

**AUTOMATIC TROUBLE ANALYSIS (ATA) SYSTEM
ARRANGED WITH PDP*-11/40 PROCESSOR
COMPUTER CENTER OPERATING PROCEDURES**

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	1	C. Unloading Magnetic Tape	7
2. STARTING AND STOPPING ATA	1	D. Restart After Fail-Safe or Power Failure	7
3. STARTING AND STOPPING UNIX	2		
4. BACKUP AND RESTORAL	2	1. GENERAL	
A. Incremental File System Backup	2	1.01 This section provides operating procedures for the Automatic Trouble Analysis (ATA) system using the PDP-11/40 computer. Procedures are provided for starting and stopping ATA and UNIX, for backup and restoral, for generic updates, for system recovery, for disk packs, and for magtape units.	
B. Epoch File System Backup	2	1.02 This section is reissued to add information pertaining to Generic 3. Revision arrows are used to emphasize the more significant changes.	
C. File System Restoral	2	1.03 The character (<i>CR</i>) means to operate the RETURN key on the keyboard printer.	
D. Utility File Loading	2	1.04 Lettered Steps: A letter a, b, c, etc, added to a step number in Part 9 of this section indicates a procedure which may or may not be required depending on local conditions. The condition under which a lettered step, or a series of lettered steps, should be made is given in the PROCEDURE column, and all steps governed by the same condition are designated by the same letter within a procedure. Where a condition does not apply, all steps designated by that letter should be omitted.	
E. Complete Disk Backup (Generic 3)	2		
5. GENERIC UPDATES	2		
6. RUN LEVELS	3		
7. SYSTEM RECOVERY	3		
8. DEC* RPO4 DISK PACK PROCEDURES	3		
A. Disk Pack Restoral	4		
B. Disk Pack Removal	4		
C. Drive Startup	5		
9. DEC TU10 MAGTAPE PROCEDURES	5		
A. Handling Magnetic Tape—Precautions	5		
B. Loading Magnetic Tape	6		

*Registered trademark of Digital Equipment Corporation.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

3. STARTING AND STOPPING UNIX

3.01 Procedures for stopping and starting UNIX are provided in Fig. 3 and 4, respectively. UNIX should be stopped prior to preventive maintenance or hardware additions.

4. BACKUP AND RESTORAL

A. Incremental File System Backup

4.01 The purpose of the incremental backup of the ATA file system is to save every file which has changed since the last epoch backup was made. This does not include the utility file system which is located on a different part of the disk. Incremental backups should be made once a day or at 1-week intervals. The procedure is given in Fig. 5.

B. Epoch File System Backup

4.02 The epoch backup is a bit-for-bit save of all information in the ATA System except the fixed-head disk and the utility file system or the master record store (MRS), the exception report directory (ERD), or any mounted file system. Epoch backups should be made at least once a month. The procedure is given in Fig. 6.

C. File System Restoral

4.03 At times, the file system must be restored because of a hardware or software failure. The following steps are required for file system restoral if both the primary file system and the fixed-head disk (Generic 2 only) have been damaged:

- (1) Restoral of the last epoch system backup
- (2) Restoral of the data on the fixed-head disk (Generic 2 only)
- (3) Restoral of the last incremental system backup, if one exists.

If only the primary file system has been damaged, only Steps (1) and (3) need be performed. In Generic 2, if the fixed-head disk has been damaged, only Steps (2) and (3) need be performed. In Generic 3, the fixed-head disk is used only for swapping.

Restoral of the last epoch backup and the fixed-head disk backup should result in a working system; restoral of the last incremental backup should bring the system as up to date as possible. The file system restoral procedure is given in Fig. 7.

D. Utility File Loading

4.04 The utility file is used for bootstrapping the operating system. The utility file loading procedure is given in Fig. 8.

E. Complete Disk Backup (Generic 3)

4.05 Epochs are a backup of the primary file system. In most cases, this is all that is required for ATA system backup. Occasionally, DEC diagnostics are required to check the hardware for the moving head disk. When this occurs, the entire disk should be backed up before performing these diagnostics. The disk backup procedure is given in Fig. 9. The first step in the disk backup procedure is to make a boot tape. The procedure to restore the disk after DEC diagnostics is given in Fig. 10.

5. GENERIC UPDATES

5.01 Generic updates must be performed whenever the ATA System undergoes an upgrade of its generic software. This procedure applies to a generic upgrade and to an upgrade of an issue of a given generic.

5.02 An updated file system tape will be supplied.

This tape contains instructions for performing the upgrade, copies of all modules to be changed, and all necessary software to assist in performing the upgrade. The tape contains a UPD.RC file which has all instructions for performing the upgrade. This file contains two sets of instructions: a set of manual instructions which must be performed by the person doing the upgrade, and a set of automatic instructions which must be performed by the ATA System. Lines containing manual instructions are denoted by an "*" in column one. All other lines are associated with automatic

instructions or comments. The generic update procedure is given in Fig. 11.

6. RUN LEVELS

6.01 There are several levels of operation in the ATA software. Each level is fundamentally independent of the rest and is characterized by the amount and type of activity going on in the system at any time. The run level is controlled by the value set into the computer console switch register at "boot" time and by telinit command on other occasions. Of the many values which can be set into that register, only the values 0 through 7, inclusive, define legal run levels. The ATA System uses only three or four of the eight levels:

- (1) Level 0—This is the multiuser level and is the level at which the ATA normally runs. At this level, the system supports the system console, ATA, and any dial-up (UNIX) ports made available.
- (2) Level 5— (used in Generic 2)—This level permits only system TTY interaction and ATA to take place. All extraneous (non-ATA, nonconsole) terminal interaction is inhibited. This level is normally used in taking incremental and CMPFS backups; at such times, it is necessary to limit access to the ATA file system.
- (3) Level 6—This level permits only the system console to interact with the system; all other functions, including ATA, are disabled at this level. This level is used only for initializing, recovering, or upgrading the ATA System.
- (4) Level 7—This level is identical to level 6 except that the run level control file, /etc/lines, is not scanned. Level 7 is a hard-wired level 6; it is intended that this level be used only if the system does not appear to be capable of running at level 6. If such is the case, then the control file has probably been destroyed and must be recreated once level 7 is attained.

