 44 |
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| SF-13B | 5372932 7251-3 | F6 B 37 | 7231-2 | G K7 B 30 |
| SF-13A | 5372932 7251-3 | E4 B 52 | 7231-3 | G K5 B 44 |
| SF-13B | 5372932 7251-3 | E6 B 37 | 7231-3 | G K7 B 30 |

**SE-4 (MOD 4) TO IOCE - REF. CHART L5-7**

| SF-13 | SF-13A | 5372932 7251-4 | D4 B 52 | 7231-1 | G J5 B 44 |
| SF-13B | 5372932 7251-4 | D6 B 37 | 7231-1 | G J7 B 30 |
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**SE-4 (MOD 8) TO IOCE - REF. CHART N5-7**

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**SE-6 (MOD 4) TO IOCE - REF. CHART L5-7**

| SF-13    | SF-13A | 5372932 7251-6 | D4 B 52 | 7231-1 | G G5 B 44 |
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| SF-13A   | 5372932 7251-6 | B4 B 52 | 7231-3 | G G5 B 44 |
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**SE-6 (MOD 8) TO IOCE - REF. CHART N5-7**

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**SE-7 (MOD 4 OR MOD 8) TO IOCE - REF. CHART L5-7 OR N5-7**

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#### SE-11 (MOD 4 OR MOD 8) TO IOCE - REF. CHART L5-7 OR N5-7

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#### SE-12 (MOD 4) TO IOCE - REF. CHART L5-7

| SF-13 | SF-13A | 5372932 | 7251-12  | D4 8 52 | 7231-1  | G A5 B 44 |
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| SF-13B | 5372932 | 7251-12  | C6 8 37  | 7231-2  | G A7 B 30 |
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#### SE-12 (MOD 8) TO IOCE - REF. CHART N5-7

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SEE NOTE 5 FOR 7251-08 NOT BUTTED

| 5F-52 5F-52A 5736191 7251- | A 07 | 7251- | H6 B 37 |

FOR 7251-08 ONLY

5F-55 5F-55A 5789760 SEE NOTE 4 FOR FULL DETAILS

CABLE PRINT SPECIFIES ALL DIMENSIONS.
### 9020A System External Cable Listing

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Note 4 - 7251 MOD 8 to be connected as shown below.

- 7251 MOD 8 - BUTTED

Cable SF-15A from S/C (7265) to stub cable 5789760 B PLUG INTO H6 ODD NUMBERED 7251 MOD 8

### Required Quantities of Cable P/N 5789760 (Per System)

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Note 5: The last even numbered connector of stub cable P/N 5789760 is left unplugged if the total number of 7251 MOD 8 on a system is odd. If there are also 7251 MOD 3 or 4 machines on the system refer to system console pads page 10500 for connecting SE indicators on the system console operators panel.

Cable SF-15A from S/C (7265) to stub cable 5789760 B PLUG INTO H6 ODD NUMBERED 7251 MOD 8

### Required Quantities of Cable P/N 5736191 (Per System)

Group SF-62.

One cable is required for each unbutted pair of 7251-MOB on the system. Round the number of stand alone (un-butted) 7251-MOB on the system to the next lower even number, divide by 2 to arrive at the number of cables required.
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- SF-04 SF-04F 5372931 7201-3 A4 B 52 7201-4 F5 B 44
- SF-04 SF-04G 5372931 7201-3 E6 B 37 7201-4 C5 B 44
- SF-04 SF-04H 5372931 7201-3 B3 B 60 7201-4 D3 B 66
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**CE TO IOCE FOR 1ST CE — REF. CHART E-G-1**

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**CE to CE for 2nd IDCE - Ref. Chart F-2-4**

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**CE to CE for 3rd IDCE - Ref. Chart G-2-4**

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**IOCE-1 to CE - Ref. Chart E-1-4**

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| **IOCE TO IOCE FOR 2ND CE - REF. CHART F-G-2** |
| SF-22   | 5F-22A | 5372931 | 7231-1    | G E1 B 72 | 7231-2 | G E3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-1    | G E2 B 66 | 7231-2 | G E4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-1    | K C1 B 51 | 7231-2 | K G1 B 51 |
| SF-22   | 5F-22A | 5372931 | 7231-2    | G E1 B 72 | 7231-3 | G E3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-2    | G E2 B 66 | 7231-3 | G E4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-2    | K C1 B 51 | 7231-3 | K G1 B 51 |

| **IOCE TO IOCE FOR 3RD CE - REF. CHART F-G-3** |
| SF-22   | 5F-22A | 5372931 | 7231-1    | G D1 B 72 | 7231-2 | G D3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-1    | G D2 B 66 | 7231-2 | G D4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-1    | K D1 B 51 | 7231-2 | K H1 B 51 |
| SF-22   | 5F-22A | 5372931 | 7231-2    | G D1 B 72 | 7231-3 | G D3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-2    | G D2 B 66 | 7231-3 | G D4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-2    | K D1 B 51 | 7231-3 | K H1 B 51 |

| **IOCE TO IOCE FOR 4TH CE - REF. CHART F-G-4** |
| SF-22   | 5F-22A | 5372931 | 7231-1    | G C1 B 72 | 7231-2 | G C3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-1    | G C2 B 66 | 7231-2 | G C4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-1    | K E1 B 51 | 7231-2 | K J1 B 51 |
| SF-22   | 5F-22A | 5372931 | 7231-2    | G C1 B 72 | 7231-3 | G C3 B 60 |
| SF-22   | 5F-22B | 5372931 | 7231-2    | G C2 B 66 | 7231-3 | G C4 B 52 |
| SF-22   | 5F-22C | 5372931 | 7231-2    | K E1 B 51 | 7231-3 | K J1 B 51 |
## 9020A System External Cable Listing

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9020A SYSTEM EXTERNAL CABLE LISTING

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MULTIPLEX CHANNEL TO 1ST CTRL DEVICE - REF CHART R-T

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CTRL TO CTRL - REF. CHART R=S

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NOTE 6 FOLLOWING ARE THE LOCATIONS FOR THE TO END OF THE CABLE, DEPENDING ON THE CONTROL UNIT MODEL NUMBER.

