FRONT

PICTURE 1

IBM Personal System/2
2.3GB External SCSI Tape Drive (3532-023)
IBM Personal System/2
2.3GB Full High SCSI Tape Drive

May 28, 1991

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PICTURE 2

May 28, 1991

This supplement contains a Symptom-to-FRU Index and a parts listing for the IBM Personal System/2 2.3GB Full High SCSI Tape Drive.

1.0 Symptom-to-FRU Index

Error symptoms and the FRUs that might be responsible for the failure are listed below. FRUs that aid in drive diagnostics are listed in the parts listing below.

Error/Symptom	**FRU/Action**
The amber light remains on.	**Tape Drive** SCSI Cable SCSI Adapter
The green in-use light fails to come on.	**Tape Drive** SCSI Adapter SCSI Cable
The tape is automatically ejected from the Drive.	**Tape Cassette** Tape Drive
The tape sticks or breaks in the drive. (Verify that the tape used is an IBM or equivalent.)	**Tape Cassette**
0211XXXX (If the failing device is an external device, go to the external devices service pamphlet.)	**Tape Drive** SCSI Adapter SCSI Cable

2.0 Parts

Internal SCSI Tape Drive

SCSI Tape Drive (internal only)	85F0055
SCSI Tape Drive (3532 only)	02G7402
Rail Kit	34F0041
Framing Bezel	64F4138
Media Kit	59F3907
□ Cleaning Tape	
□ Blank Tape	
Cleaning Tape	21F8593
Blank Tape (Qty. 5)	21F8595

PICTURE 3

IBM Personal System/2
2.3GB External SCSI Tape Drive (3532-023)
2.3GB Full High SCSI Tape Drive

3.0 General Information

This publication contains reference information for the IBM Personal System/2 2.3GB External SCSI Tape Drive (3532 External) and the IBM Personal System/2 2.3GB Full High SCSI Tape Drive (2.3GB Internal).

The SCSI tape drive can read, erase, and rewrite data on an 8mm tape cassette. The formatted capacity of an 8mm tape cassette, with data physically blocked at 1024 bytes, is approximately 2.3 billion bytes.

The drive conforms to the American National Standards Institute (ANSI) standard X3.131-1986 and X3T9.2 for the Small Computer System Interface (SCSI). The SCSI standard allows up to seven SCSI devices, such as this drive, to be connected to a single SCSI adapter. Each device connected to a SCSI adapter must be assigned a unique identification (ID) number.

Subtopics

3.1 Tape cassettes

Warning: The tape cassettes used in the drive are IBM 8MM helical-scan data cassettes that meet the ANSI standard X3B5. Use of tapes not meeting this standard can result in tape breakage and accelerated read/write head wear.

3.2 Option Compatibility

SCSI devices must be used only with SCSI adapters. See the parts catalog in the system *Hardware Maintenance Service* pamphlet for supported SCSI adapters.

3.3 Setting the SCSI ID (3532 External)

The SCSI ID on a FRU drive must be set to match the ID of the drive being replaced. To do this, the switches on the back of the FRU drive, (1, 2, 3) must be set to 0 (OFF). When a switch is in the down position, it is OFF.

After the switches have been set to 0, the rotary switch 5 on the back of the 3532 external drive then controls the SCSI ID through a cable extending to the connector 4 on the back of the FRU drive. To set the SCSI ID, turn the rotary switch 5 so that the arrow on the switch points to the desired SCSI ID.

PICTURE 4

3.4 Setting the SCSI ID (2.3GB Internal)

The SCSI ID on a FRU drive must be set to match the ID of the drive being replaced. The FRUs are shipped with the switches on the back of the drive (1, 2, 3) set to SCSI ID 1. A switch in the up position is ON. A switch in the down position is OFF.

PICTURE 5

The table below shows how to set the switches for different SCSI ID numbers.

SCSI ID	**Switch 1**	**Switch 2**	**Switch 3**
6	Off	On	On
5	On	Off	On
4	Off	Off	On
3	On	On	Off
2	Off	On	Off
1	On	Off	Off
0	Off	Off	Off

4.0 Removals and Replacements

The arrows in the removal and replacement procedures show the direction to remove a FRU, or the direction to turn a screw, or to press a tab to release the FRU. The arrows are marked in numeric order to show the correct sequence of removal.

When other FRUs must be removed to remove the failing FRU, they will be listed at the top of the page. Go to the removal procedure for each FRU listed, remove it, then continue with the failing FRU removal.

To replace a FRU, reverse the removal procedure and follow any notes that pertain to replacement. See "Locations" for internal cable connection and arrangement information.