6.02 The ATA System may be forced to change run levels at any time; to do so, login at the system console as **ROOT (CR)** and type **TELINIT [level] (CR)**. The system will terminate all processes which should not be running at the new level and create all new processes which should be running. The system will notify the user that the new level

has been achieved via some printout at the system console. For example, when changing from level 0 to level 6, the system will print only the prompt character # on the system console at the completion of the change. At this time, the system cannot terminate all processes; when the new level is achieved, there may be some processes still running. If this is the case, wait for them to finish before proceeding.

6.03 If the system is being changed from level 0 to any other level, and if the change is being done on an emergency basis (for example, if the system is in really bad shape and is getting worse), type **SYNC (CR)** at the system console and immediately lower the **ENABLE/HALT** switch to **HALT** on the computer console. Then reboot the system as usual.

7. SYSTEM RECOVERY

7.01 There are a number of occasions when it is necessary to check the integrity of the file system. For example, when recovering from a system crash, it is useless to proceed if the file system is bad. Similarly, there is no point in dumping a bad file system. In these cases, the **CHECK** program should be run and any discrepancies in the file system corrected before continuing. For a detailed description of **CHECK**, refer to Section 190-105-313.

7.02 **CHECK** should not be run when the system is at level 0. For Generic 2, **CHECK -N** can be used at level 5 to audit the file system, but any errors must be corrected at level 6 or 7. Furthermore, because **CHECK** corrects file system errors by removing and clearing the offending files, it is possible for it to eliminate a file critical to ATA operation.

7.03 System recovery procedures are given in Fig. 12.

8. DEC RP04 DISK PACK PROCEDURES

8.01 Controls, switches, and indicators for operation of the RP04 disk pack (Fig. 13) are shown in Fig. 14 and listed in Table A.

8.02 The following procedures describe the disk pack restoral, disk pack removal, and drive startup for the RP04 disk pack.

STEP	PROCEDURE
------	-----------

A. Disk Pack Restoral

- 1 Verify that a disk pack is not installed and that the spindle is stopped.
- 2 Operate and release operator cover latch (Fig. 13). The operator cover will slide back into top of the disk.
- 3 Push operator cover straight back to fully expose drive spindle area (Fig. 15).

Note: A solenoid operated latch locks the operator cover closed until spindle rotation has stopped.

Caution: *To avoid damage to the shroud, heads, disk pack, etc, do not allow disk pack to strike these areas during restoral.*

- 4 Remove disk pack bottom cover by squeezing bottom cover release mechanism.
- 5 Place disk pack on spindle.
- 6 Rotate disk pack top cover handle (Fig. 16) in a clockwise direction until it comes to a complete stop. Continue to rotate, although cover may disengage, to ensure that full stop point is reached and pack-on switch is closed.
- 7 Remove disk pack cover carefully to avoid damage to equipment.
- 8 Close and latch operator cover.
- 9 Reassemble disk pack top and bottom covers and store in a designated area.

B. Disk Pack Removal

- 1 Operate drive START/STOP switch (Fig. 14) to STOP.
- 2 With READY and START indicator extinguished, wait for disk pack to come to a complete stop (approximately 15 seconds) before opening operator cover. DOOR LOCKED indicator extinguished.
- 3 Operate and release operator cover latch (Fig. 13). The operator cover will spring open.
- 4 Push operator cover straight back to fully expose the disk pack.

Note: A solenoid operated latch locks the operator cover closed until disk pack rotation has stopped.

Caution: *Do not touch disk pack.*

Caution: *To avoid damage to the shroud, heads, disk pack, etc, do not allow disk pack cover to strike these areas during disk positioning of the cover over the disk pack.*

STEP	PROCEDURE
5	Very carefully position disk pack cover over top of disk pack.
6	Turn cover in a counterclockwise direction for two full turns so that cover is securely fastened to disk pack.
7	Remove disk pack by its top cover handle.
8	Immediately attach bottom cover to create a positive dust seal and store in a designated area.
9	If another disk pack is not to be installed at this time, close and latch operator cover.
C. Drive Startup	
1	Visually check to determine that a disk pack is installed in the drive, disk pack top cover is removed, and operator cover is closed and latched. Turn drive on.
Note: If the operator is responsible for recording usage meter time before the drive is started, it should be done now.	
2	Select control switch (either A or B).
3	Operate drive START/STOP switch to START.
4	Verify that READY indicator lights approximately 15 seconds after drive starts.
5	Drive is now ready to receive commands and to seek and transfer data.
9. DEC TU10 MAGTAPE PROCEDURES	
9.01 The DEC magtape controls and indicators are listed in Table B. All controls and indicators are mounted in a control box in the lower left-hand corner of the tape transport.	9.02 The following procedures describe magnetic tape precautions, loading and unloading tape, and restart procedures.

STEP	PROCEDURE
A. Handling Magnetic Tape—Precautions	
<ul style="list-style-type: none"> • Always handle a tape reel by the hub hole; squeezing the reel flanges can cause damage to the tape edges when winding or unwinding tape. • Never touch the portion of tape between the beginning of tape (BOT) and end of tape (EOT) markers. Oils from fingers attract dust and dirt. Do not allow the end of the tape to drag on the floor. 	

STEP	PROCEDURE
	<ul style="list-style-type: none">● Never use a contaminated reel of tape. This spreads dirt to clean tape reels and can affect tape transport operation.● Always store tape reels inside their containers. Keep empty containers closed so dust and dirt cannot get inside.● Inspect tapes, reels, and containers for dust and dirt. Replace take-up reels that are old or damaged.● Do not smoke near the transport or tape storage area. Tobacco smoke and ash are especially damaging to tape.● Do not place the DEC magtape near a line printer or other device that produces paper dust.● Clean the tape path frequently (see DEC TU10 Magtape documentation).● Do not jerk the reel when winding tape by hand. This can distort or compress the tape on the reel and damage the tape.

