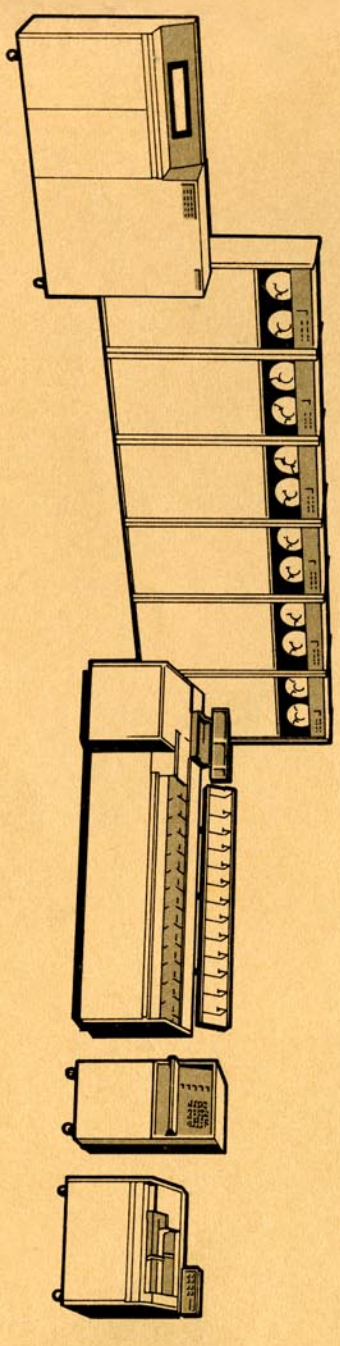

Burroughs

B 200

installation • planning manual

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REVISION A
January 1964

INSTALLATION PLANNING MANUAL
for the
Burroughs B 200 SERIES
ELECTRONIC DATA PROCESSING SYSTEMS

Burroughs Corporation
Detroit, Michigan 48232
In Canada: Burroughs Business Machines Ltd., Toronto, Canada

REVISED EDITION A

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SECTION 1

INTRODUCTION

SCOPE

This Manual has been prepared to serve as a guide in the site selection and preparation for Series B 200 Data Processing Equipment.

It contains the pertinent information of site requirements on FLOORING, AIR CONDITIONING, PRIMARY POWER and SYSTEM LAYOUT CONFIGURATIONS.

GENERAL DESCRIPTION

Current. B 200 data processing systems are designated as follows:

B 251 A Punched Card, Ledger Recorder, Electronic Computer System with *MICR.

B 260, B 263 A Card Data Processing System.

B 270, B 273 A Punched Card *MICR Check Processing System.

B 280, B 283 A Magnetic Tape Processing System.

* MICR= Magnetic Ink Character Recognition.

The above systems have options shown by block diagrams in section (5).

The Paper Tape Subsystem for the B 200 Series equipment is listed below:

B 141 Paper Tape Reader
B 341 Paper Tape Punch
B 142 Input Code Translator
B 342 Output Code Translator
B 241 Paper Tape Adapter
B 143 Reader Selector Switch
B 343 Punch Selector Switch

The B 143 Reader Selector Switch is located in the B 141 Reader.

The B 343 Punch Selector Switch is located in the B 341 Punch.

The B 142 Input Code Translator is installed in the B 141 Reader.

The B 342 Output Code Translator is installed in the B 341 Punch.

The B 241 Paper Tape Adapter is required to permit the use of a paper tape subsystem with the B 200 Series Central Processors. The subsystem may not be used with B 251 CP's or B 270 CP's delivered prior to February 1963.

With all B 200 Series Central Processors, other than the B 251 or pre-paper tape B 270 systems, paper tape capability may be ordered originally or field installed.

Section 5 of this manual shows paper tape units in the block diagrams of system options. However, a Paper Tape Reader or a Paper Tape Punch could be substituted for a Card Reader or a Card Punch where they are shown in the block diagrams.

CONSTRUCTION

Welded steel frame cabinets incorporating removable panels and swing-out chassis or gates, which contain the electronic logical packages.

Each unit is circuit-breaker equipped, and excepting the Sorter-Reader, Record Processor, and B 304 High Speed Punch, all units rest upon casters for ease of mobility. Sorter-Reader and Record Processor are shipped in sections on special steel pallets or fixtures.

UNIT COOLING

System units requiring forced-air cooling are equipped with internal fans. Room air is drawn through fibre-glass filters installed behind slotted air intake louvers. Heated air is expelled through exhaust louvers.

CABLING

All Information and Power cables enter from underneath or at the rear of the system units.

Cables may be routed along the floor's surface, beneath a free access type of floor, or in specially arranged raceways. See cable routing diagrams on pages 7 and 8 , Section 3.

COLOR

B 200 System Units, Grey with Blue accent panels.

Exception

B 251 VRC System, Tan (semi gloss) with Alpine Blue Control Panels.

SECTION 2

FACTORS PERTINENT TO INSTALLATION PLANNING

CHOICE OF SYSTEM INSTALLATION AREA

In selecting the data processing site, the ease with which it may be supplied with power facilities and cooling air (if not already so supplied) are factors to be given consideration. The data processing room should be of adequate size to functionally lay out the system units to achieve optimum operating efficiency, commensurate with the Customer's desire to have a good-looking installation.

SCHEDULE

Planning the B 200 Series system installation should begin sufficiently in advance of the system's scheduled delivery date, to allow for Customer purchase and installation of equipment required from other manufacturers (such as raised flooring, or modifications to the existing floor, primary power facilities, and air conditioning equipment).

Site preparation should be completed at least one week prior to the system arrival date, and include the following:

1. Air conditioning working normally.
2. Primary power facilities tested.
3. EDPM room thoroughly cleaned.

Arrangements for special equipment to handle system units into the EDPM room (if required) should be completed.

Other facets of thorough installation planning will include attention to the following:

Storage

Storage space for operating supplies such as cards, paper forms and magnetic tape, should be located in or near the EDPM room for easy access. In addition, the environment of the storage area should match that required of the EDPM room, which is discussed under ENVIRONMENTAL REQUIREMENTS.

Accessibility

Check how the system units will be moved from the van unloading area to the EDPM room, and determine if any building modifications will be required to admit the units. If entrance is to be by skylight or window, special equipment to handle the system units will be required. Equipment dimensions and weights may be found in Section 7.

Floor Strength

Check the floor loading specifications of the EDPM room to determine if they are adequate to sustain the system weight plus any other load that may be imposed upon it. See floor-loading specifications on page 1, Section 3.

Lighting

Generally, lighting should be even throughout the equipment area, and sufficient for the comfort of operators and the performance of maintenance. A minimum of 50 foot candles (measured 30" above the floor) is recommended. Avoid direct sunlight where it would make the reading of machine indicators difficult.

Acoustics

Some acoustical treatment of the computing room is desirable to absorb machine noises. In the case of magnetic tape units, it may be desirable to seal the acoustical surface to reduce dust. This can be postponed however, until a period of operation has demonstrated the need for such treatment. In any case, the dust factor should be considered in selecting the acoustical material to be used.

Hazards

The B 200 System should be placed in a location which affords maximum protection from exposure to such hazards as fire, earthquake, vibration, excessive dust and humidity, and water damage that might result from floods or activated water sprinklers.

SHIPPING PALLETS

Figure 2-1 shows the dimensions of the shipping pallets for the Sorter-Reader (A) and the Record Processor Unit (B). Note that the B 401 is shipped in three pieces, and the B 102 (or B 103) is shipped in two sections.

The dimensions of wooden skids (or pallets) for other B 200 system units are:

B 124 800 CPM Card Reader	2' $7\frac{1}{2}$" x 4'-$\frac{1}{2}$"
B 303 100 CPM Card Punch	2' $7\frac{1}{2}$" x
B 304 300 CPM Card Punch	2' $7\frac{1}{2}$" x 4'-9"
B 321 Line Printer	6' $10\frac{5}{8}$" x 3'-10"

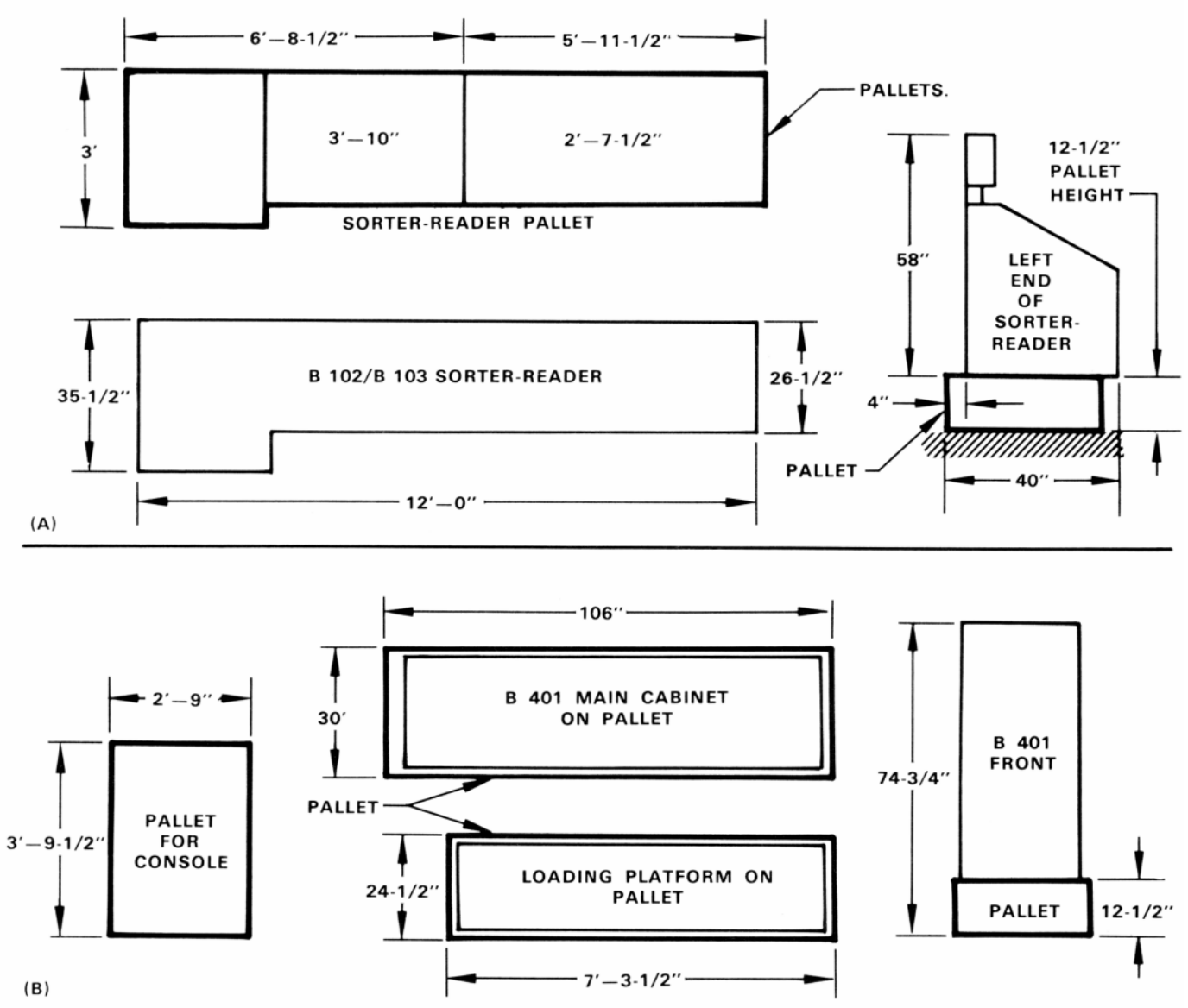


Figure 2-1. Shipping Pallet Dimensions

MAINTENANCE FACILITY

If the system size warrants a designated area or a separate room for maintenance, record keeping, and the storage of test equipment and operating spares; the following is suggested as a guide to the customer in providing these facilities:

Room size is approximately 120 square feet. A room 10' x 12' or 8' x 15' will be adequate to house a standard desk (21/2 x 5') and chair, and one or more storage cabinets 5' x 3' and 18" deep. The room will also act as a storage area for the one or more dolly-mounted oscilloscopes and other required test equipment.

The system size or number of systems may require the use of a (optional) 5' work bench. This may be requested by the District Field Service Manager, DP equipment.

SECTION 3

FLOOR LOADING

DEFINITION AND SPECIFICATIONS

Average distributed floor loading in this paragraph is defined as the total weight of all units in a building bay, divided by the area of the bay. A bay is a portion of the floor between supporting posts or girders. The average distributed floor loading of the B 200 Series systems may be kept at, or below, 30 pounds per square foot by proper layout of the system units. Since there must be both operating and maintenance clearances (or access area) to the system units, the average distributed floor loading imposed by a system unit can be visualized as the weight of the unit divided by the area of the unit, plus the additional access area. The average distributed floor loading resulting from the B 200 system units, and based upon this concept, is tabulated below.

CONCENTRATED LOADS

Concentrated loads are imposed by system units that are supported by casters or leveling pads. With the exception of the Sorter-Reader, High Speed Punch and Record Processor units, the remaining system equipments are supplied with casters. If each caster is assumed to support one fourth the unit weight, the maximum caster weight would occur from a lister or printer, and would amount to approximately 400 pounds per caster. When caster loads exceed 200 pounds, the floor's surface must be protected during any equipment movement by protective sheets of tempered masonite or other adequate protective covering. Indentation pressures from caster or leveling pads can deform vinyl tile at the point of contact (support), unless metal plates of appropriate area are placed beneath the pads or casters to reduce the stress to a non-deforming value. The heaviest stress imposed by any unit of the B 200 Series equipment, via a leveling pad, is approximately 130 pounds per square inch.

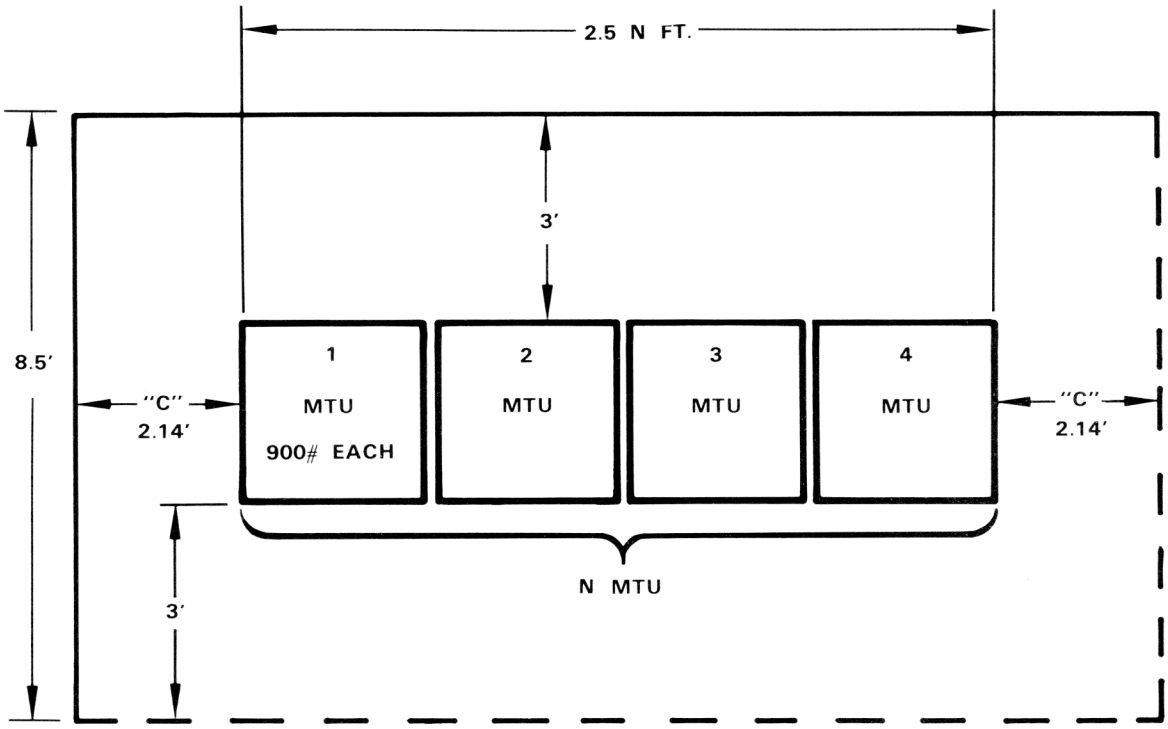
Check the floor-loading specifications of the proposed installation area to insure that they meet the loading requirements of the System. Section 7 of this manual contains the dimensions and weights of each unit.

Table 3-1. Average Distributed Floor Loading

UNIT NAME	APPROX. UNIT WEIGHT	UNIT AREA + ACCESS	AVG. DIST. F.L.
B 102 or B 103 Sorter-Reader	4000 pounds	180 Sq. Ft.	less than 25
B 401 Record Processor	2800 pounds	140 Sq. Ft.	less than 21
B 200 Series Central Processors	1200 pounds	90 Sq. Ft.	less than 15
B 122 Card Reader	150 pounds (with stand)	25 Sq. Ft.	less than 7
B 321 Printer, B 322 Lister	1750 pounds	76 Sq. Ft.	less than 24
B 124 Card Reader	920 pounds	60 Sq. Ft.	less than 16
B 303 Card Punch	655 pounds	75 Sq. Ft.	less than 10
B 304 Card Punch	1283 pounds	100 Sq. Ft.	less than 13
B 421 Magnetic Tape Unit	890 pounds	30 Sq. Ft.	less than 30
B 141 Paper Tape Reader	437 pounds	20 Sq. Ft.	less than 25
B 341 Paper Tape Punch	426 pounds	20 Sq. Ft.	less than 25

Note, in Table 3-1 that the greatest average distributed floor loading obtains when the system has magnetic tape. This value of floor loading results from allocating a specific amount of front and rear clearance, along with clearance at the ends of the tape unit array. See Figure 3-1 and the accompanying formula for calculating clearance.

Peak distributed floor loading is the weight of a system unit divided by the unit's base area. The B 102 Sorter-Reader, under this concept. would create a *peak* distributed floor loading of 4000/30, or approximately 133 pounds per square foot. This value of floor loading would not be used to determine a floor's strength for a system, but it would be used to determine the structural virtues of a warehouse floor to store B 102 Sorter-Readers where they were packed tightly together.



$(2.5\ N + 2\ C)\ 8.5 = A$ (area)

$900\ N = W$ (weight)

$\frac{900\ N}{21\ N + 17\ C} = 30$, or $C = \frac{270\ N}{510} = 0.53\ N$

(use this formula for determining minimum "C.")

Example: For 1 MTU, end clearances would be slightly over 6 inches; front and rear clearances are mandatory at 3'. This would result in the 900 pound MTU being supported by an area of 8.5 x 3.56, or slightly over 30 sq. feet. However, the six-inch end clearance would not be adequate to wheel a scope through; the minimum clearance, therefore, must be at least 20 inches (at one side only).

Example: For 4 MTU's, C = 0.53 x 4 = 2.14 (about 25 inches) at each end.

Area for tape sub-system is 8.5 x 14.28 = 121 sq. feet.

Weight of 4 MTU = 3600 pounds.

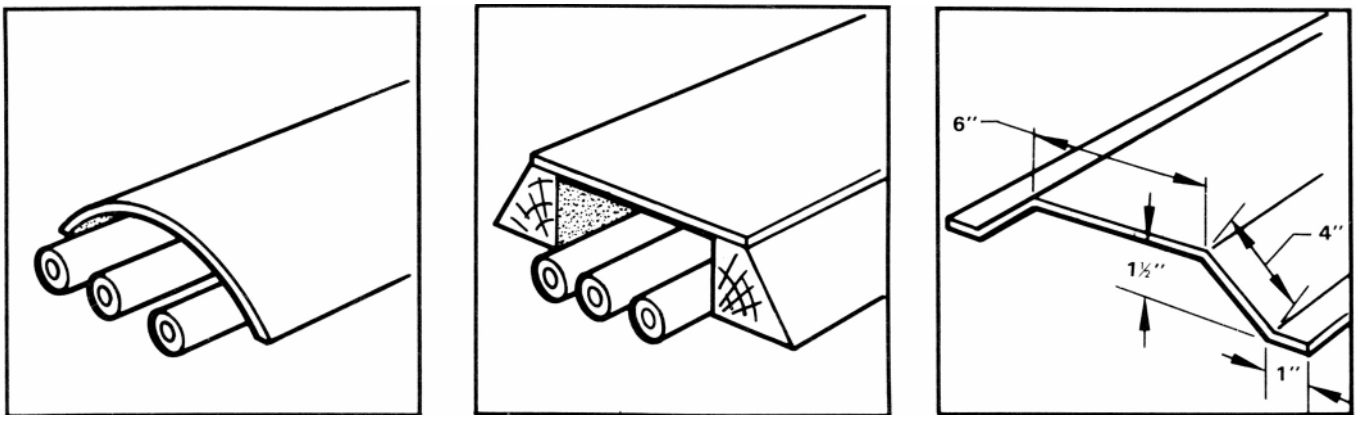
Average Dist. Fl. Loading = 3600/121 = less than 30 pounds per sq. foot.

NOTE

If floor's strength is rated at a higher value than normally encountered, the "area" allocated to the tape sub-system can be reduced; however, front and rear access areas must still permit non-restricted clearance for both operating and maintenance.

Figure 3-1. MTU Clearances

FLOOR TYPES—CABLE ROUTING TECHNIQUES



CURVED METAL COVERING | WOODEN COVERING | METAL CABLE BRIDGE

When cables are routed upon the floor's surface, some type of protection for the cables is desirable. The sketches on this page suggest three ways the customer can provide this protection.

