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IBM System/36
Power
Maintenance Information Manual

Order Number
SY31-9009-3

Section 05

Preface

This manual contains the maintenance information necessary to service the System/36 power. This manual includes maintenance procedures, FRU descriptions, and sequence of events sections to aid in diagnosing machine failures not found by the MAPs.

This manual uses a specific range of words so that the text can be understood by customer engineers in countries where English is not the normal language.

It is assumed that the hardware service representative using this manual has been trained on System/36 as described in the System/36-5360 *New Product Planning Technical Service Letter*.

About This Manual

The service procedures in this manual are numbered.

- The MAPs can send you to a specific procedure in this manual.
- Other System/36 MIMs can send you to a specific procedure in this manual.
- Steps in a procedure in this manual can send you to another procedure in this manual or in other System/36 MIMs.
- The index can send you to procedures where key words can be found.

Related Publications

System/36 Hardware Publications

- *General Maintenance Information Manual, SY31-8999*
- *Processing Unit and Channel Maintenance Information Manual, SY31-9000*
- *Data Storage Attachment Maintenance Information Manual, SY31-9001*
- *21ED Disk Drive and Adapter Maintenance Information Manual, SY31-9002*
- *51TD Diskette Drive and Adapter Maintenance Information Manual, SY31-9003*
- *Work Station Attachment Maintenance Information Manual, SY31-9004*

- *10SR Disk Drive and Adapter Maintenance Information Manual, SY31-9005*
- *72MD Diskette Magazine Drive and Adapter Maintenance Information Manual, SY31-9006*
- *Data Communications Attachment Maintenance Information Manual, SY31-9007*
- *3262 Printer Attachment Maintenance Information Manual, SY31-9008*
- *8809 Tape Adapter Maintenance Information Manual, SY31-9010*
- *Eight-Line Communications Attachment Maintenance Information Manual, SY31-9018*
- *1255 MCR Attachment Maintenance Information Manual, SY09-1026*

Fourth Edition (January 1986)

This major revision makes obsolete SY31-9009-2. Minor technical changes were made to the manual.

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IBM has prepared this maintenance manual for use by hardware service representatives in the maintenance or repair of the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

Information contained in this manual is subject to change from time to time. Any such change will be reported in subsequent revisions or Technical Newsletters.

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Safety

Danger and Caution Notices

In the System/36 maintenance manuals, the word *DANGER* informs you of conditions that could cause personal injury or death. (The word *HAZARDOUS* or *WARNING* may appear on labels on machines and field-supply items.) The word *CAUTION* informs you of an action that could cause damage to a program, to a device or system, or to data.

There are blank lines below each notice. You can translate notices and write your own words on the blank lines.

Danger Notices

A danger notice appears on page v of this Safety section, under *Electrical Accidents—First Aid*.

A danger notice also appears in the following procedure:

05-366 A2 Power Supply

Caution Notices

Caution notices appear in the following procedures:

05-365 A2 Power Supply FRUs
05-366 A2 Power Supply
05-372 A3 Power Supply FRUs (Power Feature B)
05-373 A3 Power Supply (Power Feature B)
05-375 A3 Power Supply FRUs (Power Feature A)
05-376 A3 Power Supply (Power Feature A)
05-400 Manual Power-On

Rules for Safety

If you know the safety rules for working with electrical and mechanical equipment and you observe the rules, you can work safely with IBM equipment.

Do not fear electricity, but respect it.

While you are maintaining IBM equipment, observe every safety precaution possible and the following safety rules.

Work Environment

- Do not work alone in hazardous conditions or near equipment that has dangerous voltage. Always inform your manager if the conditions or voltages are a possible problem.
- Always look for possible hazards in your work environment. Examples of hazards are: moist floors, nongrounded extension cables, power surges, and missing grounds.
- Do not perform any action that makes the product unsafe or that causes hazards for customer personnel.
- Before you start the equipment, ensure that other CEs, and customer personnel, are not in a hazardous position.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that the sleeves of your clothing are fastened or are rolled above the elbow.
- Insert your necktie into your clothing or fasten it with a clip (preferably nonconductive) at approximately 8 centimeters (3 inches) from its end.
- Lift the equipment or parts by standing or pushing up with your stronger leg muscles; this action removes the strain from the muscles in your back. Do not lift any equipment or parts that are too heavy for you.
- Put removed machine covers in a safe place while you are servicing the machine. Reinstall the covers before returning the machine to the customer.

- Always keep your CE tool kit away from walk areas so that other persons cannot trip over it. For example, keep the kit under a desk or table.
- Observe good housekeeping practices in the area of the machines while you are performing maintenance and after completing it.
- After maintenance, reinstall all safety devices, such as guards, shields, labels, and grounding devices. Exchange safety devices that are worn or defective. Remember, the safety devices protect you from a hazard. You destroy their purpose if you do not reinstall them when you have completed the service call.

Electrical Safety

- If possible, always disconnect the power-supply cables before you work on a machine. When you switch off power at the wall box, lock the switch in the off position or attach a DO NOT OPERATE tag (Z229-0237) to the switch.

Note: A non-IBM attachment to an IBM machine may be powered from another source and may be controlled by a different switch or circuit breaker.
- Switch off all power before:
 - Removing or assembling the main units of the equipment
 - Working near power supplies
 - Inspecting power supplies
 - Installing changes in machine circuits
- If you really need to work on equipment that has exposed live electrical circuits, observe the following precautions:
 - Ensure that another person who understands the power off controls, is near you. Another person must be there to switch off the power, if necessary.
 - Do not wear jewelry, chains, metal-frame eyeglasses, or other personal metal objects. Remember, if the metal touches the machine, the flow of current increases because the metal is a conductor.

- Use only insulated probe tips or extenders. Remember, worn or cracked insulation is unsafe.
- Use only one hand while you are working on live equipment. Keep the other hand in your pocket or behind your back. Remember, there must be a complete circuit for an electrical shock to occur. This precaution prevents your body from completing the circuit.
- When you use a tester, set its controls correctly and use insulated probes that have the correct electrical specification.
- Do not touch objects that are grounded, such as metal floor strips, machine frames, or other conductors. Use suitable rubber mats obtained locally, if necessary.

- When you are working with machines having voltages more than 30 Vac or 42 Vdc, observe the special safety instructions given in customer engineering memorandums (CEMs).
- Never assume that power has been removed from a circuit. First, ensure that power has been removed.
- Do not touch live circuits with the surface of a plastic dental mirror. Remember, the surface of the dental mirror is conductive and can cause damage or personal injury.
- If an electrical accident occurs:
 - Use caution. Do not be a victim yourself.
 - Switch off the power.
 - Instruct another person to get medical aid.
 - If the victim is not breathing, perform mouth-to-mouth rescue breathing. See *Electrical Accidents—First Aid*.

Mechanical Safety

Do not touch moving mechanical parts when you are lubricating a part, checking for play, or doing other similar work.

Safety Glasses

Wear safety glasses when:

- Using a hammer to drive pins or other similar parts
- Using a power drill
- Using a spring hook to attach or remove a spring
- Soldering parts
- Cutting wire or removing steel bands
- Using solvents, chemicals, or cleaners to clean parts
- Working in any other conditions that could injure your eyes

Tools, Testers, and Field-Use Materials

- Do not use tools or testers that have not been approved by IBM. Ensure that electrical hand tools, such as Wire-Wrap¹ tools and power drills, are inspected regularly.
- Exchange worn or broken tools or testers.
- Do not use solvents, cleaners, or lubricants that have not been approved by IBM.

¹Trademark of the Gardner-Denver Co.

Summary

Prevention is the main aid to electrical safety. Always think about electrical safety and use good practice; for example:

- Ensure that the customer’s power receptacle matches the IBM equipment specifications.
- Inspect power cables and plugs; check for loose, damaged, or worn parts.
- Review the procedures in the maintenance documents before you remove a part that can hold an electrical charge from the machine. Carefully discharge the necessary parts exactly as instructed by the procedure.

Never assume that a machine or a circuit is safe. No machine is always completely safe. You may not know the exact condition of a machine because, for example:

- The power receptacles could be wrongly wired.
- Safety devices or features could be missing or defective.
- The maintenance or machine level change history could be wrong or not complete.
- The design could have a problem.
- The machine could have damage, caused when it was shipped.
- The machine could have an unsafe change or attachment.
- An engineering change or a sales change could be wrongly installed.
- The machine could be deteriorated because it is old, or because it operates in an extreme environment.
- A part could be defective, therefore causing a hazard.
- A part could be wrongly assembled.

These are some of the ways that the condition of the machine could affect safety. Before you start a service call or procedure, have good judgment and use caution.

Electrical Accidents—First Aid

When performing rescue procedures for an electrical accident, do as follows:

- **Use Caution:** If the victim is touching the electrical-current source, remove the power. To do this, you may need to operate the room emergency power-off switch or the disconnecting switch. If you cannot find the switch, use a dry wooden rod or other nonconductive object to pull or push the victim away so he or she is not touching the electrical-current source.
- **Work Quickly:** If the victim is unconscious, he or she may need mouth-to-mouth rescue breathing and possibly external cardiac compression if the heart is not beating.
- **Get Medical Aid:** Instruct another person to dial the rescue service (such as the ambulance or the hospital).

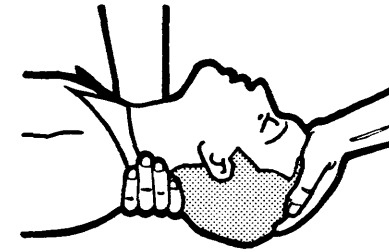
Determine if the victim needs mouth-to-mouth rescue breathing. If he or she does, perform the following steps:

DANGER

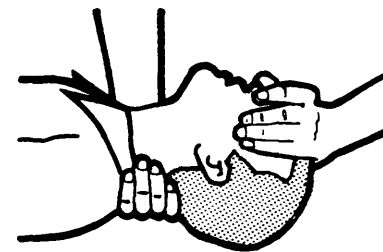
Use extreme care when you perform rescue breathing for a victim who may have breathed in toxic fumes. Do not breathe in air that the victim has breathed out.

1. Prepare for rescue breathing:
 - a. Ensure that the victim’s airway is open and that it is not obstructed; check the mouth for objects that may be obstructing the airway, such as chewing gum, food, dentures, or the tongue.

- b. Place the victim on his or her back, put one hand behind the victim’s neck, and put the other hand on his or her forehead.
- c. Lift the neck with one hand, and tilt the head backward by pressing on the forehead with the other hand.



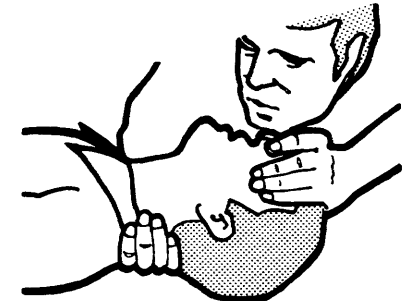
2. Look, listen, and feel to determine if the victim is breathing freely.
 - a. Put your cheek near the victim’s mouth and nose.
 - b. Listen and feel for the breathing out of air. At the same time, look at the victim’s chest and upper abdomen to see if they move up and down.
3. If the victim is not breathing correctly:
 - a. Keep the victim’s head tilted backward. Continue to press on the forehead with your hand; at the same time, position the same hand so that you can pinch together the victim’s nostrils with your thumb and finger.



- b. Open your mouth wide and take a deep breath. Make a tight seal with your mouth around the victim’s and blow into the victim’s mouth.



- c. Remove your mouth to let the victim breathe out, and check that the victim’s chest moves down.



- d. Repeat steps b and c once every 5 seconds either until the victim breathes for himself or herself, or until medical aid comes.

Reporting Accidents

Report, to your field manager, all electrical accidents, possible electrical hazards, and accidents that nearly occurred. Remember, an accident that nearly occurs might be caused by a design problem; your immediate reporting ensures that the problem will be solved quickly.

Also report all small electrical shocks. Remember, a condition that causes a small shock need only differ slightly to cause serious injury.

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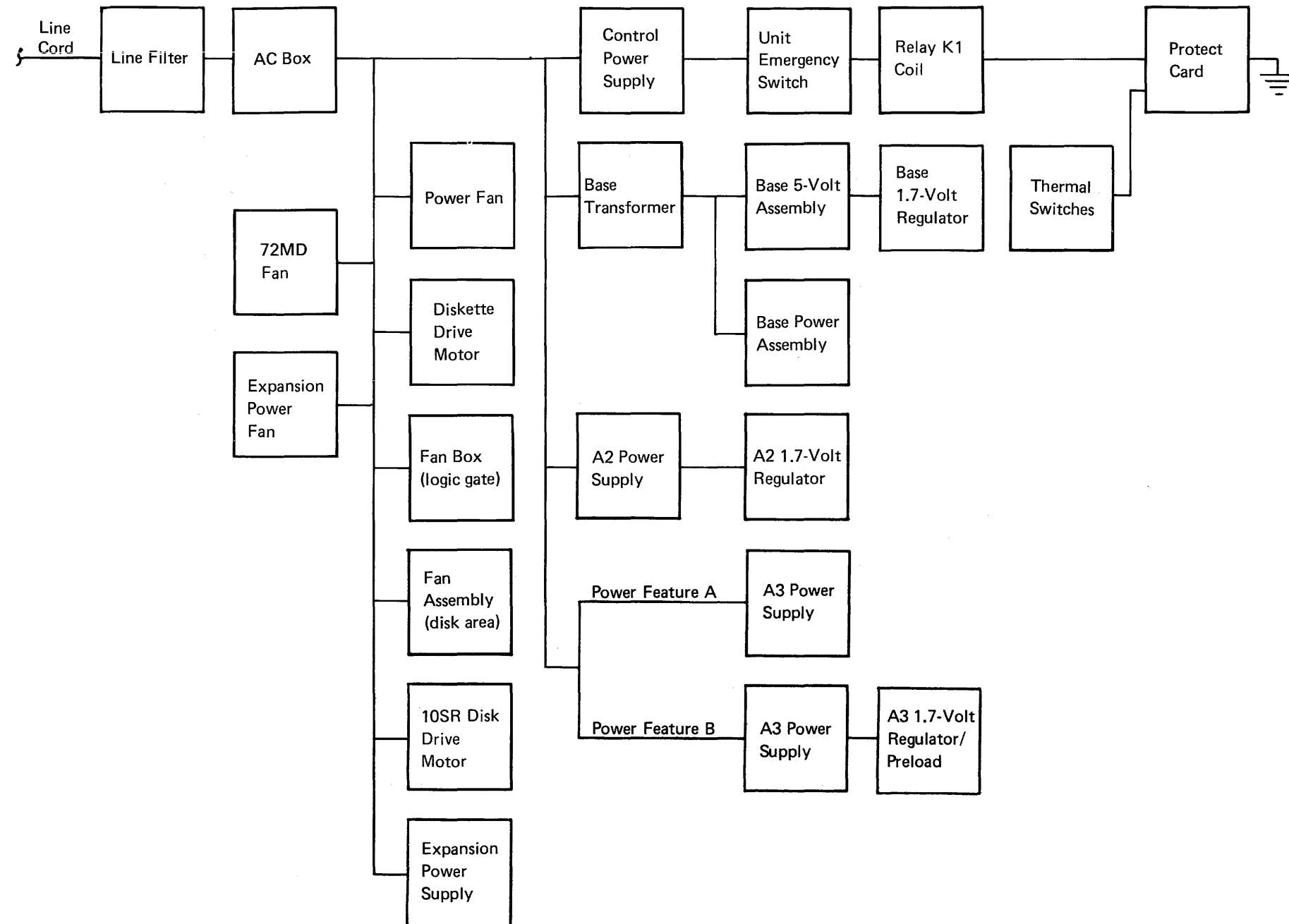
Overview

05-110 Power Overview

The System/36 power assemblies generate the voltages needed by the system and by the devices located in the system unit. The figure at the right shows the major parts of the power assemblies. For power flow, see 05-605.