B. Loading Magnetic Tape

- 1 Operate PWR ON/PWR OFF switch to PWR ON.
- 2 Operate LOAD/BR REL switch to its center position.
- 3a If data is to be written on tape, place a write-enable ring on the file reel.
- 4b If data is **not** to be written on tape, ensure that write-enable ring is **not** on the file reel.
- 5 Mount the file reel on the lower hub with the groove facing toward the back. Ensure that the reel is firmly seated against the flange of the hub.
- 6 Install the take-up reel or upper hub with the groove facing toward the back. Ensure that the reel is firmly seated against the flange of the hub.
- 7 Operate LOAD/BR REL switch to BR REL.
- 8 Unwind a sufficient amount of tape from file reel and thread the tape over the tape guides and head assembly as shown in Fig. 17.
- 9 Wind approximately five turns of tape on the upper take-up reel. Ensure that the tape is in the tape guides.
- 10 Operate the LOAD/BR REL switch to LOAD.

STEP	PROCEDURE
11	<p>Advance tape to load point by operating FWD/REW/REV switch to FWD and STOP/START switch to START. When the BOT marker passes under the BOT sensor, the tape automatically stops, the FWD indicator is extinguished, and the LD PT indicator is lighted.</p> <p>Note: If the tape continues to move for more than 10 seconds, there is either no BOT marker on the tape or too much leader has been put on the upper reel. In the latter case, operate the START/STOP switch to STOP to stop tape, then operate FWD/REW/REV switch to REV and START/STOP switch to START to position tape to load point.</p>
	<p>C. Unloading Magnetic Tape</p>
1	Operate ON-LINE/OFF-LINE switch to OFF-LINE.
2	Operate START/STOP switch to STOP. Operate FWD/REW/REV switch to REW.
3	Operate START/STOP switch to START. Tape moves in reverse direction and stops on BOT marker.
4	Operate LOAD/BR REL switch to BR REL. Gently handwind the file reel in the counterclockwise direction until all tape has been taken up on file reel.
	<p>Caution: <i>Do not jerk the reel when handwinding the tape. Jerking the reel can cause the tape to stretch or compress, thus causing the tape to be destroyed.</i></p>
5	Remove the file reel from the lower hub assembly.
	<p>D. Restart After Fail-Safe or Power Failure</p>
	<p>Note: If the tape loop in either buffer column exceeds its limits, the vacuum system automatically shuts down and tape motion stops. This is known as the fail-safe condition. A power failure can also cause the tape transport to stop. Once power has been restored, the PWR indicator is lighted. Use the following procedure to recover from either of these conditions.</p>
1	Operate the LOAD/BR REL switch to BR REL and manually wind the reels to take up any slack in the tape.
2	Operate the LOAD/BR REL switch to LOAD to draw tape into the vacuum columns.
3	Operate the ON-LINE/OFF-LINE switch to ON-LINE.