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<td>1C-A2 1C-A6 TO HAVE SECONDARY LOCATIONS FOR MPX CHANNEL CABLES</td>
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NOTE 7 FOLLOWING ARE THE LOCATIONS FOR THE FROM END OF THE CABLE, DEPENDING ON THE CONTROL UNIT MODEL NUMBER:

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PAM TO SC - REF. CHART R-T-21

| TCU TO CE - REF. CHART U-V-1 SEE B/M 5443301 FOR TERMINATORS REQUIRED WITH EACH 5F-32 GROUP

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**TCU TO TCU FOR 2ND CE - REF. CHART U-V-2**

- SF-33 SF-33A 5372931 2803-1
- SF-33 SF-33A 5372931 2803-2
- SF-33 SF-33A 5372931 2803A-1
- SF-33 SF-33A 5372931 2803A-2

**TCU TO TCU FOR 3RD CE - REF. CHART U-V-3**

- SF-33 SF-33A 5372931 2803-1
- SF-33 SF-33A 5372931 2803-2
- SF-33 SF-33A 5372931 2803A-1
- SF-33 SF-33A 5372931 2803A-2

**TCU TO TCU FOR 4TH CE - REF. CHART U-V-4**

- SF-33 SF-33A 5372931 2803-1
- SF-33 SF-33A 5372931 2803-2
- SF-33 SF-33A 5372931 2803A-1
- SF-33 SF-33A 5372931 2803A-2

**SCU TO CE - REF CHART Y-1-4** SEE B/M 5443301 FOR TERMINATORS REQUIRED WITH EACH SF-57 GROUP

- SF-57 SF-57A 5372931 2314A
- SF-57 SF-57A 5372931 2314A
- SF-57 SF-57A 5372931 2314A
- SF-57 SF-57A 5372931 2314A

**SCU TO SCU FOR 1ST CE REF. CHART Y-Z-1**

- SF-58 SF-58A 5372931 2314A-1
- SF-58 SF-58A 2314A-2

**SCU TO SCU FOR 2ND CE REF. CHART Y-Z-2**

- SF-58 SF-58A 5372931 2314A-1
- SF-58 SF-58A 2314A-2

**SCU TO SCU FOR 3RD CE REF CHART Y-Z-3**

- SF-58 SF-58A 5372931 2314A-1
- SF-58 SF-58A 2314A-2

**SCU TO SCU FOR 4TH CE REF CHART Y-Z-4**

- SF-58 SF-58A 5372931 2314A-1
- SF-58 SF-58A 2314A-2
FA64WA-5223

0920 SYSTEM EXTERNAL CABLE LISTING

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<th>TO MACH</th>
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**IOCE SELECTOR CHANNEL** - FOR TCU 2701, 6006A AND 2314A

SELECTOR CHANNEL TO 1ST CONTROL DEVICE - REF. CHARTS U-W(TCU) Y-ZA(SCU)

5F-34 5F-34B 5353920 7231
5F-34 5F-34T 5353920 7231

NOTE 8 FOLLOWING ARE THE LOCATIONS FOR THE FROM END OF THE CABLES DEPENDING ON IOCE CHANNEL NUMBER

KEY CH 1 CH 2 CH 3
B G A6 37 G C6 37 K F2 50
T G B6 37 G D6 37 K G2 50

CONTROL DEVICE TO CONTROL DEVICE REF. CHARTS U-W(TCU) Y-ZA(SCU)

5F-36 5F-36B 5353920 CTRL
5F-36 5F-36T 5353920 CTRL

NOTE 10 FOLLOWING ARE THE LOCATIONS FOR THE TO END OF THE CABLE DEPENDING ON THE CONTROL UNIT MODEL NUMBER.

KEY CTRL PRI LOC SEC LOC BT Z
B 2803 2 9 1 1 A 18
T 2803 2 11 1 2 A 18
B 2803A T-A2A1 U-A2A1 A 18
T 2803A T-A2B1 U-A2B1 A 18
B 2701 2 A3 2 B3 A 18
T 2701 2 A4 2 B4 A 18
B 2314A S A1 S B1 A 20
T 2314A S A2 S B2 A 20
B 7231 G G4 ---- ---- A 52 Y INTERFACE FOR CHANNEL TO CHANNEL
T 7231 G H4 ---- ---- A 52 ADAPTER INSTALLED ON SELECTOR CHANNEL 1 SEE NOTE 11
B 7231 G G3 ---- ---- A 60 Y INTERFACE FOR CHANNEL TO CHANNEL
T 7231 G H3 ---- ---- A 60 ADAPTER INSTALLED ON SELECTOR CHANNEL 2 SEE NOTE 11
### System External Cable Listing

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<th>PART NO</th>
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**NOTE 10** The following are the locations for the **FROM** end of the cable depending on the control unit model number.

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<td>U-A2C1</td>
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<td>2 B5</td>
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**TCU TO SC FOR TCU-1** - REF. CHART U-22

- **5F-37 5F-37A 5372932 2803-1**
  - 2 13 B 14 7265 S1 J1 B 26
- **5F-37 5F-37B 352303 2803-1**
  - 2 J1 14 7265 S2 J25 24
- **5F-37 5F-37A 5372932 2803A-1**
  - S-A4D1 B 24 7265 S1 J1 B 26
- **5F-37 5F-37B 352303 2803A-1**
  - 2 J1 14 7265 S2 J25 24

**TCU TO SC FOR TCU-2** - REF. CHART V-22

- **5F-37 5F-37A 5372932 2803-2**
  - 2 13 B 14 7265 S1 H1 B 27
- **5F-37 5F-37B 352303 2803-2**
  - 2 J1 14 7265 S2 J26 24
- **5F-37 5F-37A 5372932 2803A-2**
  - S-A4D1 B 24 7265 S1 H1 B 27
- **5F-37 5F-37B 352303 2803A-2**
  - 2 J1 14 7265 S2 J26 24

**TCU TO SC FOR TCU-3** - REF. CHART W-22

- **5F-37 5F-37A 5372932 2803-3**
  - 2 13 B 14 7265 S1 G1 B 28
- **5F-37 5F-37B 352303 2803-3**
  - 2 J1 14 7265 S2 J27 25
- **5F-37 5F-37A 5372932 2803A-3**
  - S-A4D1 B 24 7265 S1 G1 B 28
- **5F-37 5F-37B 352303 2803A-3**
  - 2 J1 14 7265 S2 J27 25
SCU TO SC FOR SCU 1 REF CHART Y-22