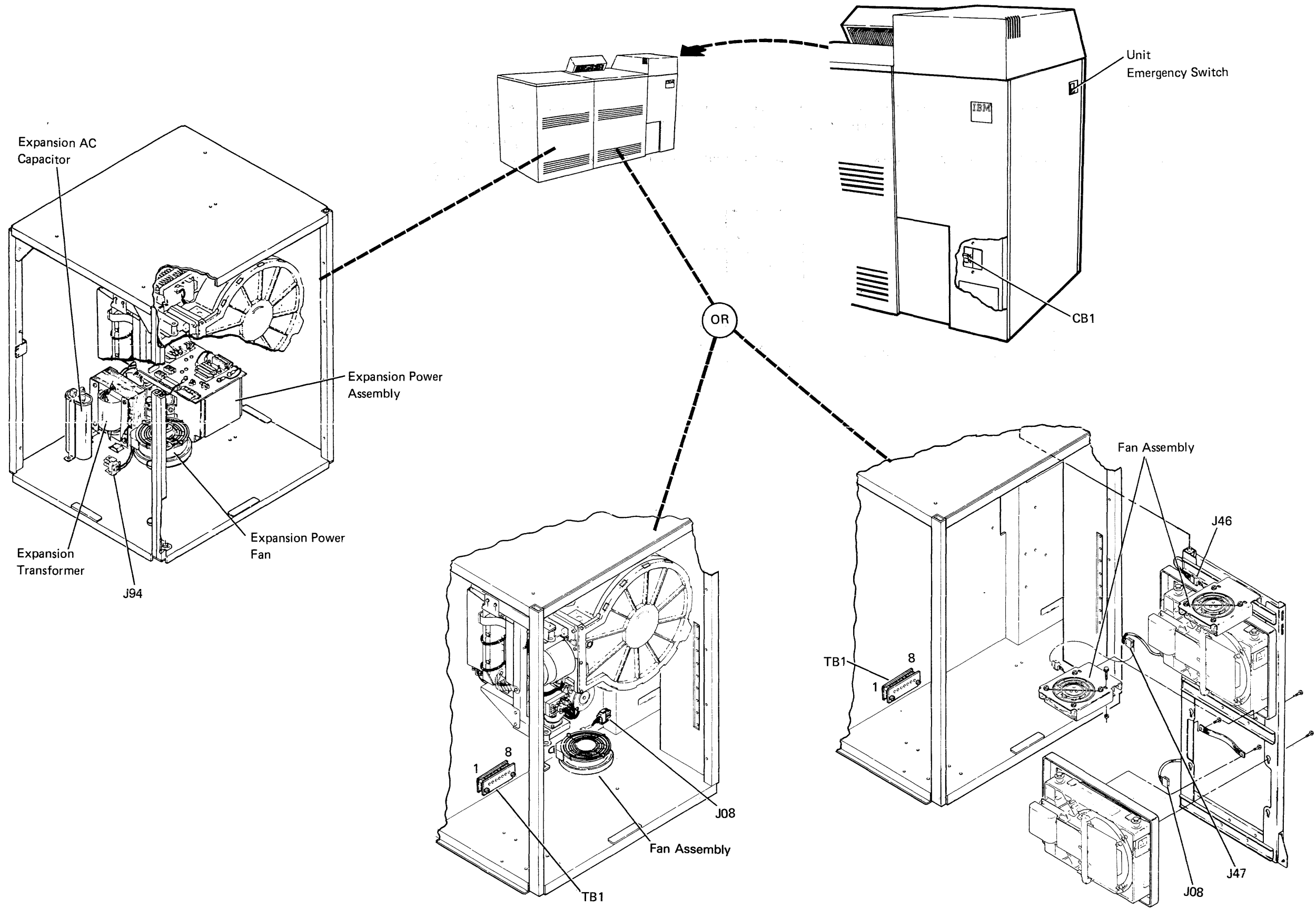
The following table describes the power features in this manual.

Power Feature	Description
A	The system has an A3 power supply (a single unit).
B	The system has an A3 power supply and an A3 1.7-volt regulator/preload (two separate units).



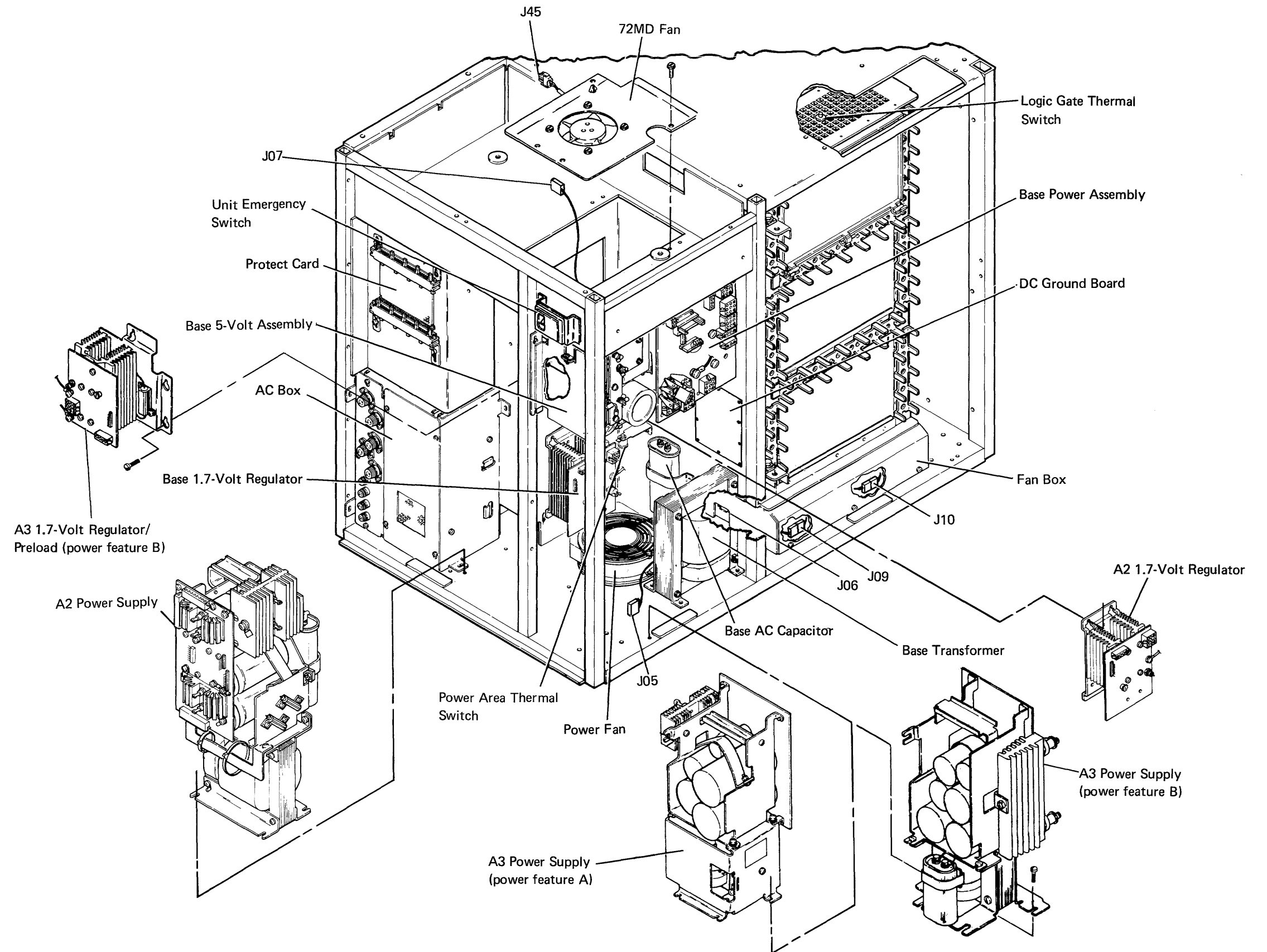
Notes:

1. The A2 power supply and the A2 1.7-volt regulator are installed only on systems with more than one I/O attachment on the A-A2 board.
2. The A3 power supply is installed only on systems with an A-A3 board installed.
3. The expansion power supply and the expansion power fan are installed only on systems with three or four 10SR disk drives.

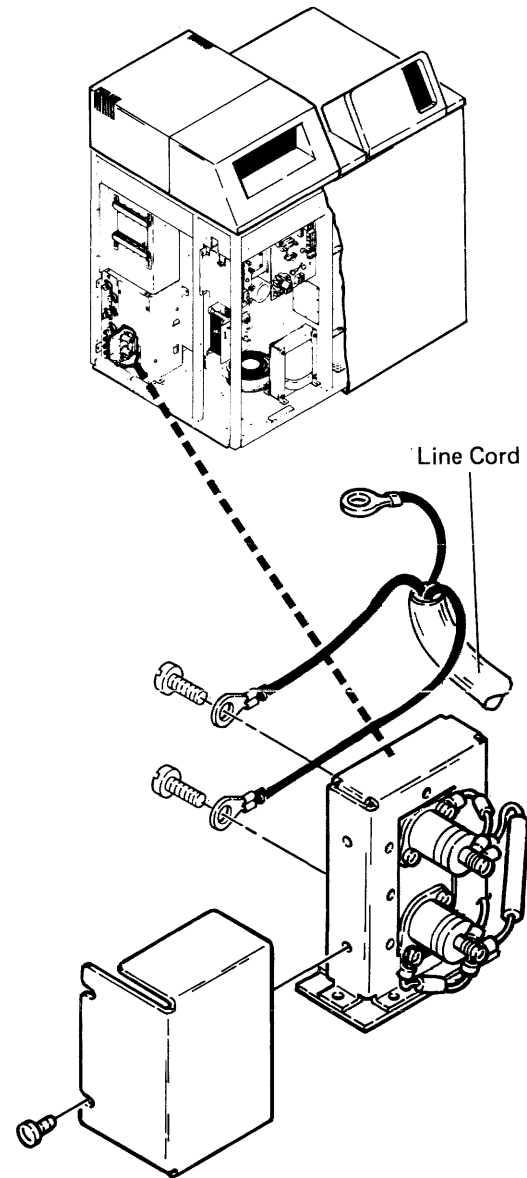


Locations

05-205
Power Area

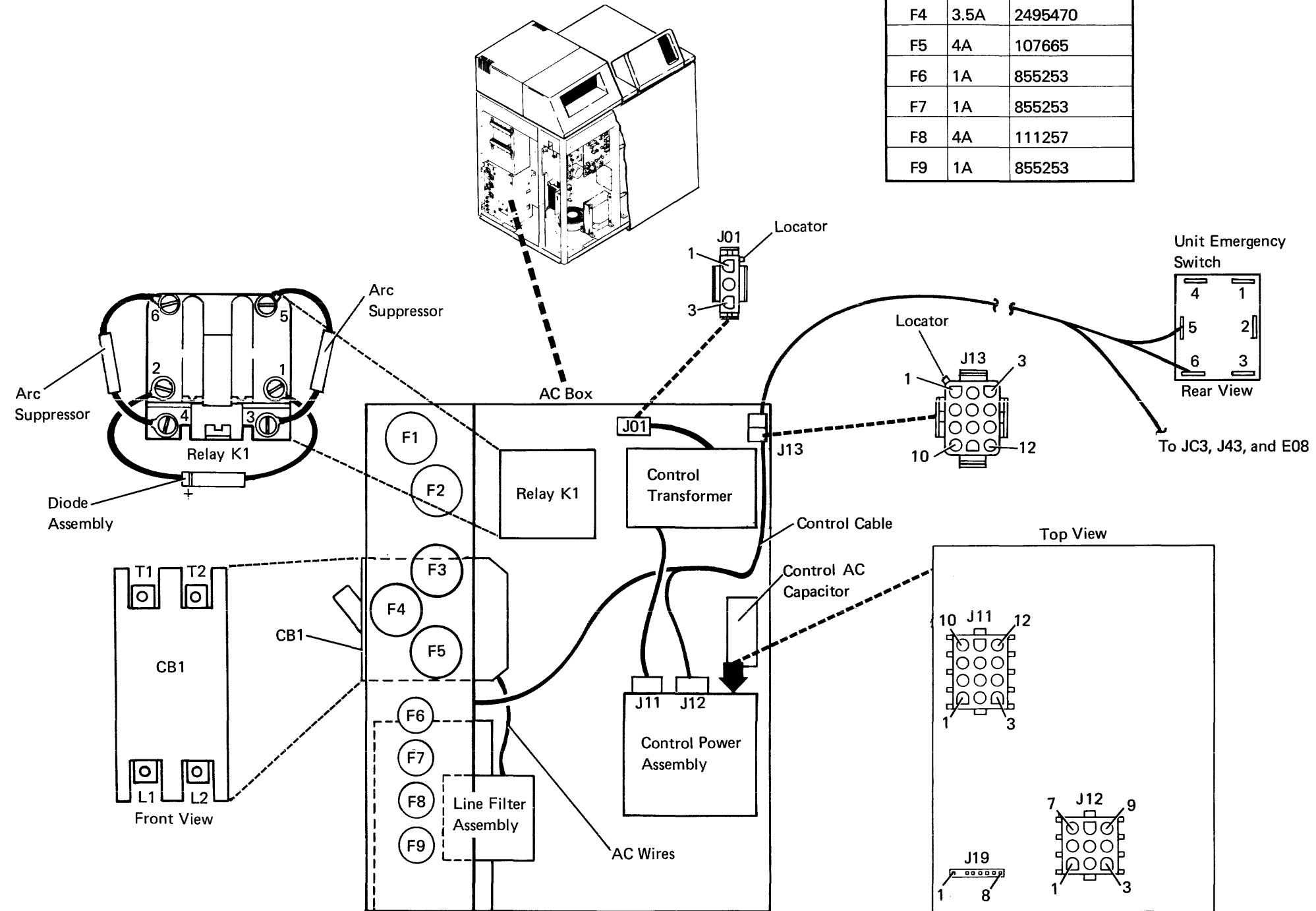


**05-210
Line Filter Assembly**



Note: In countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral, see 05-298 and FLD AY103.

**05-215
AC Box**

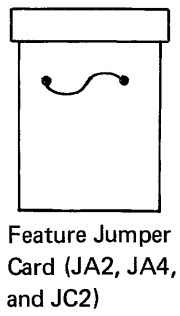
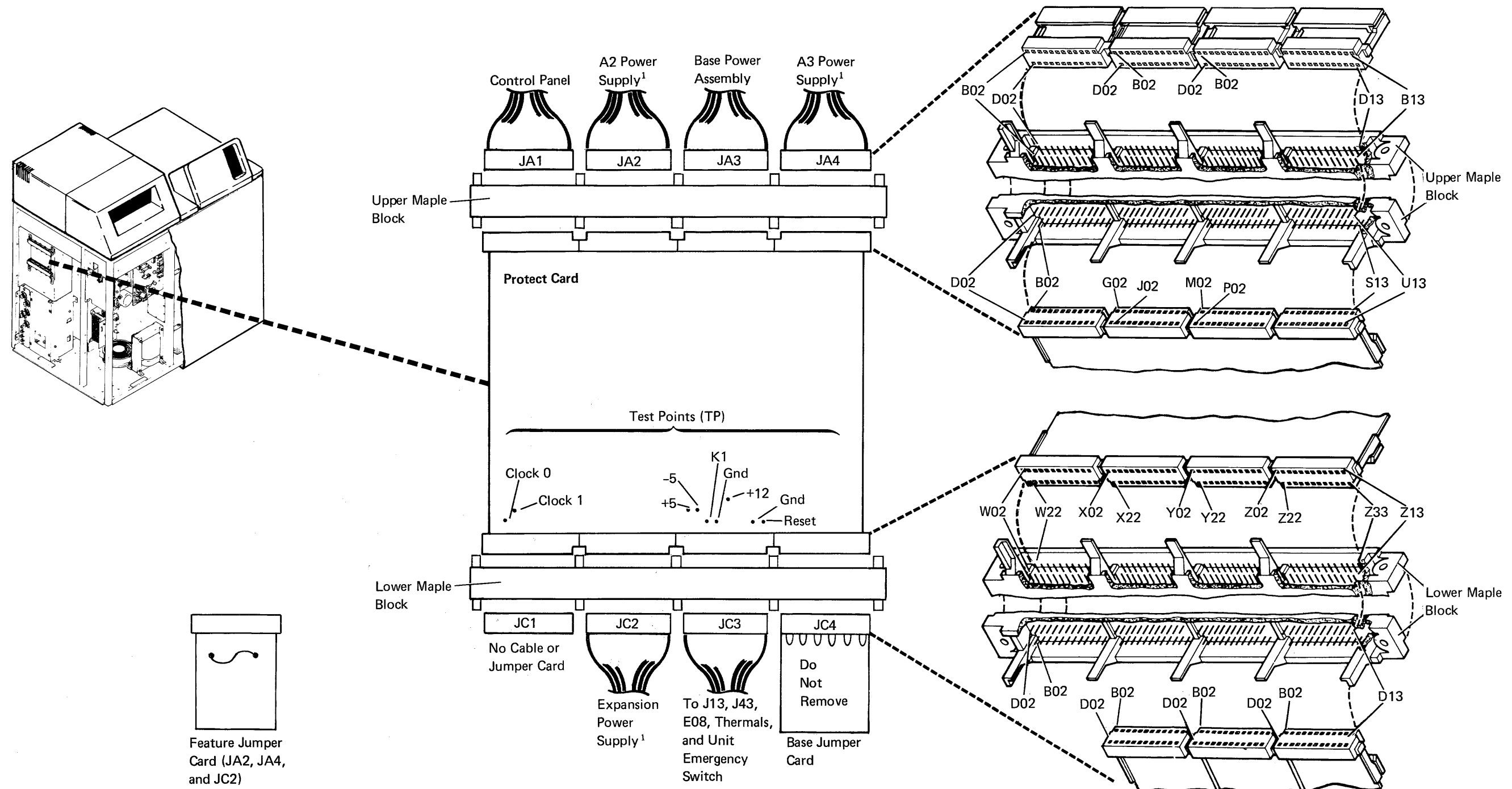


Fuse	Size	Part Number
F1	0.6A	252590
F2	7A	2495463
F3	5A	107666
F4	3.5A	2495470
F5	4A	107665
F6	1A	855253
F7	1A	855253
F8	4A	111257
F9	1A	855253

See 05-605 for fuse use.