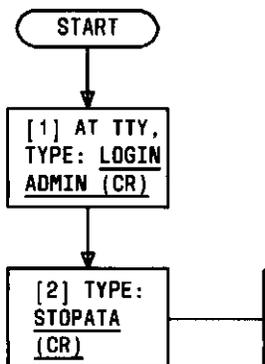


Fig. 2—Stop Procedure for ATA System

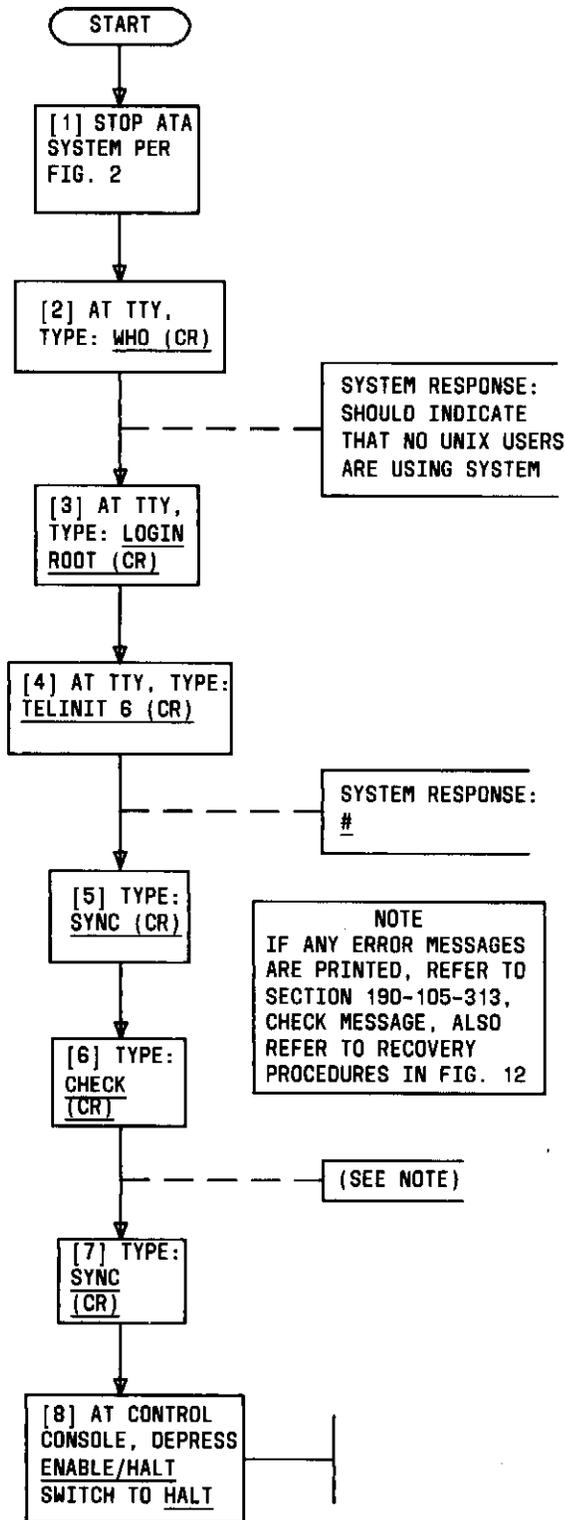


Fig. 3—Stopping UNIX Program

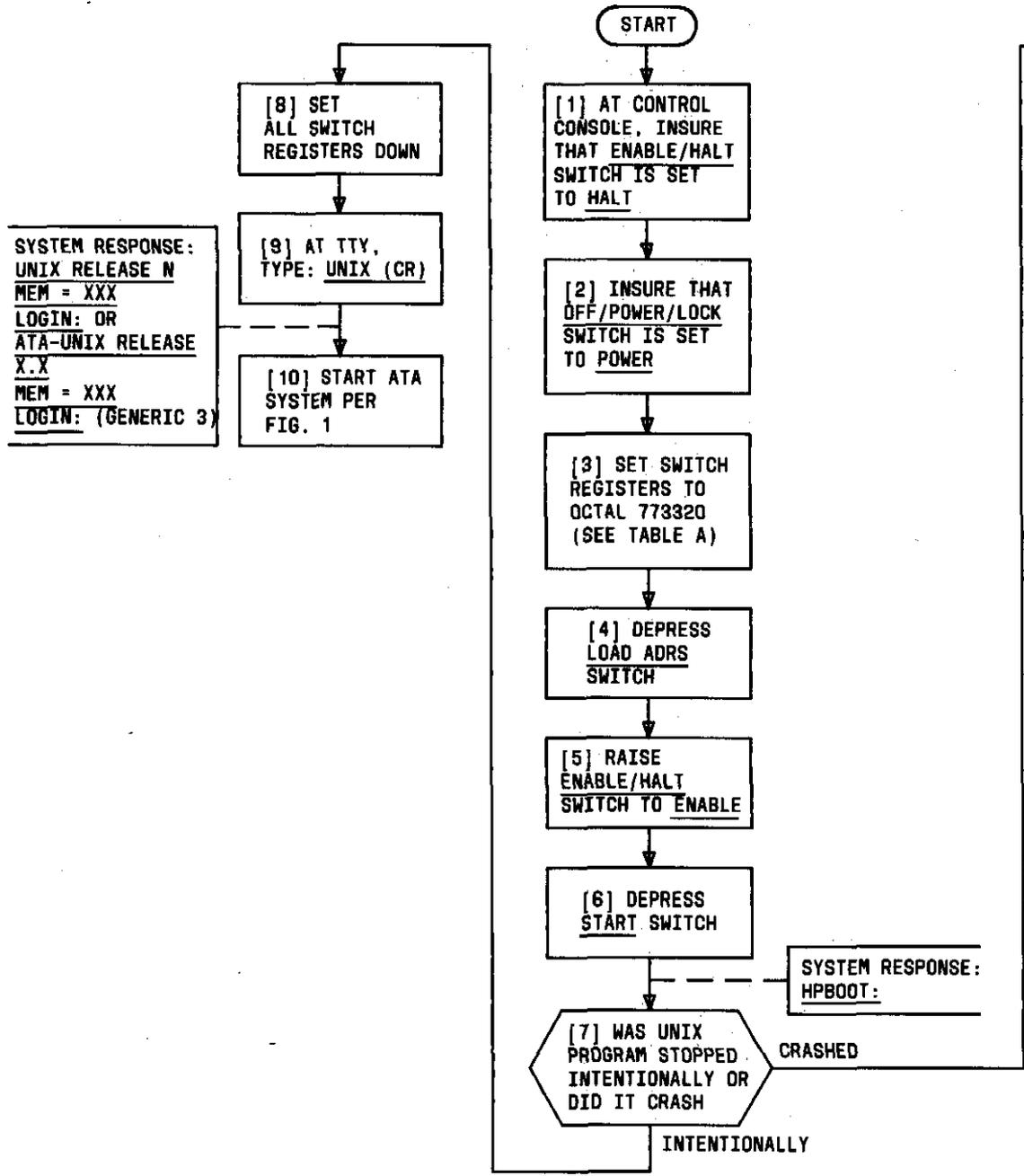


TABLE A

SWITCH REGISTER NUMBER	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SWITCH POSITION	UP	UP	UP	UP	UP	UP	DOWN	UP	UP	DOWN	UP	UP	DOWN	UP	DOWN	DOWN	DOWN	DOWN