5F-59 5F-59A 5372932 2314A-1 T A5 B 8 7265 S1 D2 B 31
5F-59 5F-59B 352303 2314A-1 PC 1 24 7265 S2 J36 36

SCU TO SC FOR SCU 2 REF CHART Z-22

5F-59 5F-59A 5372932 2314A-2 T A5 B 8 7265 S1 E2 B 30
5F-59 5F-59B 352303 2314A-2 PC 1 24 7265 S2 J37 36

SCU TO SC FOR SCU 3 REF CHART ZA-22

5F-59 5F-59A 5372932 2314A-3 T A5 B 8 7265 S1 F2 B 29
5F-59 5F-59B 352303 2314A-3 PC 1 24 7265 S2 J38 36

SC TO 2821-1 SEE NOTE 6 AND NOTE 7 FOR CTRL TO CTRL CABLES IF ADDITIONAL CTRL UNITS ARE TO BE ATTACHED WITH 2821-1 ON THE SYSTEM CONSOLE SWITCHABLE MPX CHANNEL

5F-38 5F-38B 5353920 7265 S3 Q3 B 20 2821 A1 A 30
5F-38 5F-38T 5353920 7265 S3 P3 B 21 2821 A2 A 30
5F-38 5F-38A 352303 7265 S2 J24 27 2821 JP1

SC TO 2821-2 SEE NOTE 6 AND NOTE 7 FOR CTRL TO CTRL CABLES

5F-38 5F-38A 352303 7265 S4 J1 27 2821 JP1

PAM TO 1052 FOR PAM-1

5F-39 5F-39A 5393079 7289-1 S1 E5 A 48 1052 F CE A 12
5F-39 5F-39B 5392810 7289-1 S4 R1 54 1052 G J6 16
5F-39 5F-39C 5392809 7289-1 S1 F5 A 39 1052 KEY B A 12

PAM TO 1052 FOR PAM-2

5F-39 5F-39A 5393079 7289-2 S1 E5 A 48 1052 F CE A 12
5F-39 5F-39B 5392810 7289-2 S4 R1 54 1052 G J7 16
5F-39 5F-39C 5392809 7289-2 S1 F5 A 39 1052 KEY B A 12

PAM TO 1052 FOR PAM-3

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5F-39 5F-39B 5392810 7289-3 S4 R1 54 1052 G J8 16
5F-39 5F-39C 5392809 7289-3 S1 F5 A 39 1052 KEY B A 12

Cabling 87


### 9020A System External Cable Listing

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**5F-56 5F-56A 5421305**

**Note 12** Frame 9020 System Bond Plate

Note 12 Bond Cable P/N 5421305 has a Total Fixed Length of 33.0 Feet. The total "X" length is 30 Feet. One Bond Cable is required for each of the following 9020 System Elements and connects the Element Frame to the System Bond Plate under the Floor 7201-01, 7231-02, 7251-03, 7251-04, 7251-08, 7265-02, 7289-02, 7289-03, 2803-01, 2803A-01, 2821 and 2314A. Only one Bond Cable is required when two 7251-08 Elements are buttet together.

Cable Group (Prefix 5F-) Number Reference Chart —Part One—

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88
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* DCU= PAM= TCU SCU ARE MULTIPLEX AND SELECTOR CHANNELS FOR IDCE. IT IS NECESSARY TO KNOW CONFIGURATION DESIRED. SEE NOTES IN APPROPRIATE CABLE GROUP(S) OF LISTING.
* SC REQUIRES 5F-16 LAST CE TO SC —ONE TIME FOR 9020 SYSTEM— IN ADDITION TO INDICATED CABLE GROUP(S).

INSTRUCTIONS

NUMBER(S) AT MATRIX INTERSECTION = CABLE GROUP(S) REQUIRED FOR INTERFACE. 5F PREFIX ASSUMED.

LETTER AND NUMBER IN LOCATION = INDICATES LOCATION THAT CABLE GROUP(S) MAY BE FOUND FOR INTERFACE DEFINED BY MATRIX. NOTE FOR EXAMPLE THAT N1-7 MEANS N1 THRU N7.

CROSSHATCHED LOCATIONS = INVALID INTERFACES

* = REQUIRES FURTHER DEFINITION BY NOTES LOCATED UNDER CHART.

NOTE: THIS CHART DOES NOT CONTAIN ANY INPUT OR OUTPUT EQUIPMENT. EQUIPMENT INCLUDED:

CE 7201-01
IDCE 7231-02
SE 7251-03
SE 7251-04
SE 7251-08
SCU 7214-A1
PAM 7289-02
FSP 7289-03
TCU 2803-01 **MSM**
TCU 2803A-01 **SLT**
SC 7265-02

NOTE 1 GROUP 5F-60 IS REQUIRED WITH DUPLEX; GROUP 5F-61 WITH TRIPLEX.
<table>
<thead>
<tr>
<th>Cable Group</th>
<th>SCU 1</th>
<th>SCU 2</th>
<th>SCU 3</th>
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<tbody>
<tr>
<td>CE 1</td>
<td>57</td>
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<td>CE 2</td>
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<td>CE 3</td>
<td>57</td>
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<td>CE 4</td>
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<tr>
<td>I0CE 1</td>
<td>34</td>
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<tr>
<td>I0CE 2</td>
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<tr>
<td>SE BUS 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SE BUS 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SE BUS 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EACH SE MOD 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EACH SE MOD 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EACH SE MOD 8</td>
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<td>TCU 1</td>
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<td>SC</td>
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<td>SCU 1</td>
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<td>SCU 3</td>
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<td></td>
<td>36</td>
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</tbody>
</table>
# 9020A System External Cable Listing

