AT&T 3B20D Computer
Small Computer System Interface
Disk Unit Package
General Description

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1. Overview

1.01 The small computer system interface (SCSI) disk unit package (DUP) used in the AT&T 3B20D computers is described in this practice. The SCSI DUP is a peripheral storage device installed in a SCSI disk cabinet. It is part of the SCSI feature and interfaces the computer over a SCSI bus through a SCSI disk file controller (DFC). This practice illustrates the equipment and discusses the DUP as a computer peripheral unit. The practice contains seven parts as follows:

(a) Part 1 introduces the practice.

(b) Part 2 describes the physical equipment.

(c) Part 3 describes the functions of the DUP.

(d) Part 4 describes power.

(e) Part 5 discusses alarms.

(f) Part 6 discusses maintenance.

(g) Part 7 lists abbreviations.

1.02 This practice is reissued to update information pertaining to changes in the SCSI DUP. The specific reasons for reissue are listed below:

(a) Identify mounting tabs and slots correctly in Figure 2.

(b) Update information shown in Figure 3 about SCSI DUP power switch controls and indicators.

(c) State that SCSI disk cabinet doors may be equipped with electromagnetic compatibility shielding per the application.

(d) Add note to Figure 3 identifying the moving head disks (MHDs) whose numbers are dependent on the application.

(e) State that identification (ID) selector switches can increment from 0 to 6 or 0 to 7, but that increment 7 should not be used.

(f) Divide Figure 4 (previous issue) into four separate figures (Figure 4, 5, 6, and 7) to show more clearly the four configurations of the ID selector cable connections for the 5.25-inch DUP, and to correct information shown in these figures.

(g) Add Figure 8 to show the ID selector cable connections for the 3.5-inch DUP.

(h) Renumber Figure 5 (previous issue) to Figure 9.

(i) Expand the disk module description (Paragraph 2.05) to include dimensions for the 3.5-inch disk module.

(j) Change the maintenance description (Paragraph 6.02) to include the 3.5-inch disk module.

1.03 This practice contains no safety labels.

1.04 AT&T welcomes your comments on this practice. Your comments will aid us in improving the quality and usefulness of AT&T documentation. Please use the Feedback Form provided at the back of this practice.

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2. Physical Description

Disk Unit Package

2.01 The SCSI DUP (Figure 1) consists essentially of a sheet metal box 11 inches (27.9 cm) wide, 12 inches (30.4 cm) long, and 3.5 inches (9.8 cm) high, with a removable cover that encloses:

- SCSI disk module
- Power supply (CGG2)
- Power switch (CGG1)
- Speed sensing fan
- Interconnecting cables.

2.02 An ID selector switch is mounted on the front panel. This switch provides for manual selection of the disk on the specific bus to which the disk is connected.

2.03 At the rear of the DUP, a scan/alarm backplane is installed to accommodate standard connectors for the external scan and signal distributor cable and alarm cables. A snap-in power connector brings in –48 V DC for the DUP. Also provided is a connector for the 50-pin SCSI bus to connect the DUP to the SCSI DFC.

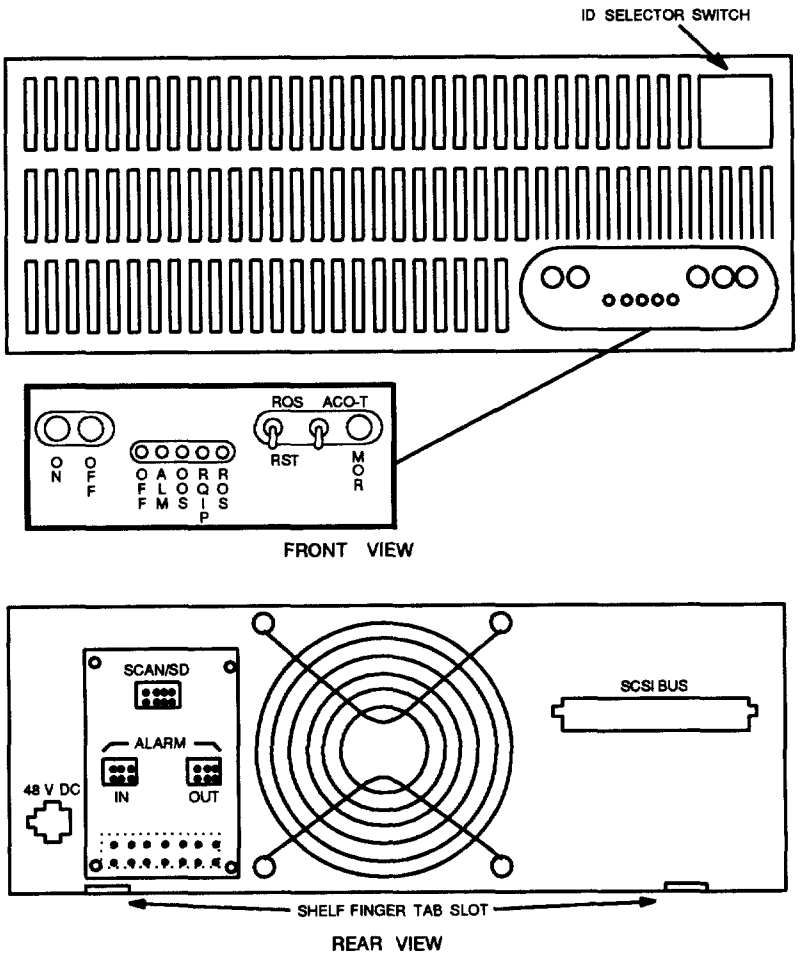

Figure 1. Disk Unit Package — Front and Rear Views

2.04 Disk unit package components (less the top cover) are arranged as shown in Figure 2. The disk module is mounted with four screws in a mounting assembly that allows for air circulation under the disk module. Likewise, the power supply and power switch are mounted, each with four screws, in a power board bracket assembly to allow for air circulation. Both the disk module mounting assembly and the power board bracket assembly are fastened to the chassis via mounting slots that fit into mounting tabs in the chassis. Each is secured by a locking slot. The fan draws air through tabs on the front panel (Figure 1) and exhausts through a fan guard at the rear.