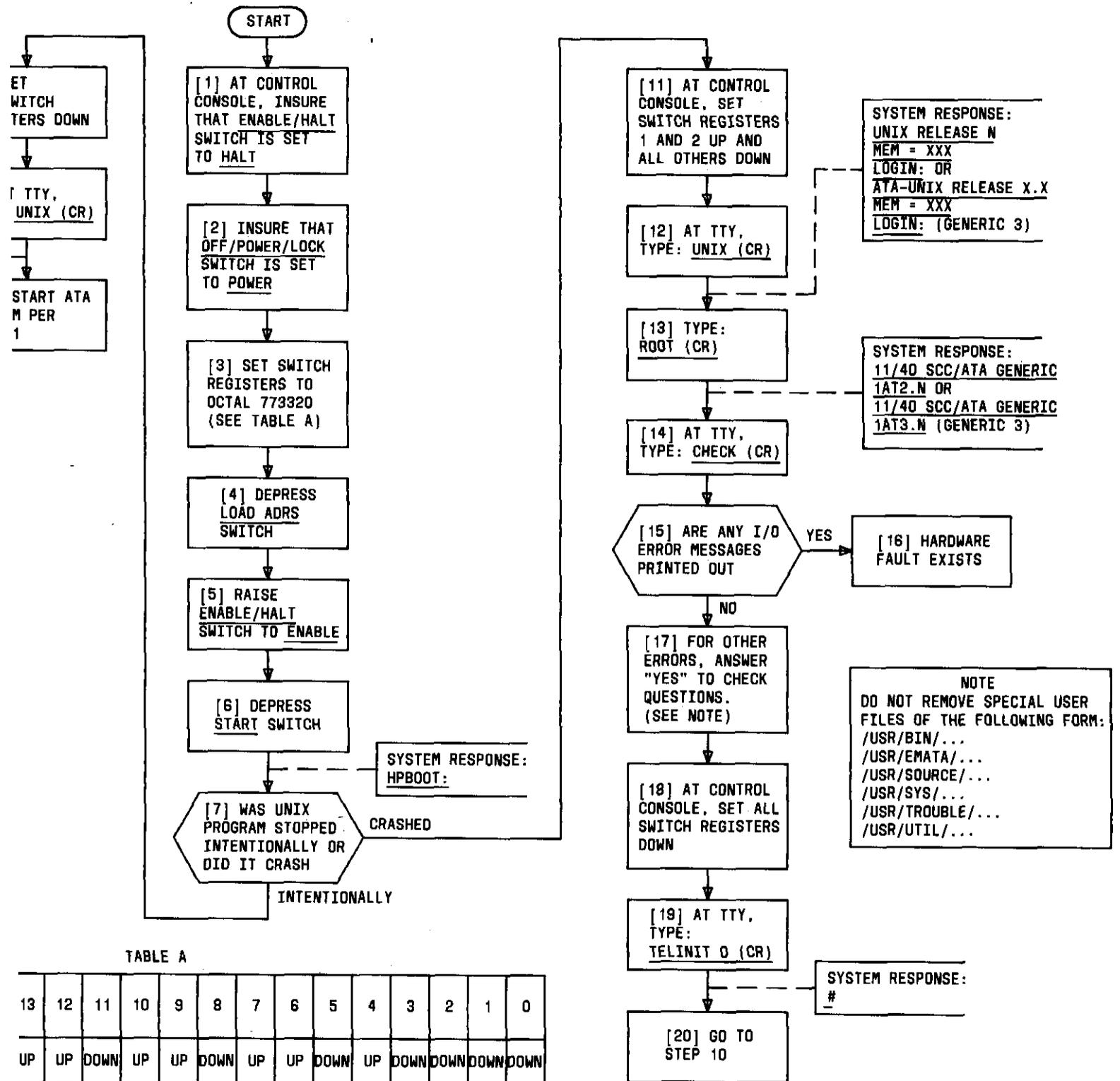
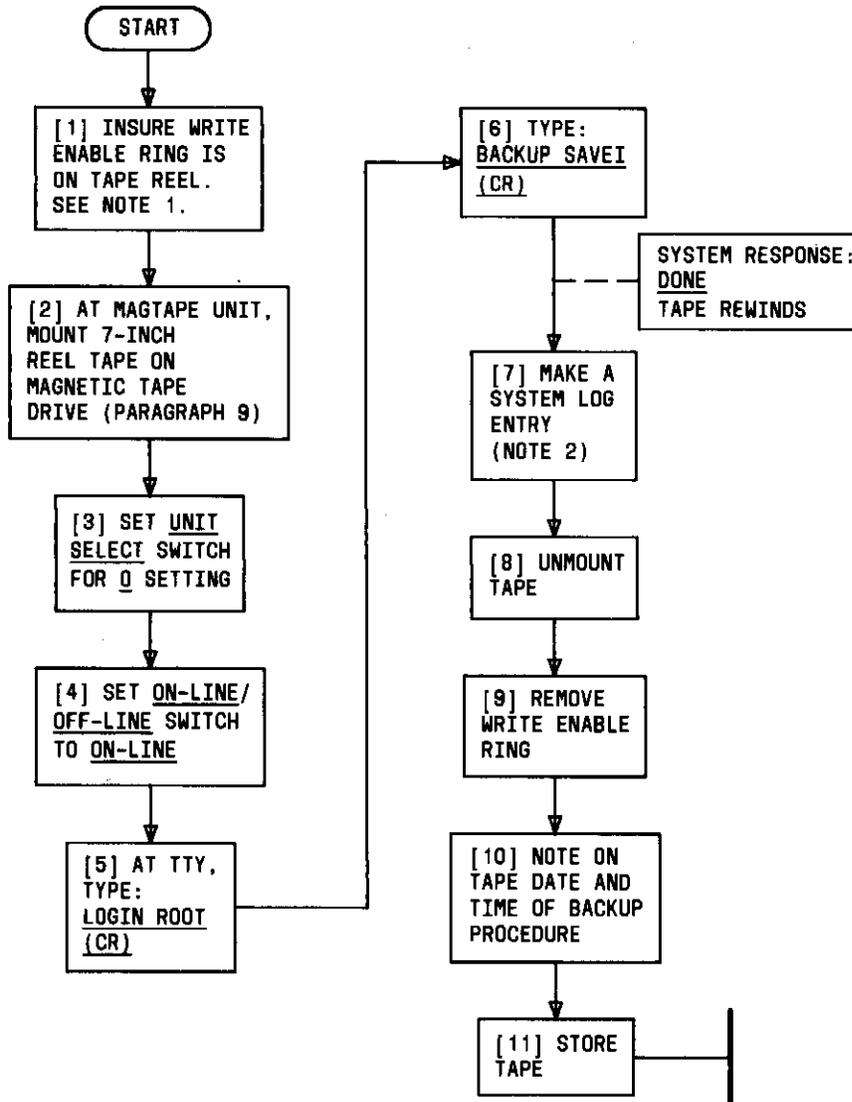