## CABLE GROUP (PREFIX SF-) B/M Reference Chart

<table>
<thead>
<tr>
<th>B/M Number</th>
<th>Quant. and P/N of Cables</th>
<th>Cable Group(s) in B/M</th>
</tr>
</thead>
<tbody>
<tr>
<td>5402266</td>
<td>2-5372931</td>
<td>SF- 10 - 12</td>
</tr>
<tr>
<td>5402267</td>
<td>2-5372932</td>
<td>SF- 11 - 13</td>
</tr>
<tr>
<td>5402269</td>
<td>4-5372931</td>
<td>SF- 18</td>
</tr>
<tr>
<td>5402270</td>
<td>2-5372931</td>
<td>SF- 14 - 53 - 54</td>
</tr>
<tr>
<td>5402272</td>
<td>3-5372931</td>
<td>SF- 21 - 22 - 50</td>
</tr>
<tr>
<td>5402279</td>
<td>2-5353920</td>
<td>SF- 27 - 28 - 34 - 36</td>
</tr>
<tr>
<td>5402284</td>
<td>1-5372931</td>
<td>SF- 19 - 20 - 26 - 33 - 58</td>
</tr>
<tr>
<td>5402287</td>
<td>4-5372932</td>
<td>SF- 16 - 17</td>
</tr>
<tr>
<td>5402288</td>
<td>1-5372932</td>
<td>SF- 02 - 15 - 24 - 31 - 37 - 59</td>
</tr>
<tr>
<td>5402292</td>
<td>30-5372931</td>
<td>SF- 04</td>
</tr>
<tr>
<td>5402293</td>
<td>8-5372931</td>
<td>SF- 03</td>
</tr>
<tr>
<td>5402295</td>
<td>1-5353920</td>
<td>SF- 01</td>
</tr>
<tr>
<td>5402296</td>
<td>1-5392809</td>
<td>SF- 39</td>
</tr>
<tr>
<td>5402297</td>
<td>2-5353920</td>
<td>SF- 38</td>
</tr>
<tr>
<td>5402276</td>
<td>1-5716132</td>
<td>SF- 19 - 20 - 26 - 33 - 58</td>
</tr>
<tr>
<td>5443301</td>
<td>1-5716197</td>
<td>SF- 40</td>
</tr>
<tr>
<td>5447611</td>
<td>5-5372931</td>
<td>SF- 29 - 32 - 57</td>
</tr>
<tr>
<td>5447612</td>
<td>1-5789760</td>
<td>SF- 51</td>
</tr>
<tr>
<td>5447616</td>
<td>1-5372932</td>
<td>SF- 52</td>
</tr>
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</table>

### Unused Group Numbers: None

### Obsolete "SF-40 GROUP - SC TO 1052"

---

END OF DOCUMENT

---
2821 Control Unit Model 1 Cabling Schematic

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>503</td>
<td>2</td>
<td>2540</td>
<td>First 2821</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>504</td>
<td>3</td>
<td>1403</td>
<td>First 2821</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>SF-28</td>
<td>2</td>
<td>Second 2821</td>
<td>7265-02</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>SF-38</td>
<td>3</td>
<td>First 2821</td>
<td>7265-02</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
1. Second 2821 only requires this cable in addition to SF-38 for two-channel switch feature. See cable listing for SF-28 and associated Note 6 in this section.
Maximum Serial or Loop Cabling Length

Maximum Cable Length Floor to Floor: \( R+S+T = 100' \); \( U+V+W+X = 150' \); \( Y+Z+AA = 150' \); \( AB+AC+AD+AE+AF = 150' \)

See Figure 13 for maximum allowable distributed simplex cable IOCE and CE to storage bus for various combinations of 7251 Models 3, 4, and 8.

Maximum Cable Length Floor to Floor: \( A + B + C = 200' \); \( H + J = 200' \); \( E + F = 200' \)

* The 200-foot maximum is for the units shown and should also be used as a planning guide when attaching other external devices to the 9020 System selector channels. However, there may be specific instances where greater distances are required. In these instances, consult the planning coordinator at the FAA Project Office.

** Last 2314 must be within 100 feet the 7231-02.
9020D/E SYSTEMS ONLY

In this section, cabling schematic diagrams are provided for each element, I/O unit, and group of elements or units. Each cable group and its paths are depicted on the schematic. A line may represent a path for one or more groups.

"From" and "to" designations, cable quantities, and significant notes are given for each cable group. The notes represent pertinent information necessary for ordering cables.

A system cable order form for 9020D/E systems is provided in the Appendix. To order cables, identify the groups required for your configuration and list the "x" length in the appropriate column on the form. The cabling schematics and related notes define the cable groups needed to interconnect all elements and units of a 9020D or 9020E system.
Cable Length Limitations for CE-CE Distributed Simplex Buses

The maximum serial length of cable allowed for any of the following configurations is 100 feet. For example, the serial cable used for the 6F-13 groups in either configuration cannot exceed 100 feet.

*Group 6F-17 is used only with triplex configurations.
<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-07</td>
<td>1</td>
<td>CE 2</td>
<td>CE 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6F-08</td>
<td>1</td>
<td>CE 3</td>
<td>CE 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6F-09</td>
<td>1</td>
<td>CE 4</td>
<td>CE 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6F-11</td>
<td>3</td>
<td>CE</td>
<td>CE</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-13</td>
<td>3</td>
<td>CE</td>
<td>CE</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-14</td>
<td>1</td>
<td>CE</td>
<td>CE</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6F-15</td>
<td>3</td>
<td>CE</td>
<td>CE</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-16</td>
<td>3</td>
<td>CE</td>
<td>CE</td>
<td>2, 3, 5</td>
<td></td>
</tr>
<tr>
<td>6F-17</td>
<td>6</td>
<td>CE 3</td>
<td>CE 2</td>
<td>2, 3, 4</td>
<td></td>
</tr>
<tr>
<td>6F-18</td>
<td>1</td>
<td>CE</td>
<td>Bond Plate</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. The "x" length can be no greater than the straight-line distance from the center of the cable exit to the center of the cable entry hole plus twice the height of the raised floor.
2. One group required where shown. The total number of groups needed depends on the number of CE's in the configuration.
3. Part of a CE-CE distributed simplex bus; refer to "Cable Length Limitations for CE-CE Distributed Simplex Buses" for the total length of serial cable allowed for any combination of these groups.
4. Used only on a triplex configuration.
5. Used only on a quad configuration.
6. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between each CE and a system bond plate under the floor.
NOTES:
1. One group required between CE 3 and CE 1, CE 2 and CE 1, CE 4 and CE 2 (QUAD only) for each IOCE in the configuration.
2. The maximum serial length of cable allowed for group 6F-23 plus the total length of the 6F-10 groups used cannot exceed 150 feet.
3. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between each IOCE and a system bond plate under the floor.
4. One group required from IOCE 1 to each CE in the configuration.
5. The maximum serial length of cable allowed for group 6F-20 plus the total length of the 6F-21 groups used cannot exceed 150 feet.
6. One group required between IOCE's for each CE in the configuration.
7. One group to each CE from each IOCE in the configuration.
8. One group required from each IOCE to CE 3.
7251-09 Storage Element
Cabling Schematic (for 9020D System)

Group No. | No. of Cables | From | To   | Maximum Length (ft) | Notes |
----------|---------------|------|------|---------------------|-------|
6F-01     | 1             | SE   | CE   | 75                  | 1,7   |
6F-02     | 2             | SE   | IOCE | 70                  | 2     |
6F-03     | 2             | SE 1 | IOCE | 70                  | 3,4   |
6F-03     | 2             | SE 3 | IOCE |                     | 4     |
6F-03     | 2             | SE 4 | IOCE |                     | 4     |
6F-04     | 2             | SE 1 | SE 2 |                      | 3,5   |
6F-05     | 12            | SE   | SE   | 30                  | 6     |
6F-18     | 1             | SE   | Bond Plate |               | 8     |

NOTES:
1. One group from each SE to each CE in the configuration.
2. One group from each SE to each IOCE in the configuration.
3. The total serial length of groups 6F-03 and 6F-04 cannot exceed 85 feet.
4. One group from SE 1, SE 3, and SE 4 to each IOCE in the configuration.
5. One group required for each CE in the configuration to connect one contiguous wall section with another.
6. One group required for each IOCE in the configuration to connect one contiguous wall section with another.
7. The "x" length cannot be larger than the straight-line distance from the center of the cable exit to the center of the cable entry hole plus twice the height of the raised floor.
8. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between each SE and a system bond plate under the floor.
Notes:
DG to DE cabling is not shown; see the 9020 D/E system installation manual (FEIM) for specific plugging locations for DG cables.