A few statements on the cable routing methods provided by figure 3-2 follow:

Figure 3-2 (A) — Free access floor: This type of floor is unexcelled for routing cables; permits equipment re-arrangement or system expansion with minimum cost and effort. The space between floors makes an ideal cool air plenum for introducing cooling air into equipment (or room) by use of adjustable air grills or registers.

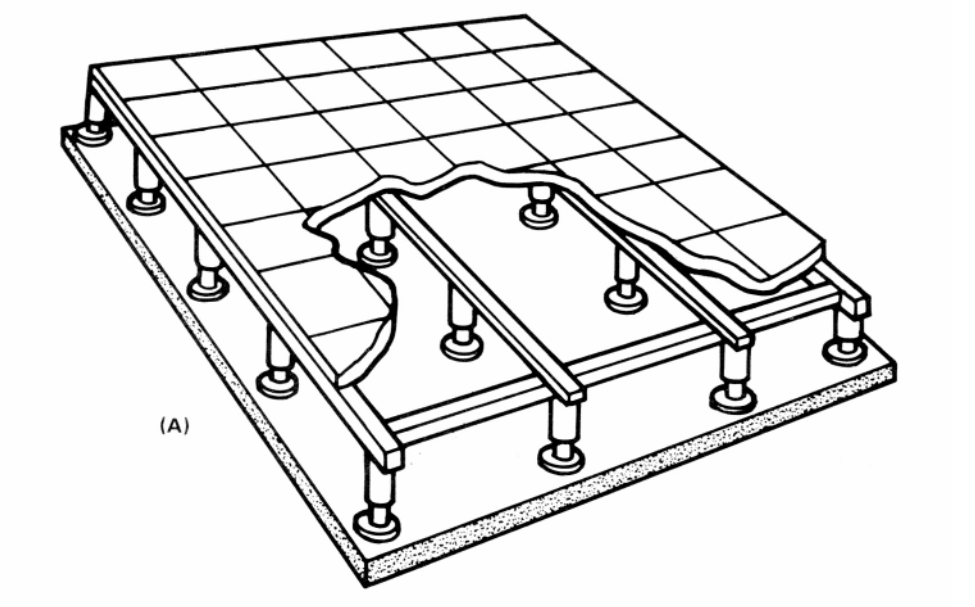


Figure 3-2. Cable Routing Methods

Figure 3-2 (B) — Creating raceways (cable trenches) on existing floor: This method does its job well, but lacks flexibility factor found in raised floor.

Figure 3-2 (C) — Cable cut-outs "cored" in existing concrete floor: This method is limited (obviously) to isolated situations where it can be employed to advantage.

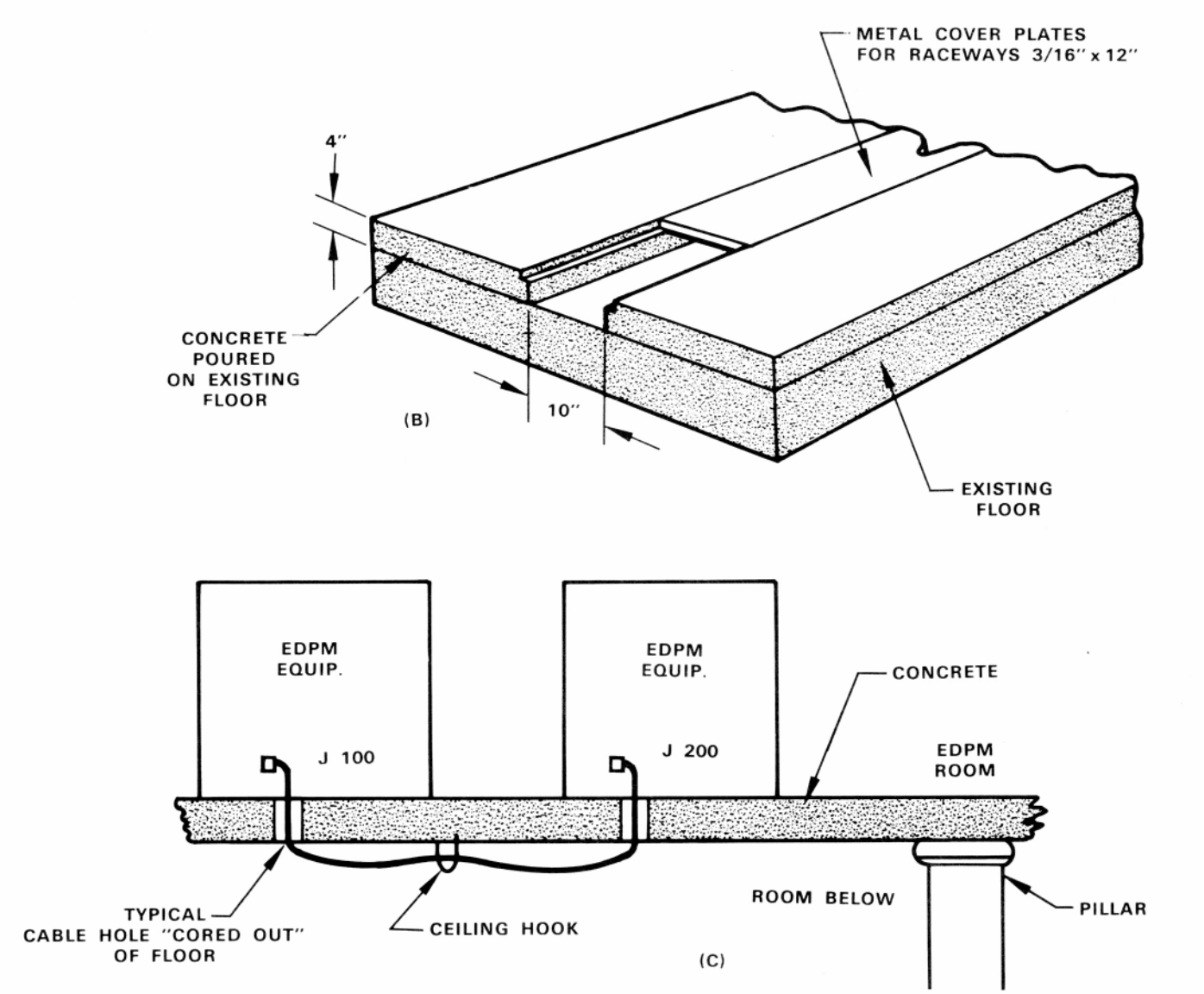


Figure* 3-2. Cable *Routing Methods (Continued)

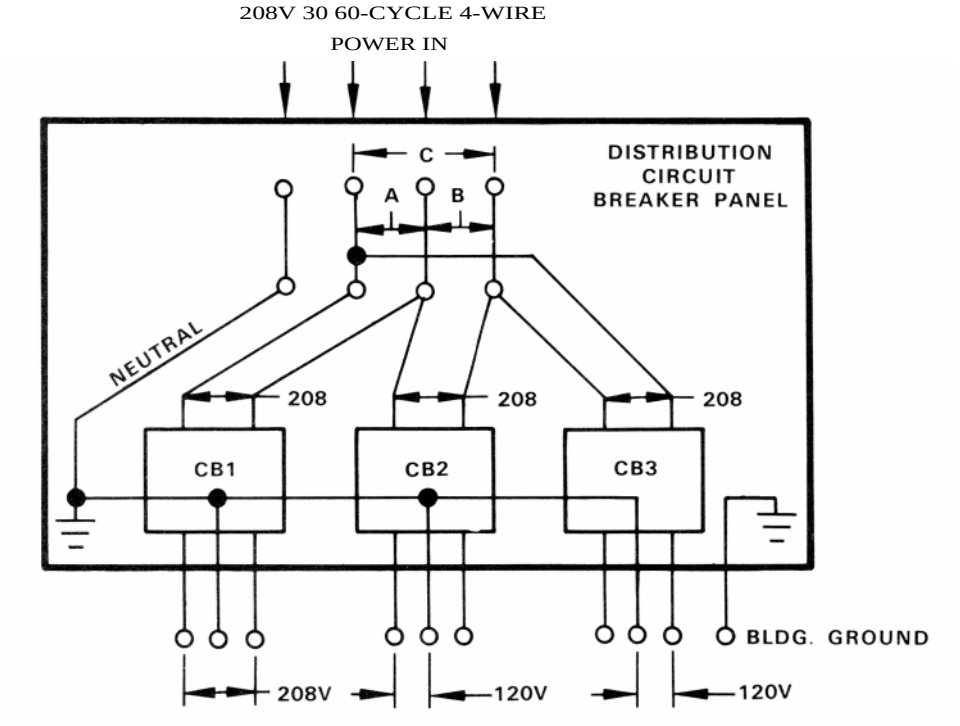
SECTION 4

SYSTEM POWER

POWER SOURCE

B 200 Series equipment is supplied single phase power over three wires to provide 120 volts to internal circuits. In a few cases, some of these units require higher voltages (208 to 240 volts), available from the two HOT lines of the three-wire source. Units that require these higher voltages in addition to the 120 volt levels are: Sorter-Reader, Record Processor, and the Magnetic Tape Unit. A fourth wire, separate from the power transmission system, is used to establish building ground.

The three-wire system of power distribution results in lower rated circuit breakers for the individual system units, smaller line current, and consequently smaller (and more flexible) power cables. Safety is enhanced since the highest potential to ground is 120 volts, although nearly double this voltage is available for circuits where required. Typical power sources for the B 200 systems are shown in Figures 4-1 and 4-2.



NOTES:

1. 208V 30 4-wire 60-cycle source to derive 120/208 volts 3-wire circuit (Effectively, 10).
2. If each circuit breaker carries equal loads, power input lines will be balanced.
3. Voltage Levels:
   208V Nominal
   Low Limit 193 volts
   High Limit 220 volts
4. Frequency Tolerance + 1%.

Figure 4-1, Three-Phase Power Source* to *Supply Single-Phase System Power

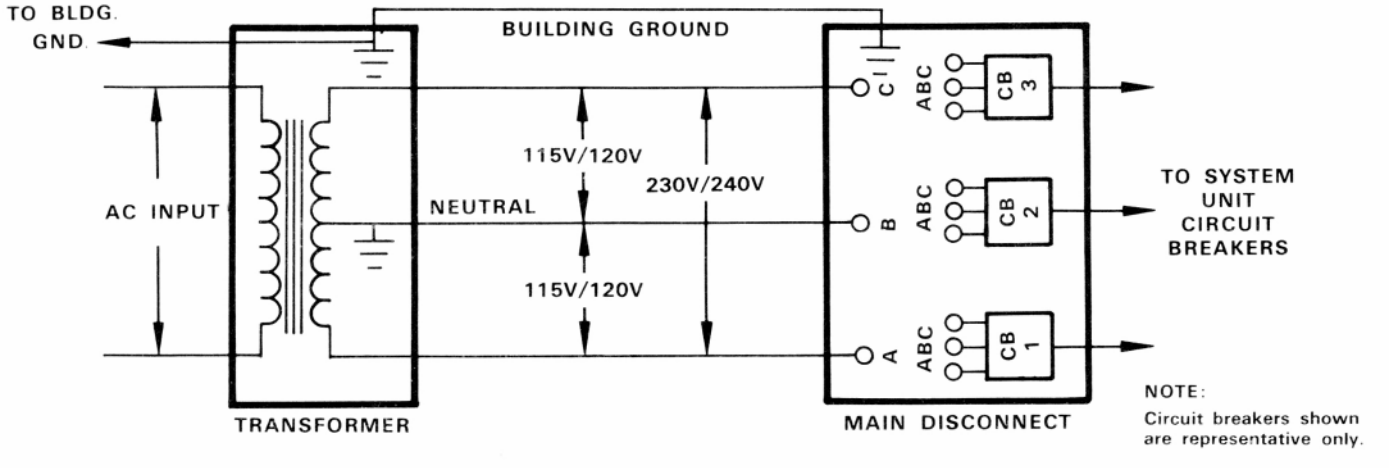


Figure 4-2. Single-Phase Three Wire Power Source to Supply System

INPUT POWER TOLERANCES

The static and transient deviations from the nominal voltage levels for the B 200 Series equipment are:

STATIC + 10% (except the Sorter-Reader, noted below)

TRANSIENT (for all B 200 Series equipment)

min. deviation=0.7 x (nominal line voltage) for 0.5 seconds

max. deviation=2.5 x (nominal line voltage) for 0.5 cycles

frequency stability = + 1%.

SORTER-READER STATIC VOLTAGE TOLERANCES

source nominal	*low limit*	*high limit*
120/208 volts	111.5/193 volts	127/220 volts
115/230 volts	107/214 volts	127/254 volts
120/240 volts		

NOTE

If the 120 volts (of the 120V/208V source) dropped to 107 volts, the 208 volts of this source would drop to 185 volts, which is too low for those units that require line to line potentials.

POWER REQUIREMENTS—HEAT DISSIPATION

The power requirements—heat dissipation for the B 200 Series equipment is contained in Table 4-1.

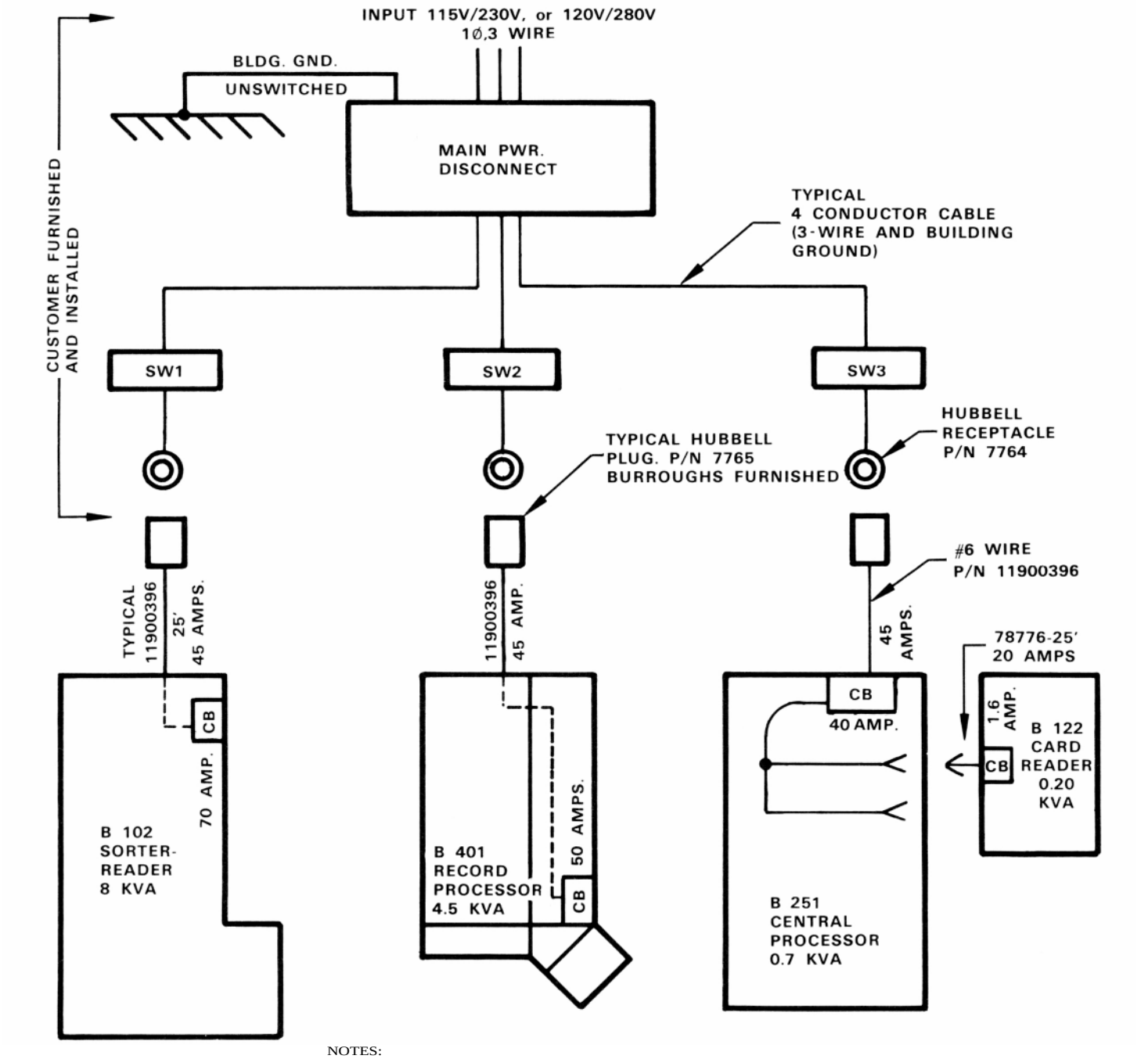
Table 4-1. Power Requirements—Heat Dissipation

UNIT IDENTITY	()PER. KVA	BTU/hr.	FAN CFM.
B 102/103 Sorter Reader	8.00	22,000	1080
B 401 Record Proc. Unit	4.50	12,000	1000
B 200 Series Central Processors .	0.70	2,000	300
B 122 Card Reader	0.20	700	
B 124 Card Reader	1.30	3,000	400
B 321 Line Printer	3.40	8,000	765
B 322 Six Tape Lister	3.40	8,000	765
B 303 100 cpm Punch	1.40	4,000	175
B 421 Magnetic Tape Unit	3.35 Max.	7,200 Max.	425
B 304 300 cpm Punch	2.2	5,500	900

NOTE

When figuring source capacity in KVA, allow approximately 3 KVA for convenience outlet power.

Customer furnished and installed wiring and other facilities must be capable of carrying the maximum operating currents plus the current taken by test equipment or other electrical loads that are plugged into the system units' convenience outlets.



NOTES:

1. Individual system unit switches (SW1, SW2, and SW3) may be desirable if twist lock connectors and receptacles are located beneath a raised floor, or in a covered raceway. This is a customer's option.
2. All cables numbered are furnished by Burroughs.