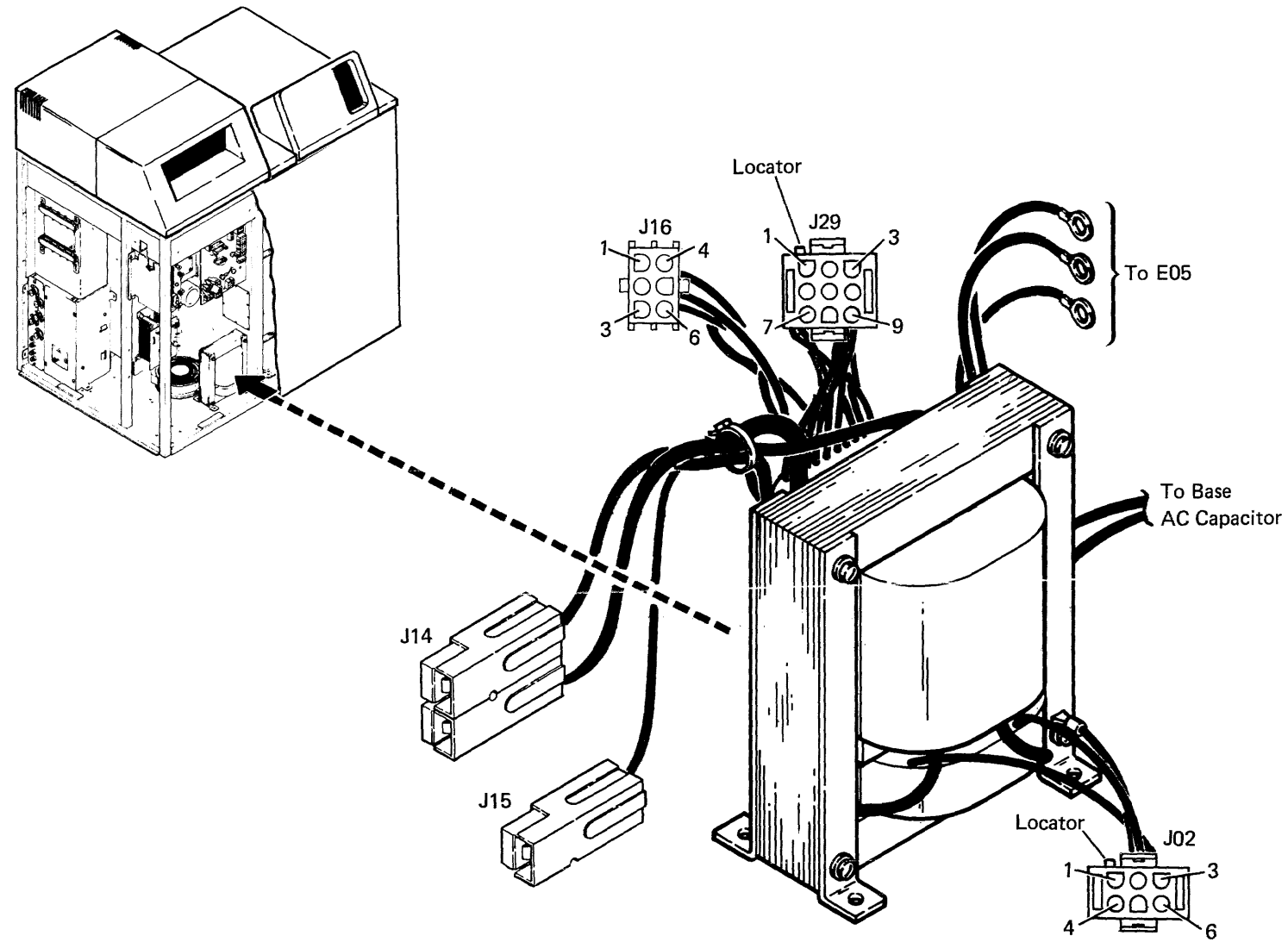
Note: In countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral, see 05-299 and FLD AY103.

**05-220
Protect Card**

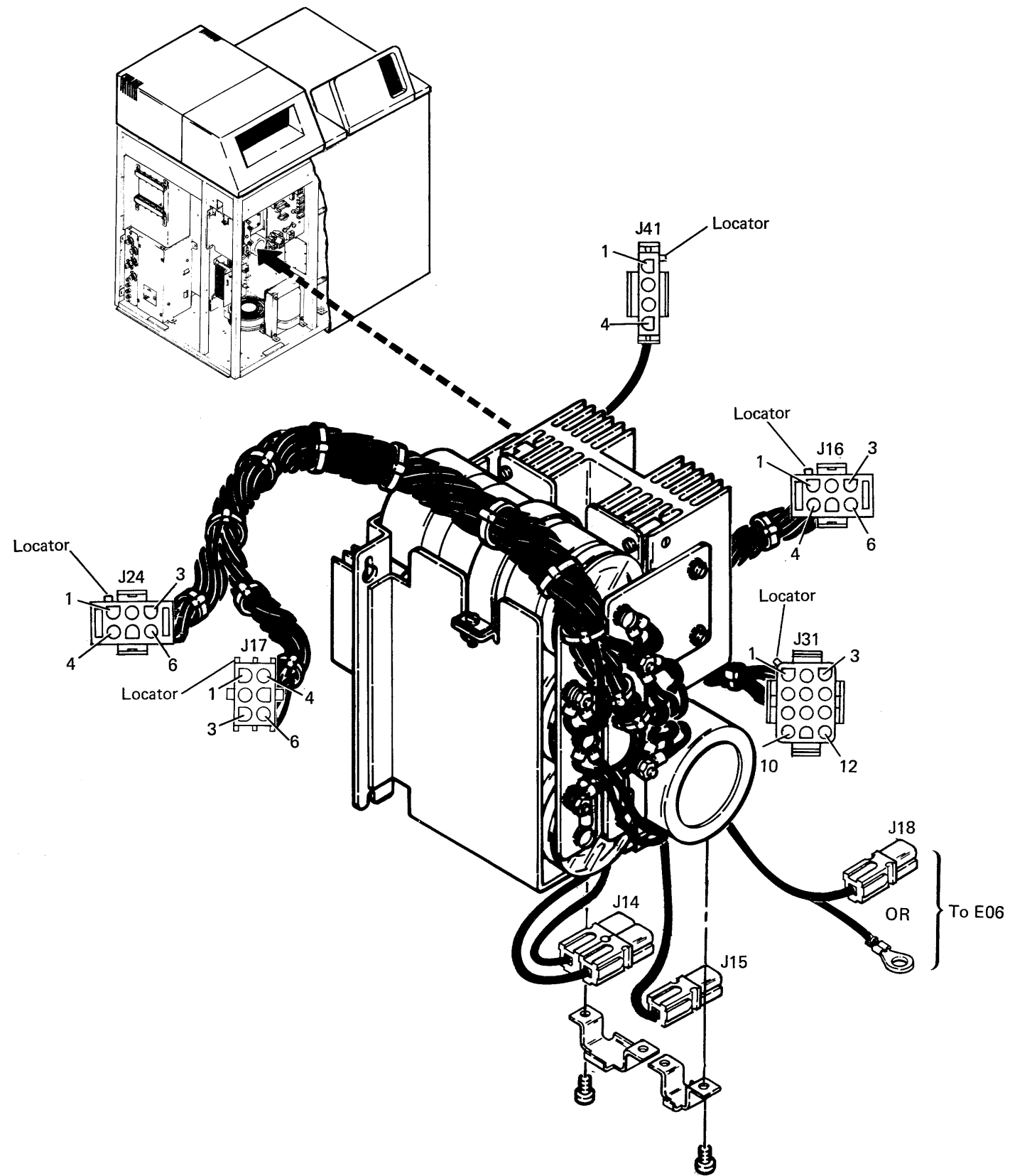


¹ If the power supply is not installed, a feature jumper card (see at left) is in this location.