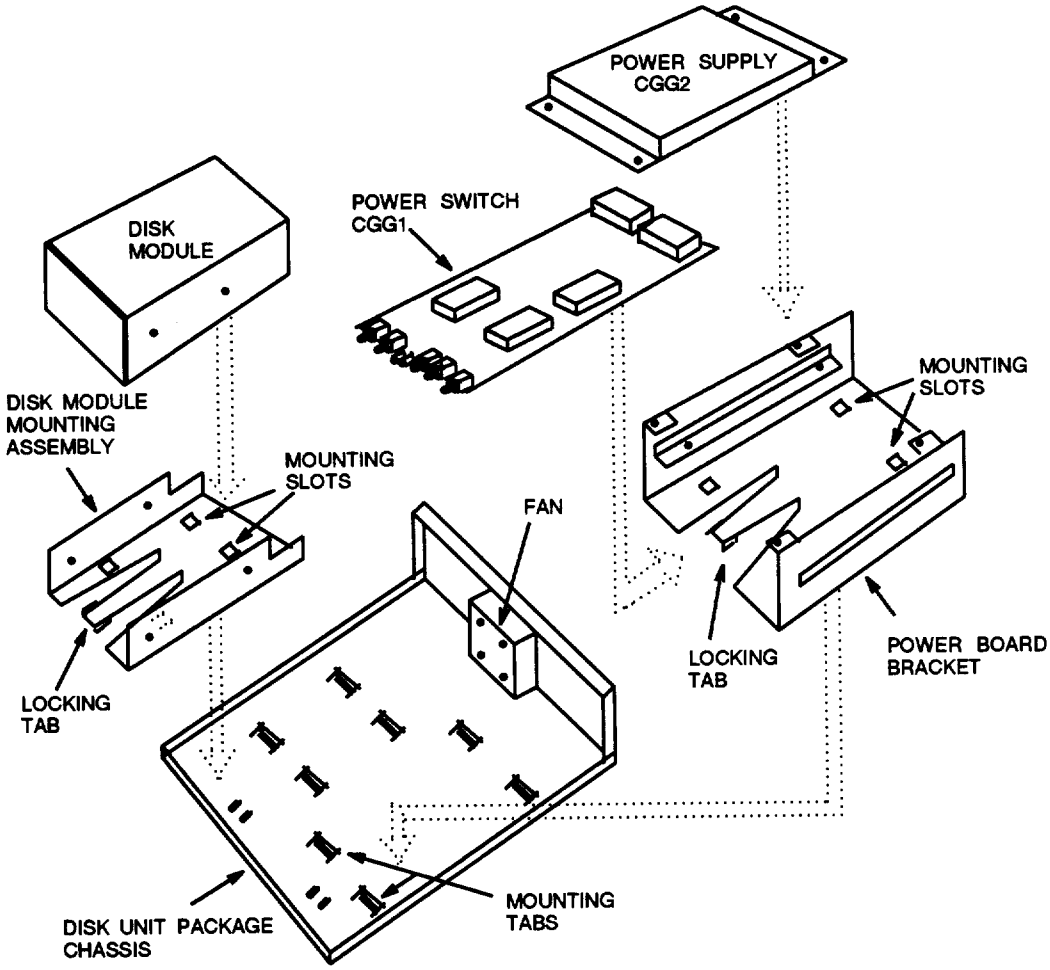

Figure 2. Disk Unit Package — Exploded View

A. Disk Module

2.05 The disk module is a reliable, relatively low cost, high capacity, high performance, random access mass storage device. The module contains a moving head disk assembly, environmentally sealed at the factory, and an embedded controller. Two form factors of disk module are used in the DUP: a 5.25-inch form factor or a 3.5-inch form factor. Dimensions of the typical 5.25-inch disk module are: height 3.25 inches (8.25 cm), width 5.75 inches (14.60 cm), length 8.0 inches (20.4 cm), and weight 7 pounds (3.2 kg). Dimensions of the typical 3.5-inch disk module are: height 1.625 inches (4.13 cm), width 4.00 inches (10.16 cm), length 5.95 inches (15.11 cm), and weight 3 pounds (1.36 kg).

2.06 External interfaces meet the requirements of the American National Standards Institute for SCSI peripheral devices.

B. Power Supply

2.07 The power supply receives a –48 V DC input fused at the power distribution unit in the top of the SCSI disk cabinet. The outputs are +12 V DC for the disk module and the fan and +5 V DC for the embedded controller in the disk module and interface circuits. Current usage depends on the disk module installed. The disk module typically requires outputs of +5 V DC at 2.7 amperes and +12 V DC at 5.0 amperes as start currents. Typical run currents are 2.0 amperes and 2.4 amperes, respectively. Dimensions of the power supply are: height 1.31 inches (2.32 cm), width 4.0 inches (10.1 cm), length 8.8 inches (22.5 cm), and weight 0.7 pounds (0.32 kg).

C. Power Switch

2.08 The power switch controls disk module power, monitors power alarms and the fan alarm, communicates with the system via the scanner and signal distributor points, provides inputs to the alarm grid, and provides craft interface via controls and indicators. Dimensions of the power switch are: height 0.62 inches (1.58 cm), width 4.0 inches (10.1 cm), length 8.8 inches (22.5 cm), and weight 0.5 pounds (0.23 kg). The controls and indicators are available through cutouts in the front cover of the disk unit package (Figure 1) and are described as follows:

ON A momentary contact switch that enables a power-on signal to activate the power supply provided –48 V DC input power is available.

OFF A momentary contact switch that disables the power-on signal and deactivates the power supply provided the out-of-service (OOS) signal distribute point is active or the OFF and manual override (MOR) switches are operated simultaneously.

OFF A red indicator that will light when the power-on signal is disabled.

ALM A red indicator that will light when the major alarm or power alarm signals are active. Indicates that a fault exists within the DUP.

OOS A yellow indicator that will light when the OOS signal distributor point is active. Indicates that the system has removed the DUP from service.

RQIP A green indicator that will flash when the request-in-progress signal distributor point is active. Indicates an acknowledgment that the system is responding to a request to remove the DUP from service or to restore the DUP to service.

ROS A green indicator that lights when the restore-to-service/request out-of-service (RST/ROS) switch is in the ROS position. Indicates that a request has been made to take the DUP out of service.

RST/ROS A two-position toggle switch when operated to the ROS position will generate a scan point request to the system to remove the DUP from service and light the ROS indicator. When operated to the RST position, the switch generates a scan point request to restore the DUP to service and extinguish the ROS indicator.

ACO-T A two-position latching toggle switch when operated to the alarm cutoff and test (ACO-T) position will retire an alarm originating within the DUP and at the same time will light all indicators for test purposes.

MOR A momentary contact switch that is operated simultaneously with the OFF switch to disable the power-on signal and power down the DUP whether or not the DUP is in or out of service. This switch is used only in an emergency.