Figure 4-3. **Primary Power** ***Distribution***

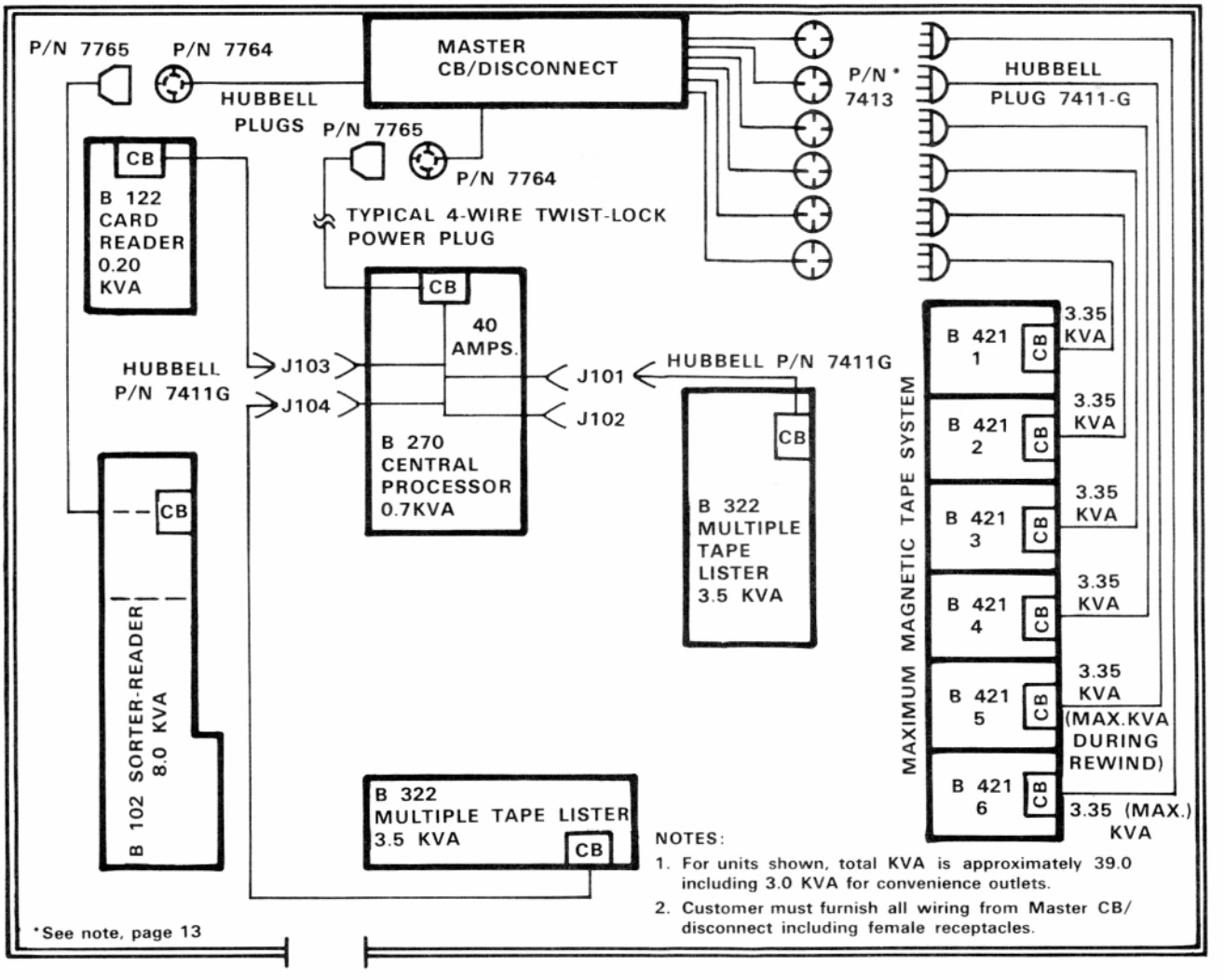


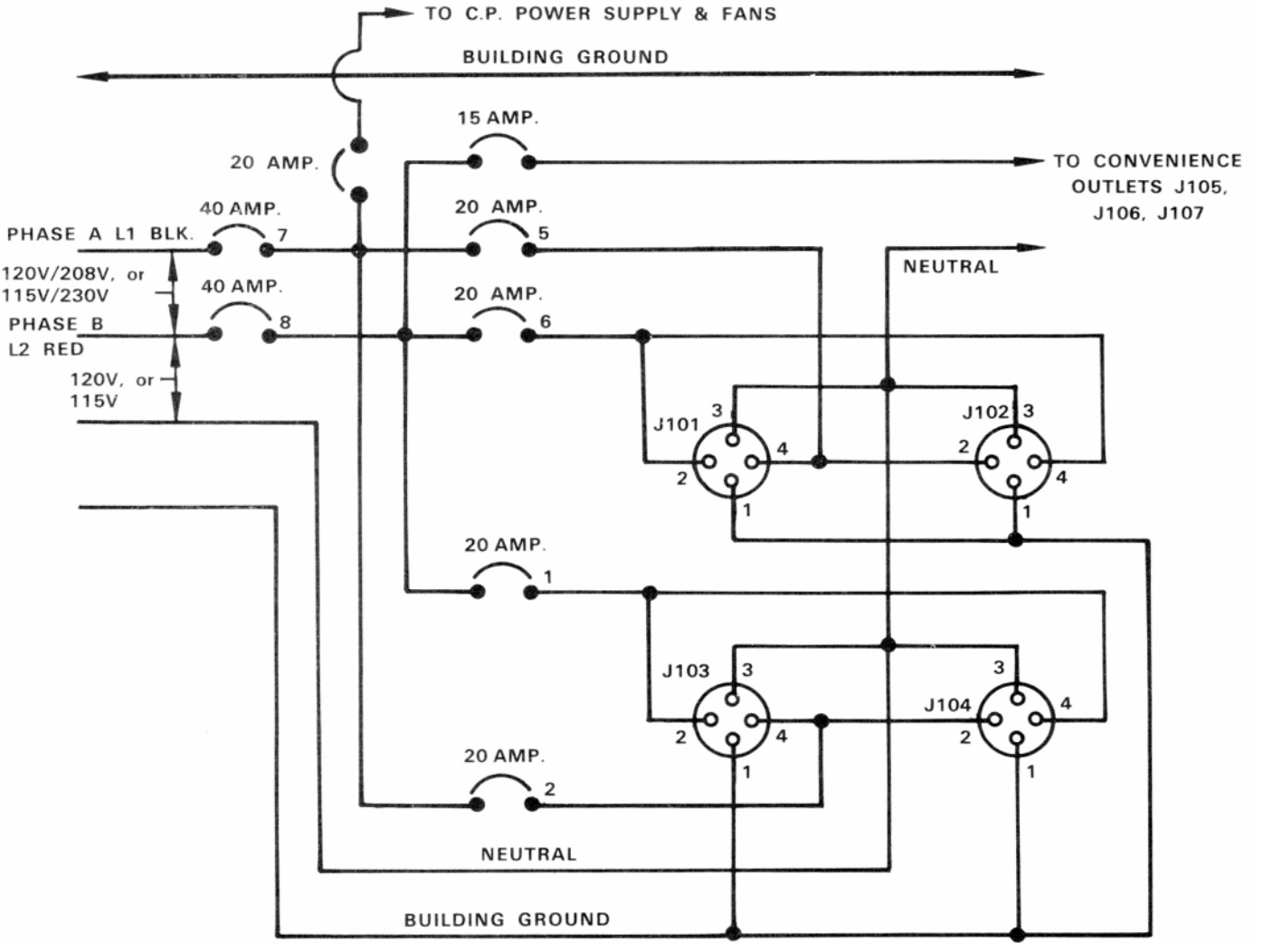
Figure 4-4. Primary Power Diagram

PRIMARY POWER

Power to Master CB/Disconnect is either 115V/230V, 1Q, 3-wire, 60 cycle, or 120V/208V, 1Q, 3-wire, 60 cycle. If power is 120V/208V, this means the main power source is 3Q, and an attempt to optimize the circuit loading should be made by using all phases of the three-phase system.

In Figure 4-4, the Sorter-Reader, Magnetic Tape Units, and the Central Processor are individually cabled back to the main disconnect via Hubbell Twist-Lock, quick-disconnect connectors.

The Central Processors contain four power receptacles which can be utilized to furnish power to the peripheral units. However, in order not to overload the circuit breakers in the Central Processor, some thought must be given to what should be plugged in these power receptacles. Refer to Figure 4-5 and note that two listers (15 amperes per line) could not be properly plugged into J101 and J102, or J103 and J104, since this would mean the 20-ampere circuit breakers would trip trying to deliver 30 amperes to the two listers. The two listers could, however, be plugged into the Central Processor by plugging lister No. 1 into J101 or J102, and the second lister into J103 or J104. The two vacant power receptacles can still be used to furnish almost 5 amperes each. Therefore, after determining what units can be properly plugged into these power receptacles by consulting Table 4-2, those peripheral units that cannot be accommodated by the Central Processor will have to be customer provided with separate power receptacles within reach of the normal 25-foot factory furnished power cable.



NOTE:

If two identical units are plugged into J101 and J102 (or J103 and J104), the current through CB5 will be the same as through CB6, even though the line to neutral loads of the units plugged in are not symmetrical.

Figure 4–5. Power Wiring to Power Receptacles J101 and 102, and J103 and 104

NOTES:

Grounding circuits for Magnetic Tape units must have the following characteristics.

1. An insulated grounding conductor that is identical to the grounded and ungrounded branch circuit supply conductors, except that it is finished to show a green color, is to be installed as part of the branch circuit that is to supply the unit.
2. The grounding conductor mentioned in item one is to be grounded at the building service equipment.
3. The attachment plug receptacles in the vicinity of the unit are all to be of the grounding type, and the grounding conductors serving these receptacles are to be connected to the grounding conductor that serves this unit.

Table 4-2. Line Currents

UNIT	NOMINAL OPERATING CURRENTS IN AMPERES Line 1	Line 2	
B 303 100 cpm Card Punch	7.5	3.9	
B 304 300 cpm Card Punch	5.8	12.6	
B 321 Line Printer	10.0	10.0	
B 322 Six Tape Drum Lister	10.0	10.0	
B 102 Sorter Reader	36.0	37.0	
B 401 Record Processor Unit	14.0	16.0	
B 421 Magnetic Tape Unit	16.0	16.0	
B 200 Series Central Processors	6.5	0	
B 124 800 cpm Card Reader	11.2	0	
B 122 200 cpm Reader	1.5		
B 141 Paper Tape Reader	8.4 Max.	*	(with Translator)
B 341 Paper Tape Punch	5.1 Max.	*	(with Translator)

*These units require only one hot line, neutral, and building ground. The paper Tape Reader and Punch power cords have three-prong power plugs attached. These plugs can be inserted in standard three-wire convenience outlets (120 volts, neutral, and building ground). The B 122 has a four-prong power plug attached to its power cord, however, the cable has only 3 conductors. The B 122 "plugs" into one of the J receptacles mentioned above.

The values of current (Table 4-2) are average and are for the Unit only. Line currents will be increased if convenience outlets or power receptacles in the Unit are delivering power to other equipment.

Figure 4-5 shows these power receptacles and how they are wired into their 20-amp. protective circuit breakers. Any single system unit can be plugged into one of these receptacles if it has the proper power plug and the Line 1 and 2 currents are less than 20 amperes.

Consult Table 4-2 to determine to what extent these power receptacles may be loaded, taking into consideration that the 40-ampere circuit breaker (number 7) already carries about 6.5 amperes from a load not shown on the diagram (the CP load). Note also that any power delivered from the three-terminal convenience outlets J105, J106 and J107 is carried by a 15-amp circuit breaker and the 40-ampere main circuit breaker (number 8).

The B 102, B 200 CP, B 401 and B 421 must be customer provided with separate power receptacles. Such receptacles, and the customer furnished wiring, disconnects, etc. should be capable of handling the normal operating currents, plus current delivered to equipment plugged into the Unit's power receptacles or convenience outlets.

The size of the Main circuit breakers in the B 200 system units are:

UNIT	**AMPERES**	ATTACHED CABLE RATED AT
B 102 (B 103) and B 101	70	50 amperes
B 200 Series Central Processors	40	45 amperes
B 321, B 322, B 303, B 124	30	20 amperes
B 401	50	50 amperes
B 421, B 141, B 341	20	20 amperes
B 122	1.6	10 amperes

ENVIRONMENTAL REQUIREMENTS

The operating environment for B 200 series data processing equipment will involve the following factors:

Temperature

It is recommended that the room ambient be maintained within these limits for reliable operation:

Low Limit 65 degrees F
High Limit 80 degrees F
Ideal level 72 degrees F

Relative Humidity

The B 200 System units per. se., are quite insensitive to extremes of relative humidity. The media being processed, however, is handled best when the relative humidity is controlled within these limits:

VRC AND TAPE SYSTEMS

Low R-H 40 percent
High R-H 60 percent
Ideal R-H 50 percent

Card systems, and B 270 systems minus tape, may be operated in an environment slightly different than the values given above, namely:

Temperature	60 to 85 degrees F.
Rel. Humidity	30 to 65 percent.

Air Cleanliness

It is important to keep the data processing room clean at all times. A clean environment helps to keep the system unit air filters cleaner for longer periods, thus keeping the cooling efficiency high.

If the system contains magnetic tape, or this type of storage media is contemplated as a future addition, the specifications for cleanliness of cool air ducted into the EDPM room becomes more stringent. Consequently, the air conditioning system should be equipped with a filter bank that will meet the NBS "blackness test" with a minimum efficiency of 50%, using atmospheric dust.

The specification and design of an air conditioning system to provide a suitable environment in the EDPM room (and media storage room), or to provide protection against abnormal air contaminants, are the responsibility of the customer.

Media Storage

The media being processed, such as cards, checks, ledgers, and magnetic tape will be handled best when the temperature and relative humidity of the storage room are maintained within the limits specified for the data processing room.

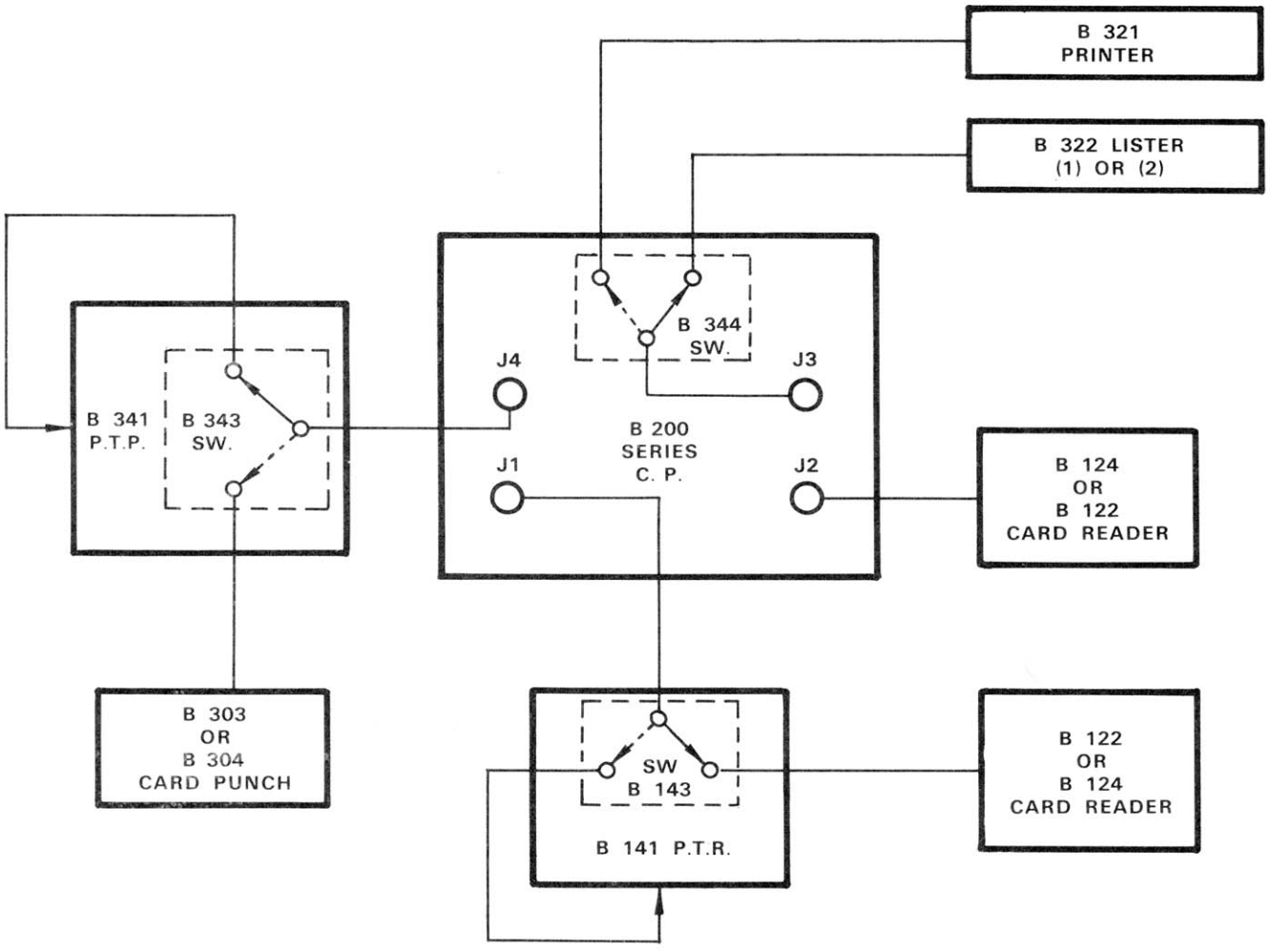
Cards warp and distort under excessive humidity, and too dry an environment will promote static troubles with paper items and magnetic tape.

Smoking in the EDPM Room

Tobacco smoke itself does not seem harmful to magnetic tape. The real culprit appears to be tobacco ashes, and smoking near the tape equipment or reels of tape may be inviting trouble. It is recommended that smoking be banned within fifteen feet of the tape equipment, and that the ash trays used for cigarette disposal be of the type that encloses the disposed cigarette butt or ash.

SECTION 5

SYSTEM OPTIONS



NOTE:
B 343, B 344 and B 143 are selector switches (optional), and may be installed where shown.