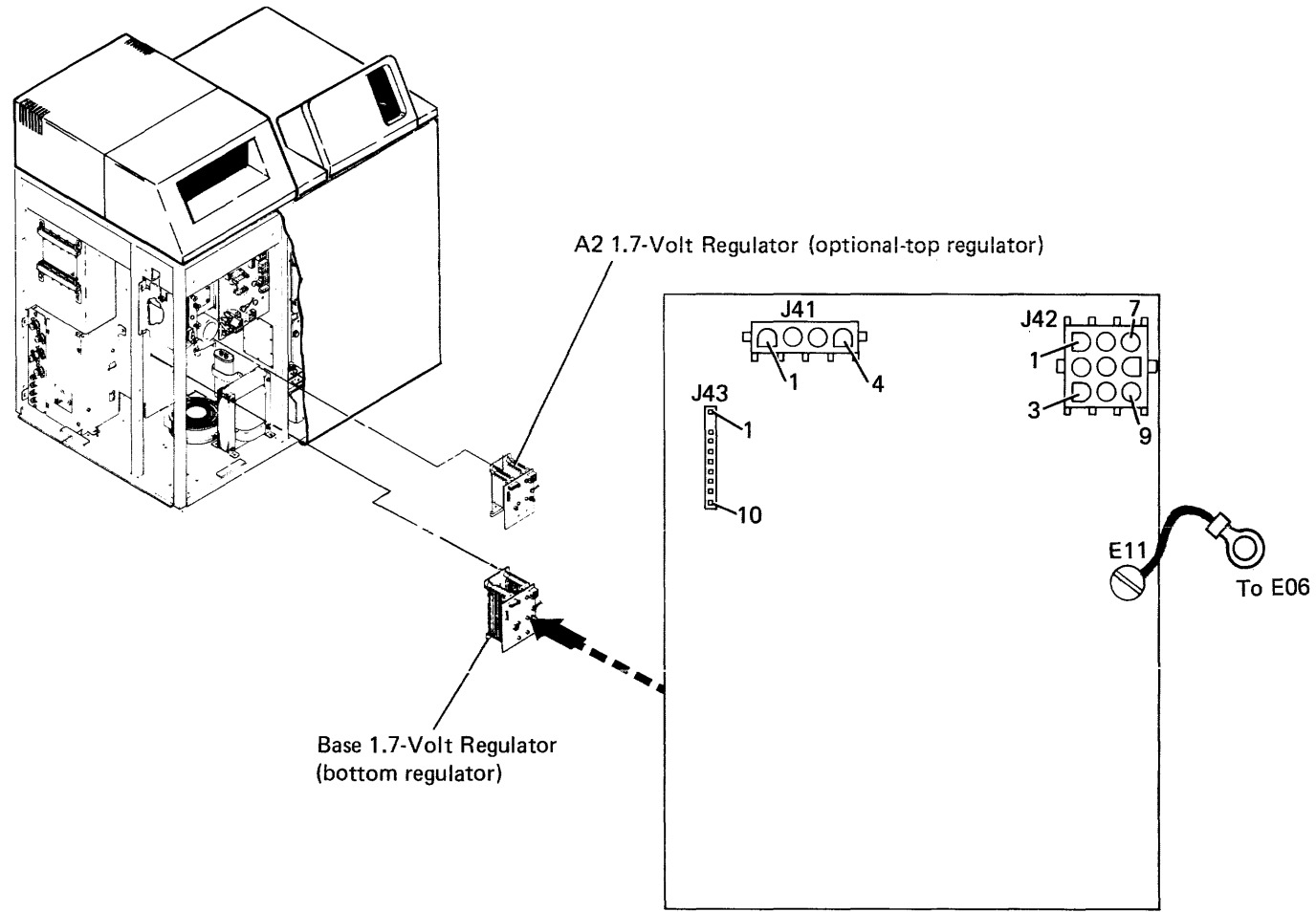
05-225
Base Transformer



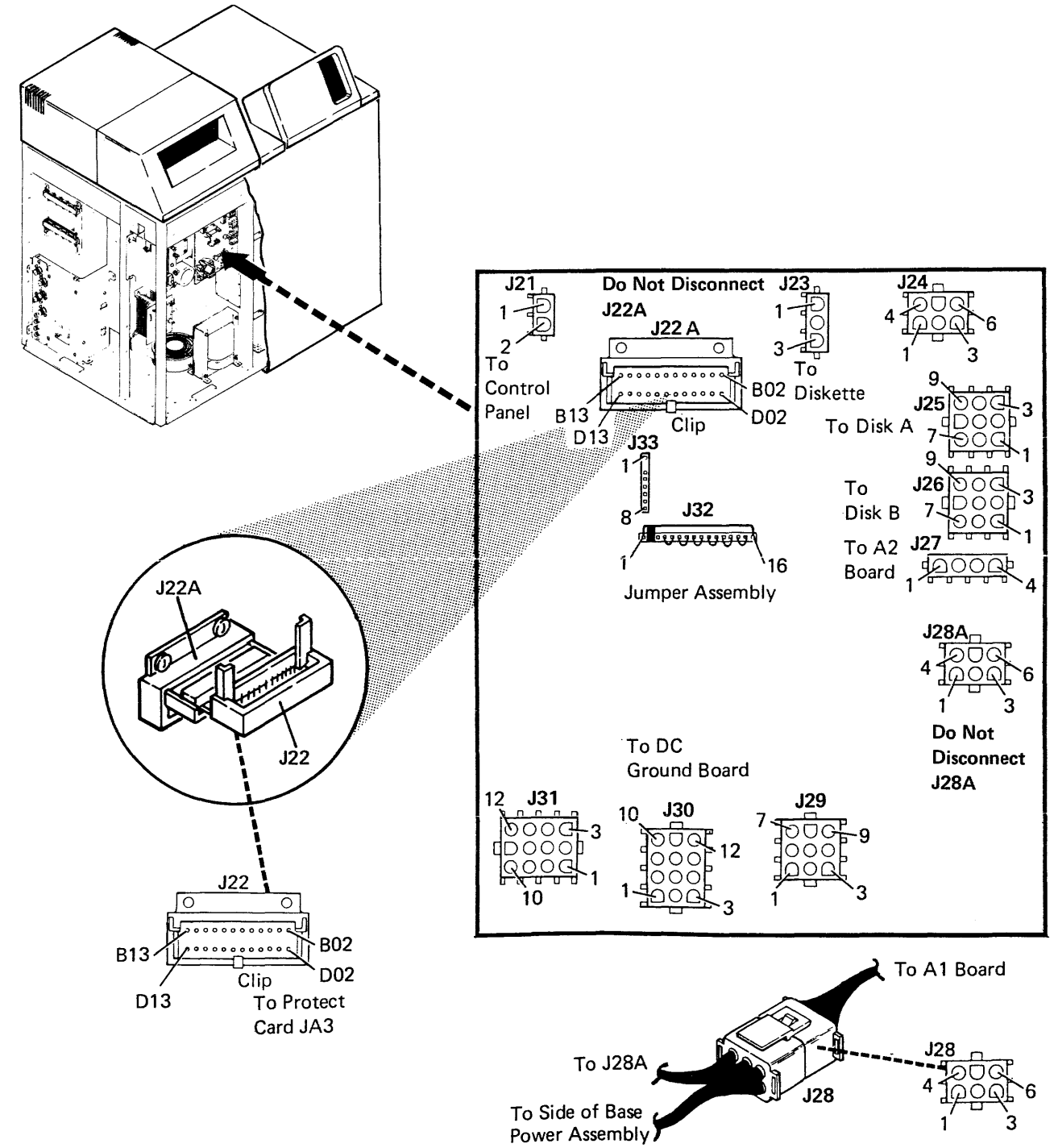
05-230
Base 5-Volt Assembly



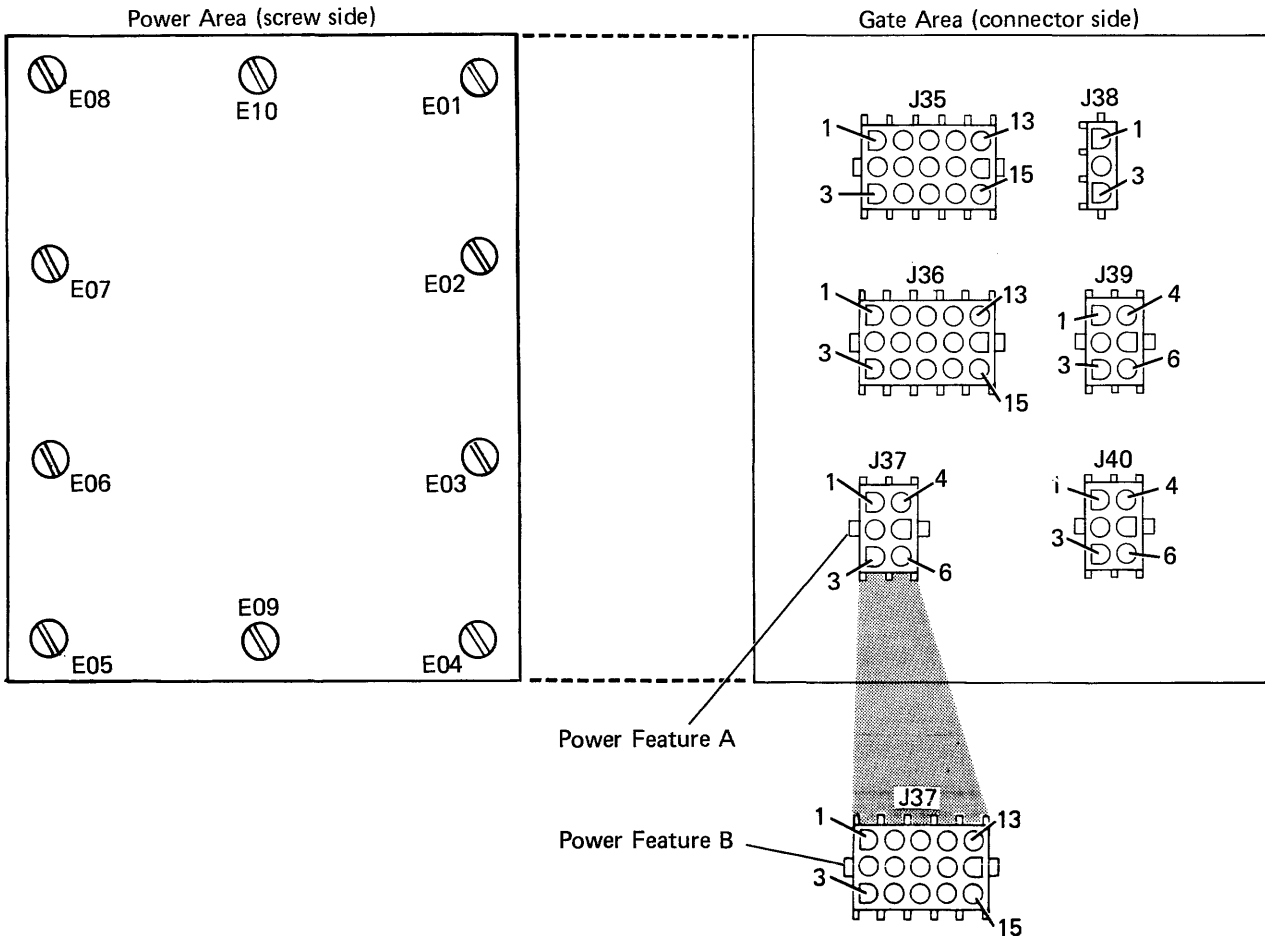
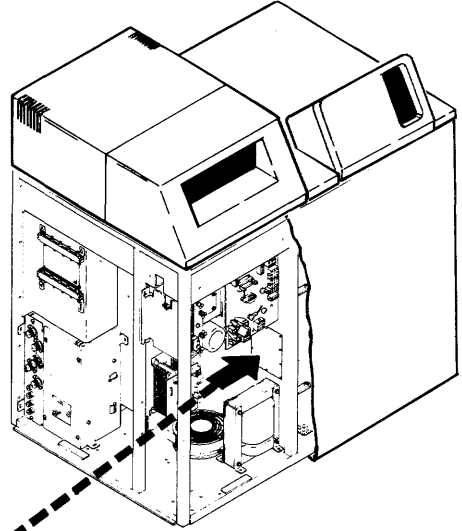
05-235
Base 1.7-Volt Regulator