CAUTION:
Before removing any field replaceable unit (FRU), power-off the system, unplug all power cords from electrical outlets, and disconnect any interconnecting cables.

Warning: The FRUs are sensitive to, and can be damaged by, electrostatic discharge. Establish personal grounding by touching a ground point with one hand before touching these units.

Note: An electrostatic discharge (ESD) strap may be used to establish personal grounding.

CAUTION:
Before removing any field replaceable unit (FRU), power-off the system, unplug all power cords from electrical outlets, and disconnect any interconnecting cables.

Subtopics

4.1 1005 Cover (3532 External)

Note: Use an l-hex wrench (2.5mm) to remove the cover screws.

PICTURE 6

4.2 1010 Power Supply (3532 External)

- Cover **(1005)**
- Disconnect any cables necessary for removal.

PICTURE 7

4.3 1015 Fan / Circuit Board (3532 External)

- Cover **(1005)**
- Disconnect any cables necessary for removal.

PICTURE 8

4.4 1020 Drive / Drive Tray (3532 External)

- Cover **(1005)**
- Disconnect any cables necessary for removal.

PICTURE 9

5.0 Locations

Subtopics
5.1 Front View (3532 External)
5.2 Rear View (3532 External)
5.3 Interior View (3532 External)
5.4 Internal Cables (3532 External)

5.1 Front View (3532 External)

1 Power-on switch
2 Power-on light
3 In-use lights
4 Load/Unload button

PICTURE 10

5.2 Rear View (3532 External)

1 SCSI ID rotary switch
2 Power cord connector
3 SCSI cable connector

PICTURE 11

5.3 Interior View (3532 External)

1 Power supply
2 Fan
3 SCSI address switch board
4 Rear chassis
5 Drive chassis cover
6 Drive chassis
7 Base
8 8mm tape drive

PICTURE 12

5.4 Internal Cables (3532 External)

1 Power supply
2 Fan power cable (yellow/black/blue)
3 SCSI cable
4 SCSI Address switch board
5 SCSI Address switch cable
6 Tape drive power cable (red/black/blue)
7 Tape drive
8 Power cable (red/white/black) (not used)

PICTURE 13

6.0 Locations

Subtopics
6.1 Front View (2.3GB Internal)
6.2 Rear View (2.3GB Internal)

6.1 Front View (2.3GB Internal)

1 Tape tray
2 Load/Unload button
3 In-use lights

PICTURE 14

6.2 Rear View (2.3GB Internal)

1 SCSI ID switches
2 SCSI cable connector
3 Power connector

PICTURE 15

7.0 Cleaning The Read-Write Heads

The read-write heads should be cleaned once a month or every 30 hours of tape motion. More frequent cleaning may be required if the drive is operated in a dusty environment or in humid conditions. If the drive is not cleaned regularly, errors may result when the drive reads from and writes to the tape cassette.

Warning: Use of the wrong type of cleaning tape cassette will accelerate wear of the read/write heads. Use only IBM cleaning tape cassettes or their equivalent.

To clean the heads, insert an IBM recommended cleaning tape into the drive. The drive detects the cleaning tape, and the cleaning operation runs automatically. Wait for the drive to complete the cleaning operation, and then unload the cleaning tape cassette. The total cleaning time is approximately 30 seconds.

Keep track of the number of times the cleaning tape cassette is used and replace the tape cassette after it has been used 12 times.

8.0 Diagnostics Information

First, perform the general checkout procedure in the system *Hardware Maintenance Service* pamphlet for the system the SCSI tape drive is connected to. Then use the *IBM Personal System/2 External SCSI Devices Hardware Maintenance Service* pamphlet.

9.0 Repair Information

A contaminated tape cassette causes the drive to be slow in reading and writing to the tape cassette, or it could cause a drive failure.

If the SCSI tape loses power while a tape cassette is loaded in the drive, the drive automatically ejects the tape cassette when power is restored. If the drive does not eject the tape cassette, do not attempt to remove the tape cassette from the drive because the tape is still wrapped around the read/write heads. However, if you must remove the tape cassette, refer to "Removing a Tape Cassette Manually" in topic 10.0 for instructions on removing a tape cassette.

Note: Each time the SCSI tape drive is powered on, 70 seconds is required for the Power-On Self-Test (POST) to complete, and 30-120 seconds is needed to unload the tape.

10.0 Removing a Tape Cassette Manually

If a tape cassette cannot be removed from the drive because of a power failure or drive failure, remove the drive and perform the following procedure in the sequence shown.