D. Fan

2.09 A three inch +12 V DC fan is mounted at the center rear of the DUP to move air over the components from the front of the DUP and out the rear. The fan contains a performance sensor that uses +5 V DC to signal the power switch when a fault occurs.

SCSI Disk Cabinet

2.10 The SCSI disk cabinet dimensions for applications vary. The SCSI disk cabinet for *4ESS*™ switch applications is 6 feet 4 inches (193.0 cm) tall, 26 inches (66.0 cm) wide, and 30 inches (76.2 cm) deep. The SCSI disk cabinet for *5ESS*® switch applications is 6 feet (182.0 cm) tall, 30 inches (76.2 cm) wide, and 21 inches (53.3 cm) deep. Both cabinets are equipped with front and rear doors. Each door may be equipped with electromagnetic compatibility shielding per the application.

2.11 The SCSI DUP is installed in a SCSI disk cabinet, two DUPs on each shelf. The SCSI disk cabinet can be configured three ways. The first configuration is for new ships and consists of a tape drive and up to 16 DUPs (Figure 3a). The second configuration, used when the SCSI feature is grown to an existing 3B20D computer, is equipped with two SCSI disk file controllers, a cooling unit, and up to 16 DUPs (Figure 3b). The third configuration is used when an existing 3B20D computer storage module drive (SMD) configuration is converted to SCSI configuration (Figure 3c).

2.12 Two DUPs are mounted on each shelf. Tabs at the rear of the shelf engage slots at the rear of the DUP as it is slid into position. A stiffening bracket, also with tabs, is installed across the front. This bracket engages slots on the front of the DUP and is installed with screws to secure both units to the shelf.

2.13 A power distribution unit at the top of the cabinet contains fuses for the –48 V DC power feeders that supply each DUP and, when equipped, the DFCs and cooling unit. A tape drive, when mounted in this cabinet, receives 120 V AC from a local AC power panel.

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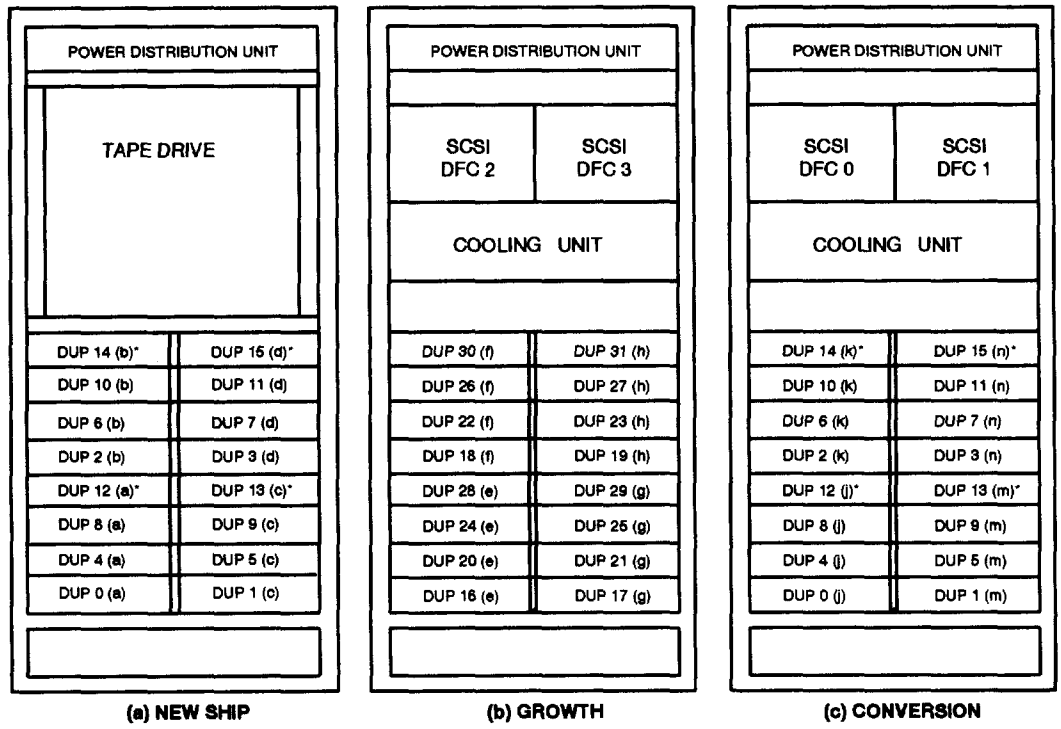


LEGEND:
(a) = SCSI DUPs on DFC 0 - Bus 0
(b) = SCSI DUPs on DFC 0 - Bus 2
(c) = SCSI DUPs on DFC 1 - Bus 1
(d) = SCSI DUPs on DFC 1 - Bus 3
(e) = SCSI DUPs on DFC 2 - Bus 4
(f) = SCSI DUPs on DFC 2 - Bus 6
(g) = SCSI DUPs on DFC 3 - Bus 5
(h) = SCSI DUPs on DFC 3 - Bus 7
(j) = SCSI DUPs on DFC 0 - Bus 0
(k) = SCSI DUPs on DFC 0 - Bus 2
(m) = SCSI DUPs on DFC 1 - Bus 1
(n) = SCSI DUPs on DFC 1 - Bus 3

* MHD number dependent on application (that is, 4ESS switch or 5ESS switch).

Figure 3. SCSI Disk Cabinet

3. Functional Description

Disk Module

3.01 Since disk modules are supplied for the SCSI feature by different manufacturers, internal functions vary; thus, only general information will be given here.

3.02 The disk module contains an embedded controller and a head/disk assembly.

3.03 ***Embedded Controller:*** The controller embedded in the disk module controls the operation of the disk. The SCSI bus interface, spindle speed, head positioning, data transfer, and power distribution are all handled by components in the embedded

controller. The circuits include a SCSI bus interface, microprocessor, data controller, disk controller, servo, read/write circuit, spindle driver, actuator driver, and power. Since these circuits were designed by many independent manufacturers, only the functions of interface circuits are described.

3.04 ***Head/Disk Assembly:*** The head/disk assembly (HDA) contains the platters, heads, an actuator assembly, head interface circuits, and a spindle assembly. The supporting structure for these parts is sealed to provide an environment free of contamination.