TABLE A

13	12	11	10	9	8	7	6	5	4	3	2	1	0
UP	UP	DOWN	UP	UP	DOWN	UP	UP	DOWN	UP	DOWN	DOWN	DOWN	DOWN

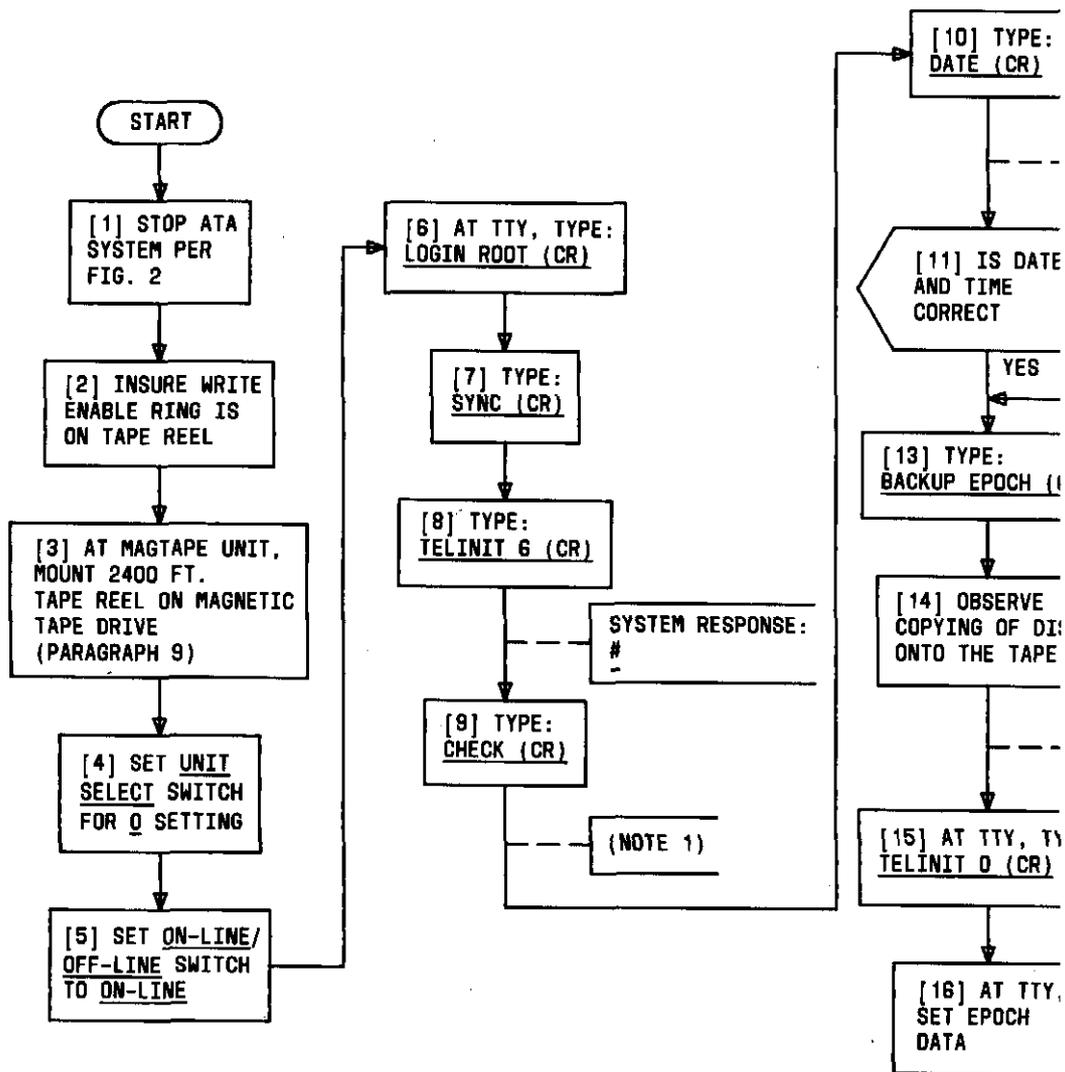
Fig. 4—Starting UNIX Program



NOTES

1. INCREMENTAL TAPES SHOULD BE ROTATED SO THAT THE SAME TAPE IS NOT USED AGAIN UNTIL AN EPOCH BACKUP IS PERFORMED.
2. INDICATE IN THE SYSTEM ACTIVITY LOG THAT AN INCREMENTAL DUMP WAS TAKEN.

◆ Fig. 5—Incremental File System Backup Procedure◆



START

[1] STOP ATA
SYSTEM PER
FIG. 2

[2] INSURE WRI
ENABLE RING IS
ON TAPE REEL

[3] AT MAGTAPE UN
MOUNT 2400 FT.
TAPE REEL ON MAGN
TAPE DRIVE
(PARAGRAPH 9)