Figure 5-1 B 260 or B 263 Card Data Processing System

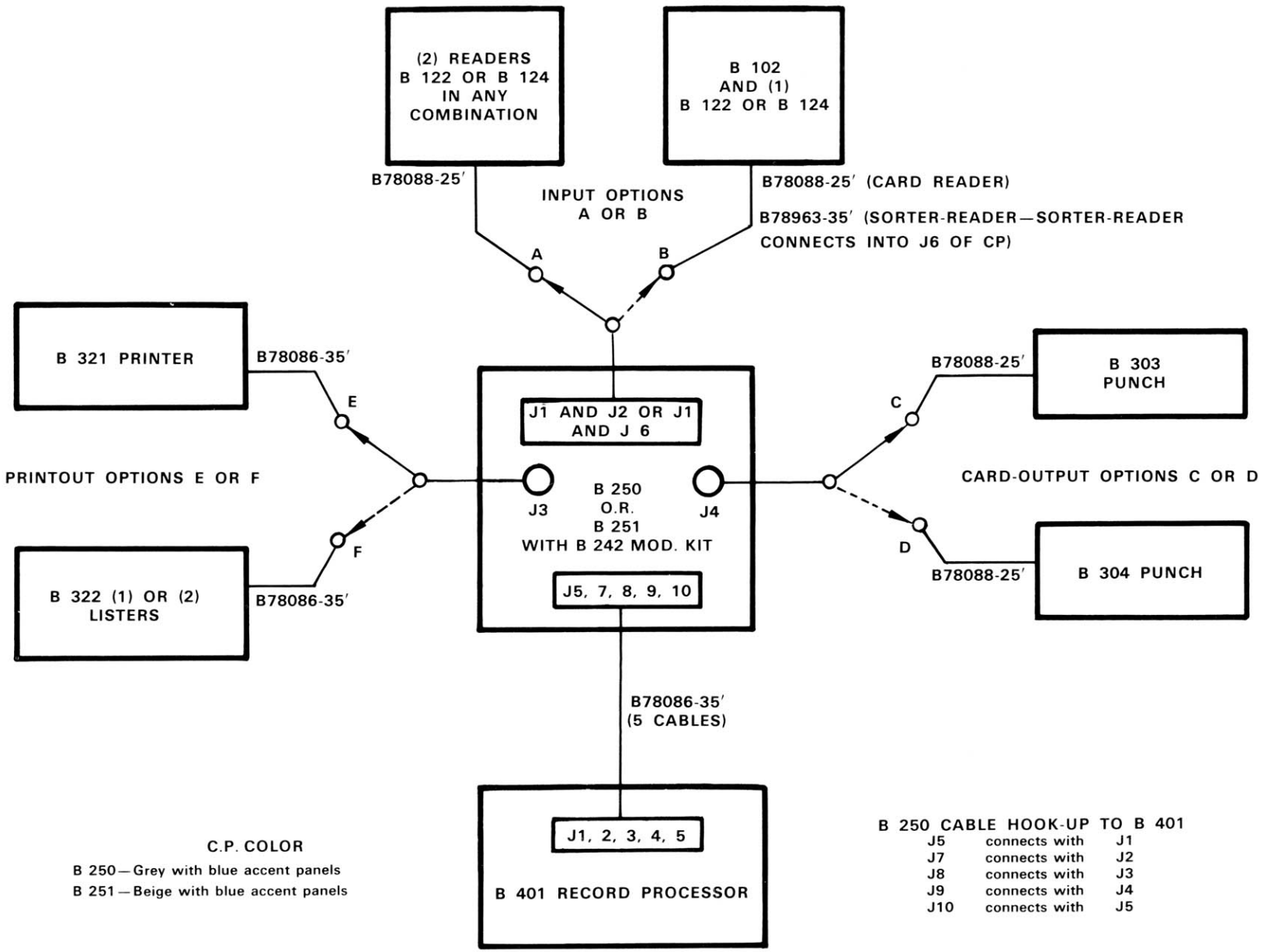


Figure 5-2. B 250 VRC System Options

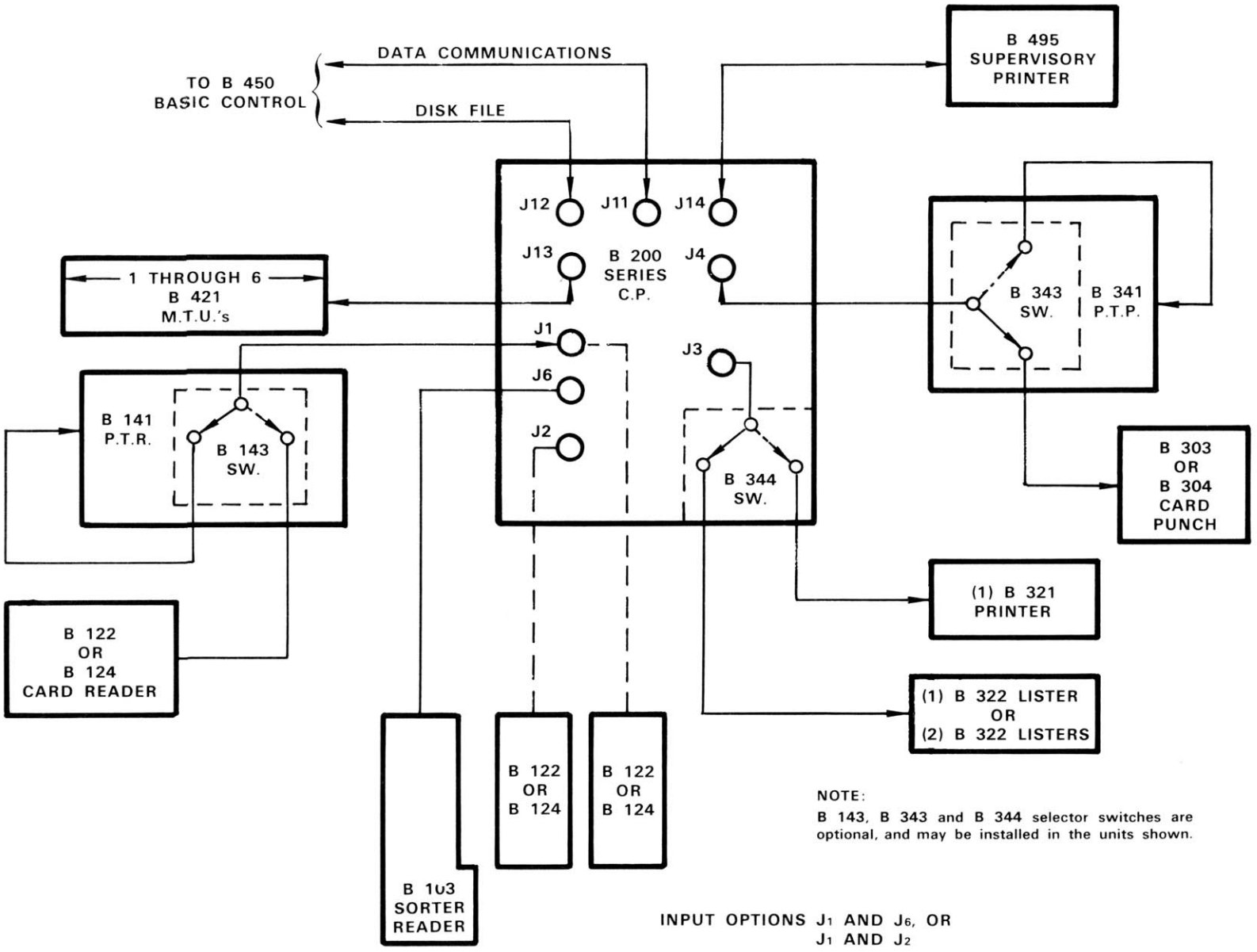


Figure 5-3 B 270 or B 273 MICR Check Processing System

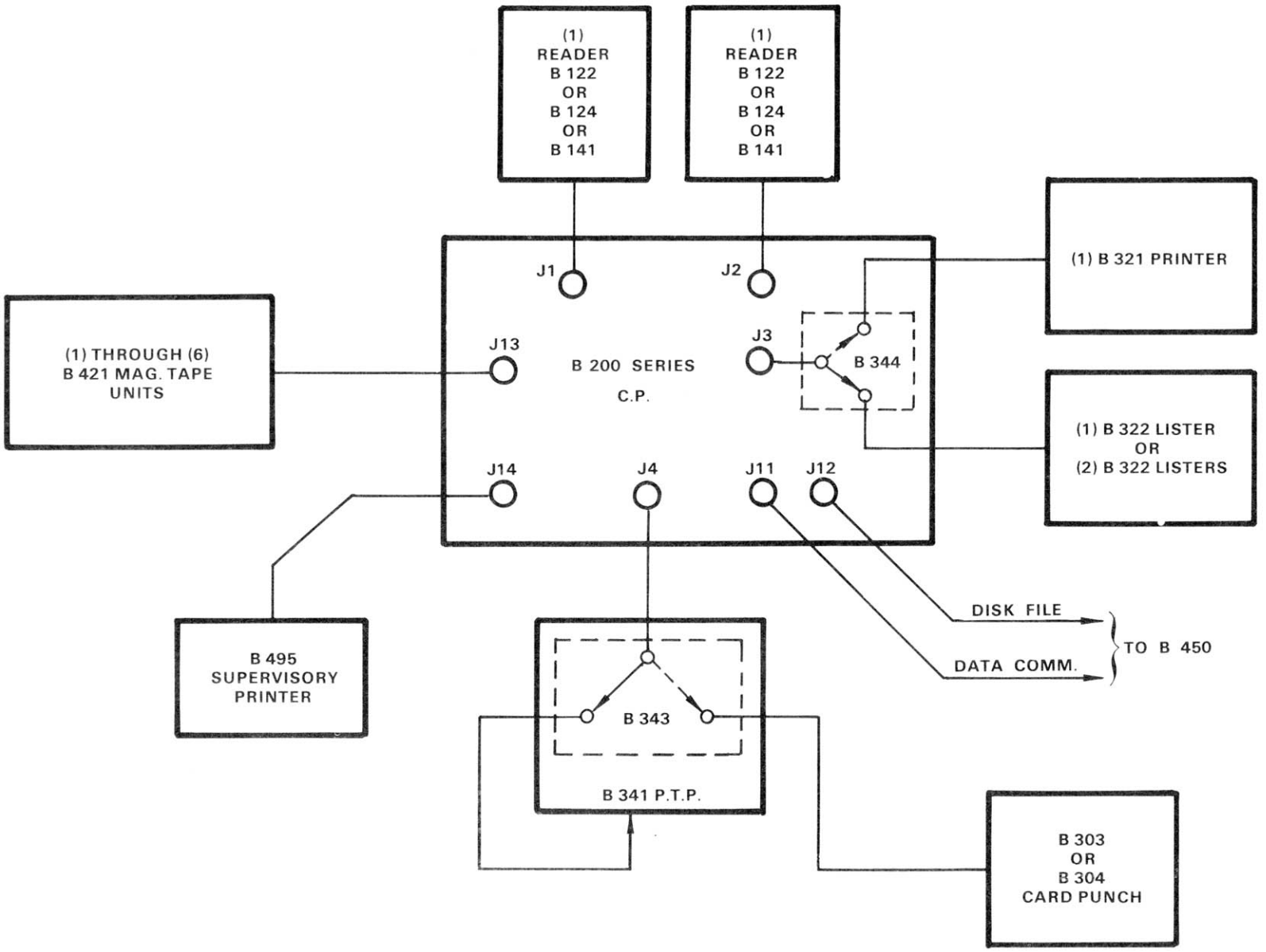


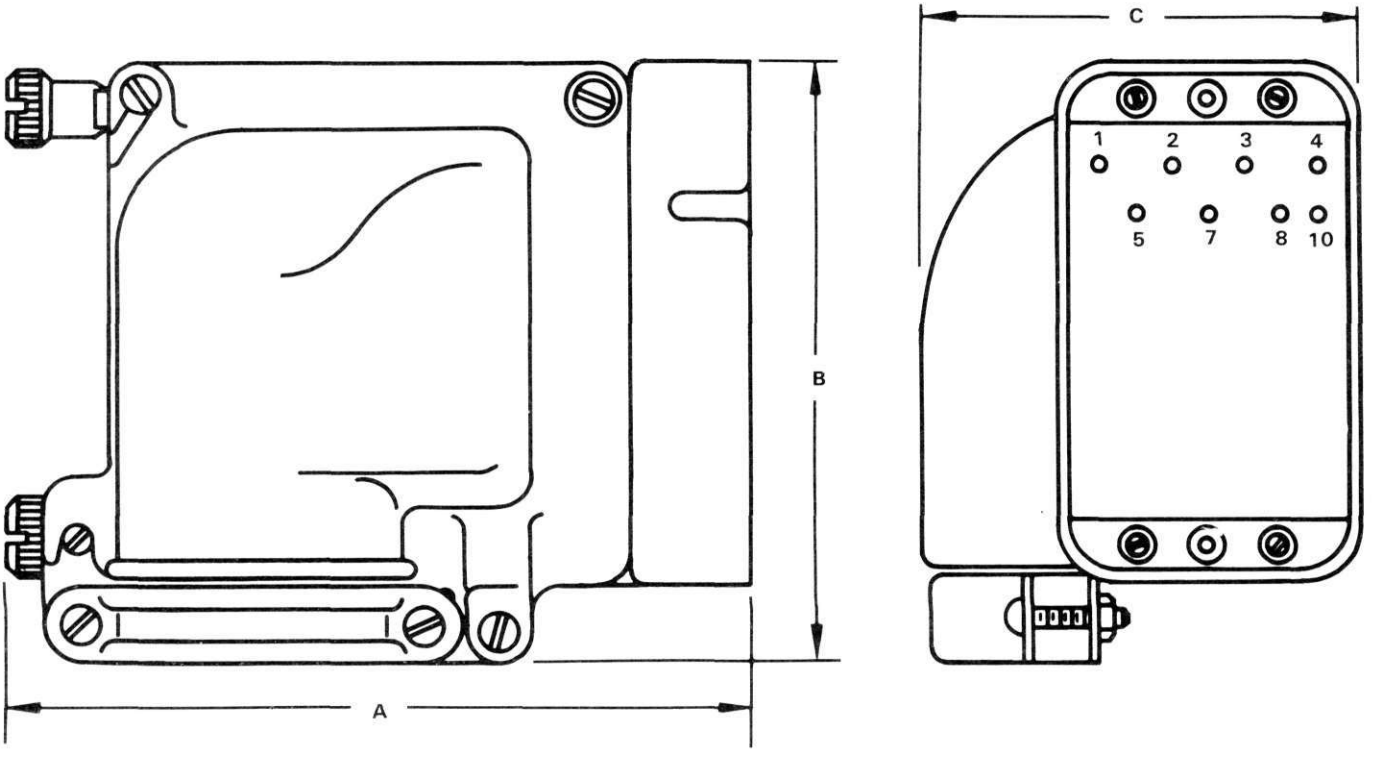
Figure 5-4 B 280 or B 283 Card-Magnetic Tape Data Processing System

SECTION 6

INFORMATION, POWER CABLES AND CONNECTORS

This section contains data on information and power cables, and the connectors that are attached to these cables.

Figure 6-1 is a dimensional sketch of the Information connectors used on the series B 200 Burroughs equipment.



NOTES:

1. Dimension A is 4-1/16" for 52-TP cables, 3-3/4" for 37 TP cables.
   Dimension B is 3-23/64" for 52-TP cables, 3-11/64" for 37-TP cables.
   Dimension C is 2-5/8" for 52-TP cables, 2-9/64" for 37-TP cables.
2. 52-twisted pair cables are used on Record Processor, Printer, Lister, and Mag. Tape Units.
   37-twisted pair cables are used on Sorter-Reader, Card Readers, and Punches.
3. When planning cable cutout sizes in the floor, allow for all the cables that will pass through the opening.

Figure* 6-7. B 200 *Information Connectors

Figure 6-2 depicts the Hubbell four-prong, twist-lock connector rated at 20 amperes, and is attached to Burroughs-furnished power cables for the following units:

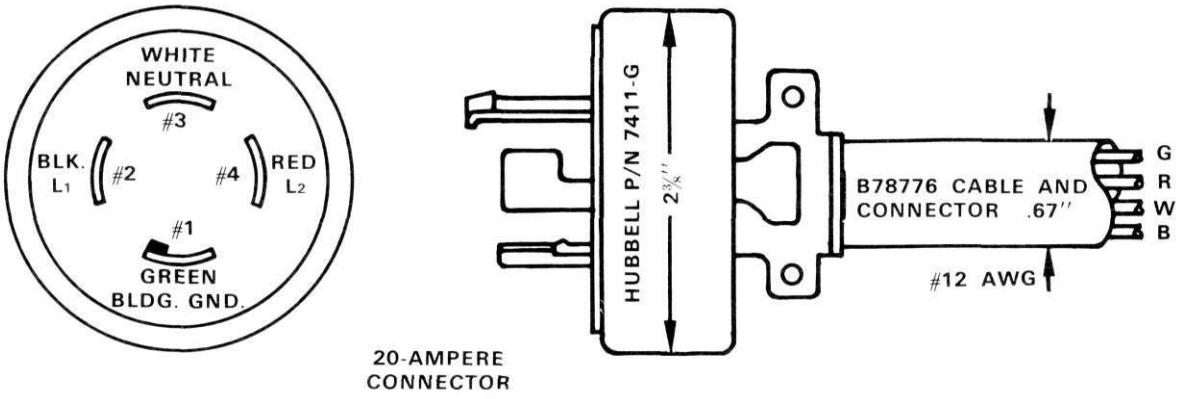
B 321 Printer
B 322 Lister
B 124 Reader
B 303 Punch
B 421 Mag. Tape Unit
B 122 Card Reader
B 304 Punch

Figure 6-3 depicts the heavy duty 50-ampere four-wire, twist-lock connector found on the power cables attached to the B 102 and B 103 Sorter-Reader, B 200 Series Central Processor, and B 401 Record Processor Unit.

The Hubbell mating plugs that the customer furnishes attached to his power cabling are identified here:

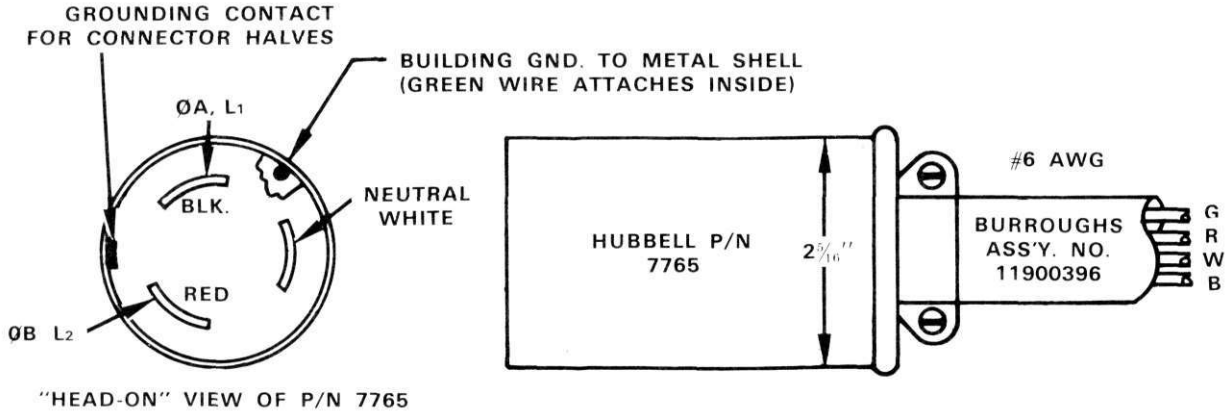
Hubbell plug P/N 7765, 50 ampere Burroughs furnished, mates with Hubbell receptacle P/N 7764, which is customer furnished.

Hubbell plug P/N 7411-G, 20 ampere Burroughs furnished, mates with Hubbell receptacle P/N 7413, which is customer furnished.



NOTE:
Burroughs supplied Hubbell twist-lock connector. Will mate with Hubbell P/N 7413 (Customer supplied).

Figure 6-2. Hubbell Four-Prong, Twist-Lock Connector



NOTE:
Hubbell 50-ampere connector No. 7765. Will mate with Hubbell P/N 7764.

Figure 6-3. Hubbell 50-Ampere Connector

Cable footage used vertically within the various B 200 system units:

INFORMATION CABLES

B 200 Series Central Processors	3' maximum
B 122 Card Reader (200 cpm)	3' maximum
B 102 or B 103 S-R	2' maximum
B 401 Rec. Proc. Unit	20 inches
B 321 Printer	12 inches
B 322 Lister	12 inches
B 124 Reader (800 cpm)	10 inches
B 303 Card Punch (100 cpm)	10 inches
B 421 Magnetic Tape Unit	$16^{1}/_{2}$ inches
B 141 Paper Tape Reader	15 inches
B 341 Paper Tape Punch	15 inches

	CABLE #	DIA.	LENGTH	CONNECTING	TO	MINIMUM BENDING RADIUS
P/N	B78086	1 1/8″	35'	Cent. Proc.	RPU	8 inches
				Cent. Proc.	Lister	
				Cent. Proc.	Printer	
	B78963	1 1/8″	35'	Cent. Proc.	Sorter-Reader	7 inches
	*B78088	7/8″	25'	Cent. Proc.	Card Reader	7 inches
	B78962	1 5/32"	25'	Cent. Proc.	B 421 MTU	8 inches
	B80570	1 5/32"	6'	B 421 MTU	B 421 MTU	8 inches
	B10091320	1 5/32"	15'	B 322 Lister	B 322 Lister	8 inches

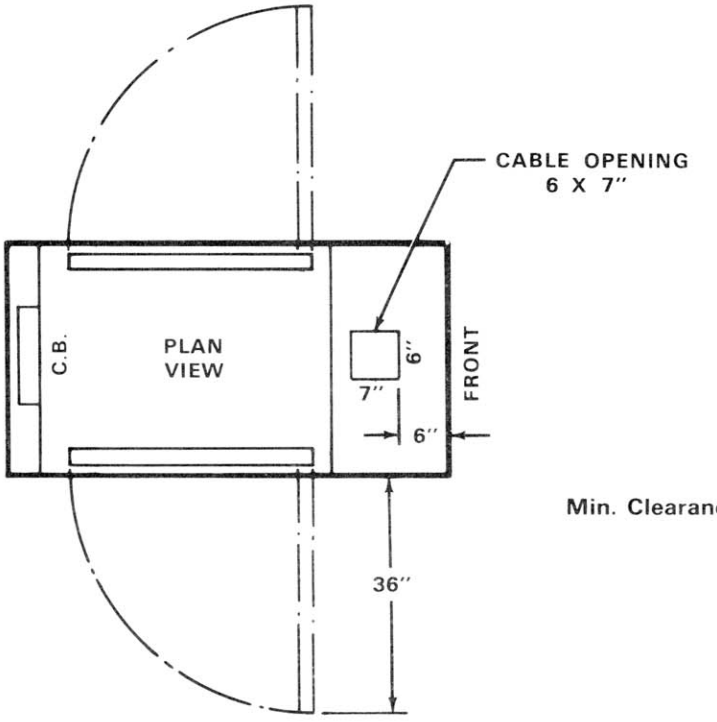
The following cables are about 25 feet (except B11070752 which is 15') in useable length and have a minimum bending radius of 6 inches. These three cables plug into customer-provided and customer-wired-in receptacles that have a Hubbell P/N 7764.

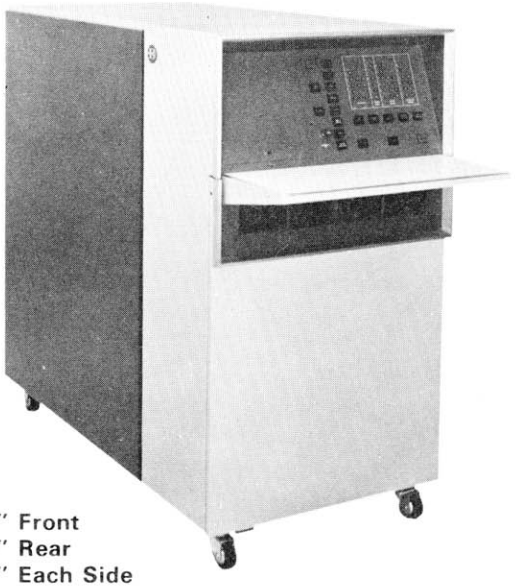
	POWER CABLES	RATED AT	HUBBEL CONNECTOR ATTACHED	PART OF EQUIPMENT
P/N	11900396	45 amperes	7765	B 200 Series Central Processors
	11900396	45 amperes	7765	B 401 Rec. Pro. Unit
	11900396	45 amperes	7765	B 102 or B 103 S-R.
	B 78776	20 amperes (#12 AWG) stranded	7411-G	B 421, B 124, B 303, B 321, B 322, and B 304
	B 78794	15 amperes (#14 AWG) stranded	**7411-G	B 122 Card Reader.
	B110707052			B 141/B 341 Paper Tape Units.

*This cable also used on B 303, B 124, B 304.
**The Card Reader uses only 120 volts obtained from one hot line and neutral.