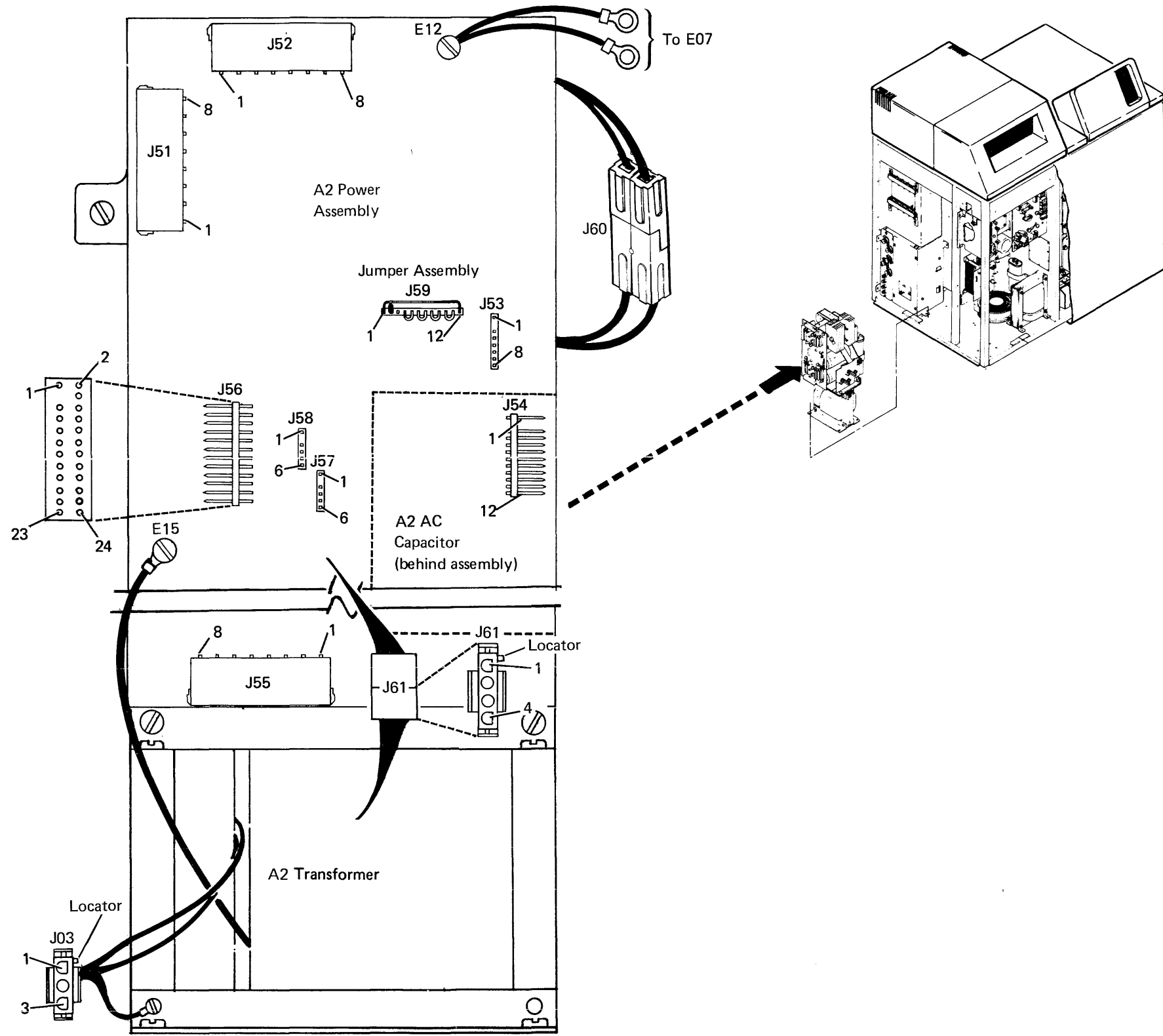
05-240
Base Power Assembly



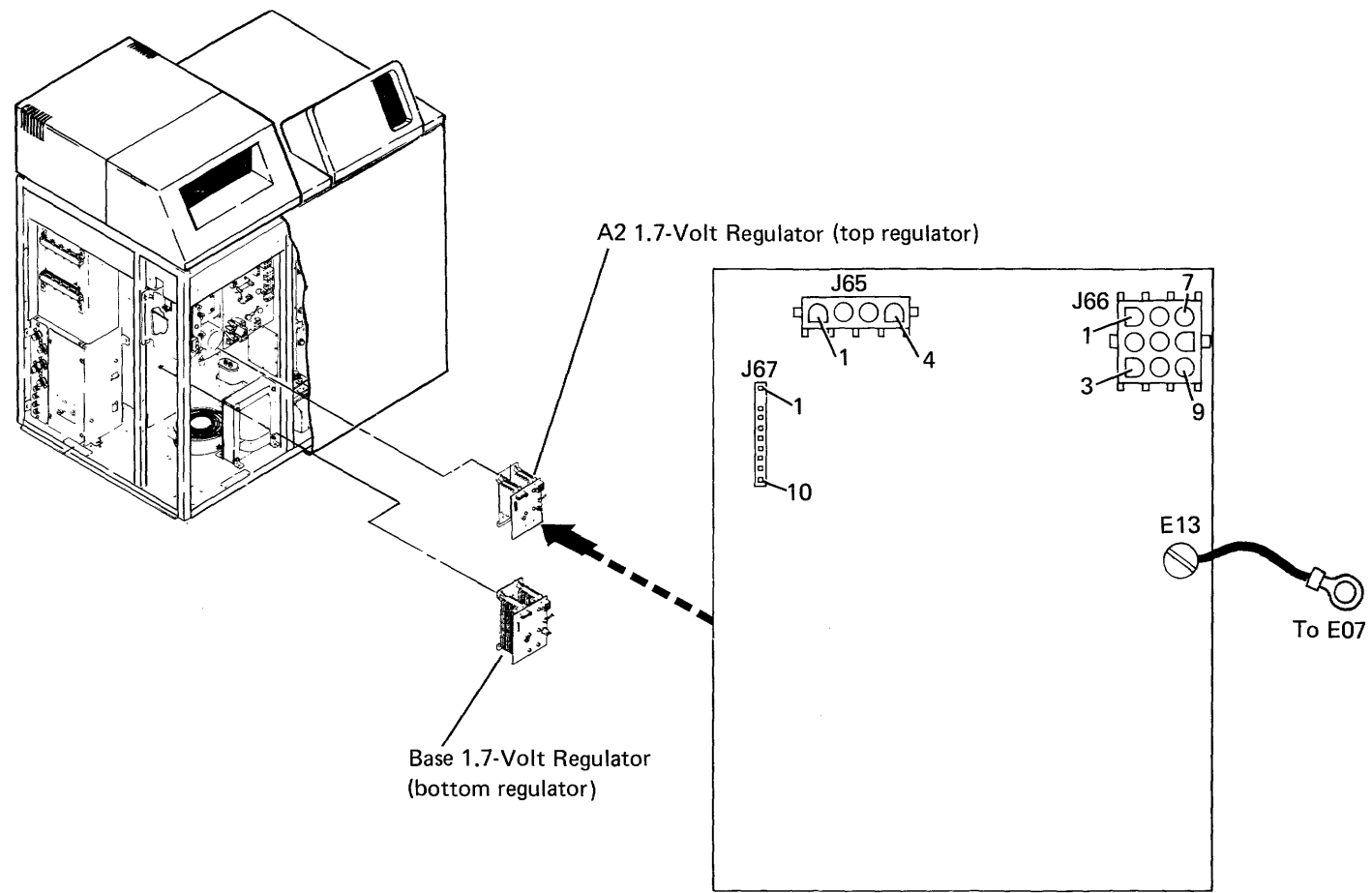
05-245
DC Ground Board

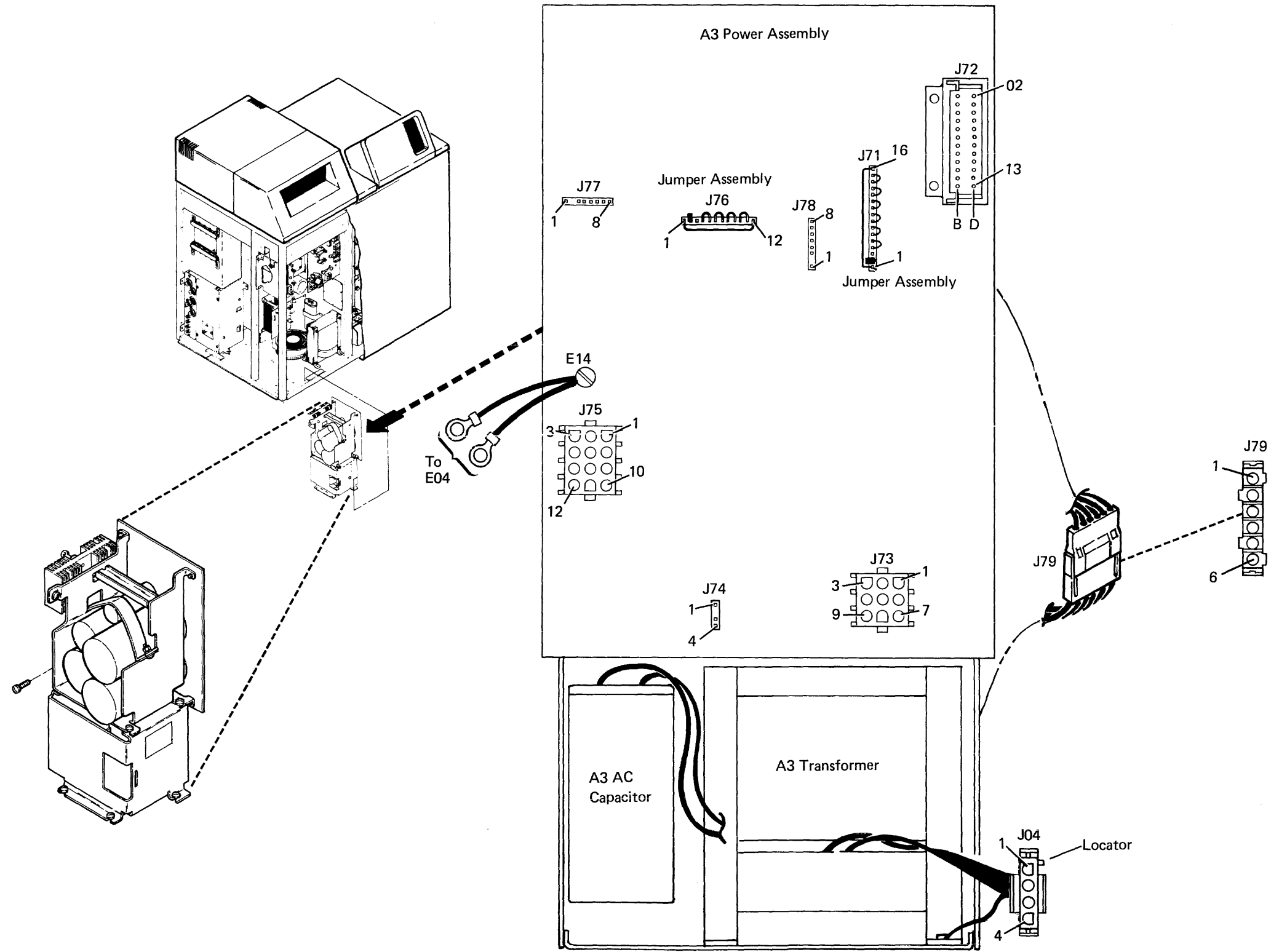


05-250
A2 Power Supply

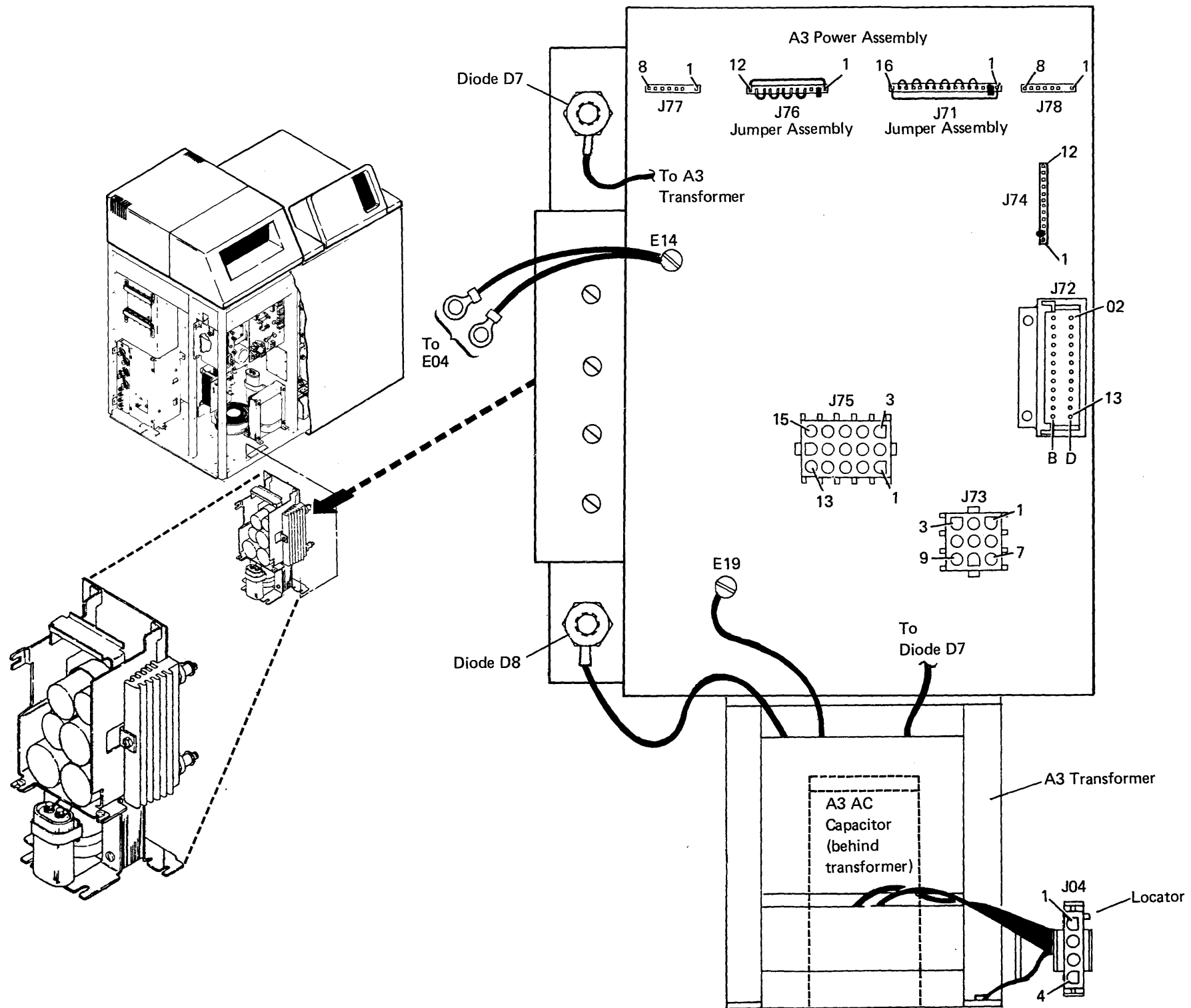


05-255
A2 1.7-Volt Regulator

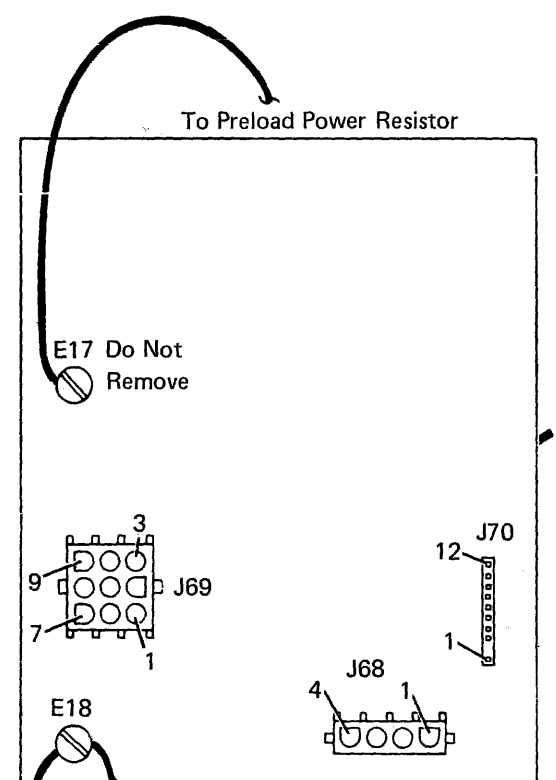
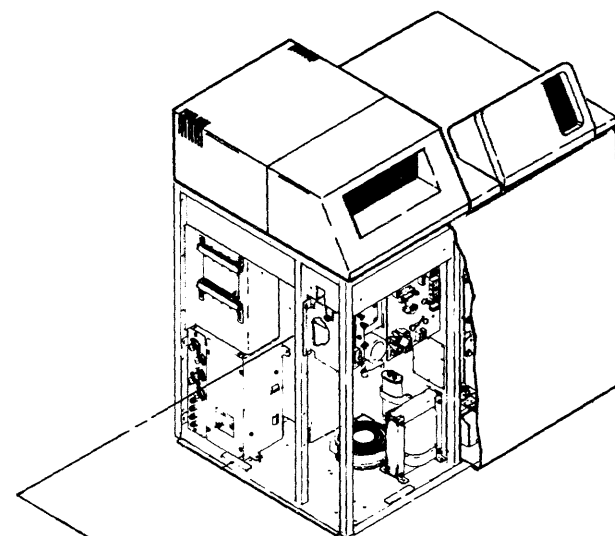




05-261
 A3 Power Supply (Power Feature B)



05-262
A3 1.7-Volt Regulator/Preload (Power
Feature B)



To DC Ground Board
(through A3 DC distribution cable)

To 1.7-Volt Test Jumper
(power feature B only)

**05-265
J-Connector Reference Chart**

Connector Number	MIM Reference	FLD Reference
J01	05-215	YA100
J02	05-225	YA105
J03	05-250	YA105
J04 ¹	05-260	YA105
J04 ²	05-261	YA105
J05	05-205	YA105
J06	05-205	YA105
J07	05-205	YA105
J08	05-205	YA105
J09	05-205	YA115
J10	05-205	YA115
J11	05-215	YA110
J12	05-215	YA110
J13	05-215	YA120
J14	05-230	YA150
J15	05-230	YA150
J16	05-230	YA150
J17	05-230	YA150
J18	05-230	YA150
J19	05-215	YA110
J21	05-240	YA170
J22/J22A	05-240	YA170
J23	05-240	YA170
J24	05-240	YA170
J25	05-240	YA170
J26	05-240	YA170
J27	05-240	YA170
J28/J28A	05-240	YA170
J29	05-240	YA170
J30	05-240	YA170
J31	05-240	YA170
J32	05-240	YA170
J33	05-240	YA170
J35	05-245	YA175
J36	05-245	YA175
J37	05-245	YA175
J38	05-245	YA175
J39	05-245	YA175

¹Use for power feature A.
²Use for power feature B.

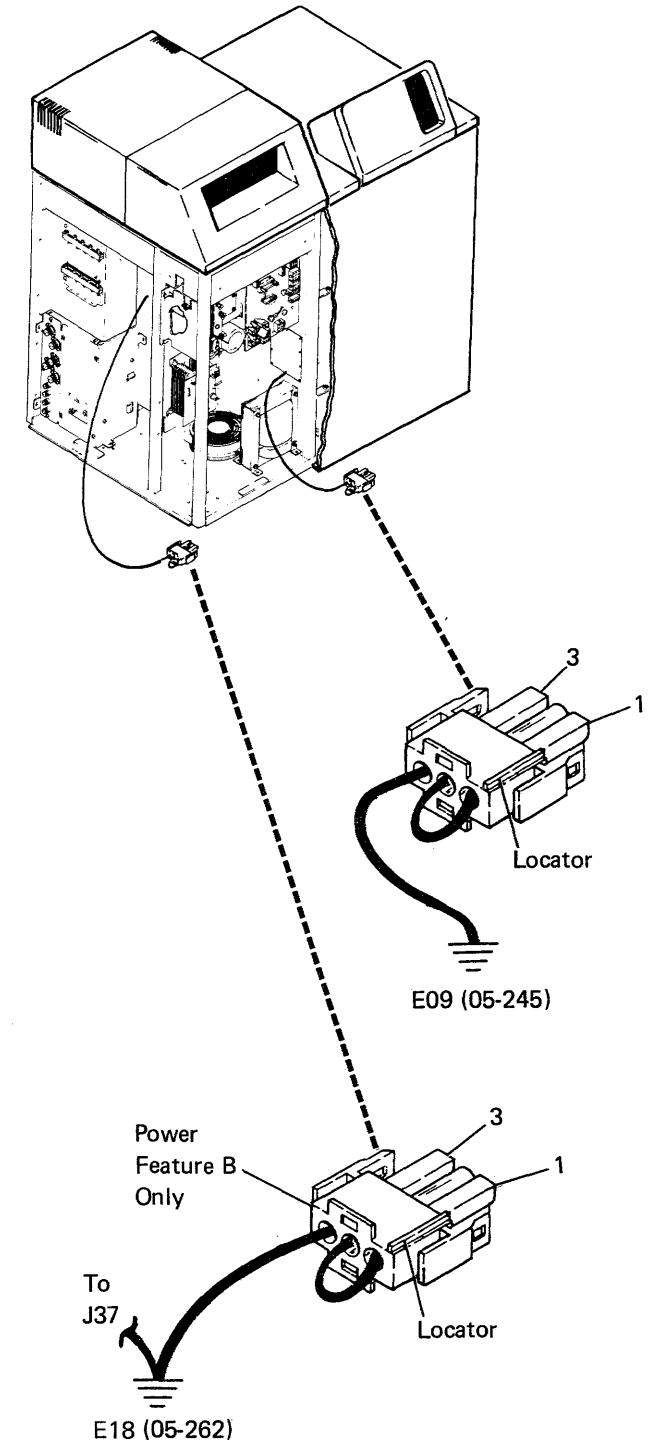
Connector Number	MIM Reference	FLD Reference
J40	05-245	YA175
J41	05-235	YA160
J42	05-235	YA160
J43	05-235	YA160
J45	05-205	YA115
J46	05-205	YA115
J47	05-205	YA115
J51	05-250	YB100
J52	05-250	YB100
J53	05-250	YB100
J54	05-250	YB100
J55	05-250	YB100
J56	05-250	YB100
J57	05-250	YB100
J58	05-250	YB100
J59	05-250	YB100
J60	05-250	YB100
J61	05-250	YB100
J65	05-255	YB200
J66	05-255	YB200
J67	05-255	YB200
J68	05-262	YC110
J69	05-262	YC110
J70	05-262	YC110
J71 ¹	05-260	YC100
J71 ²	05-261	YC100
J72 ¹	05-260	YC100
J72 ²	05-261	YC100
J73 ¹	05-260	YC100
J73 ²	05-261	YC100
J74 ¹	05-260	YC100
J74 ²	05-261	YC100
J75 ¹	05-260	YC100
J75 ²	05-261	YC100
J76 ¹	05-260	YC100
J76 ²	05-261	YC100
J77 ¹	05-260	YC100
J77 ²	05-261	YC100

¹Use for power feature A.
²Use for power feature B.

Connector Number	MIM Reference	FLD Reference
J78 ¹	05-260	YC100
J78 ²	05-261	YC100
J79	05-260	YC100
J81	05-290	YD100
J82	05-290	YD100
J83	05-290	YD100
J84	05-290	YD100
J85	05-290	YD100
J87	05-290	YD100
J88	05-290	YD100
J89	05-290	YD100
J90	05-290	YD100
J91	05-290	YD100
J92	05-290	YD100
J93	05-290	YD100
J94	05-205	YA115
J95	05-285	YA105
J96	05-290	YD100
J97	05-290	YD100
JA1	05-220	YA900
JA2	05-220	YA910
JA3	05-220	YA920
JA4	05-220	YA930
JC2	05-220	YA950
JC3	05-220	YA960
JC4	05-220	YA970

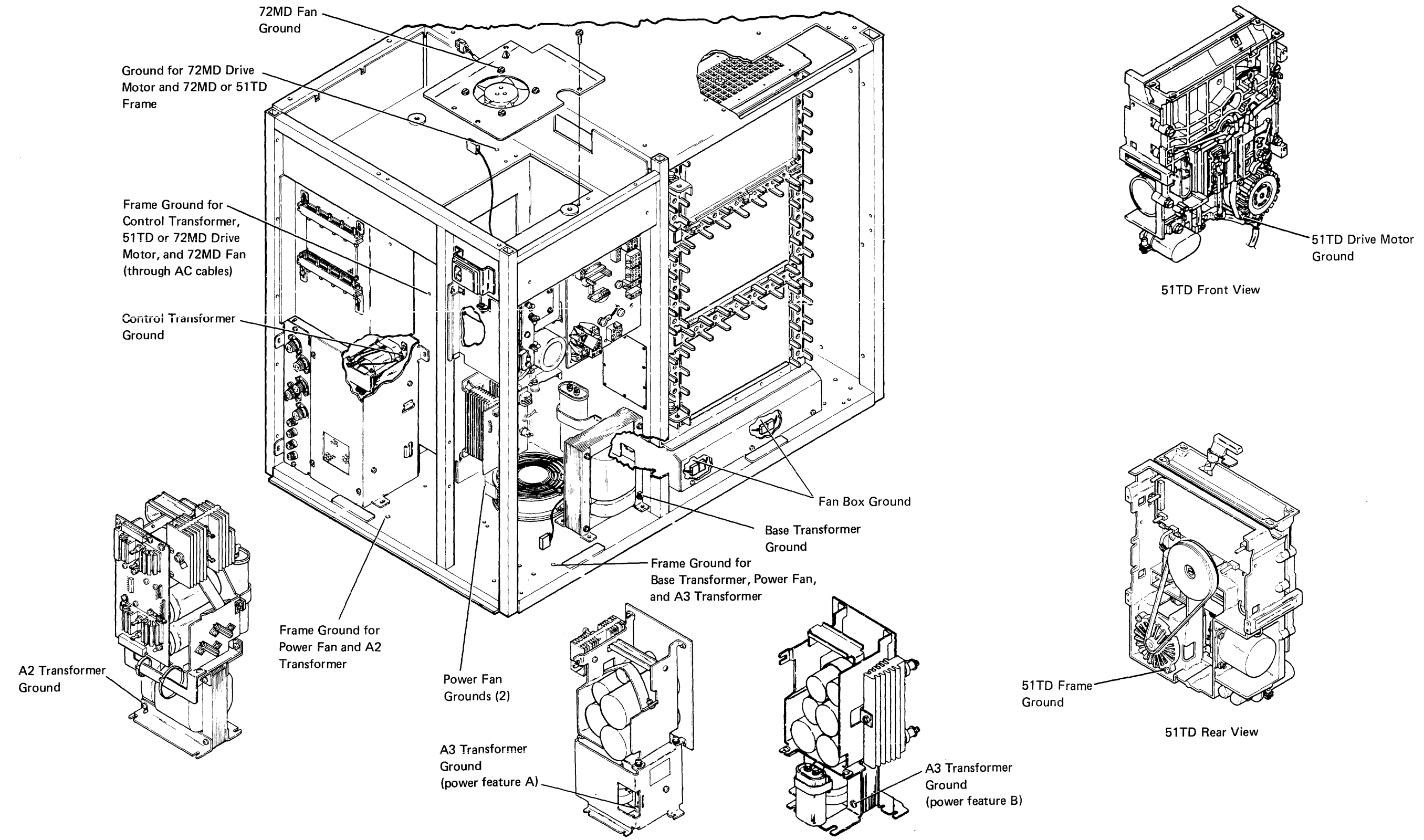
¹Use for power feature A.
²Use for power feature B.