[4] SET UNIT
SELECT SWITCH
FOR 0 SETTING

[5] SET ON-LINE
OFF-LINE SWITCH
TO ON-LINE

START

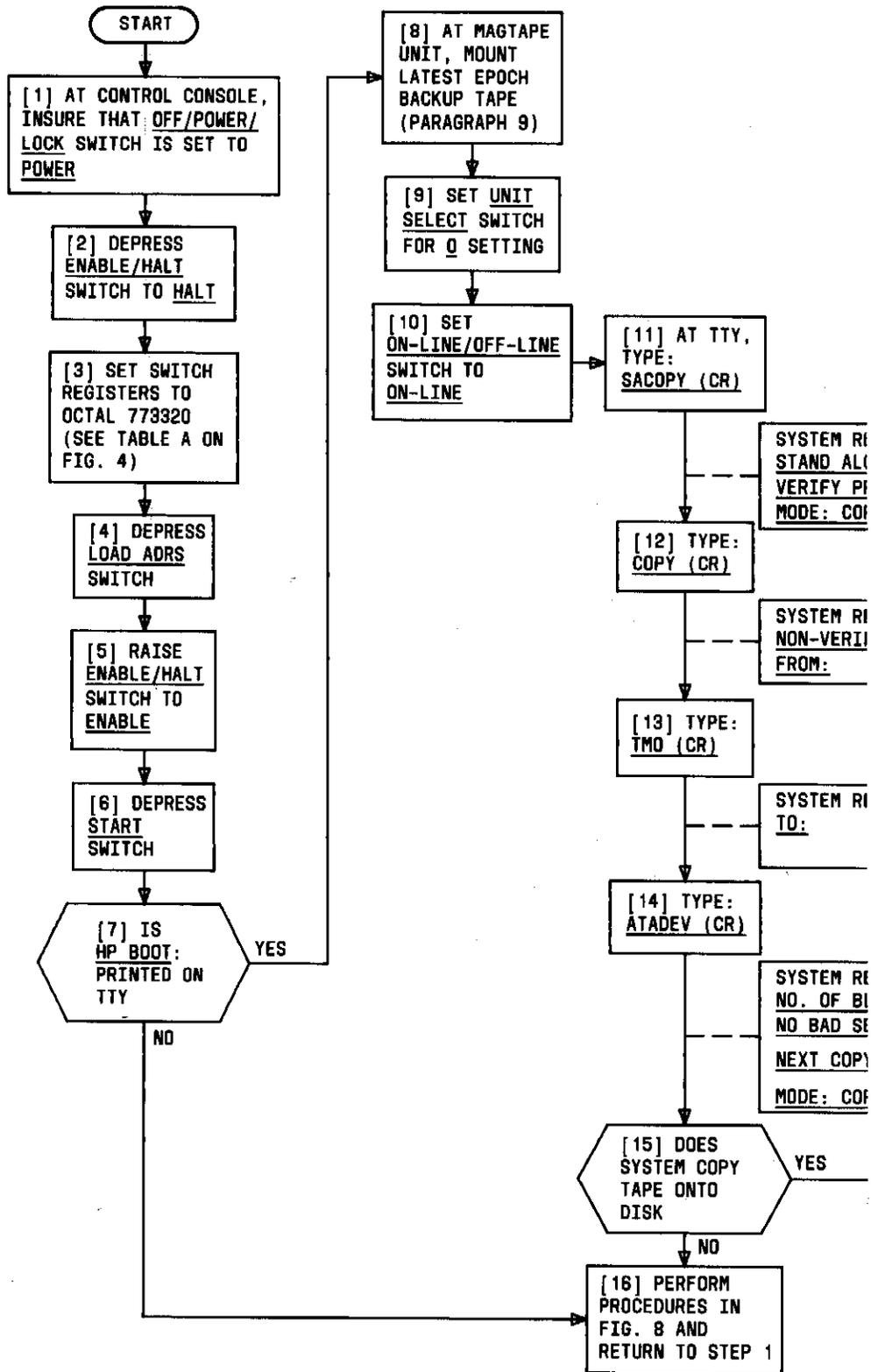
[1] STOP ATA
SYSTEM PER
FIG. 2

[2] INSURE WRI
ENABLE RING IS
ON TAPE REEL

[3] AT MAGTAPE UN
MOUNT 2400 FT.
TAPE REEL ON MAGN
TAPE DRIVE
(PARAGRAPH 9)