SCSI Bus

3.05 The SCSI bus is a flat ribbon cable that connects the DFC host adapter with the DUP. Each DFC host adapter supports two independent SCSI buses designated 0 and 1. The SCSI bus contains 50 conductors with terminating resistor blocks at each end. Power and control for the bus are provided by the DFC host adapter. Each SCSI bus can be isolated without affecting operations on the other bus by disabling the bus drivers in the host adapter. While the SCSI bus can handle seven DUPs, only four DUPs per bus are supported on the 3B20D computers. The SCSI bus has nine control signals and eight data signals plus parity. Pin assignments for the SCSI bus are shown in Table A.

ID Selector

3.06 The ID selector switch provides the DUP identity to the system. The switch setting must agree with the unit control block in the equipment configuration data base and with the fixed assignment on the scanner signal distributor. Otherwise, disk access problems will result and disk data will be mutilated.

3.07 The switch is connected to disk modules by an ID selector cable as shown in Figures 4, 5, 6, 7, and 8. The switch, snapped in on the front panel of the DUP, will increment from 0 to 7 or 0 to 6 when depressed.

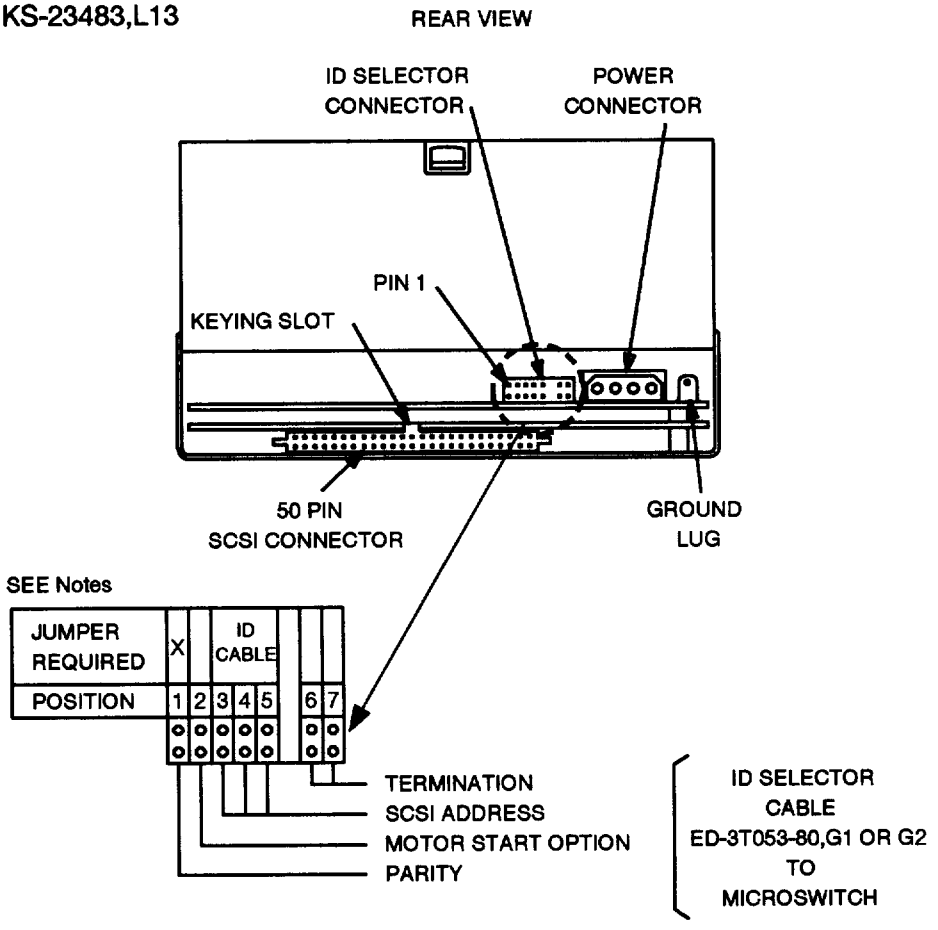
NOTE:
Increment 7 should never be used.

3.08 The switch setting is an octal code that either shorts or leaves open the three pairs of pins on the ID selector connector on the rear of the disk module.

Table A. SCSI Bus Pin Assignments

PIN	SIGNAL	DEFINITION	PIN	SIGNAL	DEFINITION
1	Shield Gnd	Optional	26	TERMPWR	Terminator power
2	Ground		27	Ground	
3	+DB 0	Data bit 0	28	Ground	
4	–DB 0		29	+ATN	Attention
5	+DB 1	Data bit 1	30	–ATN	
6	–DB 1		31	Ground	
7	+DB 2	Data bit 2	32	Ground	
8	–DB 2		33	+BSY	Busy
9	+DB 3	Data bit 3	34	–BSY	
10	–DB 3		35	+ACK	Acknowledge
11	+DB 4	Data bit 4	36	–ACK	
12	–DB 4		37	+RST	Reset
13	+DB 5	Data bit 5	38	–RST	
14	–DB 5		39	+MSG	Message
15	+DB 6	Data bit 6	40	–MSG	
16	–DB 6		41	+SEL	Select
17	+DB 7	Data bit 7	42	–SEL	
18	–DB 7		43	+C/D	Control/Data
19	+DB P	Parity bit	44	–C/D	
20	–DB P		45	+REQ	Request
21	DIFFSENS	Diff Driver Sense	46	–REQ	
22	Ground		47	+I/O	Input/Output
23	Ground		48	–I/O	
24	Ground		49	Ground	
25	TERMPWR	Terminator power	50	Ground	