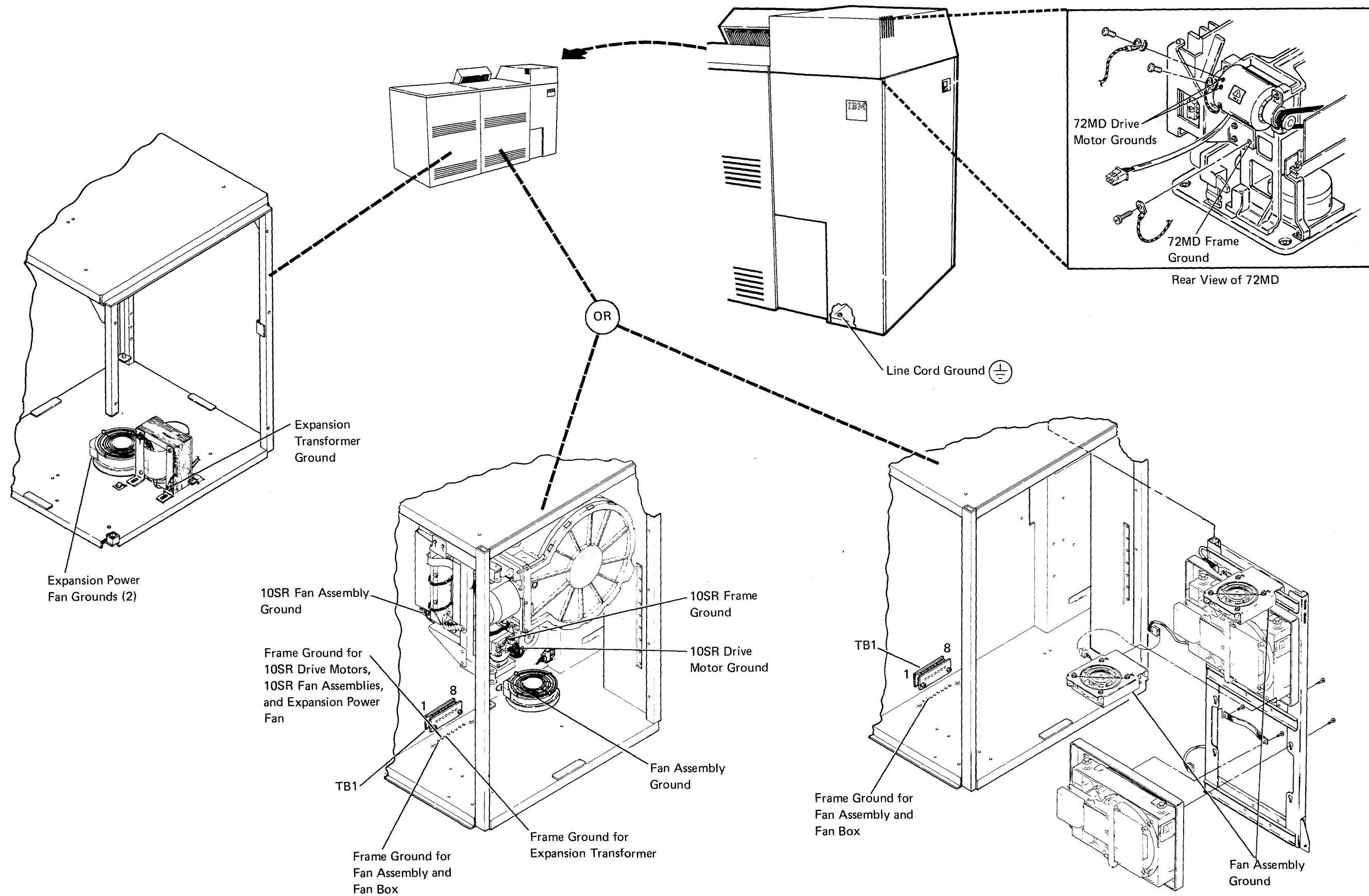
**05-270
1.7-Volt Test Jumpers**



05-275 AC Safety Grounds

Note: See FLD AY110 for electrical path of AC safety grounds.





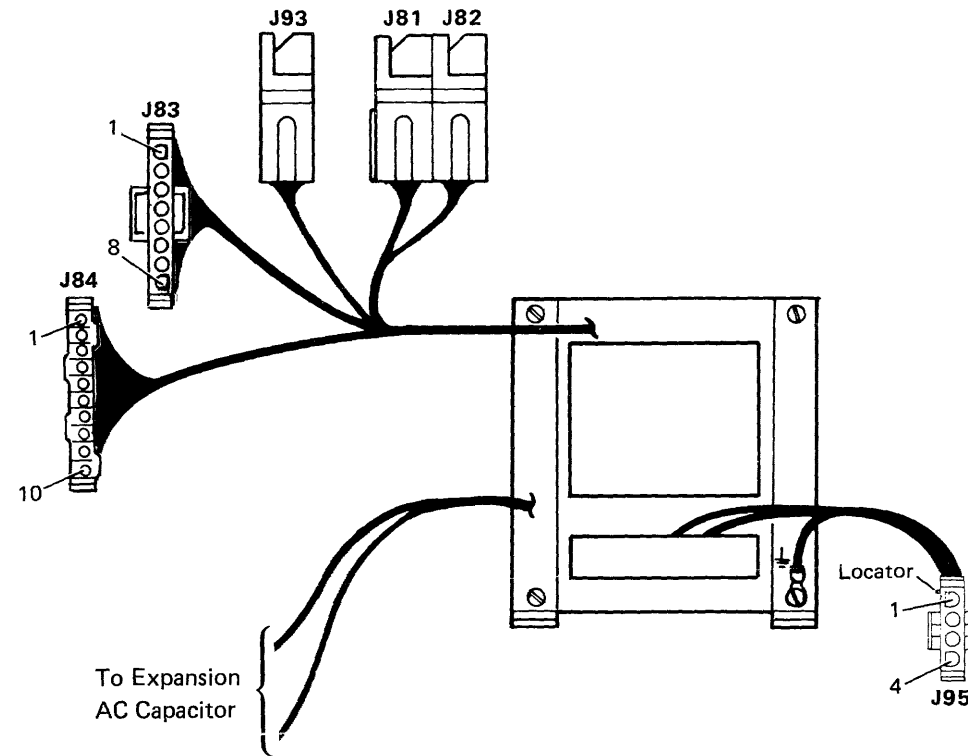
05-280
E-Connector Reference Chart

Connector Number	MIM Reference	FLD Reference
E01	05-245	YA175
E02	05-245	YA175
E03	05-245	YA175
E04	05-245	YA175
E05	05-245	YA175
E06	05-245	YA175
E07	05-245	YA175
E08	05-245	YA175
E09	05-245	YA175
E10	05-245	YA175
E11	05-235	YA160
E12	05-250	YB100
E13	05-255	YB200
E14 ¹	05-260	YC100
E14 ²	05-261	YC100
E15	05-250	YB100
E16	05-290	YD100
E17 ²	05-262	YC110
E18 ²	05-262	YC110
E19 ²	05-261	YC100

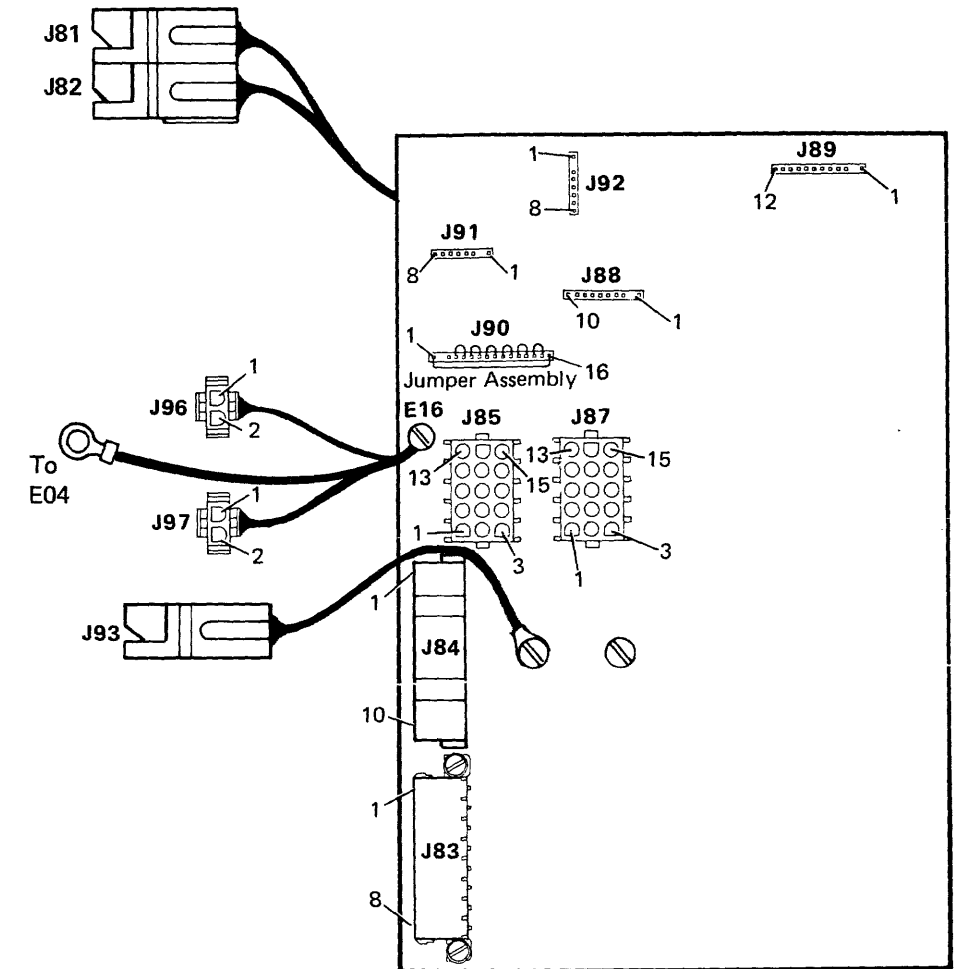
¹Use for power feature A.

²Use for power feature B.

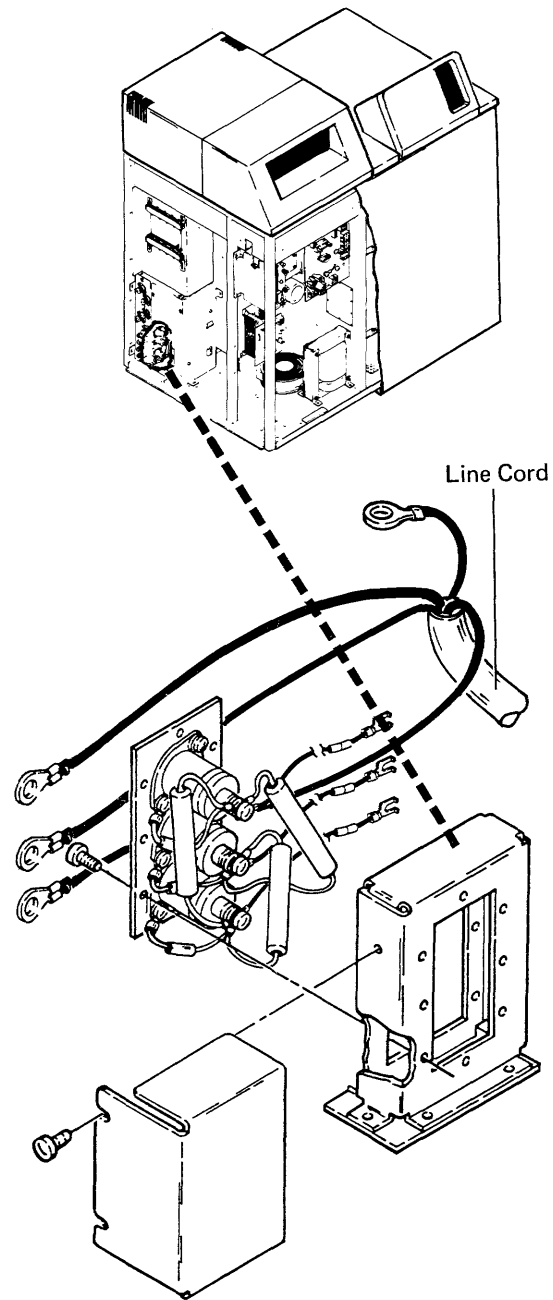
05-285
Expansion Transformer



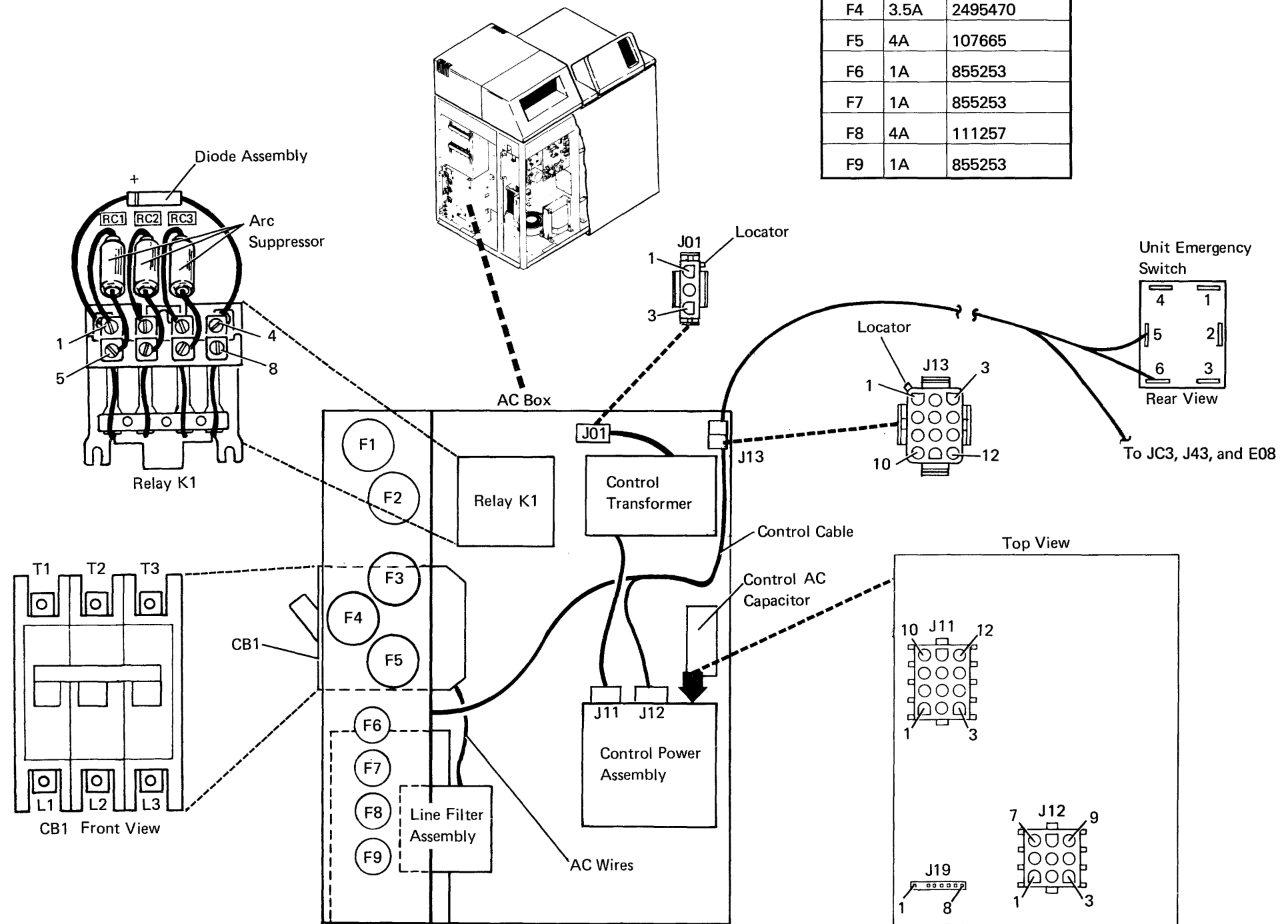
05-290
Expansion Power Assembly



05-298
Line Filter Assembly (Denmark and Switzerland)

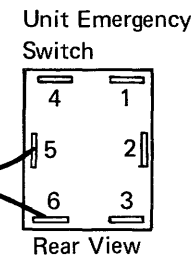


05-299
AC Box (Denmark and Switzerland)



Fuse	Size	Part Number
F1	0.6A	252590
F2	7A	2495463
F3	5A	107666
F4	3.5A	2495470
F5	4A	107665
F6	1A	855253
F7	1A	855253
F8	4A	111257
F9	1A	855253

See 05-605 for fuse use.



To JC3, J43, and E08

Maintenance Procedures

05-305 Power Adjustments

The System/36 power assemblies have no adjustments.

05-310 Line Filter Assembly

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Remove the three screws and the cover below CB1.
5. Remove the eight screws and the cover from the line filter assembly.
6. Disconnect the two line cord wires from the line filter assembly.
7. Remove the eight screws and the line filter assembly.
8. Disconnect the two wires from CB1 to the line filter assembly.

See 05-210 for line filter assembly locations.

Note: In countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral, disconnect three wires in steps 6 and 8 above.

05-315 AC Box Parts

Note: The AC box does not have to be removed to exchange the parts located on the inside, such as relay K1.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Loosen the four screws and remove the cover from the AC box.

See 05-215 for AC box locations.

05-320 Protect Card

The protect card can be removed without disconnecting each cable separately. Perform the following:

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Loosen the screws on the lower maple block bracket and slide the maple block down to separate the protect card from a maple block.
5. Disconnect the protect card from the other maple block.