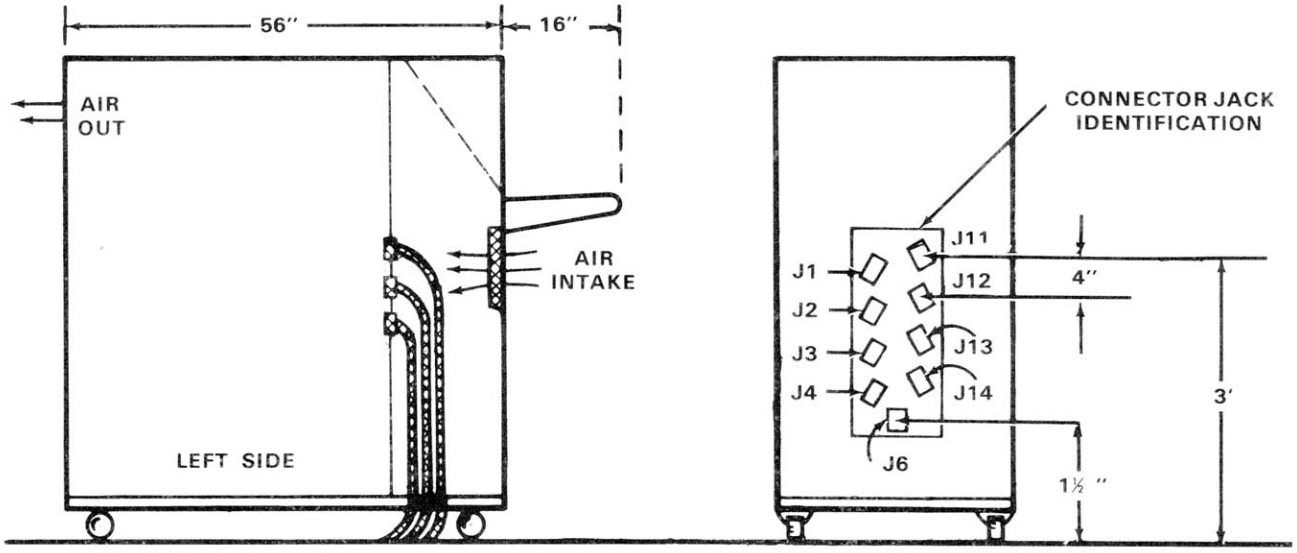
SECTION 7

PHYSICAL AND ELECTRICAL DATA





Min. Clearances:
4'0" Front
3'0" Rear
4'0" Each Side

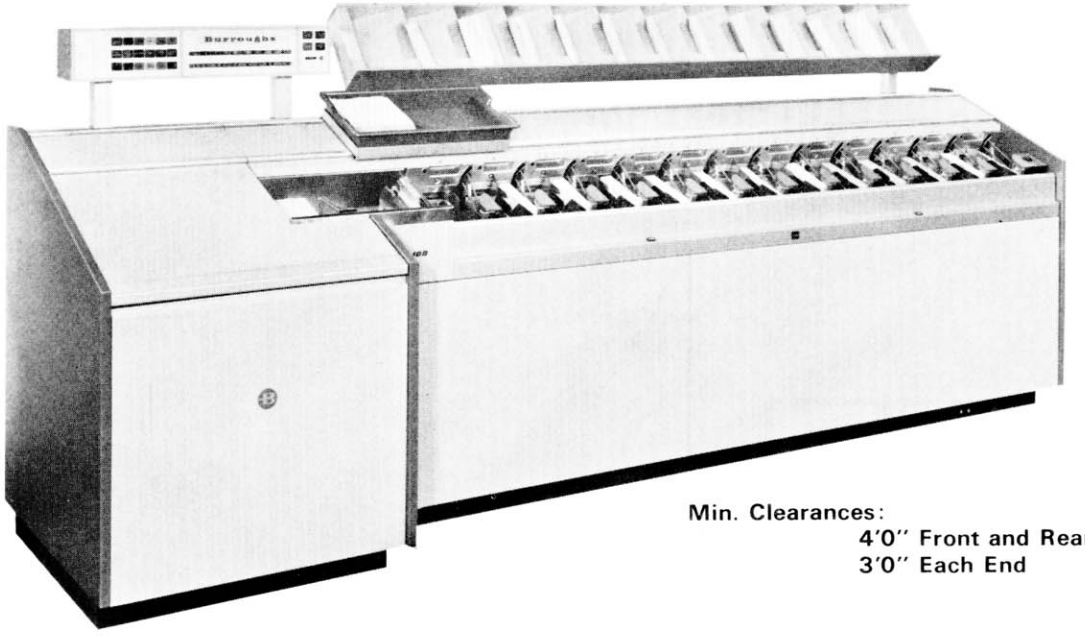


B 200 SERIES CENTRAL PROCESSORS

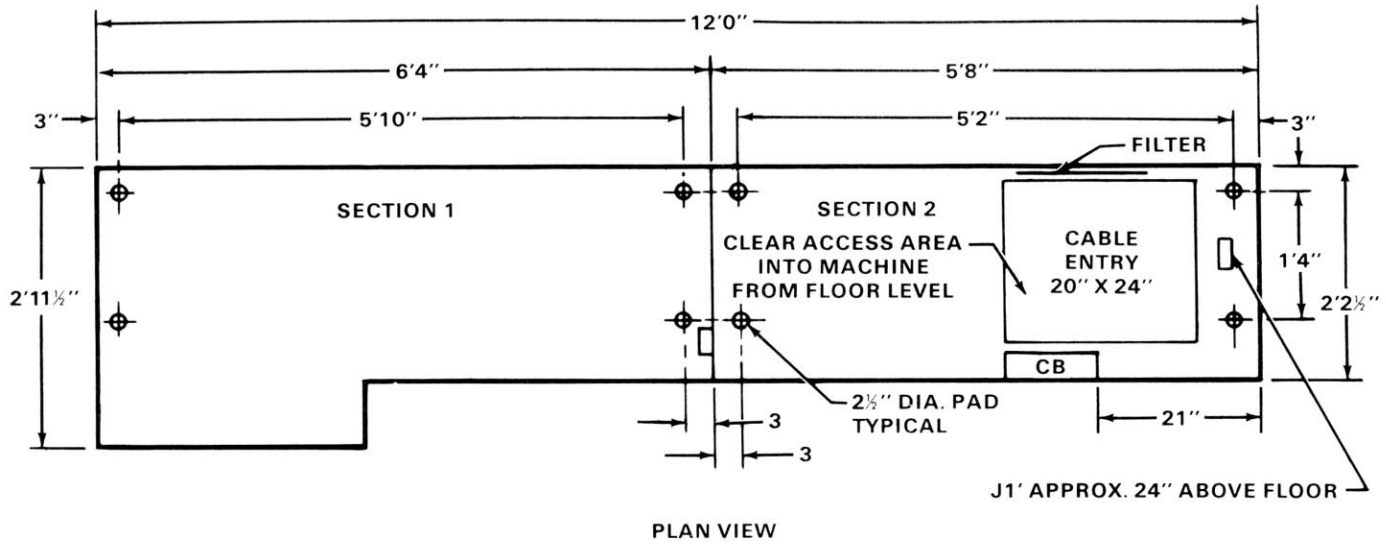
Power	0.7 KVA, 0.6 KW
BTU/HR	2000
CFM	300
Main Circuit Breaker Rated at 40 Amps.	
Operating Current L1	6.5 Amps.
Width	29"
*Depth	66"
Height	55"
Weight (Approx.)	1200 Lbs.

*Includes 10" for "shelf"

Figure 7-1 Central Processor



Min. Clearances:
4'0" Front and Rear
3'0" Each End



PLAN VIEW

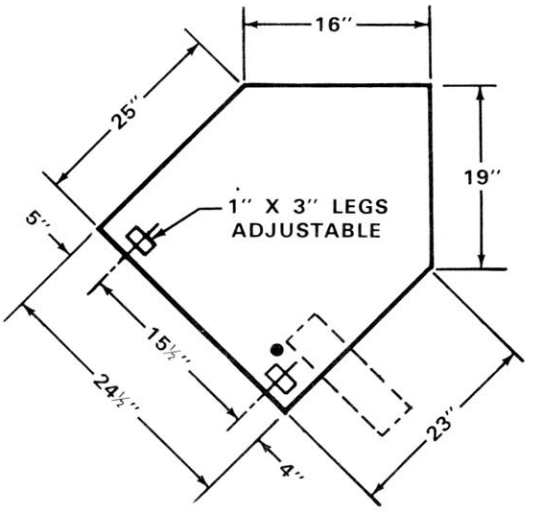
Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	*120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA (Operating)	8.0
Main Circuit Breaker Rated at 70 Amps.	
CFM	1080
BTU/HR	22,000

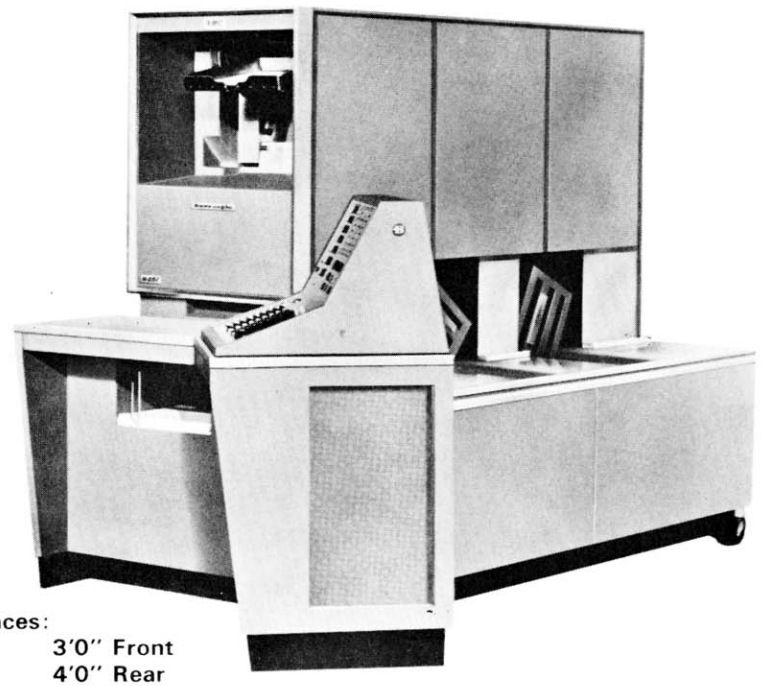
NOTE:
A B 101 "off-line" S-R requires same power and site preparation as a B 102 or B 103. The power cable and connector half are not furnished with the B 101.

Starting Surge	160 Amps. (For 0.2 Sec.)
Line Current (Operating)	(Under) 40 Amps.
Height	58"
Length	144"
Depth	(Section 1) 35½"
Depth	(Section 2) 26½"
Sections 1 and 2 are Separated for Shipping Weight	3982 Lbs.

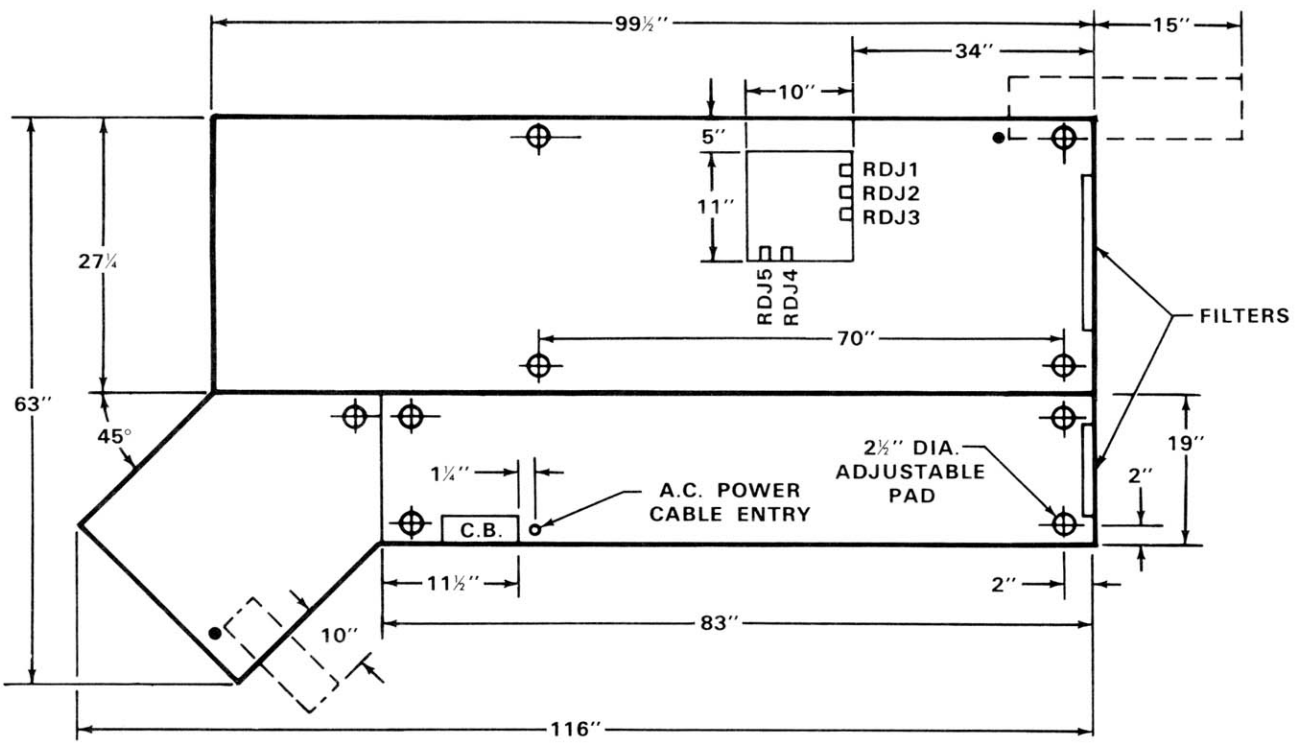
*Derived from 120V/280V 3Ø-4-Wire Source

Figure 7-2 B 102—B 103 Sorter-Reader





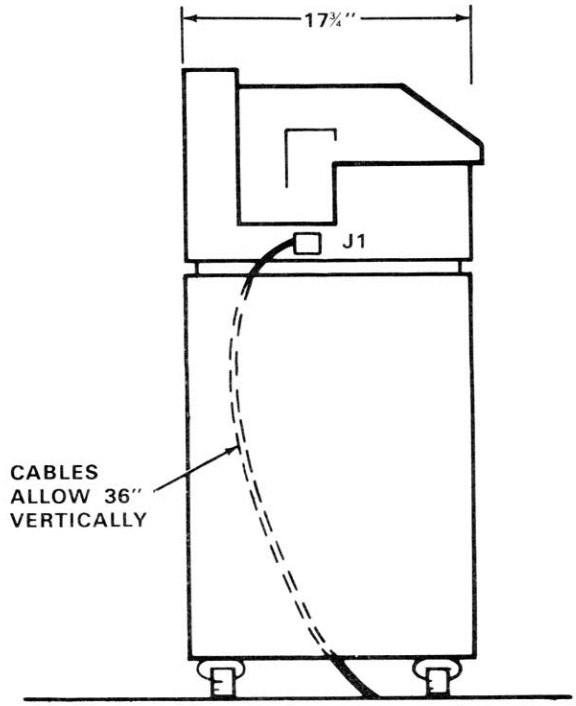
Min. Clearances:
3'0" Front
4'0" Rear
3'0" Each Side



Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	*120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA. . . 6.0 (Includes 1.5 KVA for Conv. Outlets)	
Main Circuit Breaker Rated at 50 Amps.	
CFM. . . . . 1000 (500 Through Each Filter)	
BTU/HR 12,000	

Operating Current (Approx.) L1.	14 Amps.
L2.	16 Amps.
Max. Start Surge .	210 Amps.
Height.	65"
Length.	63"
Depth	116"
Weight.	2800 Lbs.

Figure 7-3 B 401 Record Processor



Min. Clearances:
3'0" Front
1'6" Rear
2'6" Each End

Power Source	120V 10 2-Wire plus Bldg. Grd.
Power Consumption	0.20 KVA
BTU/HR	700
CFM	None

Approx. Dimensions (On Stand)

Height	41"
Width	29⅜"
Depth	17¾"
Weight (Less Stand)	102 Lbs.

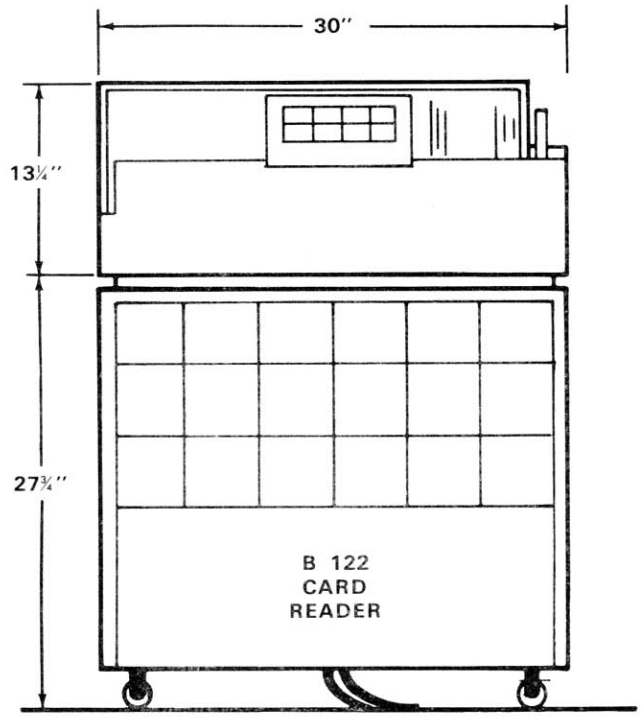
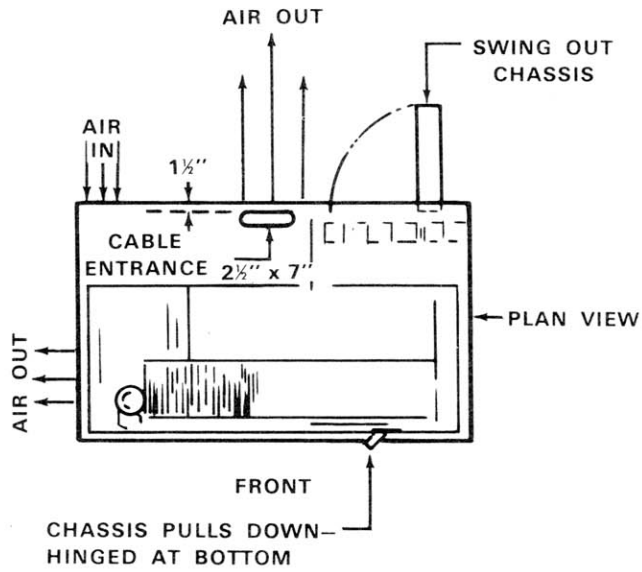


Figure 7-4 B 122 Card Reader



Min. Clearances:
3'0" Front and Rear
2'0" Left End
1'0" Right End

Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
Power	1.30 KVA
BTU/HR	3000
Operating Current (Approx.) L1	11.2 Amps
Max. Start Surge	50 Amps.
Main Circuit Breaker Rated at 30 Amps.	
Width	48"
Depth	29"
Height (Includes Height to Top of Control Panel)	50"
Weight (Approx.)	920 Lbs.

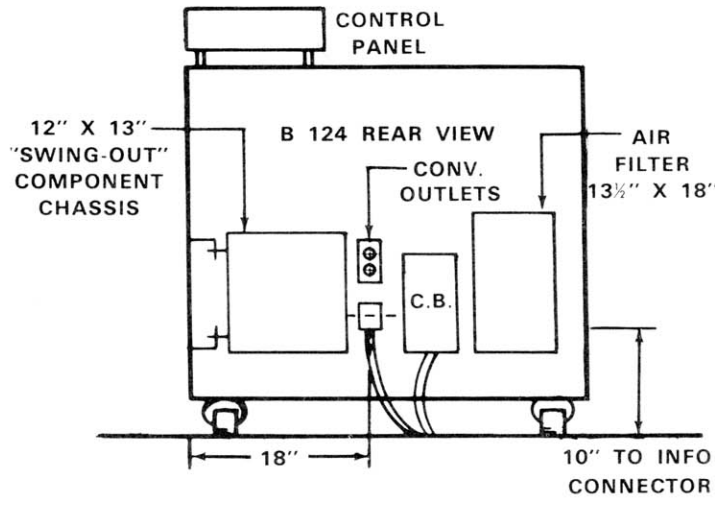
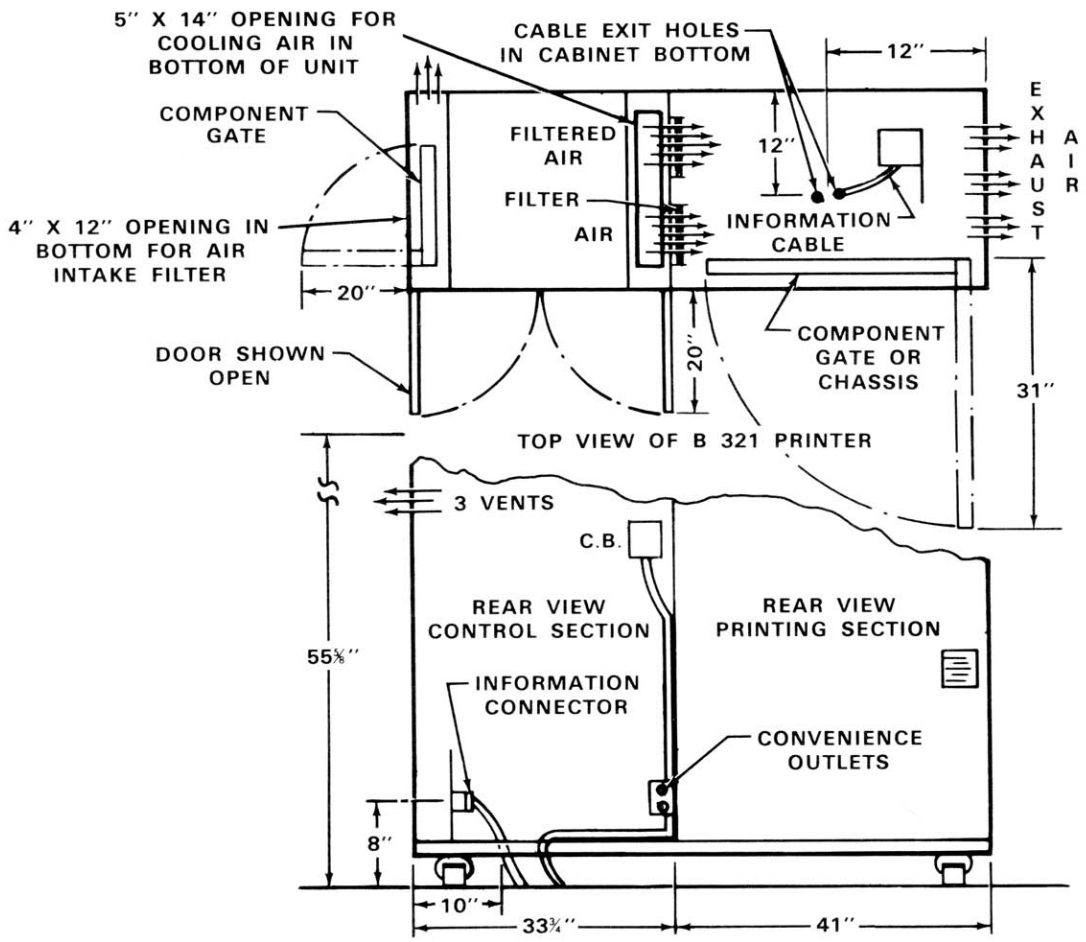


Figure 7-5 B 124 800 Card Per Minute Reader

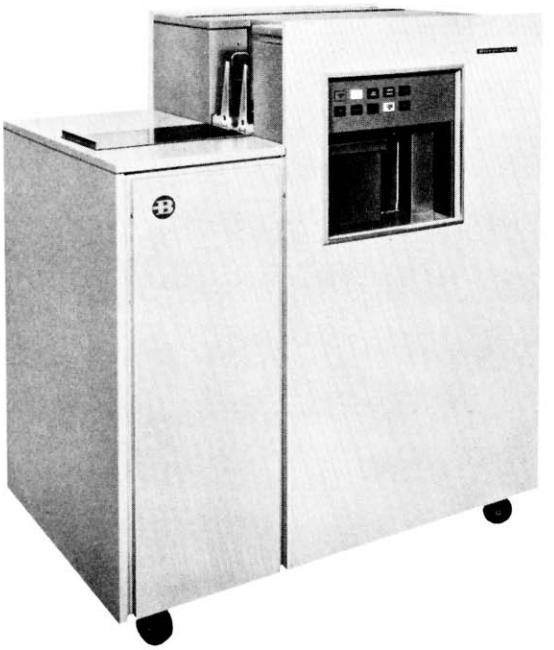
Min. Clearances:
3'0" Front and Rear
2'6" Left End
1'0" Right End

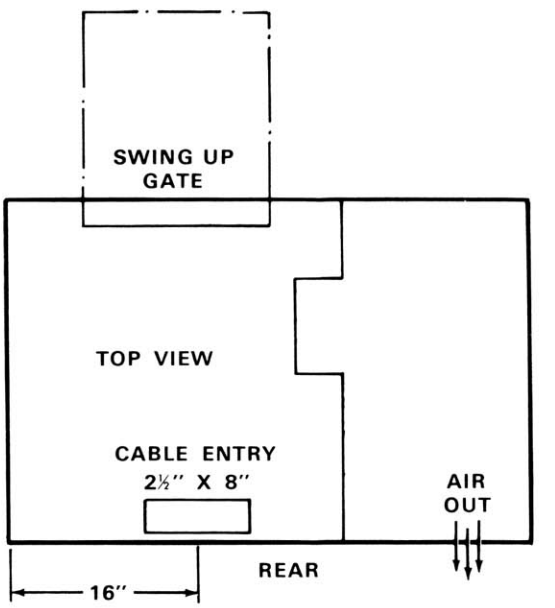


Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA (Operating)	2.40
BTU/HR	8000
CFM (Blower)	765
Main Circuit Breaker Rated at 30 Amps.	