The following tools are required to remove the tape cassette:

- 3/8-inch flat-blade screwdriver
- Pointed tweezers or small screwdriver
- Torx (**) Driver T8
- Torx Driver T10
- Cellophane tape
- 6-volt lantern battery (purchase locally).

(**) Torx is a trademark of Textron, Inc.

Subtopics

10.1 Tape Cassette Removal Procedure No. 1

1. Remove the top cover of the drive by removing the five screws as shown.

PICTURE 16

If the tape is not loaded in the drive (tape wrapped around the read/write heads), the tape cassette can be removed by only using the "Tape-Tray Door release and Tape Rewind Procedures" in topic 10.4.

Warning: Do not touch the outside edge of the exposed tape. That is the surface of the tape where data is recorded. Touching the tape could damage the data on the tape.

2. Tape the tape cassette door 1 open. The tape cassette door must be held open to prevent the door from closing on the data tape 2 before it is returned to the cassette. To hold the door open, gently position two pieces of cellophane tape 3 about 63.5 mm (2.5 in.) long, as shown.

PICTURE 17

3. Locate the load motor 1 inside the drive unit. There is a small metal cover positioned over the load motor. Lift the cover straight up, off of the load motor, to expose the red and brown connector wires.

PICTURE 18

Carefully lift the insulating tape covering the load motor contacts. Do not touch the data tape.

Warning: Care must be taken to ensure that the data tape does not get pinched in any of the rollers or guide posts of the load mechanism while moving the load mechanism to the unload position.

4. To move the load mechanism to the unload position, do the following:

   a. Position the drive so that the bottom of the drive is facing down and the right side of the drive is facing you. The red wire from the load motor is the ground, and the brown wire is the +5 vdc for the unload operation.

      Note: Read steps 4b, 4c, and 4d completely before performing them.

   b. Connect the ground lead from the 6-volt power source to the pin connector attached to the red wire on the load motor.

   c. Connect the +6-volt lead from the power source to the pin of the connector attached to the brown wire on the load motor.

      Warning: Do not leave power applied to the load motor for more that five seconds maximum. Leaving power applied for more than five seconds may damage the load motor.

   d. Apply power to the connector for about two seconds. The load rings and guide posts should move to the unload position. When the movement of the load mechanism stops, remove the power from both pins of the connector.

5. If the load mechanism moved correctly, go to "Tape-Tray Door release and Tape Rewind Procedures" in topic 10.4. If the load mechanism did not move, disconnect the power to the connector. Verify that the power source is good and that you were applying the power correctly as described in steps 4b, 4c, and 4d. If you did not apply the power as described, repeat steps 4b, 4c, and 4d. If the load mechanism still fails to move, go to "Tape Cassette Removal Procedure No. 2" in topic 10.2.

10.2 Tape Cassette Removal Procedure No. 2

1. Perform "Tape Cassette Removal Procedure No. 1" in topic 10.1 if you have not already done so.

2. Remove the bottom cover of the drive by removing the six screws as shown.

PICTURE 19

3. Remove the connectors to the servo board to prevent damage from occurring to it during this procedure. Note the location of all of the connectors to the servo board. Disconnect them by using a small screwdriver or similar tool and pushing the key in the center of the connector. Push the connector away from the servo board. Start by removing the connectors closest to the back of the drive.

4. Remove the servo board from the bottom of the drive by removing the two screws as shown.

PICTURE 20

5. With the front of the drive facing you, locate gear number 4 1 in the following figure. Use this gear to return the load mechanism to the unload position.

PICTURE 21

6. Tilt the drive so that you can see the tape, load mechanism, and gear posts. While holding the drive in this position and watching the load mechanism, use your thumb to turn gear number 4 in a counter clockwise direction. Continue to turn the gear until the load ring and all of the guide posts have returned to their unload positions. The load ring stops moving before all of the guide posts and rollers have retracted to their unload positions. Continue to turn the gear until the guide posts stop moving. To prevent damage to the tape, the gear should be rotated slowly and without jerking the tape. The load mechanism is in the unload position when all of the guides, posts, and rollers on the load ring, and all of the other guide posts are almost positioned in a straight line closest to the tape.

PICTURE 22

7. If the load mechanism has successfully been moved, go to "Tape-Tray Door release and Tape Rewind Procedures" in topic 10.4.

If the load mechanism still failed to move, go to "Tape Cassette Removal Procedure No. 3" in topic 10.3.