To install the protect card, perform the following:

1. Install the protect card in the lower maple block.
2. Slide the protect card and the lower maple block up to seat the card in the upper maple block.
3. Tighten the screws on the lower maple block bracket.

See 05-220 for protect card locations.

05-325 Base Transformer

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J02
 - b. J14
 - c. J15
 - d. J16
 - e. J29
 - f. E05
 - g. The two wires to the base AC capacitor
5. Remove the two front screws.
6. Remove the base transformer.

See 05-225 for base transformer locations.

05-330 Base 5-Volt Assembly

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J14
 - b. J15
 - c. J16
 - d. J17
 - e. J18
 - f. J24
 - g. J31
 - h. J41
5. Loosen the three screws (two on the left side and one on the right side) that attach the base 5-volt assembly to the system frame.
6. Remove the base 5-volt assembly.

See 05-230 for base 5-volt assembly locations.

05-335 Base 1.7-Volt Regulator

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J41
 - b. J42
 - c. J43
 - d. E11
5. Loosen the two upper screws that attach the base 1.7-volt regulator to the system frame.
6. Remove the base 1.7-volt regulator.

See 05-235 for base 1.7-volt regulator locations.

05-340 Base Power Assembly

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J21
 - b. J22 (do not disconnect J22A)
 - c. J23
 - d. J24
 - e. J25
 - f. J26
 - g. J27
 - h. J28 (do not disconnect J28A)
 - i. J29
 - j. J30
 - k. J31
5. Loosen the four screws (two on the left side and two on the right side) that attach the base power assembly to the system frame.
6. Remove the base power assembly.

See 05-240 for base power assembly locations.

**05-365
A2 Power Supply FRUs**

Use this procedure to remove the FRUs in the A2 power supply. Perform steps 1 through 8 to remove the A2 power assembly and the attached A2 AC capacitor. To remove the A2 transformer, continue with steps 9 through 11.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the two wires at the A2 AC capacitor and pull them down through the A2 power assembly frame.
5. Disconnect the following:
 - a. J51
 - b. J52
 - c. J54
 - d. J55
 - e. J56
 - f. J60
 - g. J61
 - h. E12
 - i. E15
6. Loosen the two front screws and remove the two rear screws that attach the A2 power assembly to the A2 transformer.
7. Remove the screw (located at the upper left) that attaches the A2 power supply to the system frame.
8. Remove the A2 power assembly and the attached A2 AC capacitor.

Note: When you reinstall the A2 power assembly and the attached A2 AC capacitor, push the two wires to the A2 AC capacitor up through the A2 power assembly frame.
9. Disconnect J03 and fasten it away from the A2 transformer.
10. Remove the two front screws that attach the A2 transformer to the base.

CAUTION

To prevent damage, do not place the A2 transformer on top of the AC cable or J03.

11. Remove the A2 transformer.

See 05-250 for A2 power supply locations.

**05-366
A2 Power Supply**

Use this procedure to remove the A2 power supply as a unit.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J51
 - b. J52
 - c. J54
 - d. J56
 - e. E12
5. Remove the two front screws that attach the A2 power supply to the base.
6. Remove the screw (located at the upper left) that attaches the A2 power supply to the system frame.
7. Disconnect J03 and fasten it away from the A2 power supply.

DANGER

The A2 power supply has a weight of more than 27 kilograms (60 pounds). If necessary, get aid when you remove the A2 power supply in step 8.

CAUTION

To prevent damage, do not place the A2 power supply on top of the AC cable or J03.

8. Remove the A2 power supply.

See 05-250 for A2 power supply locations.

**05-370
A2 1.7-Volt Regulator**

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J65
 - b. J66
 - c. J67
 - d. E13
5. Loosen the two upper screws that attach the A2 1.7-volt regulator to the system frame.
6. Remove the A2 1.7-volt regulator.

See 05-255 for A2 1.7-volt regulator locations.

**05-372
A3 Power Supply FRUs (Power Feature B)**

Use this procedure to remove the FRUs in the A3 power supply (power feature B). Perform steps 1 through 7 to remove only the A3 power assembly. To remove the A3 AC capacitor and the A3 transformer, continue with steps 8 through 10.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J72
 - b. J73
 - c. J74
 - d. J75
 - e. E14
 - f. E19
 - g. D7
 - h. D8
5. Loosen the two screws at the rear and remove the screw at the front that attach the A3 power assembly to the A3 transformer.
6. Remove the screw (located at the upper left) that attaches the A3 power assembly to the frame.

CAUTION

To prevent damage, do not let the A3 power assembly hit the connectors at the bottom of the base 5-volt assembly.

7. Remove the A3 power assembly.
8. Disconnect J04.
9. Loosen the three screws (one at the front and two at the rear) that attach the A3 AC capacitor and the A3 transformer to the base.

CAUTION

To prevent damage, do not place the A3 AC capacitor and the A3 transformer on top of the AC cable or J04.

10. Remove the A3 AC capacitor and the A3 transformer.

See 05-261 for A3 power supply (power feature B) locations.

**05-373
A3 Power Supply (Power Feature B)**

Use this procedure to remove the A3 power supply as a unit.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J04
 - b. J72
 - c. J74
 - d. J75
 - e. E14
5. Loosen the three screws (one at the front and two at the rear) that attach the A3 AC capacitor and the A3 transformer to the base.
6. Remove the screw (located at the upper left) that attaches the A3 power supply to the frame.

CAUTION

To prevent damage, do not let the A3 power supply hit the connectors at the bottom of the base 5-volt assembly. Also, do not place the A3 power supply on top of the AC cable or J04.

7. Remove the A3 power supply.

See 05-261 for A3 power supply (power feature B) locations.

**05-374
A3 1.7-Volt Regulator/Preload (Power Feature B)**

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J68
 - b. J69
 - c. J70
 - d. E18
5. Loosen the three screws (one on the top and two on the right side) that attach the A3 1.7-volt regulator/preload to the frame.
6. Remove the A3 1.7-volt regulator/preload.

See 05-262 for A3 1.7-volt regulator/preload (power feature B) locations.

**05-375
A3 Power Supply FRUs (Power Feature A)**

Use this procedure to remove the FRUs in the A3 power supply. Perform steps 1 through 7 to remove only the A3 power assembly. To remove the mounting assembly containing the A3 transformer and the A3 AC capacitor, continue with steps 8 through 10.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J72
 - b. J73
 - c. J75
 - d. J79
 - e. E14
5. Loosen the two screws on the front and remove the screws at the rear that attach the A3 power assembly to the mounting assembly.
6. Remove the screw (located at the upper left) that attaches the A3 power assembly to the system frame.

CAUTION

To prevent damage, do not let the A3 power assembly hit the connectors at the bottom of the base 5-volt assembly.

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7. Remove the A3 power assembly.
 8. Disconnect J04.
 9. Loosen the three screws (two on the left side and one on the right side) that attach the mounting assembly to the base.

CAUTION

To prevent damage, do not place the mounting assembly on top of the AC cable or J04.

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10. Remove the mounting assembly containing the A3 transformer and the A3 AC capacitor.

See 05-260 for A3 power supply (power feature A) locations.

**05-376
A3 Power Supply (Power Feature A)**

Use this procedure to remove the A3 power supply as a unit.

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Disconnect the following:
 - a. J04
 - b. J72
 - c. J75
 - d. E14
5. Loosen the three screws (two on the left side and one on the right side) that attach the A3 power supply to the base.
6. Remove the screw (located at the upper left) that attaches the A3 power supply to the system frame.

CAUTION

To prevent damage, do not let the A3 power supply hit the connectors at the bottom of the base 5-volt assembly. Also, do not place the A3 power supply on top of the AC cable or J04.

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-
7. Remove the A3 power supply.
- See 05-260 for A3 power supply (power feature A) locations.

**05-377
Expansion Transformer**

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Remove the expansion power assembly (05-378).
5. Disconnect the following:
 - a. J95
 - b. The two wires to the expansion AC capacitor
6. Remove the two front screws that attach the expansion transformer to the base.
7. Remove the expansion transformer.

See 05-285 for expansion transformer locations.

**05-378
Expansion Power Assembly**

1. Power off (01-115).
2. Set CB1 to off.
3. Disconnect the line cord.
4. Remove the two screws that attach the cable bracket (located above the expansion power assembly) to the frame. Fasten the cable bracket away from the expansion power assembly.
5. Disconnect the following:
 - a. J81
 - b. J82
 - c. J83
 - d. J84
 - e. J85
 - f. J87
 - g. J89
 - h. J93
 - i. E16
6. Loosen the two screws that attach the expansion power assembly to the frame.
7. Remove the expansion power assembly.

See 05-290 for expansion power assembly locations.

**05-380
Voltage Service Checks**

The following charts show the voltages generated by the System/36 power assemblies (these voltages are for reference only). The power assemblies have no adjustments.

Notes:

1. Use a digital meter to check the following voltages.
2. Perform all probing on the rear of the connectors without disconnecting them.

Base 5-Volt Assembly

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+5 Vdc	+5.52	+4.65	J17-01	E01	YA150	05-230
+4.9 Vdc	+5.9	+4.3	J41-01	E05	YA160	05-230

Base 1.7-Volt Regulator

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+1.7 Vdc	+1.754	+1.685	J42-02	J42-03	YA160	05-235

Base Power Assembly

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+24 Vdc	+26.4	+21.8	J25-01	J30-01	YA170, YA171	05-240
+12 Vdc	+13.2	+11.1	J28-06	J30-01	YA170, YA171	05-240
+8.5 Vdc	+8.925	+8.075	J28-04	J30-01	YA170, YA171	05-240
-5 Vdc	-5.52	-4.6	J28-05	J30-01	YA170, YA171	05-240
-12 Vdc	-13.2	-10.85	J28-03	J30-01	YA170, YA171	05-240

A2 Power Supply

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+36 Vdc	+39.6	+33.1	J51-01	E12	YB100	05-250
+5 Vdc	+5.52	+4.65	J56-01	E12	YB100	05-250
-12 Vdc	-13.2	-11	J51-07	E12	YB100	05-250
-36 Vdc	-39.6	-33.1	J51-05	E12	YB100	05-250

A2 1.7-Volt Regulator

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+1.7 Vdc	+1.754	+1.685	J66-02	J66-03	YB200	05-255

A3 Power Supply (Power Feature A)

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+8.5 Vdc	+9.35	+7.8	J75-12	E14	YC100	05-260
+5 Vdc	+5.52	+4.65	J75-07	E14	YC100	05-260
+1.7 Vdc	+1.754	+1.685	J75-02	J75-03	YC100	05-260
-5 Vdc	-5.5	-4.65	J75-05	E14	YC100	05-260
-12 Vdc	-13.2	-11	J75-06	E14	YC100	05-260

A3 Power Supply (Power Feature B)

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+8.5 Vdc	+9.35	+7.8	J75-01	E14	YC100	05-261
+5 Vdc	+5.52	+4.65	J75-04	E14	YC100	05-261
-5 Vdc	-5.5	-4.56	J75-02	E14	YC100	05-261
-12 Vdc	-13.2	-11	J75-03	E14	YC100	05-261

A3 1.7-Volt Regulator/Preload (Power Feature B)

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+1.7 Vdc	+1.754	+1.685	J69-02	J69-03	YC110	05-262

Expansion Power Supply

Voltage	Voltage Tolerance		Probe Point	Ground Point	FLD Reference	MIM Reference
	Maximum	Minimum				
+36 Vdc	+39.6	+33.1	J85-10	E16	YD100, YD105	05-290
+12 Vdc	+13.2	+11	J85-11	E16	YD100, YD105	05-290
+5 Vdc	+5.52	+4.65	J85-01	E16	YD100, YD105	05-290
-5 Vdc	-5.52	-4.65	J85-12	E16	YD100, YD105	05-290
-12 Vdc	-13.2	-11	J85-13	E16	YD100, YD105	05-290
-36 Vdc	-39.6	-33.1	J85-14	E16	YD100, YD105	05-290

The following chart shows the AC voltage needed by the System/36.

Note: Disconnect the line cord from the customer power outlet.

AC Voltage

Frequency	Voltage	Voltage Tolerance		Probe Point	Ground Point
		Maximum	Minimum		
60 Hz	200-235 Vac	254	180 ¹	Customer power outlet only	
50 Hz	200-237 Vac	259	180 ¹	Customer power outlet only	
50 Hz ²	200-237 Vac	242	197 ¹	Customer power outlet only (phase-to-neutral)	
	340-420 Vac	418	342	Customer power outlet only (phase-to-phase)	

¹The AC voltage can fall to 140 Vac for less than 0.5 seconds without causing an error.

²Use this part of the table only in countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral.

**05-400
Manual Power On**

Use this procedure to measure the output of power assemblies when the system will not power on normally.

1. Set the Unit Emergency switch to the Power Off position.
2. Set the meter to measure the expected AC or DC output voltage. See 05-380 for meter lead probe and ground points.
3. Install a jumper from TP K1 to TP Gnd on the protect card (05-220).

CAUTION

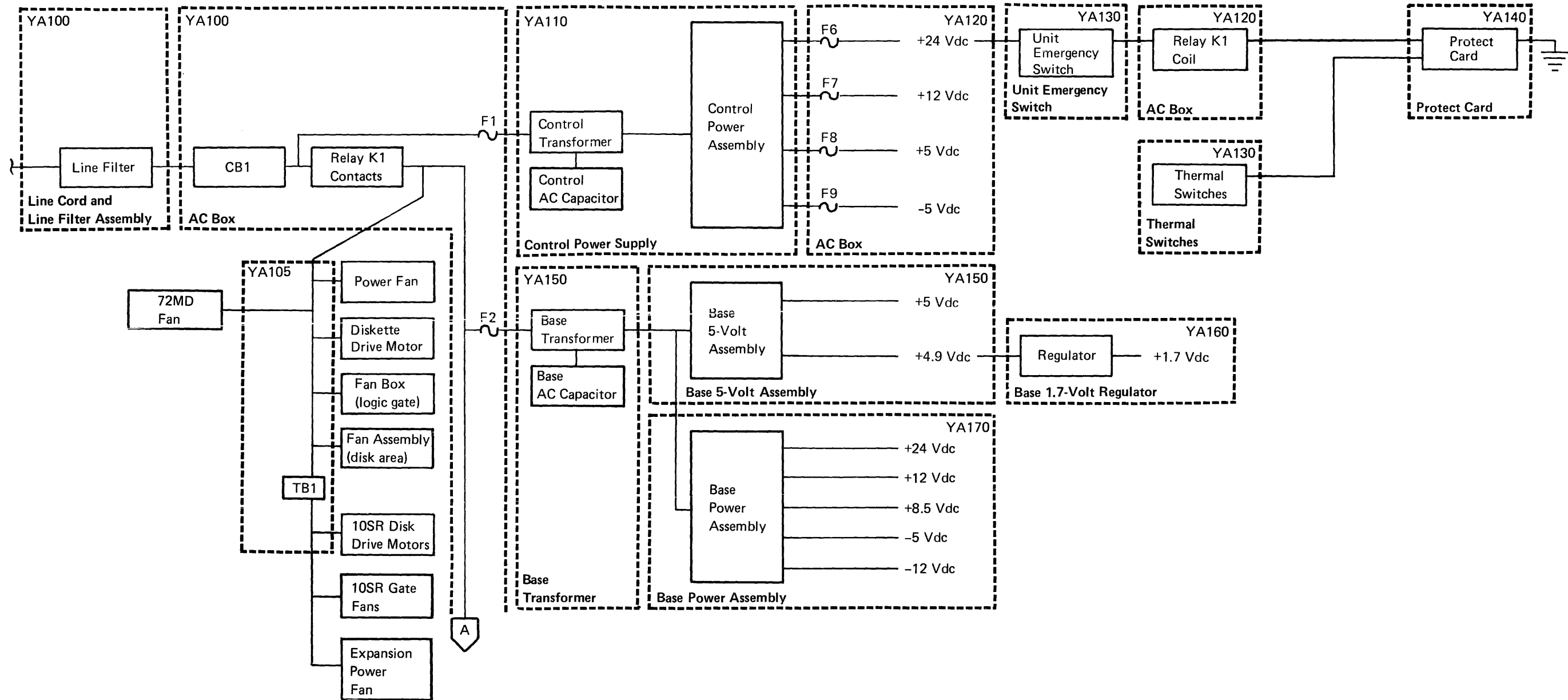
Damage to the machine can occur when this procedure is used. Do not keep system power on any longer than necessary to make the measurement.

4. Set the Unit Emergency switch to the Power Enable position only long enough to read the meter; then, set the Unit Emergency switch to the Power Off position.
5. Remove the jumper and set the Unit Emergency switch to the Power Enable position.