Operating Current L1	10 Amps.
L2	10 Amps.
Max. Start Surge	56 Amps.
Width	74¾"
Depth	29"
Height	55⅞"
Weight	1738 Lbs.

Figure 7-6 B 321 Printer





Min. Clearances:
3'0" Front and Rear
0'0" Left End
1'0" Right End

Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA (Max. Operating)	1.40
BTU/HR	4000
CFM (Exhaust Fan)	(Less Than) 200
Operating Current L1	7.5 Amps.
L2	3.9 Amps.
Max. Start Surge	50 Amps.
Width	44½"
Depth	28"
Height	53"
Weight	655 Lbs.

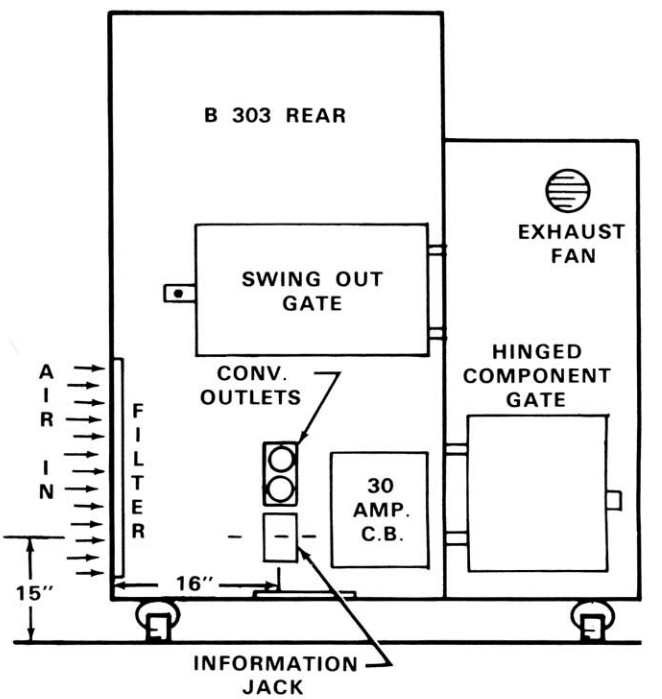
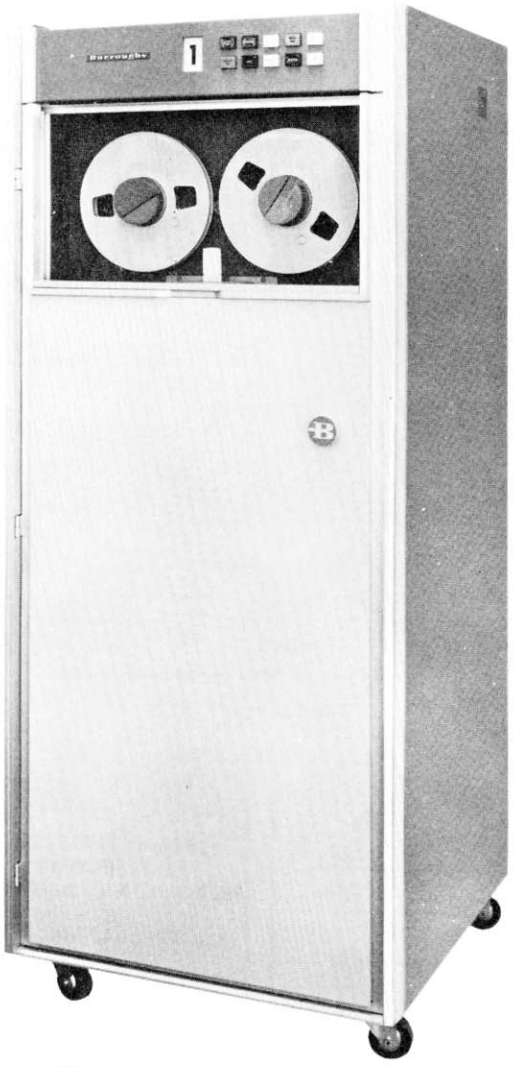


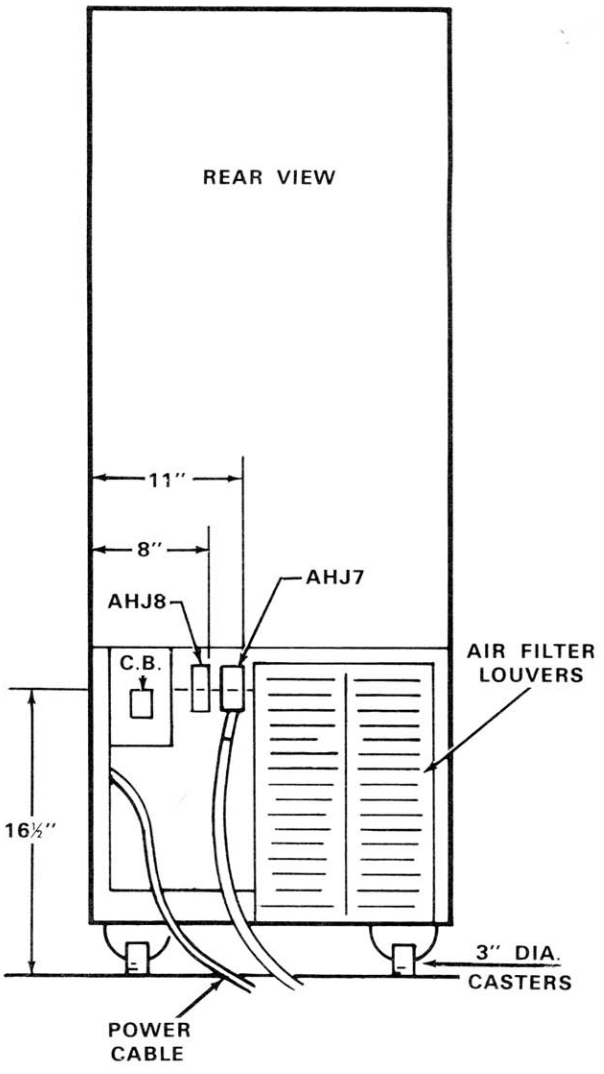
Figure 7-7 B 303 Card Punch

NOTES:

1. Power, heat dissipation, size, and weight—same as for B 321 printer.
2. Minimum operating and maintenance clearances—same as for B 321.

Figure 7-8 B 322 Multiple Tape Lister





Min. Clearances:
3'0" Front and Rear
0'1" Between Units

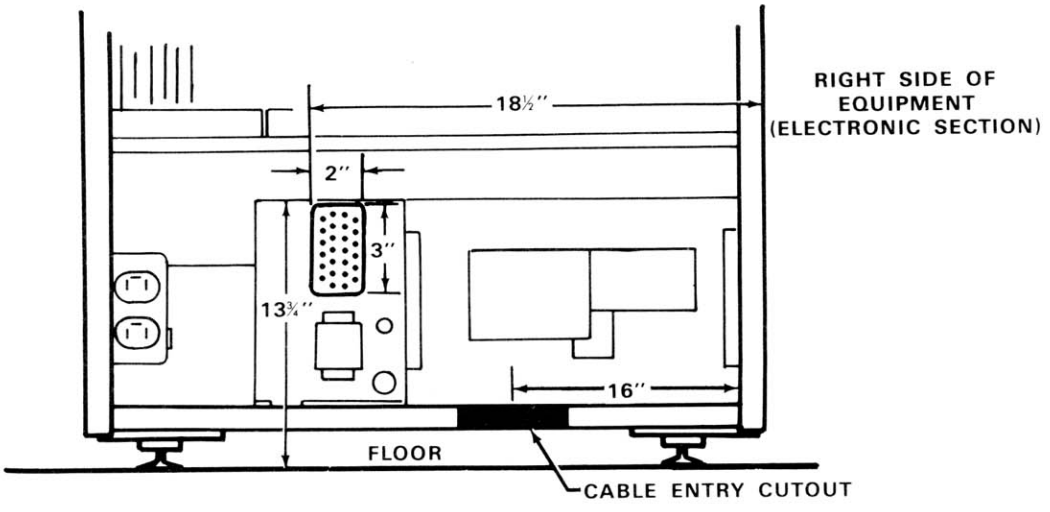
Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	120/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA (Max. Power)	3.35 (Rewind Mode)
	2.05 (Forward Drive)
BTU/HR	7200
CFM (Est.)	425
Circuit Breaker Rated at 20 Amp.	
Line Current	16 Amp. (Approx.)
Max. Start Surge	52 Amp. (For 24 MS)

Width	29⅝"
Depth	28⅜"
Height	74¾"
Weight	900 Lbs.

Figure 7-9 B 421 Magnetic Tape Unit

Min. Clearances:
3'0" Front
0'0" Rear
3'0" Right and Left Side

FRONT



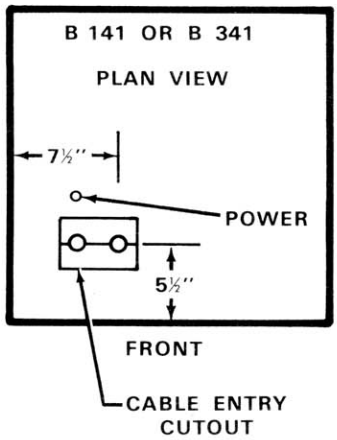
Power Source	115V/230V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
	120V/208V 60 Cycle, 1Ø 3-Wire plus Bldg. Grd.
KVA (Full Load)	2.20
BTU/HR	5500
CFM	900
Main Circuit Breaker Rated at 30 Amp.	

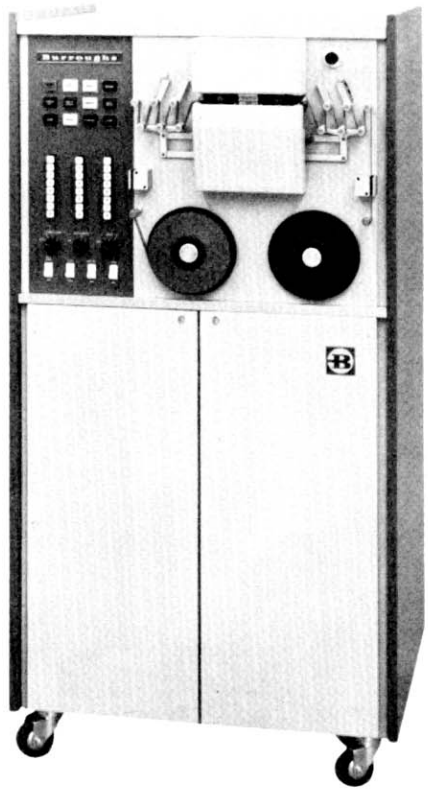
Operating Current

	START SURGE	IDLE	PUNCHING
L2	50 Amp.	12.3 Amp.	12.6 Amp.
L1	15 Amp.	5.5 Amp.	5.8 Amp.

Average power factor	0.65
Width	27½"
Height	47"
Length	73"
Weight	1283 Lbs.

Figure 7-10 B 304 300 Card Per Minute Punch





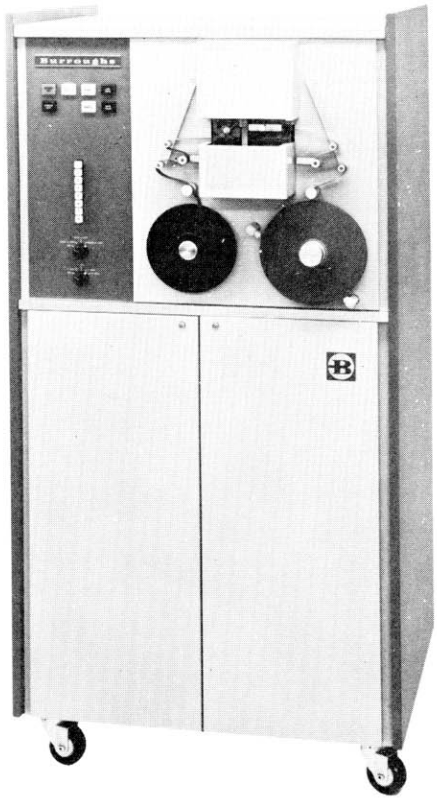
Min Clearances:
3'0" Front and Rear
0'0" Left and Right Side

Power Source	120V 60 Cycle, 1Ø 2-Wire plus Bldg. Grd.
P.S. Cabinet + 20V DC Supply	6 Watts
− 12V DC Supply	12 Watts
Power Consumption	0.91 KVA Max. with Translator
BTU/HR	3100
CFM	200
Width	30⅜"
Depth	24⅞"
Height	60"
Weight	437 Lbs. with Translator
Operating Equipment	
Temp. Range	60°-100°F.
Rel. Humidity	10%-90%

The 15' power cable has a 3-pronged connector. Information cable length is 25' between CP and PTR, P/N B78088.

Allow 15" vertical drop for signal cable.

Figure 7-11 B 141 Paper Tape Reader



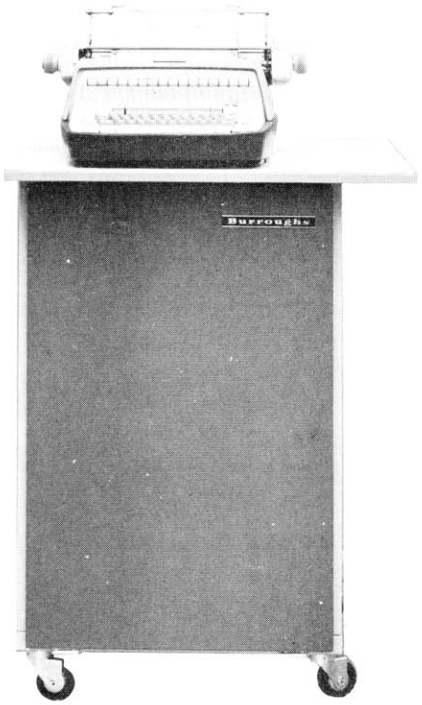
Min. Clearances:
3'0" Front and Rear
0'0" Left and Right Side

Power Source	120V 60 Cycle, 1Ø 2-Wire plus Bldg. Grd.
P.S. Cabinet + DC Supply	4 Watts
− 12V DC Supply	6 Watts
Power Consumption	0.595 KVA Max. with Translator
BTU/HR	1500
CFM	200
Width	30⅜"
Depth	24⅞"
Height	60"
Weight	426 Lbs. with Translator
Operating Environment	
Temp. Range	60°-100°F.
Rel. Humidity	10%-90%

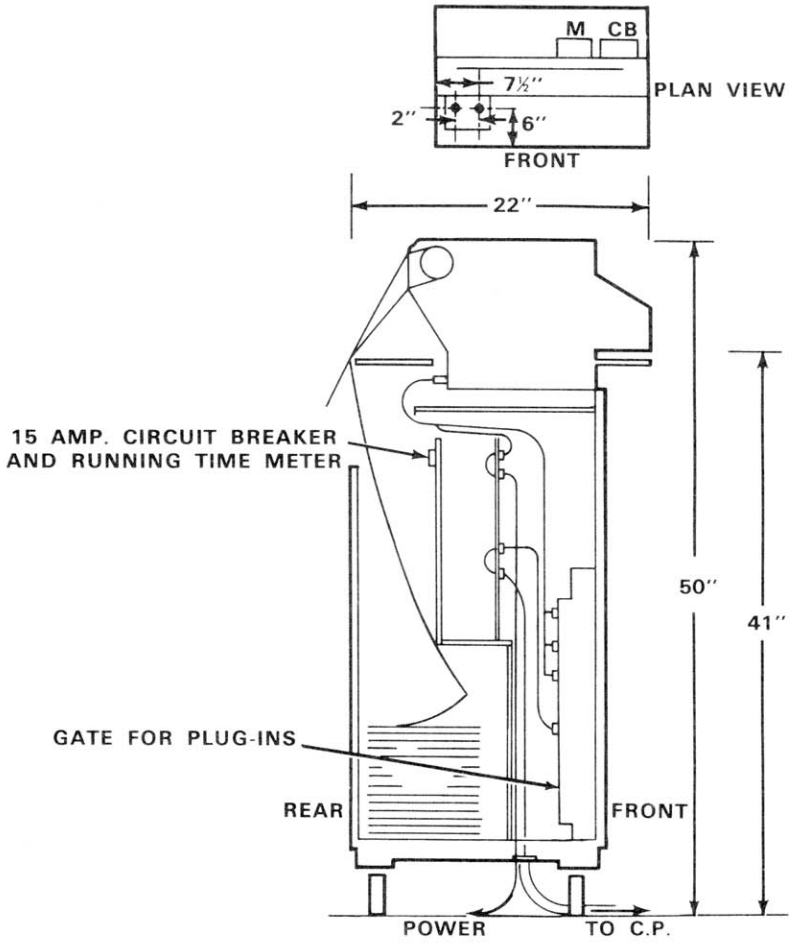
The 15' power cable has a 3-pronged connector. Information cable length is 25' between CP and PTR, B 78088.

Allow 15" vertical drop for signal cable.

Figure 7-12 B 341 Paper Tape Punch



Min. Clearances:
0'0" Right End
0'0" Left End
3'0" Front
1'0" Rear



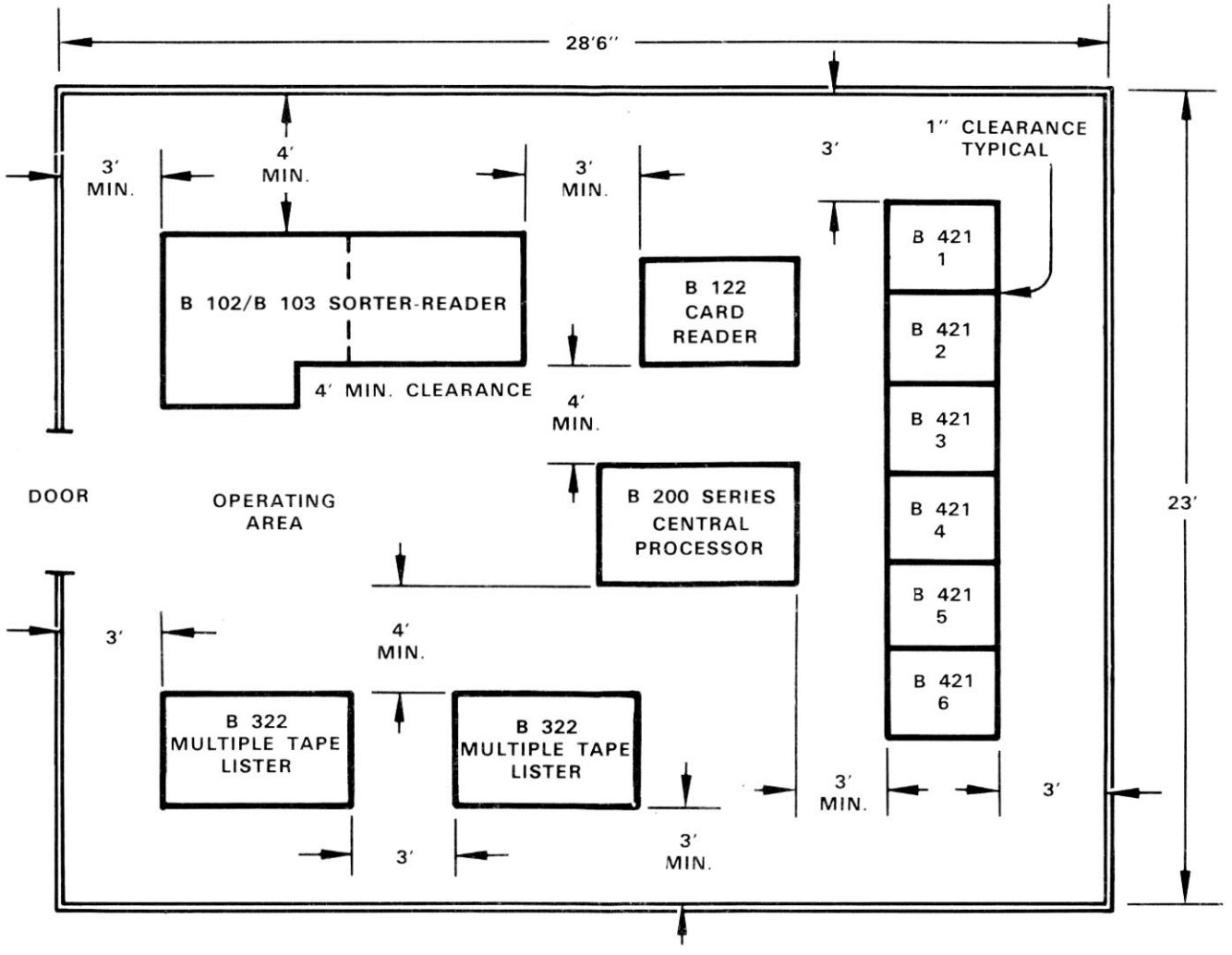
Power Source	120V 60 Cycle, 1Ø 2-Wire plus Bldg. Grd.
Power Consumption	0.3 KVA
Width	22"
Height	50"
Depth	22"
Weight (Approx.)	200 Lbs.
Heat Dissipation	Negligible

Power cable is 15' in length. Signal cable P/N 78087 is 30' in length.