Cable Ordering Instructions
For an original system order, specify the groups required for your configuration.
For expansion to less than four DE's:
- Specify the additional groups required.
- Relocate the "from" end of cable group 6F-42, when expanding from two DE's to three DE's.
- Relocate the "from" end of cable group 6F-43, when expanding from three DE's to four DE's.
For expansion to a five-DE configuration, see "Special Instructions for Expanding to a Five-DE, 17-DG Configuration."
### 7251-09 Storage Element, 7289-04 Display Element, Cabling Schematic (9020E System)

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-01</td>
<td>1</td>
<td>SE</td>
<td>CE</td>
<td>1</td>
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<tr>
<td>6F-02</td>
<td>2</td>
<td>SE</td>
<td>IOCE</td>
<td>75</td>
<td>2</td>
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<td>6F-03</td>
<td>2</td>
<td>SE 1</td>
<td>IOCE</td>
<td>75</td>
<td>3</td>
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<td>6F-03</td>
<td>2</td>
<td>SE 3</td>
<td>IOCE</td>
<td>75</td>
<td>3</td>
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<tr>
<td>6F-06</td>
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<td>SE/DE</td>
<td>DE/SE</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>6F-18</td>
<td>1</td>
<td>DE</td>
<td>Bond Plate</td>
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</tr>
<tr>
<td>6F-36</td>
<td>2</td>
<td>DE</td>
<td>CE</td>
<td>5, 6</td>
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</table>

For a two-DE configuration with 1, 2, 3, or 4 DG's:

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<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-41</td>
<td>3</td>
<td>DE 2</td>
<td>DE 1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6F-42</td>
<td>1</td>
<td>DE 2</td>
<td>DE 1</td>
<td>18</td>
<td>11, 13</td>
</tr>
</tbody>
</table>

For a three-DE configuration with 5, 6, 7, or 8 DG's:

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-41</td>
<td>3</td>
<td>DE 2</td>
<td>DE 1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6F-42</td>
<td>1</td>
<td>DE 3</td>
<td>DE 1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6F-43</td>
<td>2</td>
<td>DE 3</td>
<td>DE 1</td>
<td>34</td>
<td>12, 14</td>
</tr>
<tr>
<td>6F-44</td>
<td>2</td>
<td>DE 3</td>
<td>DE 2</td>
<td>12</td>
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</tr>
</tbody>
</table>

For a four-DE configuration with 9, 10, 11, or 12 DG's:

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
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<tr>
<td>6F-41</td>
<td>3</td>
<td>DE 2</td>
<td>DE 1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6F-42</td>
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<td>DE 3</td>
<td>DE 1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6F-43</td>
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<td>DE 4</td>
<td>DE 1</td>
<td>34</td>
<td>12, 14</td>
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<tr>
<td>6F-44</td>
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<td>DE 3</td>
<td>DE 2</td>
<td>12</td>
<td></td>
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<tr>
<td>6F-45</td>
<td>3</td>
<td>DE 4</td>
<td>DE 1</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>6F-46</td>
<td>1</td>
<td>DE 3</td>
<td>DE 1</td>
<td>18</td>
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</tr>
</tbody>
</table>

For a five-DE configuration with 13, 14, 15, 16, or 17 DG's:

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-42</td>
<td>1</td>
<td>DE 3</td>
<td>DE 1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6F-43</td>
<td>2</td>
<td>DE 5</td>
<td>DE 1</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>6F-44</td>
<td>2</td>
<td>DE 3</td>
<td>DE 2</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6F-46</td>
<td>1</td>
<td>DE 3</td>
<td>DE 1</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>6F-47</td>
<td>3</td>
<td>DE 5</td>
<td>DE 1</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>6F-47</td>
<td>3</td>
<td>DE 2</td>
<td>DE 1</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>6F-48</td>
<td>1</td>
<td>DE 3</td>
<td>DE 1</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>6F-49</td>
<td>1</td>
<td>DE 5</td>
<td>DE 1</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. One group from each SE to each CE in the configuration.
2. One group from each SE to each IOCE in the configuration.
3. One group from SE 1 and SE 3 to each IOCE in the configuration.
4. One group required for each CE in the system, to connect contiguous wall sections.
5. One group from each DE to each CE in the configuration.
6. The "x" length cannot be longer than the straight-line distance from the center of the cable exit hole to the center of the cable entry hole plus twice the height of the raised floor.
7. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between each DE and a system bond plate under the floor.
8. Used only on a four-DE configuration.
9. Used only on a five-DE configuration.
10. Used on both four-DE and five-DE configurations.
11. Specify one group for an original two-DE or three-DE system order; reuse when expanding to a three-DE configuration by relabeling and relocating the "from" end of the group.
12. Specify one group for an original three-DE or four-DE system order; reuse when expanding to a four-DE or five-DE configuration by relabeling and relocating the "from" end of the group.
13. Must be ordered at maximum length (18 feet).
14. Must be ordered at maximum length (34 feet).
Special Instructions for Expanding to a Five-DE, 17-DG Configuration

To expand from a two-DE, four-DG configuration:

1. Convert group 6F-41 to group 6F-47 by relabeling cables, and relocate the group to new tailgate positions on DE 1.

2. Relabel and relocate the "from" end of cable group 6F-42 on the tailgate of DE 3.

3. Order cable groups 6F-43, 6F-44, 6F-46, 6F-47 (two groups, for DE 5 to DE 4 and DE 4 to DE 3), 6F-48, and 6F-49.

To expand from a three-DE, eight-DG configuration:

1. Convert group 6F-41 to 6F-47 by relabeling cables, and relocate it to new tailgate positions on DE 1.

2. Relabel the "from" end of cable group 6F-43, relocating it to a new tailgate position from DE 5.

3. Order cable groups 6F-46, 6F-47 (twice, for DE 5-DE 4 and DE 4-DE 3), 6F-48, and 6F-49.

To expand from a four-DE, 13-DG configuration:

1. Convert group 6F-41 and group 6F-45 to two 6F-47 groups by relabeling cables, and relocate the groups to their new positions on the tailgates of DE's 1 and 2 and DE's 4 and 5, respectively.