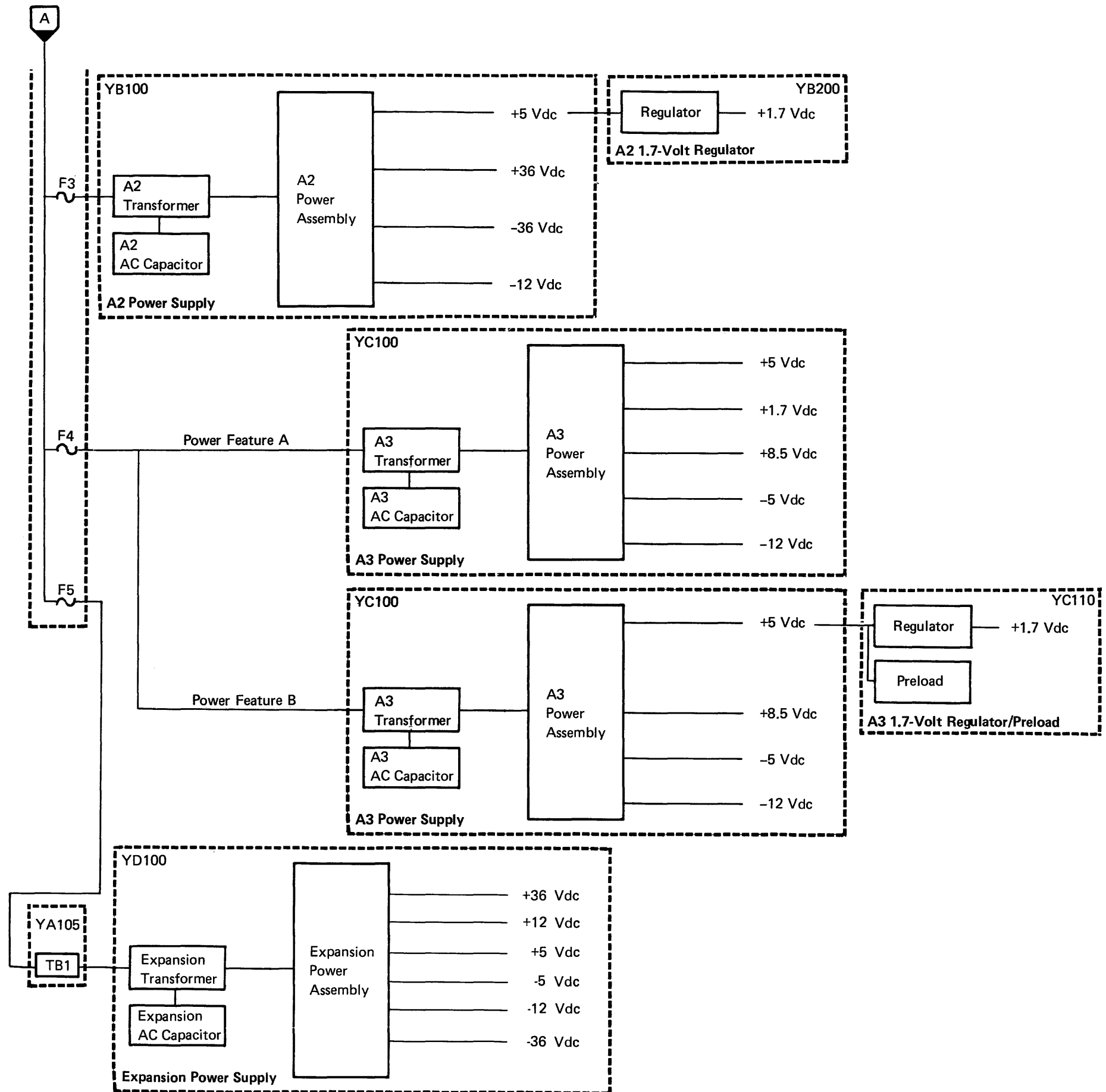
FRU Descriptions

05-605 Power Flow

See the following chart when reading the the FRU description paragraphs.



Note: In countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral, see 05-298, 05-299, and FLD AY103. In all other countries, see FLD AY110.



05-610 Line Filter Assembly

The line filter assembly isolates the system from any ripple or electrical noise on the AC voltage source. This assembly also isolates the AC voltage source from any ripple or electrical noise generated by the system.

05-615 AC Box

The AC box contains the following major parts:

- Control power supply
- CB1
- Relay K1
- Arc suppressors

The AC box supplies AC voltage to the following:

- All transformers
- Diskette drive motor
- 10SR disk drive motors
- Power fan
- Fan box (logic gate)
- Fan assembly (disk area)
- 72MD fan
- Expansion power fan

Control Power Supply

The control power supply receives AC voltage through the line filter assembly, CB1, fuse F1, and connector J01. The control power supply contains three FRUs: a transformer, an AC capacitor, and a power assembly. Together, these FRUs supply -5 Vdc, +5 Vdc, +12 Vdc, and +24 Vdc.

The +5 Vdc and -5 Vdc are used by control and sense circuits in the base power assembly and by the A2, A3, and expansion power supplies. The +5 Vdc is also used by the control circuits in the control power supply and by the protect card. The +12 Vdc is used by control circuits in the base 1.7-volt and A2 1.7-volt regulators and by either the A3 power supply (power feature A) or the A3 1.7-volt regulator/preload (power feature B). The +24 Vdc is used to pick relay K1.

The control power supply also contains circuits that generate a 203-kilohertz clock signal.

CB1

CB1 is a 20-ampere circuit breaker that protects the system from AC overcurrent and short-circuit conditions.

Note: In countries where the system must use two-phase power (380 Vac phase-to-phase) with neutral, CB1 is a 15-ampere circuit breaker.

Relay K1

When relay K1 picks, its contacts supply AC voltage to the following:

- All transformers (except the control transformer)
- 10SR disk drive motors
- Diskette drive motor
- All fans

Arc Suppressors

The arc suppressors prevent arcing on the relay K1 contacts when relay K1 deactivates.

05-620 Protect Card

The protect card contains circuits that:

- Control power on and power off
- Control a power-off delay (only on systems with 21ED disk drives)
- Generate the '+system POR' and '-system POR' signals
- Check the status of all the power assemblies:
 - The undervoltage status is not checked until 480 milliseconds after power on.
 - The overvoltage, overcurrent, and cable-not-seated status is checked when the control voltages are present.
- Store overvoltage, undervoltage, overcurrent, and cable-not-seated conditions of all the power assemblies
- Control the Temperature Check and Power Check lights

05-625 Base Transformer

The base transformer receives AC voltage through the line filter assembly, CB1, the relay K1 contacts, fuse F2, and connector J02. The transformer has six outputs:

- 4.9 Vac to the base 5-volt assembly
- 5 Vac to the base 5-volt assembly
- 5 Vac to the base power assembly
- 12 Vac to the base power assembly
- 24 Vac to the base power assembly
- 550 Vac to the base AC capacitor

05-630 Base 5-Volt Assembly

The base 5-volt assembly converts 4.9 Vac from the base transformer to +4.9 Vdc for the base 1.7-volt regulator. It also converts 5 Vac from the base transformer to +5 Vdc for the A-A1 board.

05-635 Base 1.7-Volt Regulator

The base 1.7-volt regulator converts the +4.9 Vdc from the base 5-volt assembly to +1.7 Vdc. The +1.7 Vdc is used by the A-A1 board.

The base 1.7-volt regulator contains circuits that sense the overvoltage, undervoltage, and overcurrent conditions of the +1.7 Vdc.

05-640 Base Power Assembly

The base power assembly converts the 5 Vac and 12 Vac from the base transformer to -5 Vdc and +12 Vdc, respectively. This assembly also converts the 24 Vac from the base transformer to +24 Vdc and -12 Vdc. It also supplies +8.5 Vdc from the +12 Vdc. These voltages are used by the A-A1 board.

The base power assembly contains circuits that:

- Generate the '+master POR' pulse, which resets the protect card logic
- Check the control power supply voltages
- Sense overvoltage, undervoltage, and overcurrent conditions of the voltages supplied by this assembly

05-645 Thermal Switches

The system unit contains two thermal switches: one in the power area and one in the logic gate.

Power Area Thermal Switch

The Power Area Thermal switch protects the system from high temperatures in the power area that can damage the power assemblies. This switch opens at $50^{\circ}\text{C} \pm 3^{\circ}$ ($122^{\circ}\text{F} \pm 5^{\circ}$) and closes at $42^{\circ}\text{C} \pm 3^{\circ}$ ($107^{\circ}\text{F} \pm 5^{\circ}$).

Logic Gate Thermal Switch

The Logic Gate Thermal switch protects the system from high temperatures in the logic gate that can damage the logic cards. This switch opens at $50^{\circ}\text{C} \pm 3^{\circ}$ ($122^{\circ}\text{F} \pm 5^{\circ}$) and closes at $42^{\circ}\text{C} \pm 3^{\circ}$ ($107^{\circ}\text{F} \pm 5^{\circ}$).

05-650 Power Fan

The power fan receives AC voltage through the relay K1 contacts and connector J05. The fan continuously moves air down through the power area.

05-655 Fan Box

The fan box receives AC voltage through the relay K1 contacts and connector J06. The fan continuously moves air down through the logic gate.

05-660 Fan Assembly

The fan assembly receives AC voltage through the relay K1 contacts and connector J08. The fan continuously moves air down through the disk drive area.

Systems with 10SR disk drives have one fan located on the base of the disk area.

Systems with 21ED disk drives have a fan located over each disk drive.

05-665 A2 Power Supply

The A2 power supply receives AC voltage through the line filter, CB1, the relay K1 contacts, fuse F3, and connector J03. The A2 power supply contains three FRUs: a transformer, an AC capacitor, and a power assembly. Together, these FRUs supply +5 Vdc to the A-A2 board and +36 Vdc, -36 Vdc, and -12 Vdc to the 10SR disk drives A and B. The +5 Vdc also goes to the A2 1.7-volt regulator.

The A2 power supply contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the voltages supplied by this power supply.

05-670 A2 1.7-Volt Regulator

The A2 1.7-volt regulator converts the +5 Vdc from the A2 power supply to +1.7 Vdc. The +1.7 Vdc is used by the A-A2 board.

The A2 1.7-volt regulator contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the +1.7 Vdc.

05-675 A3 Power Supply (Power Feature A)

The A3 power supply receives AC voltage through the line filter, CB1, the relay K1 contacts, fuse F4, and connector J04. The A3 power supply contains three FRUs: a transformer, an AC capacitor, and a power assembly. Together, these FRUs supply +1.7 Vdc, +5 Vdc, +8.5 Vdc, -5 Vdc, and -12 Vdc to the A-A3 board.

The A3 power supply contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the voltages supplied by this power supply.

05-676 A3 Power Supply (Power Feature B)

The A3 power supply receives AC voltage through the line filter, CB1, the relay K1 contacts, fuse F4, and connector J04. The A3 power supply contains three FRUs: a transformer, an AC capacitor, and a power assembly. Together, these FRUs supply +5 Vdc, +8.5 Vdc, -5 Vdc, -12 Vdc to the A-A3 board.

The A3 power supply contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the voltages supplied by this power supply.

05-677 A3 1.7-Volt Regulator/Preload (Power Feature B)

The A3 1.7-volt regulator/preload converts the +5 Vdc from the A3 power supply to +1.7 Vdc. The +1.7 Vdc is used by the A-A3 board. This regulator/preload also supplies a preload to prevent the +5 Vdc from going over a preset level.

The A3 1.7-volt regulator/preload contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the +1.7 Vdc.

05-680 1.7-Volt Test Jumpers

The 1.7-volt test jumpers permit powering on each of the following FRUs with its output cable disconnected.

FRU	Output Cable
Base 1.7-volt regulator	J42
A2 1.7-volt regulator	J66
A3 1.7-volt regulator/preload (power feature B only)	J69
A3 power supply (power feature A only)	J73

05-685 72MD Fan

The 72MD fan receives AC voltage through the relay K1 contacts and connector J45. The fan continuously moves air down through the 72MD area.

05-690 Expansion Power Fan

The expansion power fan receives AC voltage through the line filter, CB1, the relay K1 contacts, TB1, and connector J94. The fan continuously moves air down through the disk expansion area.

05-695 Expansion Power Supply

The expansion power supply receives AC voltage through the line filter, CB1, the relay K1 contacts, fuse F5, TB1, and connector J95. The expansion power supply contains three FRUs: a transformer, an AC capacitor, and a power assembly. Together, these FRUs supply +36 Vdc, +12 Vdc, +5 Vdc, -5 Vdc, -12 Vdc, and -36 Vdc to the 10SR disk drives C and D.

The expansion power supply contains circuits that sense overvoltage, undervoltage, and overcurrent conditions of the voltages supplied by this power supply.

Sequence of Events

05-805 Sequence of Events Prerequisites

The sequence of events section has the following prerequisites:

- The line cord is plugged in.
- CB1 is on.
- AC voltage is present at the control power supply (F1 is good).

The control power supply generates the following control voltages:

- +24 Vdc (F6 is good)
- +12 Vdc (F7 is good)
- +5 Vdc (F8 is good)
- -5 Vdc (F9 is good)

05-810 Power On

Prerequisites

- No temperature check condition can be present.
- The Unit Emergency switch is in the Power Enable position.
- Fuses F2, F3, F4, and F5 are good. F3 is a prerequisite only on systems with an A2 power supply. F4 is a prerequisite only on systems with an A3 power supply. F5 is a prerequisite only on systems with an expansion power supply.

Sequence

1. The operator performs the following:
 - a. Sets the Security switch to the Normal or Service position.
 - b. Presses the Power key.
2. The protect card generates the following:
 - a. The '+system POR' and '-system POR' signals, which reset the complete system.
 - b. The '-data protect' signal, which remains at an active level until all DC voltages are inside their overvoltage, undervoltage, and overcurrent limits.
 - c. The '-K1' signal, which picks relay K1.
3. The relay K1 contacts supply AC voltage to the remainder of the system (see 05-605). The power assemblies do not have a power-on sequence.
4. The Power light appears when +5 Vdc is present from the base 5-volt assembly.

**05-815
Power Off (Normal)**

Prerequisite

System power must be on.

Sequence

1. The system issues an I/O immediate instruction to power off the system; or the operator selects mode 6 (Enable Power Off) and presses the Power key.
2. The protect card:
 - a. Resets the '-data protect' signal.
 - b. Starts a delay (only on systems with 21ED disk drives) to permit the 21ED disk drive(s) to stop. The Power Check light blinks during this delay.
 - c. Resets the '-K1' signal after the delay, which deactivates relay K1.
3. The relay K1 contacts open, which removes AC voltage from the remainder of the system except the control power supply (see 05-605).

**05-820
Power Off (Not Normal)**

Temperature Check

Prerequisite

System power must be on.

Sequence

1. Either the Logic Gate Thermal switch or the Power Area Thermal switch opens.
2. The Temperature Check light on the control panel appears.
3. The protect card:
 - a. Resets the '-data protect' signal.
 - b. Starts a delay (only on systems with 21ED disk drives) to permit the 21ED disk drive(s) to stop. The Power Check light blinks during this delay.
 - c. Resets the '-K1' signal after the delay, which deactivates relay K1.
4. The relay K1 contacts open, which removes AC voltage from the remainder of the system except the control power supply (see 05-605).

Note: The system cannot be powered on until the Thermal switch closes; then, the system can be powered on (05-810).

Power Check

Prerequisite

System power must be on.

Sequence

1. The protect card senses an overvoltage, undervoltage, overcurrent, or cable-not-seated condition.
2. The Power Check light on the control panel appears.
3. The '-K1' signal is reset, which deactivates relay K1.
4. The relay K1 contacts open, which removes AC voltage from the remainder of the system except the control power supply (see 05-605).

Note: The error condition is indicated in the Power Status lights on the control panel (see 01-350).

Unit Emergency Switch

Prerequisite

System power must be on.

Sequence

1. The Unit Emergency switch is set to the Power Off position, which removes 24 Vdc from the relay K1 coil.
2. The relay K1 contacts open, which removes AC voltage from the remainder of the system except the control power supply (see 05-605). When the DC voltages fall, an undervoltage power check is caused.
3. The Power Check light appears.

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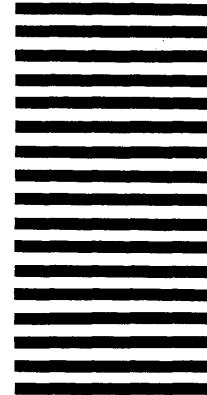
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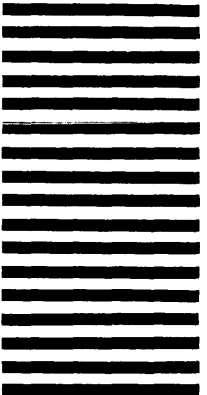
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