Figure 7-13 B 495 Supervisory Printer

SECTION 8

SAMPLE LAYOUTS INCLUDING SYSTEM KVA AND HEAT DISSIPATION IN BTU/HR



	POWER IN KVA		HEAT DISSIPATION
1	B 102 S-R	8.00	22000 BTU/hr
1	B 270 C-P	0.70	2000 BTU/hr
1	B 122 C-R	0.20	700 BTU/hr
2	B 322 MTL	7.00	21500 BTU/hr
6	B 421 MTU's	20.10	43200 BTU/hr
Conv. Outlet		3.00	89400
		39.00	

Figure 8-1 B 270 or B 273 System Layout (Room Size 23' X 28½')

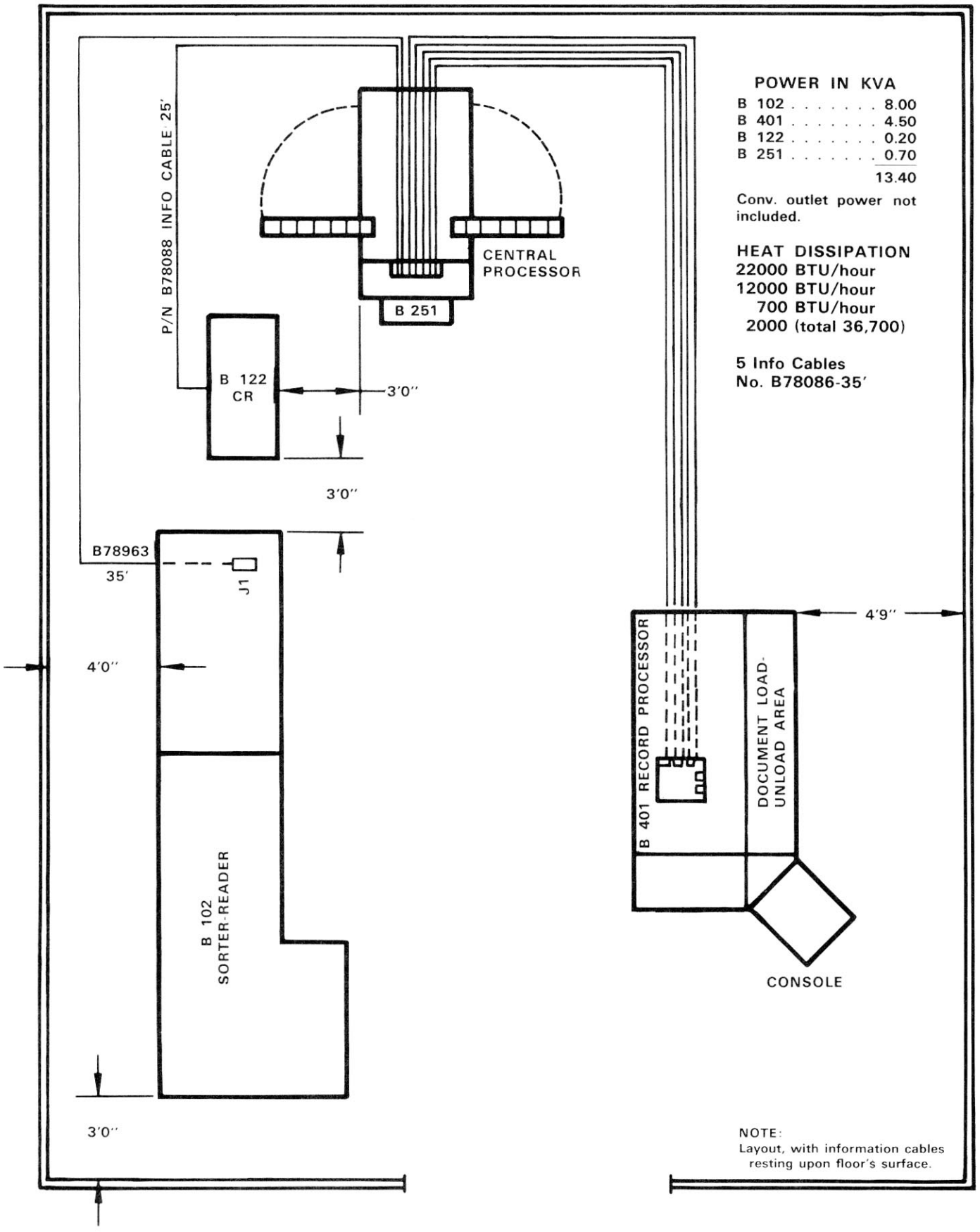


Figure 8-2 B 251 VRC System Layout Configuration (Room Size 28'6" X 23'0")

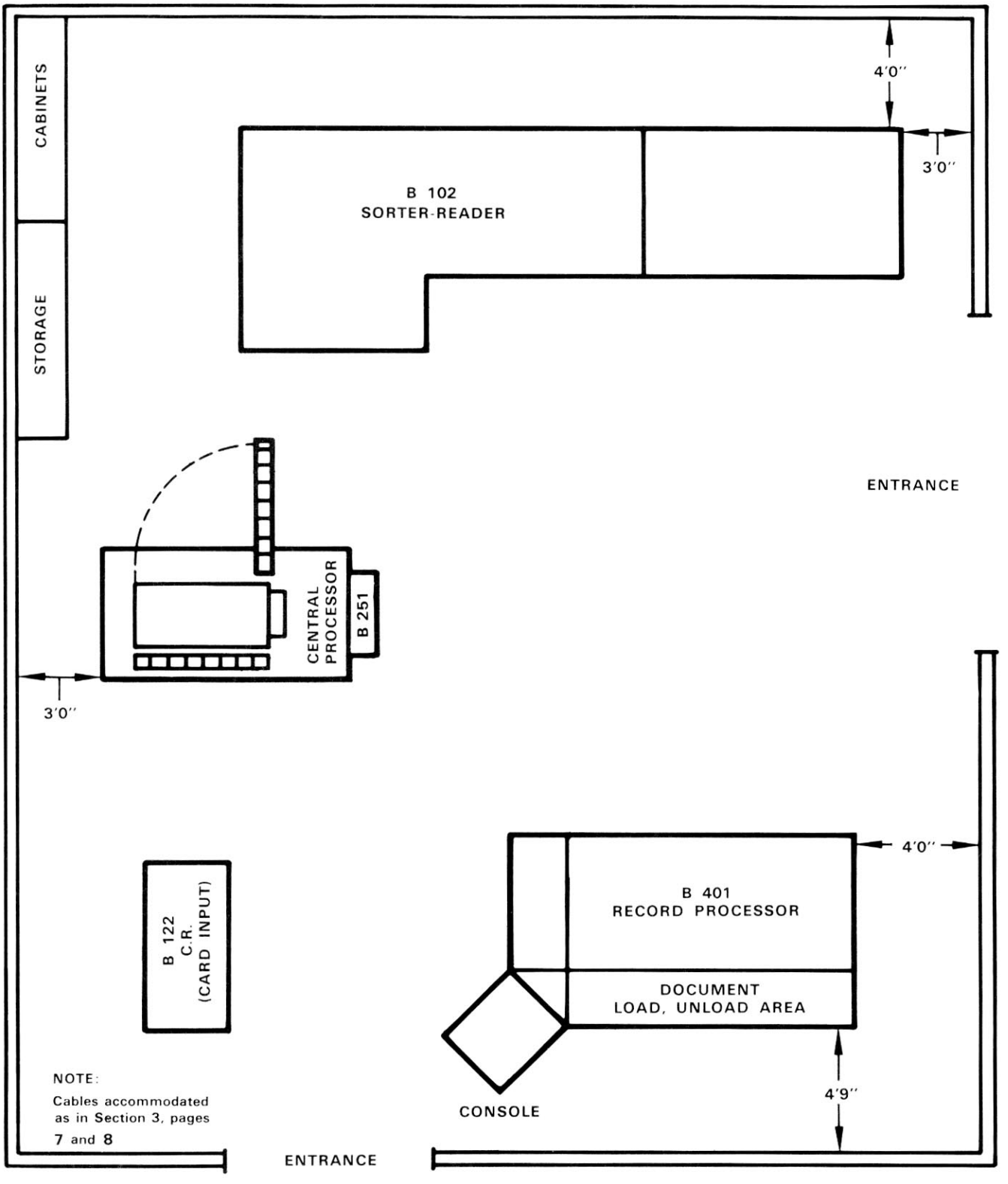
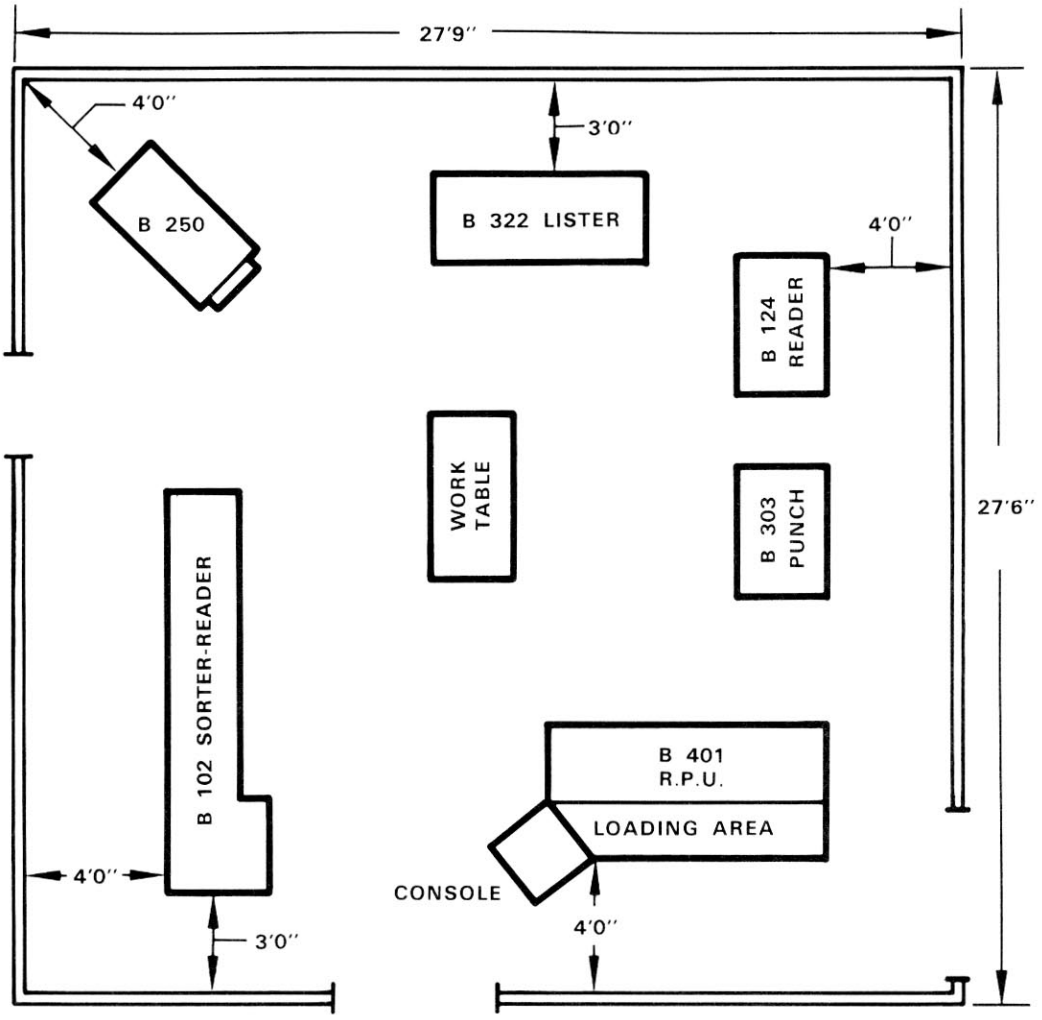


Figure 8-3 Alternate B 251 VRC System Layout Configuration (Room Size 24'8" X 22'4")



ELECTRICAL

1	B 102 S-R	8.00
1	B 401 RPU	4.50
1	B 250 CP	0.70
1	B 322 List	2.40
1	B 124 Read.	1.30
1	B 303 Punch	1.40
		18.30
Conv. Outlets		3
		21.30

115V/230V 60 Cycle 10-3-Wire
plus Bldg. Grd.
120V/208V 60 Cycle 10-3-Wire
plus Bldg. Grd.

HEAT DISSIPATION

1	B 102 Sorter-Reader	22000 BTU/hr
1	B 401 Record Proc. Unit	12000 BTU/hr
1	B 250 Central Proc.	2000 BTU/hr
1	B 322 Lister	8000 BTU/hr
1	B 124 Reader	3000 BTU/hr
1	B 303 Punch	4000 BTU/hr
		29,000 BTU/hr

Figure 8-4 B 250 VRC Card System (Room Size 27'9" X 27'6")

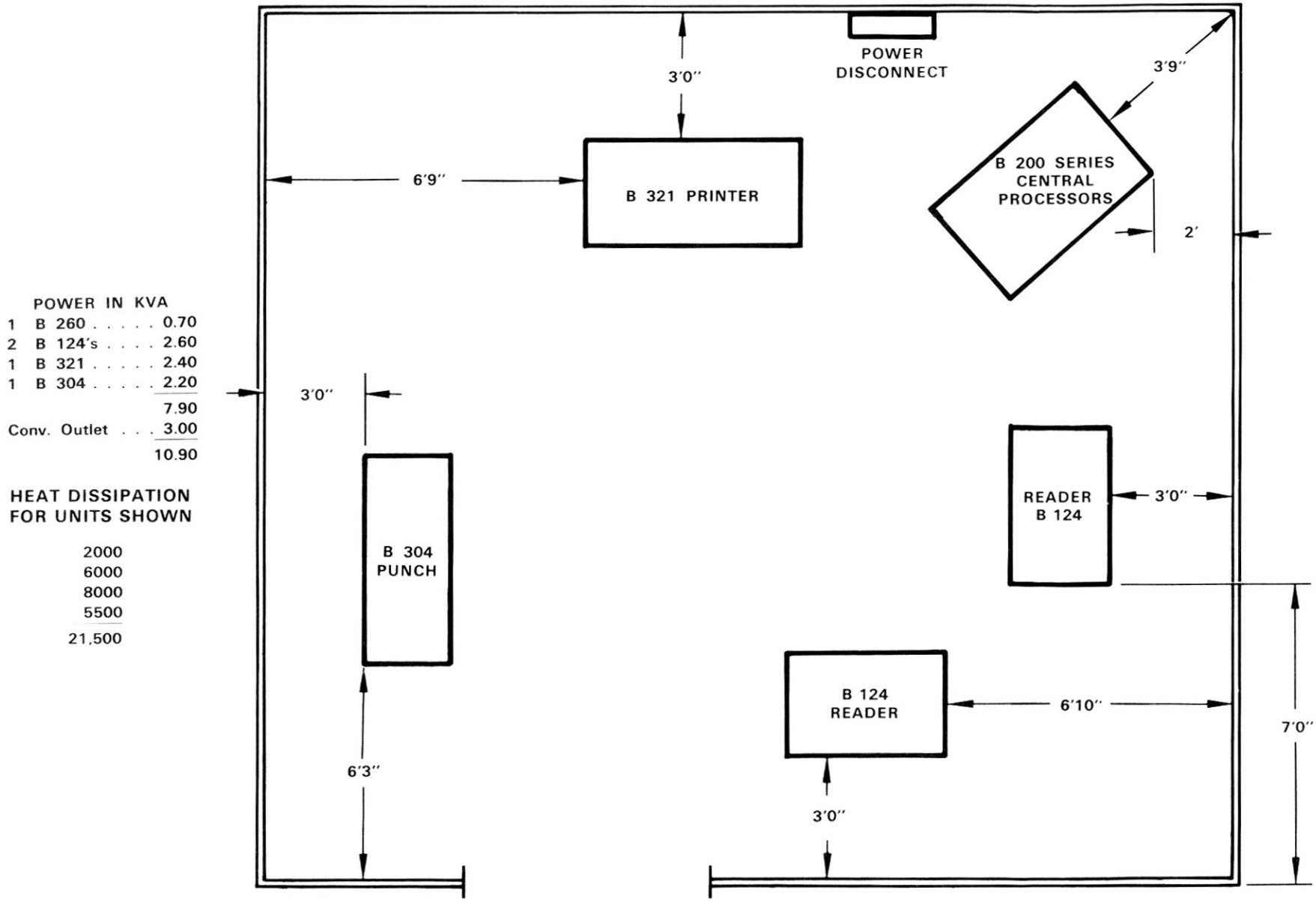


Figure 8-5 Typical Punched Card System B 260 or B 263 (Room Size 23'6" X 20'6")

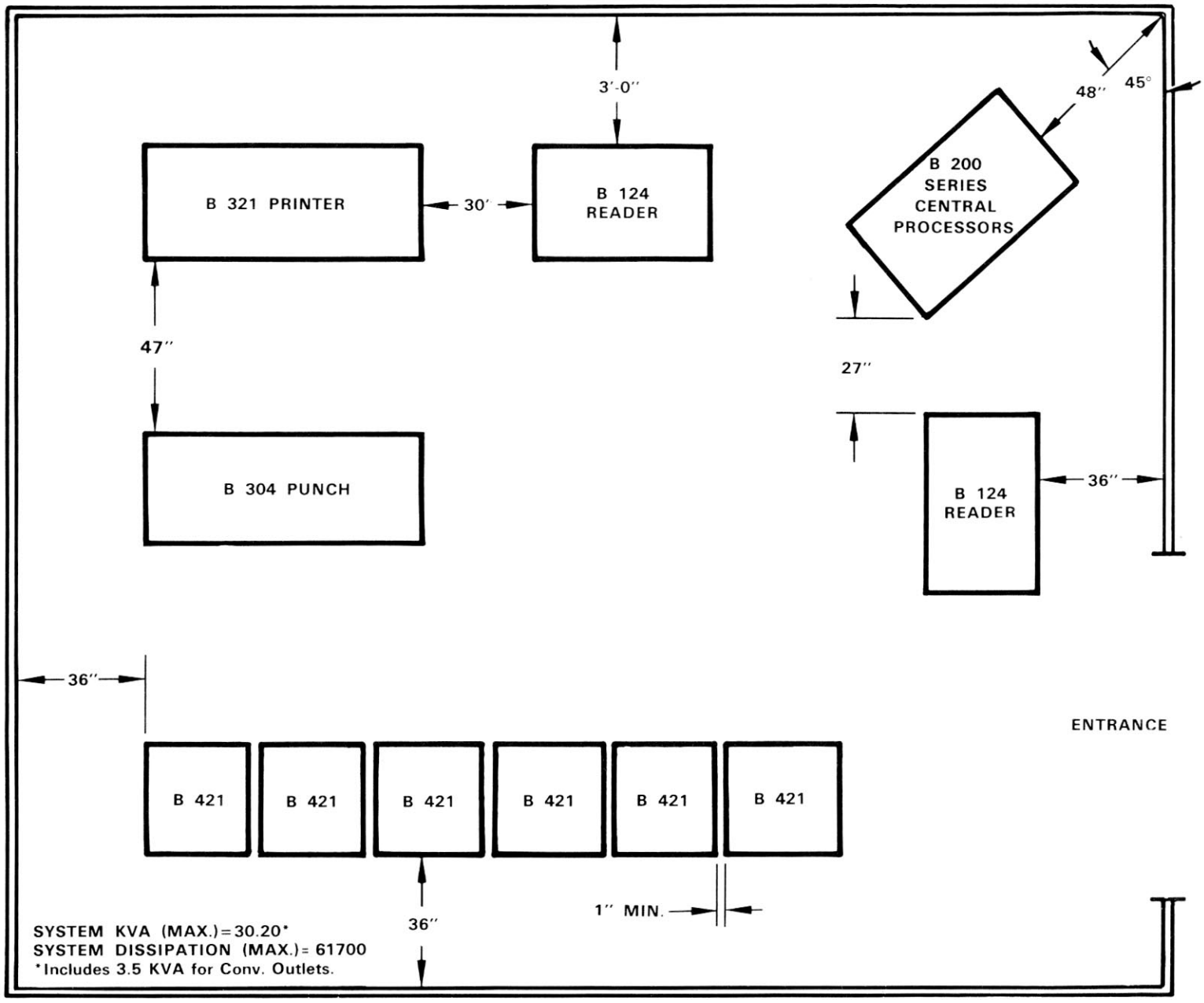
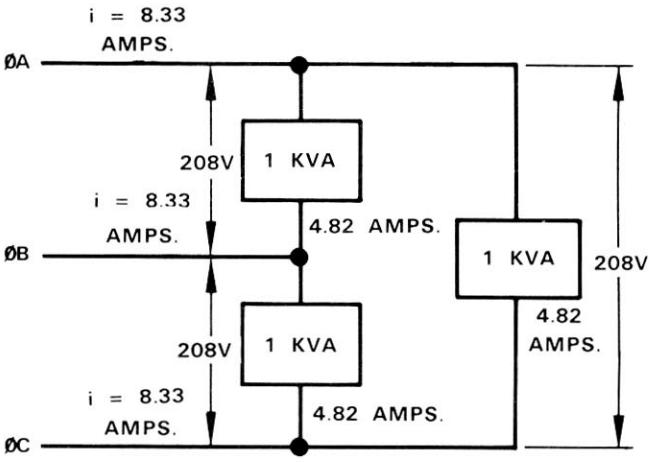


Figure 8-6 B 280 or B 283 Punched Card Magnetic Tape System (Room Size 21'8" X 26'0")

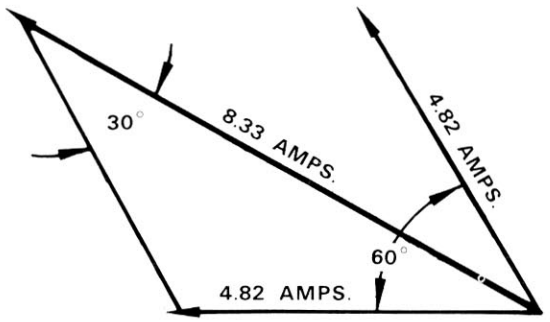
SECTION 9

PRIMARY POWER CALCULATIONS

The diagram below may be considered one three-phase load of 3.0 KVA, or three equal single-phase loads of 1 KVA each. If the load is considered a 3Ø, line currents are obtained from the relationship: i_L = KVA/E x 1.73, or 3000/208 x 1.73 = 8.33 amperes.