2. Relabel the "from" end of group 6F-43, relocating it to its new tailgate position on DE 5.

7289-04 Display Element Wrap Bus Cabling Schematic

NOTES:
- Internal cabling required to complete the serial bus. Internal cabling between DE 3 and DE 4 is used only when a fourth CE is not in the configuration.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-37</td>
<td>1</td>
<td>CE 3</td>
<td>CE 1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>6F-38</td>
<td>1</td>
<td>CE 1</td>
<td>DE 1</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>6F-39</td>
<td>1</td>
<td>DE</td>
<td>CE 2</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>6F-40</td>
<td>1</td>
<td>DE</td>
<td>CE 4</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

NOTES:
1. One group required from DE 1 and DE 2 to CE 2.
2. One group required from DE 3 and DE 4 to CE 4.
7265-02 System Console Cabling Schematic

9020A cable group numbers, enclosed in parentheses, for reference only.
## 7265-02 System Console Cabling Schematic

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-12</td>
<td>4</td>
<td>CE</td>
<td>CE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F-18</td>
<td>1</td>
<td>SC</td>
<td>Bond Plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F-24</td>
<td>4</td>
<td>SC</td>
<td>CE 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F-25</td>
<td>4</td>
<td>SC</td>
<td>CE 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F-26</td>
<td>4</td>
<td>SC</td>
<td>CE 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6F-27</td>
<td>2</td>
<td>CE</td>
<td>SC</td>
<td>100</td>
<td>2,6</td>
</tr>
<tr>
<td>6F-28</td>
<td>2</td>
<td>SE</td>
<td>SC</td>
<td>100</td>
<td>1,2</td>
</tr>
<tr>
<td>6F-29</td>
<td>2</td>
<td>IOCE</td>
<td>SC</td>
<td>100</td>
<td>2,7</td>
</tr>
<tr>
<td>6F-74</td>
<td>2</td>
<td>SC</td>
<td>Ctl Unit</td>
<td></td>
<td>8,9</td>
</tr>
<tr>
<td>6F-75</td>
<td>2</td>
<td>SC</td>
<td>IOCE</td>
<td></td>
<td>8,9</td>
</tr>
</tbody>
</table>

### NOTES:

1. One group required from each SE to the System Console.
2. Contains one EPO cable.
3. The total cable length allowed for group 6F-24 + (6F-25 or 6F-26) plus the number of 6F-12 groups used between the CE's is 150 feet.
4. Used only on a triplex system.
5. Used only on a quad system.
6. One group from each CE to the System Console.
7. One group from each IOCE to the System Console.
8. Multiplexer channel cabling.
9. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
10. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between the System Console and a system bond plate under the floor.
7265-03 Configuration Console Cabling Schematic

7251-09 SE 1-5
7289-04 DE 1-5
7201-02 CE 3
7201-02 CE 1
7201-02 CE 2
7201-02 CE 4
6F-56
6F-57
6F-58 Ctl Unit, Mpx
6F-59 IOCE, Mpx
6F-52, 6F-54
6F-53, 6F-54
6F-54
Sys Bond
6F-18
6F-55
7231-02 IOCE 1
7231-02 IOCE 2
7265-03 Configuration Console
### 7265-03 Configuration Console

#### Cabling Schematic

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-12</td>
<td>4</td>
<td>CE</td>
<td>CE</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6F-18</td>
<td>1</td>
<td>CC</td>
<td>Bond Plate</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6F-51</td>
<td>4</td>
<td>CC</td>
<td>CE 3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6F-52</td>
<td>4</td>
<td>CC</td>
<td>CE 2</td>
<td>4,5</td>
<td></td>
</tr>
<tr>
<td>6F-53</td>
<td>4</td>
<td>CC</td>
<td>CE 4</td>
<td>4,6</td>
<td></td>
</tr>
<tr>
<td>6F-54</td>
<td>3</td>
<td>CE</td>
<td>CC</td>
<td>100</td>
<td>3,7,9</td>
</tr>
<tr>
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<td>2</td>
<td>IOCE</td>
<td>CC</td>
<td>100</td>
<td>3,8,9</td>
</tr>
<tr>
<td>6F-56</td>
<td>2</td>
<td>SE</td>
<td>CC</td>
<td>100</td>
<td>1,3,9</td>
</tr>
<tr>
<td>6F-57</td>
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<td>DE</td>
<td>CC</td>
<td>100</td>
<td>2,3,9</td>
</tr>
<tr>
<td>6F-68</td>
<td>2</td>
<td>CC</td>
<td>Ctrl Unit</td>
<td>11,12</td>
<td></td>
</tr>
<tr>
<td>6F-69</td>
<td>2</td>
<td>CC</td>
<td>IOCE</td>
<td>11,12</td>
<td></td>
</tr>
</tbody>
</table>

#### NOTES:

1. One group required from each SE to the Configuration Console.
2. One group required from each DE to the Configuration Console.
3. Contains one EPO cable.
4. The total cable length allowed for group 6F-51 + (6F-52 or 6F-53) plus the length of the 6F-12 groups between the CE's is 150 feet.
5. Used only on a triplex system.
6. Used only on a quad system.
7. One group from each CE to the Configuration Console.
8. One group from each IOCE to the Configuration Console.
9. Cables enter configuration console at two different holes; specify length (distance) to the furthest hole.
10. The bond cable has a fixed "x" length of 30 feet. One bond cable is required between the Configuration Console and a system bond plate under the floor.
11. Multiplexer channel cabling.
12. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
Channel-Channel Adapters (CTC) are installed in the IOCE. The "X" interface is cabled internally. The same connector positions specified for the selector channel without an adapter are used for the "TO" end of cable groups. The "Y" is the CTC connection and the "FROM" end for cable groups.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-61</td>
<td>2</td>
<td>IOCE/CTC</td>
<td>IOCE</td>
<td>1, 2</td>
<td></td>
</tr>
<tr>
<td>6F-63</td>
<td>2</td>
<td>IOCE/CTC</td>
<td>Ctl Unit</td>
<td>1, 2, 3</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
2. The Channel-to-Channel Adapter (CTC) is considered as a control unit on each of the channels involved.
3. When this group connects to a 2803, measure the distance to the appropriate cable entry hole and specify 2803 or 2803A on order form.
**Cabling Schematic**