10.3 Tape Cassette Removal Procedure No. 3

1. Perform "Tape Cassette Removal Procedure No. 1" in topic 10.1 and "Tape Cassette Removal Procedure No. 2" in topic 10.2 if you have not already done so.

   Warning: The following procedure is considered to have the highest potential for damage to the data tape and the heads of the drive. Use extreme caution when attempting to remove the tape using this procedure.

2. Refer to the following figure and remove the screw 1 that secures the erase head bracket 2. Lift the erase head bracket up out of the drive.

PICTURE 23

   Note: The connector and wires do not have to be removed from the servo board. There is sufficient slack in the wires to allow the erase head bracket to be removed.

3. Remove the tape guide 1 by lifting it straight up out of the drive.

PICTURE 24

   Note: The heavy black line in the figure on page 10.3 represent the data tape path. Use a nonconductive tool, such as a molded potentiometer adjustment tool when removing the tape from the guide posts and rollers. Whenever this procedure describes the use of the tool, the tool must touch the side of the tape where no data is recorded. If you are unsure of which side of the tape to touch with the tool, carefully inspect the tape path before starting this procedure. The side of the tape that comes in contact with the rotating drum is the side where data is recorded. The tool must only be used to touch the opposite side.

4. Use the tool to loosen the tape at 1 as shown. While touching the side of the tape where no data is recorded, move the tool toward the rear of the drive. This action should cause the tape to pull off of the takeup reel and make a loose loop.

PICTURE 25

5. Move the pinch roller flange 1 toward the side of the drive, and hold it in this position 2. This action releases the pinch roller.

PICTURE 26

6. Insert the tool in the tape loop at 1.

PICTURE 27

   Warning: Once you start to remove the tape from between the pinch roller and the capstan, **do not** release the pinch roller until the tape is completely clear of this area. If the pinch roller is released during this part of the procedure, before the tape is clear of these components, **damage will occur to the tape**.

7. Remove the tape from around the guide posts and rollers at 1 and 2, making sure to place the tool inside the tape loop (that is the

nonrecorded side of the tape).

PICTURE 28

8. Find the **L**-shaped molded black plastic part 1. The **L** is mounted upside down and prevents the tape from riding up on the rotating drum. Care must be taken so that the tape is not creased or damaged in any way during tape removal.

9. Position the tool between points 1 and 2, inside the loop. Gently move the tape up so that it passes between the **L** and the top edge of the drum.

PICTURE 29

10. Remove the tape from around the guide posts and roller at point 1. Be sure to place the tool inside the tape loop.

PICTURE 30

11. Go to "Tape-Tray Door release and Tape Rewind Procedures" in topic 10.4.

10.4 Tape-Tray Door release and Tape Rewind Procedures

To release the tape-tray door and rewind the tape, do the following:

1. Using a small screwdriver, move the tape-tray door release lever 1 toward the front of the drive. The tape-tray door release lever is inside and about 12.7 mm (0.5 in.) below the opening shown. You must be careful when removing the tape-tray door components with the tape cassette still in the drive. When opening the door, control the rate at which it opens by holding the door with your fingers so that it opens more slowly. This prevents the tape cassette from moving quickly and damaging the loose tape.

PICTURE 31

Warning: Do not bend the tabs too far or they will break.

2. Release the two tabs 1 on the tape-tray door, then remove the front and back parts of the door assembly from the door hinge.

PICTURE 32

Remove the inside portion of the tape-tray door first. To do this, tilt it toward the inside of the drive and remove it. Then, remove the outside portion of the tape-tray door by lifting it off of the drive.

3. Position the drive, with the tape-tray door open, so that it is resting on the back of the frame, with the door facing up and the bottom of the drive facing you.

   Warning: Do not touch the tape on the outside of the loop with your fingers, or with any metal object. Data is recorded on the outside loop portion of the tape.

4. Insert a flat-blade screwdriver into the hub of the takeup reel through the opening created by the removal of the tape-tray door. Slowly, turn the hub counter-clockwise, rewinding the tape. While turning the screwdriver, watch the tape loop to ensure that it does not get caught on any of the components. If the tape gets caught, free the tape from the obstruction before turning the hub any further.

   Warning: Make sure that all of the loose tape has been wound into the tape cassette. If all of the tape is not in the cassette, the tape will be damaged by the tape-tray door. Do not over wind the tape into the cassette. Overwinding the tape will damage the tape.

5. When all of the loose tape is in the tape cassette, remove the screwdriver.

6. Remove the cellophane-tape holding the door of the cassette open.

7. Remove the cassette from the drive.

To reassemble the tape drive, reverse the removal procedure.