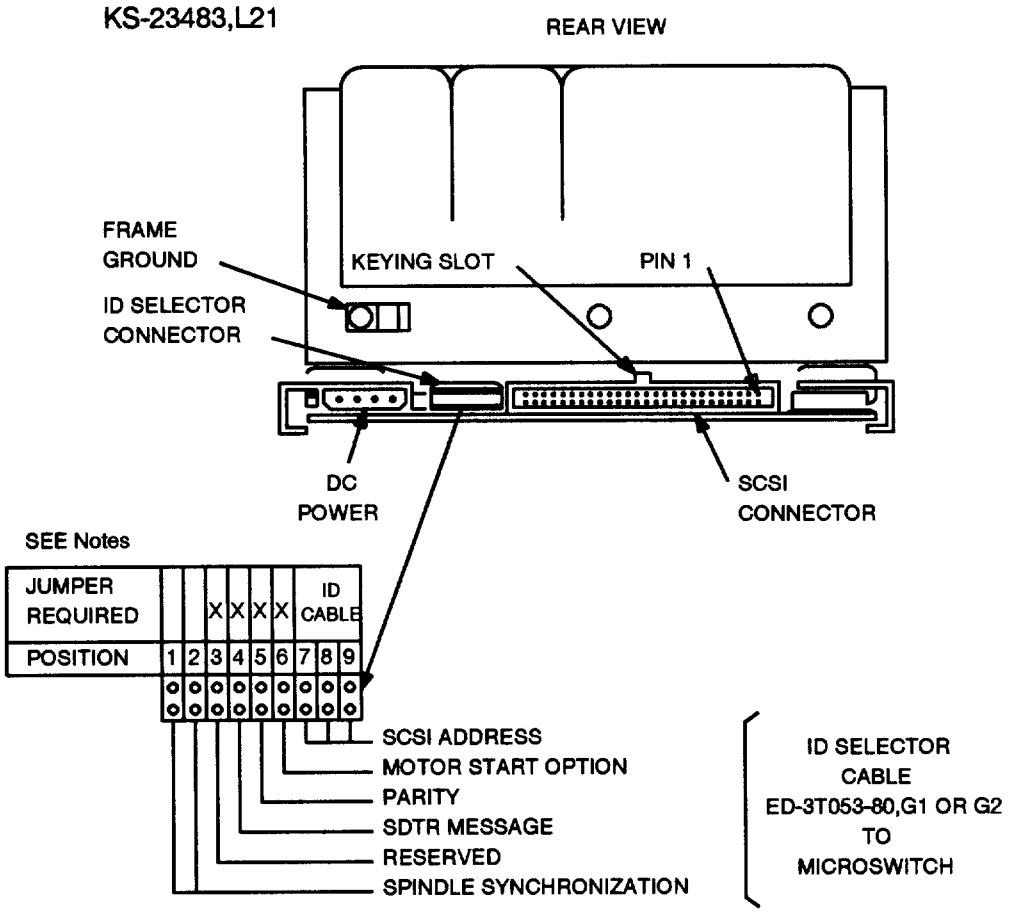
KS-23483,L13



Notes:

1. Remove any jumpers in positions not indicated with an "X".
2. Install jumpers in all positions indicated with an "X".
3. Install the ID select cable in the indicated position. Observe proper orientation of the selector cable plug.

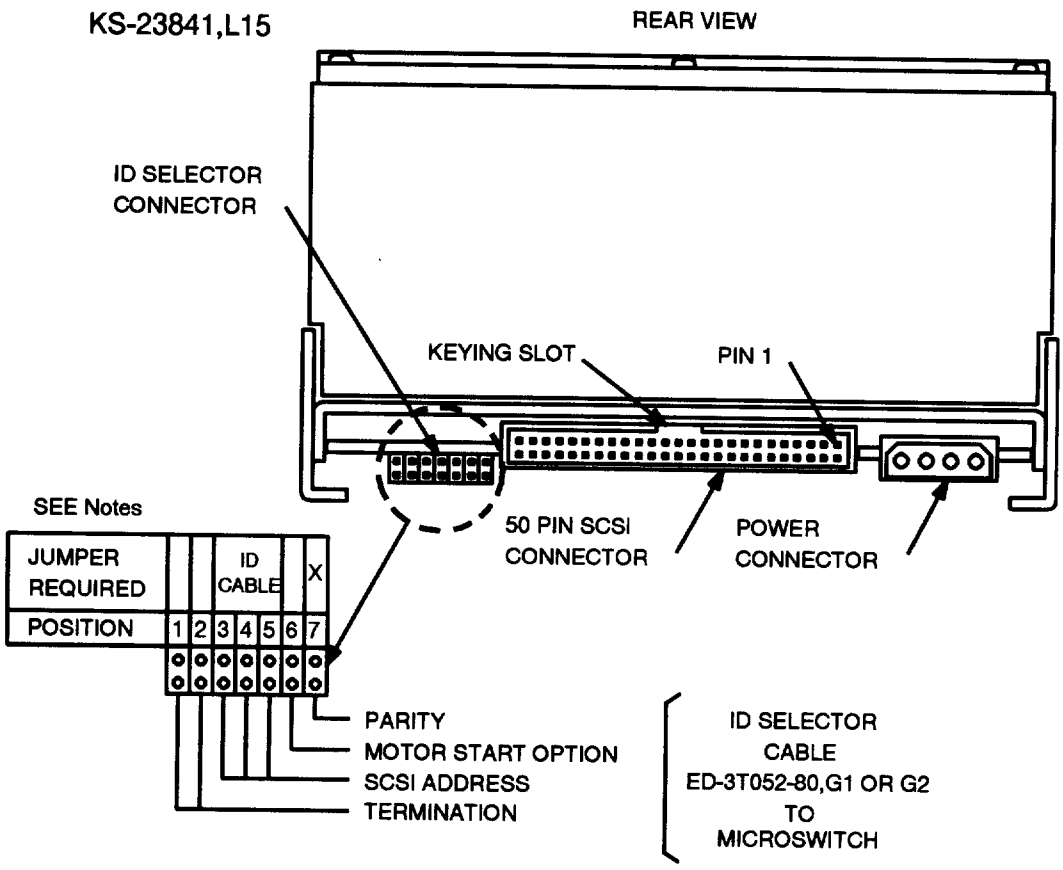
Figure 4. KS-23483,L13 ID Selector Cable Connections



Notes:

1. Remove any jumpers in positions not indicated with an "X".
2. Install jumpers in all positions indicated with an "X".
3. Install the ID select cable in the indicated position. Observe proper orientation of the selector cable plug.