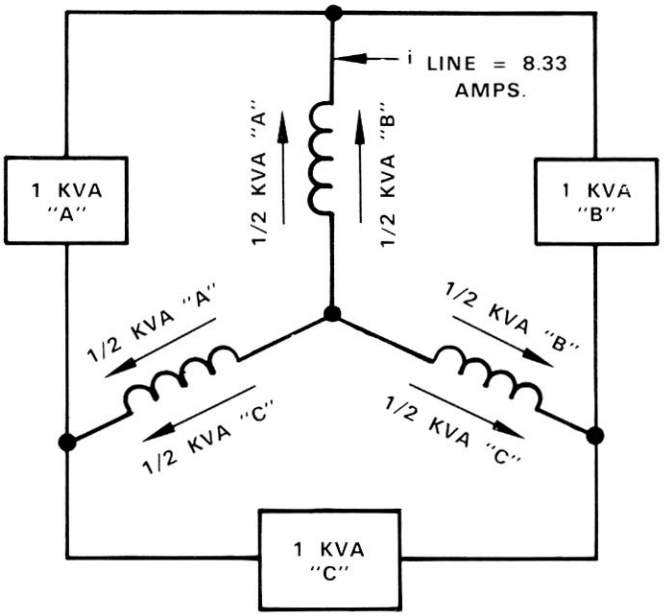
If the loads are considered single phase, each load current is 1000/208 = 4.82 amperes. The vector sum of any two load currents is shown by the diagram below.



NOTE:
8.33/4.82 = 1.73 (sq. root of 3)
= 2 cos 30 degrees.

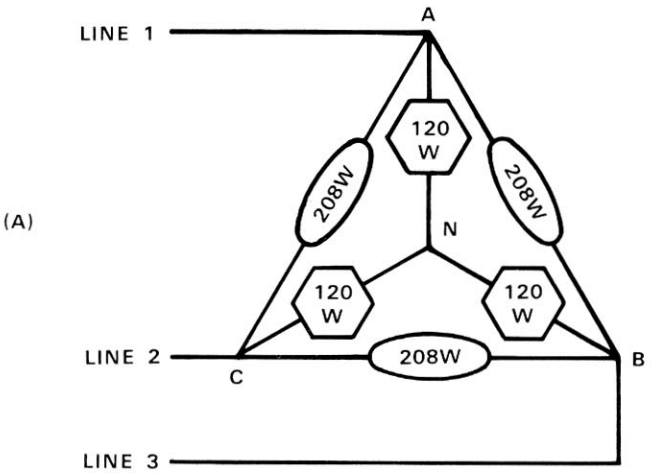
In the diagram below, each winding of the "wye" source supplies ½ + ½ KVA = 1 KVA. Since coil voltage is 120 volts, line currents are: 1000/120 = 8.33, which checks with the above calculations.

The above examples are illustrative only. Actually, no unit of a B 200 System takes its power solely at 208 volts. All units (excepting the B 122 Reader) receive power at line to neutral potentials from two hot lines; and the B 102, B 401 and B 421 receive power at 120 *and* 208 volts (or 115 and 230 volts). The following pages show techniques to help determine the line currents for various B 200 Series system mixes.



DETERMINATION OF LINE CURRENTS

A. For symmetrical loads:
Power = 120V/208V 3Ø
Line to N and Ø to Ø loads are balanced.
Total watts = 360 + 624 or 984 watts (or VA)
Line i = VA/E x 1.73
= 984/208 x 1.73 = 2.74 amperes



(A)

In (A) above, the current through each 120-watt load is 1 ampere. Likewise, the current through

each 208-watt load is 1 ampere. Consequently, the loads shown by (B) (lifted out of (A)) are 120-ohm loads. The loads indicated at 208 watts (C) are also 208-ohm loads.

Drawing (C) can be reduced to a resistive load like (B), and then put in parallel with (B) to obtain the equivalent resistance of each leg to neutral. This new value of resistance, divided into the coil voltage (120 volts), will give the line current(s).

Ref. (C): **a** = product of the adjacent sides, divided by sum of the three sides.

a = 208 x 208/208 + 208 + 208 = 69 ohms (approx.)

b and **c** are the same as **a** in this example.

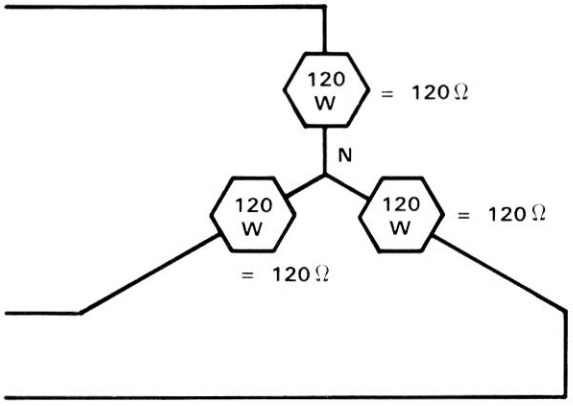
69 is paralleled with 120 to obtain 69 x 120/69 + 120 = 43.8 ohms.

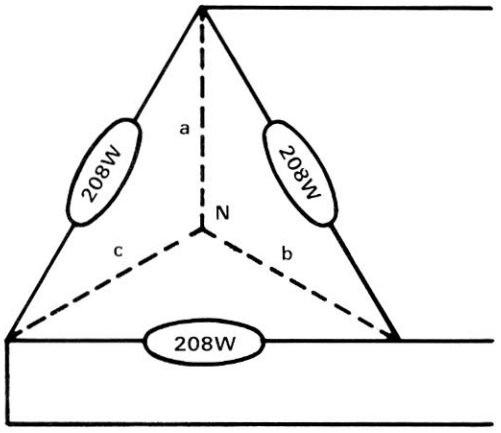
i_{line} = 120/43.8 = 2.74 amperes, which checks with the first calculation above.

*B. For non-symmetrical loads:
Use same technique as demonstrated for equal loads. If line currents differ too greatly, try other combinations of hook-ups until optimum results are obtained.

*Each phase to neutral must have some loading, likewise each line to line must have some loading.

(B)

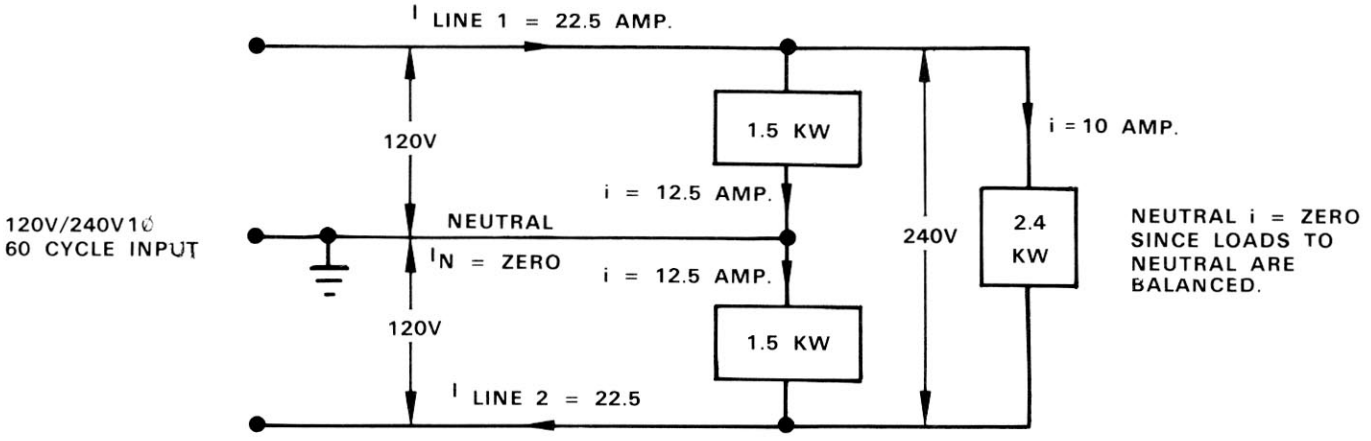


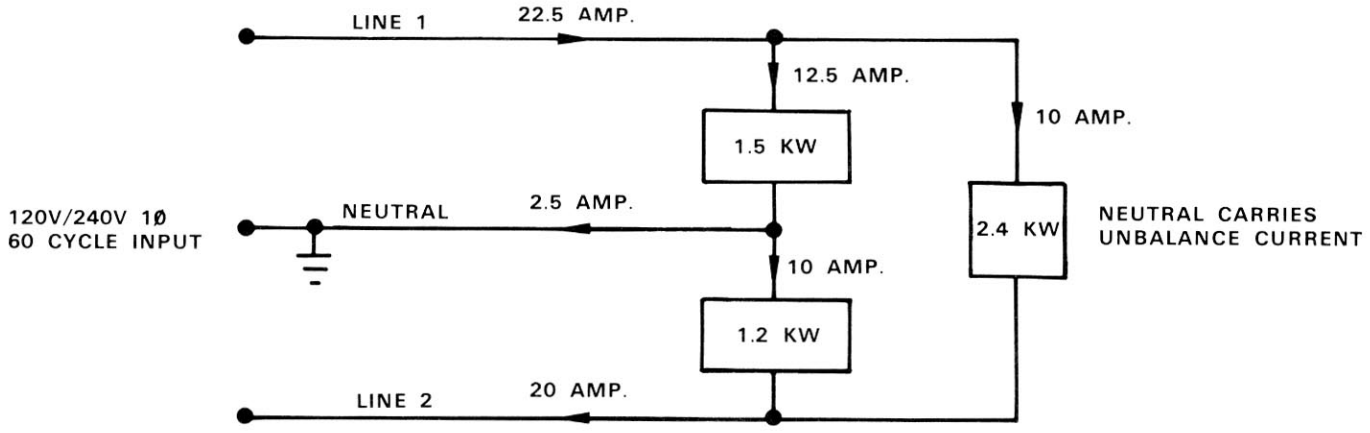


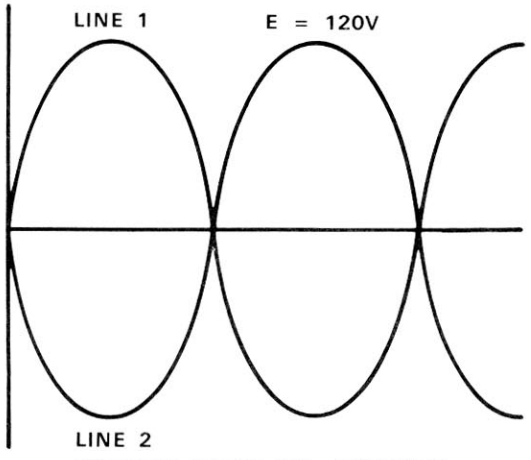
(C)

POWER INFORMATION FOR SINGLE AND THREE PHASE CIRCUITS

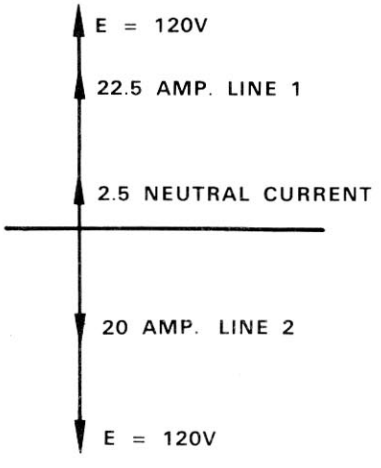
Single phase (3-wire) circuits.



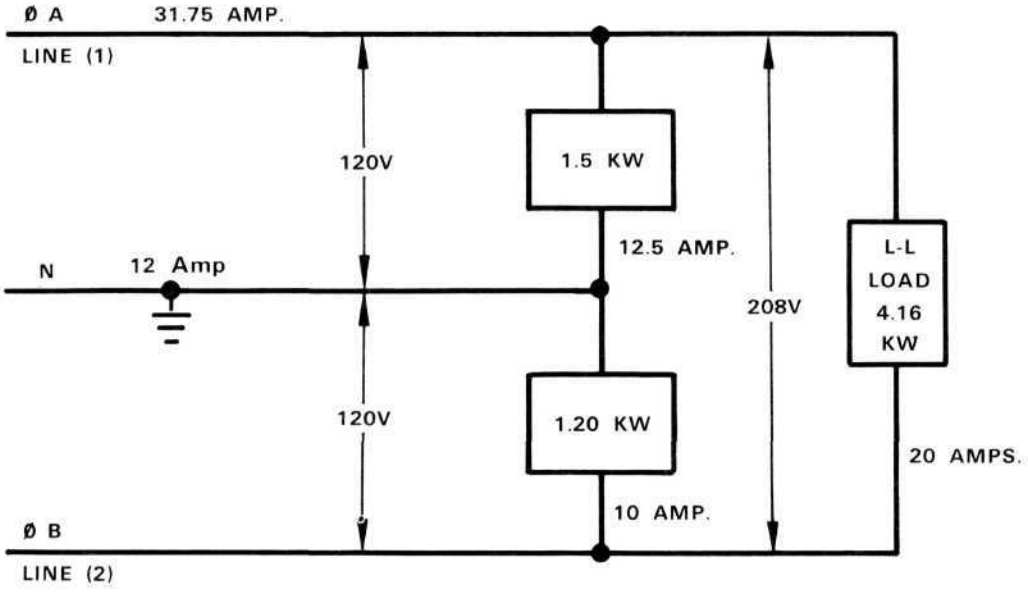




VOLTAGE UNITY P.F. ASSUMED.



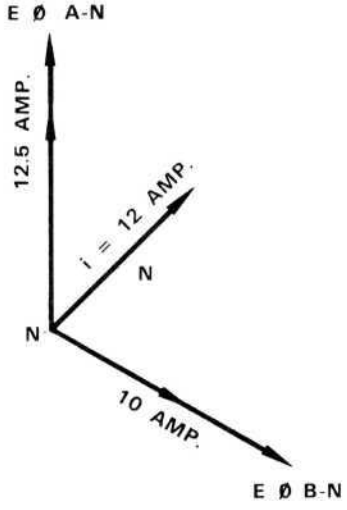
CURRENT



120V/208V, 3-wire, 10 source providing power for a fictitious system unit that requires power at the 120V and the 208V levels; p.f. assumed = unity.

The neutral current results from the 120-volt loads. The neutral wire carries the same current as the other conductors (closely). In this example, i_N scales off to measure 12 amperes.

Line 1 current is the vector sum of 12.5 amp. and 20 amp. where the angle between them is 30 degrees. Line 2 current is the vector sum of the 10 amp. and the 20 amp.current where the angle involved is 30 degrees. It can be shown that for unity p.f. loads, the line currents are, for all practicable purposes, equal to the sum of the line to line currents and the phase to neutral currents. In the above case, the vector sum scales off at 31.75 amps (Line 1), while the arithmetic sum is 32.5 amps, a difference of only 0.75 amps. This error is about 2.3%. In the above power discussion, currents and voltages are rms (root mean square).



APPENDIX A

INSTALLATION-PLANNING CHECK LIST

The following remarks are intended to serve as a guide and reminder for personnel planning an installation of Burroughs Data Processing Systems.

SPACE AND LAYOUT REQUIREMENTS

1. Will the space allocated for the data processing installation permit system configurations resulting in functional distribution of the various system units?

2. Will the layout as initially planned permit system expansion economically?

3. Does the site location prevent special problems for unloading and locating units? If so, have solutions been devised and have the necessary arrangements been implemented?

4. What type of flooring is to be employed? Does it meet the approval of the customer's architect or engineer?

5. Is the proposed layout compatible with maximum length system cables?

6. Has the system site been checked for unusual vibrations?

POWER REQUIREMENTS

1. Are the full power requirements for the present system known?

2. Is the requirement for cables, conduit, breakers, or disconnect switches acknowledged?

3. Is the intended power source of sufficient capacity to permit any envisaged system expansion?

AIR CONDITIONING

1. Has the total heat load of the system in BTU/hr been established?

2. Are the requirements for ambient temperature and relative humidity acknowledged?

3. Has the total system CFM figure been established?

4. Is it understood that it is desirable to include temperature and humidity recording instruments for the data-processing room?

5. Is the requirement regarding cleanliness of cooling air introduced into the computer room acknowledged?

6. Has the customer been informed that the following factors relating to the air conditioning system are his responsibility?

   A. Cooling capacity of the system.

   B. Air circulation capacity of the system.

   C. Method of distribution of cooling air.

   D. Method of removal of warm air.

   E. Additional capacity requirements for future system expansion.

MISCELLANEOUS

1. Have the lighting requirements for the data processing room been established?

2. Has acoustical treatment of the data processing room been discussed?

3. Has the customer been advised of the arrival date of the system?

4. Have provisions been made to have Rol-A-Lifts available at the time of system arrival?

5. The following site preparations should be completed before the system arrives:

   A. Power wiring should be completed up to the point of connecting into system units.

   B. The air-conditioning system should be tested to ensure that this system is operational.

   C. The area should be completely cleaned and in readiness to accept the data processing system.

APPENDIX B

FORMULAS AND DEFINITIONS

AIR CONDITIONING FORMULAS AND DEFINITIONS

1 HP = 746 watts
= 2540 BTU/hr
1 KW = 3413 BTU/hr (usually 3400 is used)
= 1.34 HP
1 BTU/hr = 0.000394 HP
= 0.293 watt
12,000 BTU/hr of refrigeration = 1 ton

$^{0}F = \frac{9C}{5} + 32 \quad ^{0}C = \frac{5}{9}(F-32)$

DEFINITION OF AMBIENT

Completely surrounded, circulating.

DEFINITION OF RELATIVE HUMIDITY*

Normally, air contains water vapor. When air at a specified temperature contains all the water vapor it can hold, the air is said to have a relative humidity of 100 percent; the air is saturated. If this same amount of air contained only one-half as much water vapor, its relative humidity would be 50 percent.

Air at 90°F and a relative humidity of 50 percent contains more water vapor than air at 70°F and 50 percent relative humidity.

Air at 60°F and 90 percent relative humidity contains 70 grains of moisture per pound of dry air. Air at 80°F and 45 percent relative humidity contains the same number of grains of moisture.

ELECTRICAL POWER FORMULAS AND DEFINITIONS

1 horsepower = 746 watts

Power factor = KW/KVA, where KW is actual power consumed (wattmeter reading) and KVA is apparent power consumed (volts x amps/1000)

KW = electrical energy converted into heat
= KVA x PF

PF = 1 for resistive loads, 0.5 to 0.9 for motor loads (inductive), depending upon the size and type of A. C. motor.

$$3\emptyset \text{ power} = \frac{PF \times I_{line} \times E_{line} \times 1.73}{1000} = KW$$

$$3\emptyset \text{ power} = \frac{I_{line} \times E_{line} \times 1.73}{1000} = KVA$$

*R-H is also defined as the vapor pressure divided by the saturation vapor pressure.

APPENDIX C

WIRE TABLES
1959 N.E.C.

ALLOWABLE CURRENT-CARRYING CAPACITIES OF INSULATED CONDUCTORS, IN AMPERES.

Not more than three conductors in a raceway or cable (based upon room temperature of 86°F). If number of cables exceeds three, or room temperature is over 86°F, see derating examples below.

	INSULATION TYPES	
	TYPE R, RW RU, RUW T, TW.	TYPE RH, RUH RHW, THW
Conductor Size	**Amperes**	**Amperes**
14	15	**15**
12	20	**20**
10	30	**30**
8	40	45
6	55	65
4	70	85
3	80	**100**
2	95	**115**
1	110	**130**
0	125	**150**
00	145	**175**
000	165	**200**
0000	195	**230**

More than three conductors in raceway or cable:

No. of conductors	Per cent of values in above table
4 to 6	80
7 to 24	70
25 to 42	60
43 and above	50

Example: Six size three conductors in a raceway or cable:
80 amperes x 80% = 64 amperes

Correction factor for room temperature above 86°F:

87 to 104 degrees F	0.82	0.88
105 to 113 degrees F	0.71	0.82
114 to 122 degrees F	0.58	0.75
123 to 131 degrees F	0.41	0.67

Example: Three number six conductors; temp. of room is 98°F; wire insulation type RUH: 65 amperes x 0.88 = 57 amperes

Conductor Type Information	Max. Operating Temperature (°F)
R = Code Rubber	140
RH = Heat Resistant Rubber	167
RW = Moisture Resistant Rubber	140
RHW = Moisture and Heat Resistant Rubber	167
RU = Latex Rubber	140
RUH = Latex Rubber, Heat Resistant	167
RUW = Latex Rubber, Moisture Resistant	140
T = Thermoplastic	140
TW = Thermoplastic, Moisture Resistant	140
THW = Thermoplastic, Moisture and Heat Resistant	167

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