![Diagram of cabling schematic]

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-18</td>
<td>1</td>
<td>2314</td>
<td>Bond Plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6F-81</td>
<td>1</td>
<td>2314</td>
<td>CE</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-82</td>
<td>1</td>
<td>2314</td>
<td>2314</td>
<td>3, 4</td>
<td></td>
</tr>
<tr>
<td>6F-83</td>
<td>2</td>
<td>2314</td>
<td>SC</td>
<td>100</td>
<td>5, 6</td>
</tr>
<tr>
<td>6F-84</td>
<td>2</td>
<td>2314</td>
<td>Ctl Unit</td>
<td>7, 8</td>
<td></td>
</tr>
<tr>
<td>6F-85</td>
<td>2</td>
<td>2314</td>
<td>IOCE</td>
<td>7, 8</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each 2314 and the system bond plate under the floor.
2. SCON interface; one group from 2314 #1 to each CE in the configuration.
3. The total cable length allowed for group 6F-81 plus the number of 6F-82 groups serially connected cannot exceed 150 feet.
4. SCON interface; one group required between 2314s for each CE in the configuration.
5. One group from each 2314 to the System Console (SC).
6. One EPO cable included in this group.
7. Last 2314 must be within 100 feet from IOCE.
8. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation is exceeded.
### 2803A Tape Control Unit

**Cabling Schematic**

```
6F-60 → IOCE, Sel
6F-62 → Ctl Unit, Sel
6F-58 → CC, Ind, EPO
6F-30 → SC, Ind, EPO
6F-33 → 2803A, SCON
6F-32 → CE, SCON

System Bond Plate
```

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-18</td>
<td>1</td>
<td>2083A</td>
<td>Bond Plate</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>6F-30</td>
<td>2</td>
<td>2803A</td>
<td>SC</td>
<td>100</td>
<td>2, 3</td>
</tr>
<tr>
<td>6F-32</td>
<td>1</td>
<td>2803A</td>
<td>CE</td>
<td></td>
<td>4, 5</td>
</tr>
<tr>
<td>6F-33</td>
<td>1</td>
<td>2803A</td>
<td>2803A</td>
<td></td>
<td>5, 6</td>
</tr>
<tr>
<td>6F-58</td>
<td>2</td>
<td>2803A</td>
<td>CC</td>
<td>100</td>
<td>3, 7</td>
</tr>
<tr>
<td>6F-60</td>
<td>2</td>
<td>2803A</td>
<td>IOCE</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>6F-62</td>
<td>2</td>
<td>2803A</td>
<td>Ctl Unit</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

**NOTES:**

1. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each 2803A and a system bond plate under the floor.
2. One group from each 2803A to the System Console (SC).
3. One EPO cable included in this group.
4. SCON interface; one group from 2803A #1 to each CE in the configuration.
5. The total cable length allowed for group 6F-32 plus the number of 6F-33 groups serially connected cannot exceed 150 feet.
6. SCON interface; one group required between 2803s for each CE in the configuration.
7. One group from each 2803A to the Configuration Console (CC). Cables enter CC at two different holes; specify length (distance) to the furthest hole.
8. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation is exceeded.

Refer to the 2401 Tape Unit Cabling Schematic (page 121) for Tape Unit Cabling. These cable groups are common to all 9020 Systems.
1052-7 Printer/Keyboard Adapter
Cabling Schematic

GROUP NO. OF
NO. CABLES FROM TO

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-64</td>
<td>2</td>
<td>1052 Adapter</td>
<td>Ctrl Unit</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-65</td>
<td>2</td>
<td>1052 Adapter</td>
<td>IOCE</td>
<td>2, 3</td>
<td></td>
</tr>
<tr>
<td>6F-79</td>
<td>3</td>
<td>1052 Adapter</td>
<td>CC</td>
<td>75</td>
<td>1, 4</td>
</tr>
</tbody>
</table>

NOTES:

1. One group required from each 1052 Adapter to the Configuration Console patch panel. Measure distance to hole under reading board.
2. Multiplexer channel cabling.
3. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
4. One power cable included in this group.
**2701 Data Adapter Unit**

*Cabling Schematic*

```
6F-67 ← IOCE, Mpx
6F-66 ← Ctl Unit, Mpx
6F-59 ← Config Cons, Ind, EPO

System Bond Plate
```

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-18</td>
<td>1</td>
<td>2701</td>
<td>Bond Plate</td>
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<td>1</td>
</tr>
<tr>
<td>6F-59</td>
<td>2</td>
<td>2701</td>
<td>CC</td>
<td>100</td>
<td>2, 5, 6</td>
</tr>
<tr>
<td>6F-66</td>
<td>2</td>
<td>2701</td>
<td>Ctl Unit</td>
<td></td>
<td>3, 4</td>
</tr>
<tr>
<td>6F-67</td>
<td>2</td>
<td>2701</td>
<td>IOCE</td>
<td></td>
<td>3, 4</td>
</tr>
</tbody>
</table>

**NOTES:**
1. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each 2701 and a system bond plate under the floor.
2. One group required from each 2701 to the Configuration Console.
3. Multiplexer channel cabling.
4. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
5. Contains one EPO cable.
6. Cables enter Configuration Console at two different holes; specify length (distance) to the furthest hole.
9020A cable group number, enclosed in parentheses, is for reference only.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-18</td>
<td>1</td>
<td>2821-01</td>
<td>Bond Plate</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>6F-76</td>
<td>3</td>
<td>2821-01</td>
<td>CC</td>
<td>50</td>
<td>2, 3, 5</td>
</tr>
<tr>
<td>6F-77</td>
<td>3</td>
<td>2821-01</td>
<td>SC</td>
<td>50</td>
<td>2, 3</td>
</tr>
<tr>
<td>503</td>
<td>2</td>
<td>2540</td>
<td>2821-01</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>504</td>
<td>3</td>
<td>1403</td>
<td>2821-01</td>
<td>25</td>
<td>4</td>
</tr>
</tbody>
</table>

NOTES:
1. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each 2821-01 and a system bond plate under the floor.
2. One group required from the 2821-01 to either the System Console or Configuration Console.
3. Contains one EPO cable.
4. One group required for each I/O device.
5. Cables enter Configuration Console (CC) at two different holes; specify length (distance) to the furthest hole.
2821-02 Control Unit
Cabling Schematic