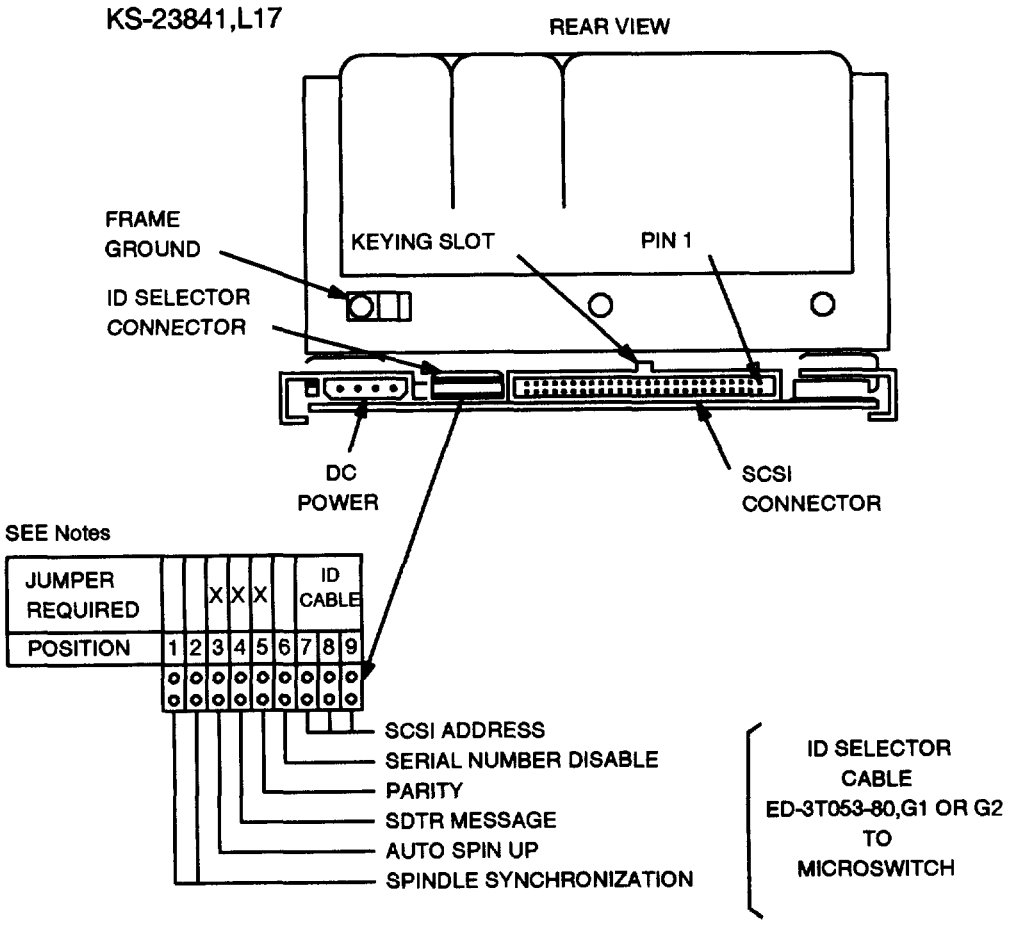
Figure 5. KS-23483,L21 ID Selector Cable Connections



Notes:

1. Remove any jumpers in positions not indicated with an "X".
2. Install jumpers in all positions indicated with an "X".
3. Install the ID select cable in the indicated position. Observe proper orientation of the selector cable plug.

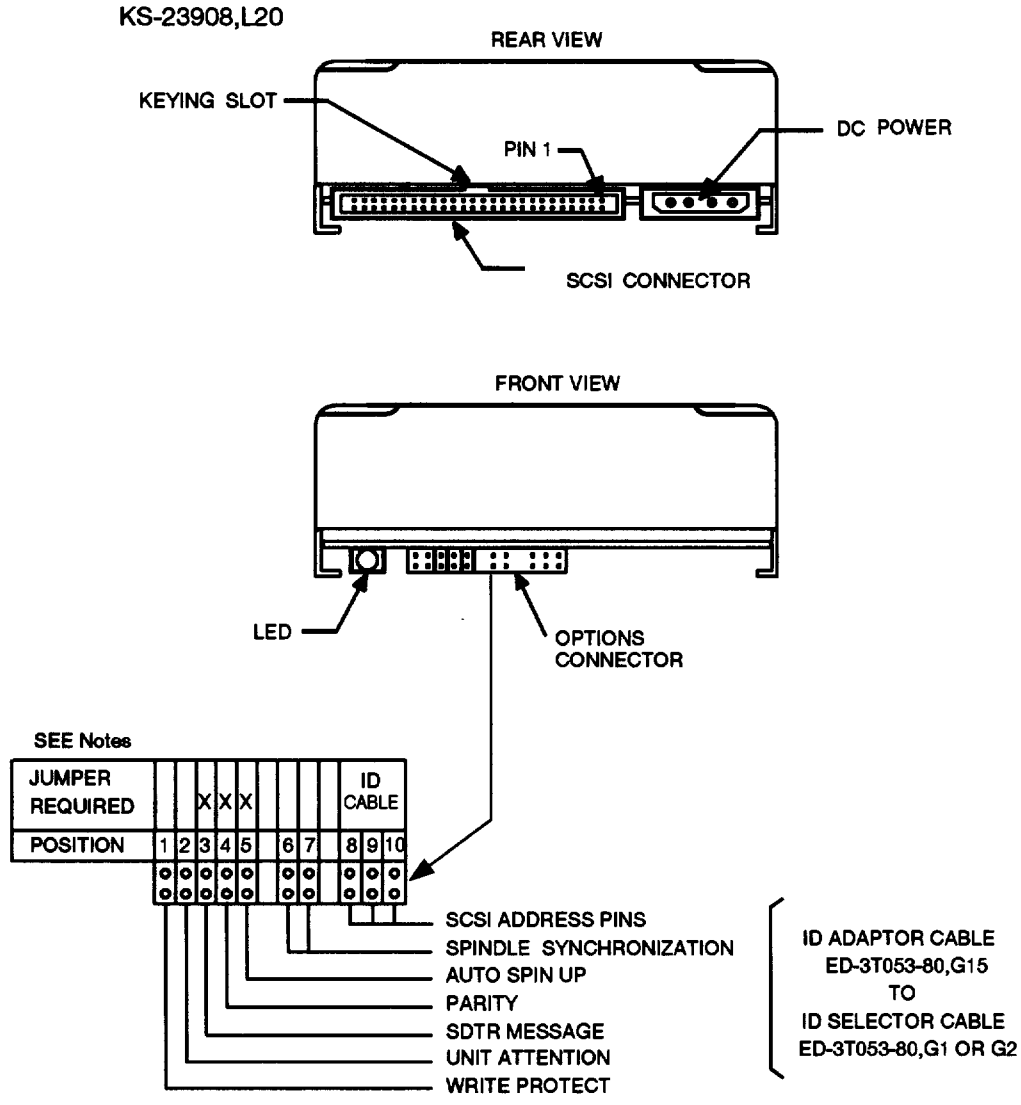
Figure 6. KS-23841,L15 ID Selector Cable Connections



Notes:

1. Remove any jumpers in positions not indicated with an "X".
2. Install jumpers in all positions indicated with an "X".
3. Install the ID select cable in the indicated position. Observe proper orientation of the selector cable plug.

Figure 7. KS-23841,L17 ID Selector Cable Connections



Notes:

1. Remove any jumpers in positions not indicated with an "X".
2. Install jumpers in all positions indicated with an "X".
3. Install the ID Adaptor cable in the indicated position. Observe proper orientation of the cable plug.

Figure 8. KS-23908,L20 ID Selector Cable Connections

4. Power

4.01 A power distribution block diagram for the DUP is shown in Figure 9. Input −48 V DC is fused at the power distribution unit at the top of the SCSI disk cabinet. Internally, the −48 V DC is routed to the power supply (CGG2) and to the power switch (CGG1). The power supply converts the input voltage to +5 V DC and +12 V DC which is routed to the disk module and monitored by the power switch. The fan is also powered by +12 V DC and receives +5 V DC for the performance sensor to produce an alarm signal in the event of a fault.

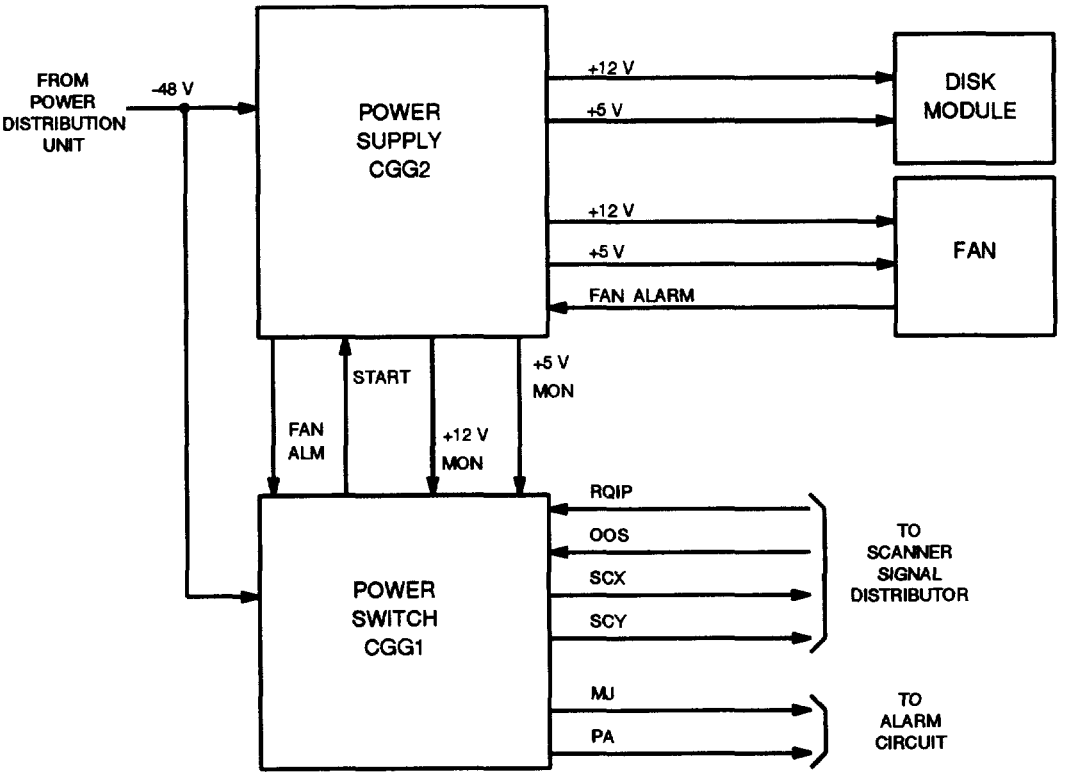


Figure 9. Disk Unit Package Power Block Diagram

4.02 The power supply regulates the +5 V DC to +5 V DC ±0.2 volts and the +12 V DC to +12 V DC ±0.4 volts. The power supply stabilizes the output voltages within their ranges within 100 milliseconds after start-up. The power supply provides low input voltage protection, over-voltage protection, and output current limiting. The power supply shuts down when a fault is detected and provides an alarm signal to the power switch.

4.03 ***Power-Up Sequence:*** Provided no alarms are present and the −48 V DC input is available, pressing the ON switch on the CGG1 power switch will start the power-up sequence. A start signal will enable the power supply and apply the voltage inputs to activate the disk module and the fan. The OFF indicator on the power switch, lighted in the off state, will now extinguish and the ON indicator will light.

4.04 ***Power-Down Sequence:*** Pressing the OFF switch will start the power-down sequence provided the OOS signal distributor point has lighted the OOS indicator or the MOR switch is pressed simultaneously. The start signal to the power supply is removed and the power supply will shut down. The OFF indicator on the power switch will light when the power-down sequence is complete and the ON indicator will extinguish.

4.05 ***Scan, Alarm, and Signal Distributor Points:*** The power switch interfaces the system through two scan points (SCX and SCY), two signal distributor points [OOS and request in progress (RQIP)], and two alarm points [major (MJ) and power alarm (PA)]. Each scan and alarm point consists of an isolated metallic contact. An active (1) state is defined as a resistance of less than 200 milliohms, while the inactive state (0) is defined as an open circuit. The scan point (SCX) monitors requests (ROS and RST) while scan point (SCY) monitors the status (power on/off and alarm fault). A power-off activates both SCX and SCY points. The MJ alarm point closes when a fault powers the DUP down and remains closed until the ACO-T switch is toggled. When power is left on in the presence of a fan fault, both MJ and PA alarm points close. The MJ point remains closed until the ACO-T switch is pressed or the fault is cleared. Scan point and alarm point states are shown in Table B.

Table B. Scan Point and Alarm Point States

Condition	SCX	SCY	MJ	PA
Normal in service	0	0	0	0
ROS (no fault, power on)	1	0	0	0
Normal power off	1	1	0	0
Fault power off*	1	1	1‡	0
Fan fault (power on)†	0	1	1‡	1‡

* Loss of −48 V DC, CGG1 low voltage, or fan fault with DUP OOS
† Fan fault with DUP in service
‡ MJ/PA = 00 with ACO-T switch on

4.06 The signal distributor points act on requests and provide the system response. An active (1) state of the RQIP signal distributor point indicates system acknowledgment that a request to remove or restore the DUP has been made. If the request is granted, the RQIP point will become inactive (0) state. If the request is denied, the RQIP point will intermittently flash for a short period. The OOS signal

distributor point becomes active when the DUP has been taken out of service. States of signal distributor points are shown in Table C.