NOTES:
1. Multiplexer channel cabling.
2. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
3. Contains one EPO cable.
4. One group required for each I/O device.
5. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each 2821-02 and a system bond plate under the floor.
7289-02 Peripheral Adapter Module
Cabling Schematic

System Bond Plate

9020A cable group numbers, enclosed in parentheses are for reference only.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>No. of Cables</th>
<th>From</th>
<th>To</th>
<th>Maximum Length (ft)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6F-18</td>
<td>1</td>
<td>PAM</td>
<td>Bond Plate</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6F-31</td>
<td>2</td>
<td>PAM</td>
<td>SC</td>
<td>100</td>
<td>4,5</td>
</tr>
<tr>
<td>6F-34</td>
<td>1</td>
<td>PAM #1</td>
<td>CE</td>
<td>1,2</td>
<td></td>
</tr>
<tr>
<td>6F-35</td>
<td>1</td>
<td>PAM</td>
<td>PAM</td>
<td>2,3</td>
<td></td>
</tr>
<tr>
<td>6F-70</td>
<td>2</td>
<td>PAM</td>
<td>Ctrl Unit</td>
<td>6,7</td>
<td></td>
</tr>
<tr>
<td>6F-71</td>
<td>2</td>
<td>PAM</td>
<td>IOCE</td>
<td>6,7</td>
<td></td>
</tr>
<tr>
<td>6F-80</td>
<td>3</td>
<td>PAM</td>
<td>SC</td>
<td>75</td>
<td>8</td>
</tr>
</tbody>
</table>

NOTES:
1. SCON interface: one group from PAM #1 to each CE in the configuration.
2. The total cable length allowed for group 6F-34 plus the length of the 6F-35 groups serially connected, cannot exceed 150 feet.
3. SCON interface: one group required between PAM's for each CE in the configuration.
4. One group required from each PAM to the System Console.
5. Contains one EPO cable.
6. Multiplexer channel cabling.
7. The total length of 200 feet is available to attach up to eight control units. Consult the planning coordinator at the FAA Project Office if this limitation must be exceeded.
8. One group required from each 1052 Adapter to System Console patch panel. Measure distance to hole under reading board.
9. The bond cable has a fixed "X" length of 30 feet. One bond cable is required between each PAM and a system bond plate under the floor.

Refer to the 1052 PAM-to-PAM external cable listing for duplex cabling of the 1052 Adapters.
9020D Multiplexer Channel Cabling
Typical I/O Configuration

Note:
This schematic identifies the cable groups required for a typical I/O configuration. Consult the planning coordinator at the FAA project office to obtain cabling sequence and channel priorities for your configuration.

9020A cable group numbers, enclosed in parentheses, for reference only.
9020E Multiplexer Channel Cabling

Typical I/O Configuration

Note:
This schematic identifies the cable groups required for a typical I/O configuration. Consult the planning coordinator at the FAA project office to obtain cabling sequence and channel priorities for your configuration.
### 1052 PAM-TO-PAM EXTERNAL CABLE LISTING

<table>
<thead>
<tr>
<th>GROUP NO</th>
<th>KEY NO</th>
<th>PART NO</th>
<th>MACH</th>
<th>FROM S LC BT Y</th>
<th>TO MACH</th>
<th>S LC BT Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>5F-42</td>
<td>A</td>
<td>5393077</td>
<td>7289-02-</td>
<td>R 72</td>
<td>7289-02-</td>
<td>A 72</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>5392825</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
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<td>5393077</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>5392825</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
</tr>
<tr>
<td>5F-42</td>
<td>A</td>
<td>5393077</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>5392825</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
</tr>
<tr>
<td>5F-42</td>
<td>A</td>
<td>5393077</td>
<td>7289-02-</td>
<td>B 72</td>
<td>7289-02-</td>
<td>A 72</td>
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**NOTE:** PLANNING COORDINATOR AT FAA PROJECT OFFICE WILL ASSIGN ADDRESSES FOR EACH 5F-42 GROUP CABLE AND IDENTIFY LOCATION (LC) POINTS ON THE "FROM" AND "TO" END OF EACH CABLE.
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**NOTE:** PLANNING COORDINATOR AT FAA
PROJECT OFFICE WILL ASSIGN PAM GPO ADDRESS AND LOCATION POINT FOR EACH CABLE.
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**NOTE:** PLANNING COORDINATOR AT FAA PROJECT OFFICE WILL ASSIGN PAM GPO ADDRESS AND LOCATION POINT FOR EACH CABLE.
Maximum of eight tape drives (2401) may be attached to each TCU (2803)

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<th>No. of Cables</th>
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NOTES:
1. For eight units the maximum total length of group 115 and all groups 109, should not exceed 100 feet.
2. For four units the maximum total length of group 114 and all groups 110, should not exceed 100 feet.
ORDER NOMENCLATURE

Alphameric designations, such as CE 1 and IOCE 1, are used for units unique to the 9020D/E systems; numeric designations, such as 2821 and 1403, are used for I/O units. The following table can be used to convert the alphameric designations to numeric designations.

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<td>Configuration Console</td>
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INSTRUCTIONS

1. Determine the cable groups required for your configuration; refer to the cabling section of this manual for group numbers, maximum group lengths, and restrictions for each cable group.
2. Measure the distances between the cable entry holes and the cable exit holes for the cables required.
3. When a raised floor is used, add twice the height of the floor.
4. Round off the total length of cables required to the nearest foot and enter it under "Length Req (ft)".
5. Where applicable insert unit type and number in the appropriate FROM or TO column. Example 2314#1, 2701#1, etc.
6. For Selector Channel Cabling:
   - GROUP 6F-60, 62, 63, 84, and 85
     a. Use a P or S in the P/S columns to specify primary and secondary tailgate positions for the control units. Use a number in the CHAN column to specify the Channel or Channel-to-Channel (CTC) positions.
   - GROUP 6F-61
     b. Use a number in the FROM P/S to specify the CTC "FROM" tailgate positions and another number in the CHAN column to specify the "TO" channel positions.
7. For Multiplexer Channel Cabling:
   a. Use a P or S in the FROM and TO P/S columns to specify primary and secondary tailgate positions for the control units and the IOCE designation (number) in the IOCE column to identify tailgate positions for the System or Configuration Console.
8. Include a system layout showing the numbers assigned to the various elements/units with your cable order, Examples are: IOCE#1, 2314#2, . . . 2401#2.
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MULTIPLEXOR CHANNEL AND
I/O DEVICE GROUP

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