Table C. Signal Distributor Point States

Condition		SD State	
DUP	**Request and Response**	**RQIP**	**OOS**
In service	RST request granted	0	0
In service	ROS request acknowledged	1	0
In service	ROS request denied	Flash	0
Out of service	ROS request granted	0	1
Out of service	RST request acknowledged	1	1
Out of service	RST request denied	Flash	1

5. Alarms

5.01 This part describes the actions taken by the power switch in responding to the following alarms:

- Low voltage alarm
- Loss of −48 V DC input
- Fan alarm.

A. Low Voltage Alarm

5.02 ***With ACO-T Switch Released:*** A low-voltage alarm generated by the power supply when the ACO-T switch is in the off (normal) position will cause the power switch to:

- Turn off the power supply.
- Set the SCX and SCY scan points to 1.
- Activate the MJ alarm point.
- Extinguish the ON indicator.
- Light the alarm (ALM) and OFF indicators.

5.03 Operating the ACO-T switch to the ACO-T position will retire the MJ alarm point and light all five indicators. Returning the ACO-T switch to normal will leave the OFF indicator lighted and extinguish the remaining indicators including the ALM indicator.

5.04 ***With ACO-T Switch Operated:*** A low-voltage alarm generated by the power supply when the ACO-T switch has been left in the ACO-T position with all indicators lighted will cause the power switch to:

- Turn off the power supply.
- Set both SCX and SCY scan points to 1.

5.05 Returning the ACO-T switch to normal will leave the OFF indicator lighted and extinguish the remaining indicators including the ALM indicator. The MJ alarm point was not activated for this condition.

B. Loss of −48 V DC Input

5.06 ***With ACO-T Switch Released:*** Loss of the −48 V DC input will generate a power supply alarm when the ACO-T switch is in the off (normal) position. This condition will cause the power switch to:

- Turn off the power supply.
- Set the SCX and SCY scan points to 1.
- Activate the MJ alarm point.
- Extinguish all power switch indicators.

5.07 Operating the ACO-T switch to the ACO-T position will retire the MJ alarm point. All indicators remain extinguished due to the lack of input power. Returning the ACO-T switch to normal will reactivate the MJ alarm point.

5.08 ***With ACO-T Switch Operated:*** Loss of the −48 V DC input will generate a power supply alarm when the ACO-T switch has been left in the ACO-T position with all indicators lighted. This condition will cause the power switch to:

- Turn off the power supply.
- Set both SCX and SCY scan points to 1.
- Extinguish all power switch indicators.

5.09 Returning the ACO-T switch to normal will remove the alarm cutoff and allow the MJ alarm point to activate.

C. Fan Alarm

5.10 ***With ACO-T Switch Released and DUP In Service:*** An alarm generated by the fan when the ACO-T switch is in the off (normal) position with the DUP in service (OOS indicator off) will cause the power switch to:

- Set the SCX scan point to 0 and SCY scan point to 1.
- Activate the MJ and PA alarm points.
- Light the ALM indicator.

5.11 Operating the ACO-T switch to the ACO-T position will retire the MJ alarm point and light all five indicators. Returning the ACO-T switch to normal will reactivate the MJ alarm point, leave the ALM indicator lighted, and extinguish the remaining indicators.

5.12 ***With ACO-T Switch Operated and DUP In Service:*** An alarm generated by the fan when the ACO-T switch has been left in the ACO-T position with all indicators lighted and the DUP in service (OOS indicator off) will cause the power switch to:

- Set the SCX scan point to 0 and SCY scan point to 1.
- Activate the PA alarm point.

5.13 Returning the ACO-T switch to normal will activate the MJ alarm point, leave the ALM indicator lighted, and extinguish the remaining indicators.

5.14 ***With ACO-T Switch Released and DUP Out of Service:*** An alarm generated by the fan when the ACO-T switch is in the off (normal) position and the DUP out of service (OOS indicator lighted) will cause the power switch to:

- Turn off the power supply.
- Set the SCX and SCY scan points to 1.
- Activate the MJ alarm point.
- Light the ALM and OFF indicators.

5.15 Operating the ACO-T switch to the ACO-T position will retire the MJ alarm point and light all five indicators. Returning the ACO-T switch to normal will leave the OFF indicator lighted and extinguish the remaining indicators including the ALM indicator.

5.16 ***With ACO-T Switch Operated and DUP Out of Service:*** An alarm generated by the fan when the ACO-T switch has been left in the ACO-T position and the DUP out of service with all indicators lighted will cause the power switch to:

- Turn off the power supply.
- Set both SCX and SCY scan points to 1.

5.17 Returning the ACO-T switch to normal will leave the OFF indicator lighted and extinguish the remaining indicators including the ALM indicator.

6. Maintenance

6.01 The DUP and its components require no preventive maintenance services. Under no circumstances should the disk module be opened. The ACO-T switch should be used routinely to test all indicators on the power switch. Refer to *AT&T 3B20D Model 2 and Model 3 Computers, Common Systems, Routine Tasks (PDS Formats)* Section 254-302-831, for maintenance procedures for the DUP.

6.02 When replacing a disk module, remove or install jumpers and the ID selector cable on the rear of the disk module as shown in Figures 4, 5, 6, or 7 for the 5.25-inch disk modules. Use the KS number to determine the appropriate figure that illustrates the connection. For 3.5-inch disk modules, attach the ID cable to the ID adapter cable on the front of the disk module. Be sure to match the "TOP" markings. See Figure 8 for information on the location of the ID adaptor cable. Make sure that the ID switch is set to the same value for the disk module that was removed. Never set the ID switch to 7, since this is reserved for the SCSI DFC.

7. Abbreviations

7.01 The following abbreviations are used in this practice:

ACK	Acknowledge
ACO	Alarm cutoff
ACO-T	Alarm cutoff and test
ALM	Alarm
ATN	Attention
BSY	Busy
DFC	Disk file controller
DGN	Diagnostics
DIFFSENS	Differential sense
DUP	Disk unit package
HDA	Head disk assembly
ID	Identification
MHD	Moving head disk
MJ	Major

MOR	Manual override
MSG	Message
OOS	Out of service
PA	Power alarm
RAM	Random access memory
REQ	Request
ROM	Read-only memory
ROS	Request out of service
RQIP	Request in progress
RST	Restore to service
SCSI	Small computer system interface
SEL	Select
SMD	Storage module drive
TERMPWR	Terminator power

How Are We Doing?

Document Title: AT&T 3B20D Computer Small Computer System Interface Disk Unit Package General Description

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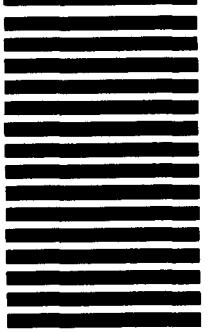

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