[4] SET UNIT
SELECT SWITCH
FOR 0 SETTING

[5] SET ON-LINE
OFF-LINE SWITCH
TO ON-LINE



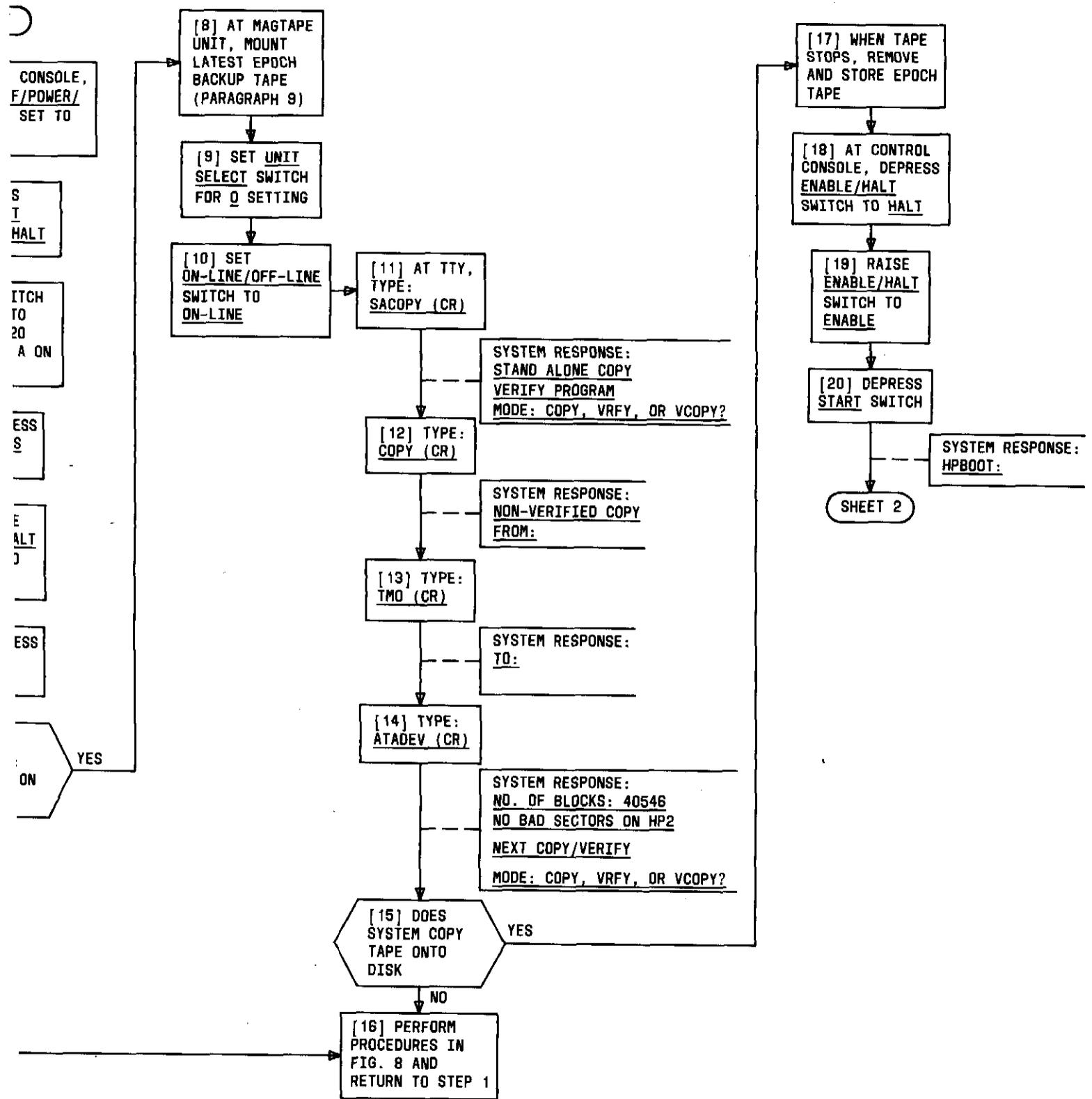
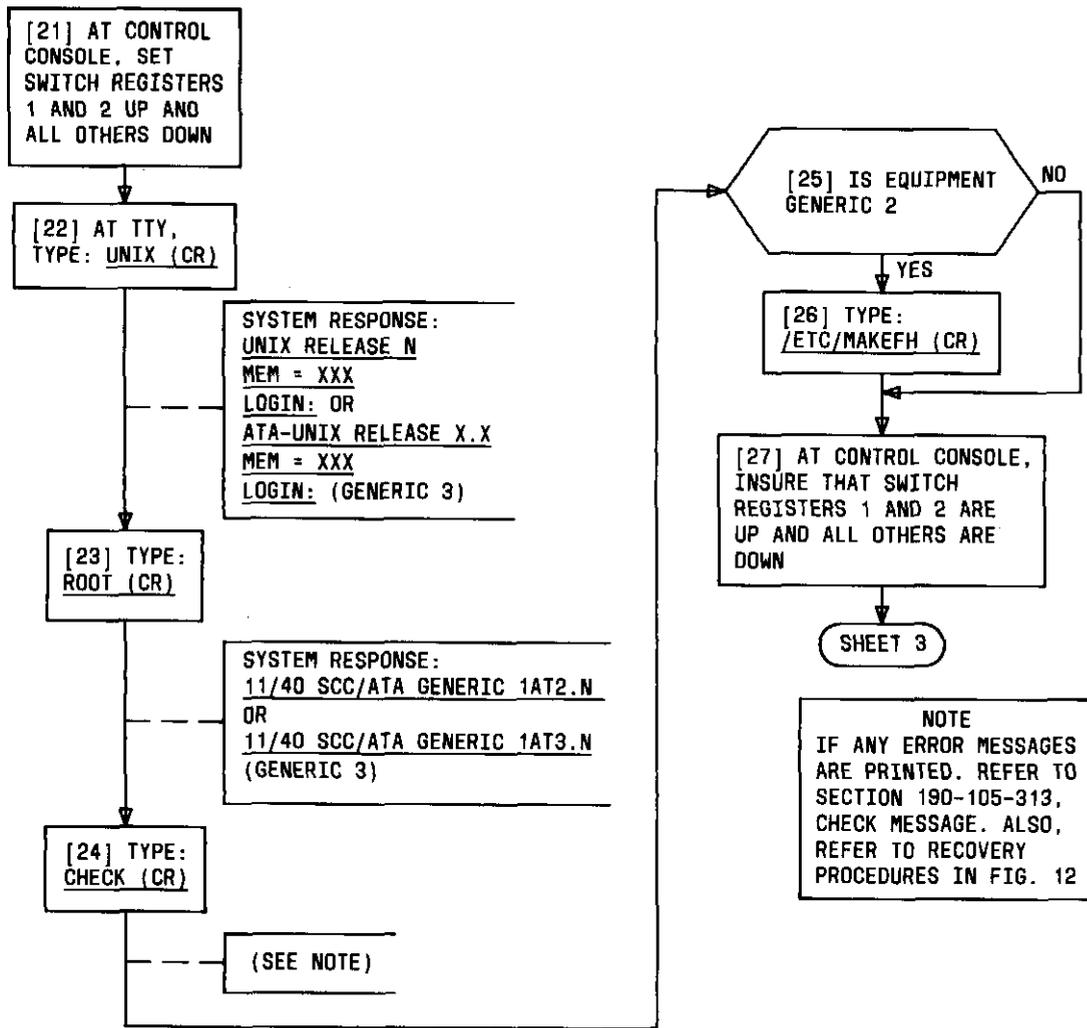
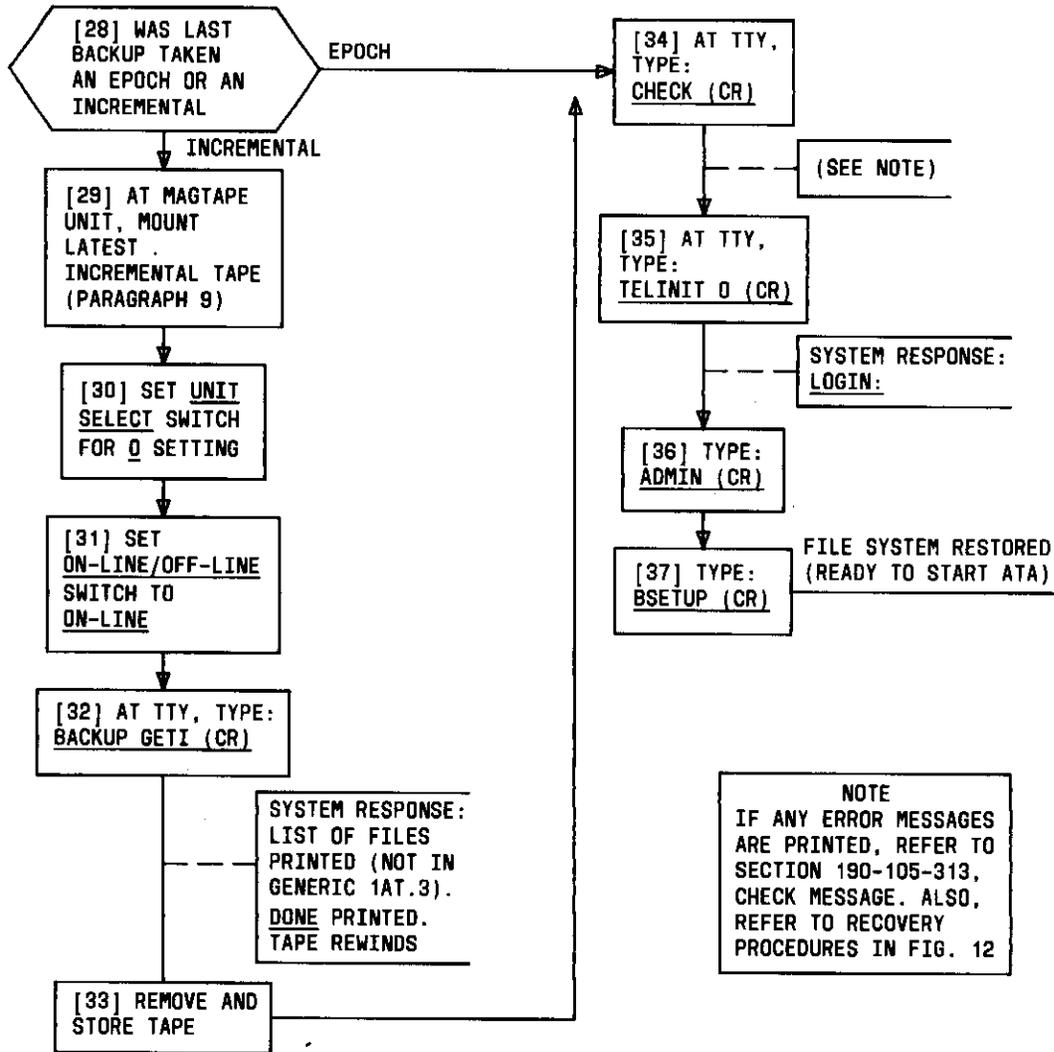


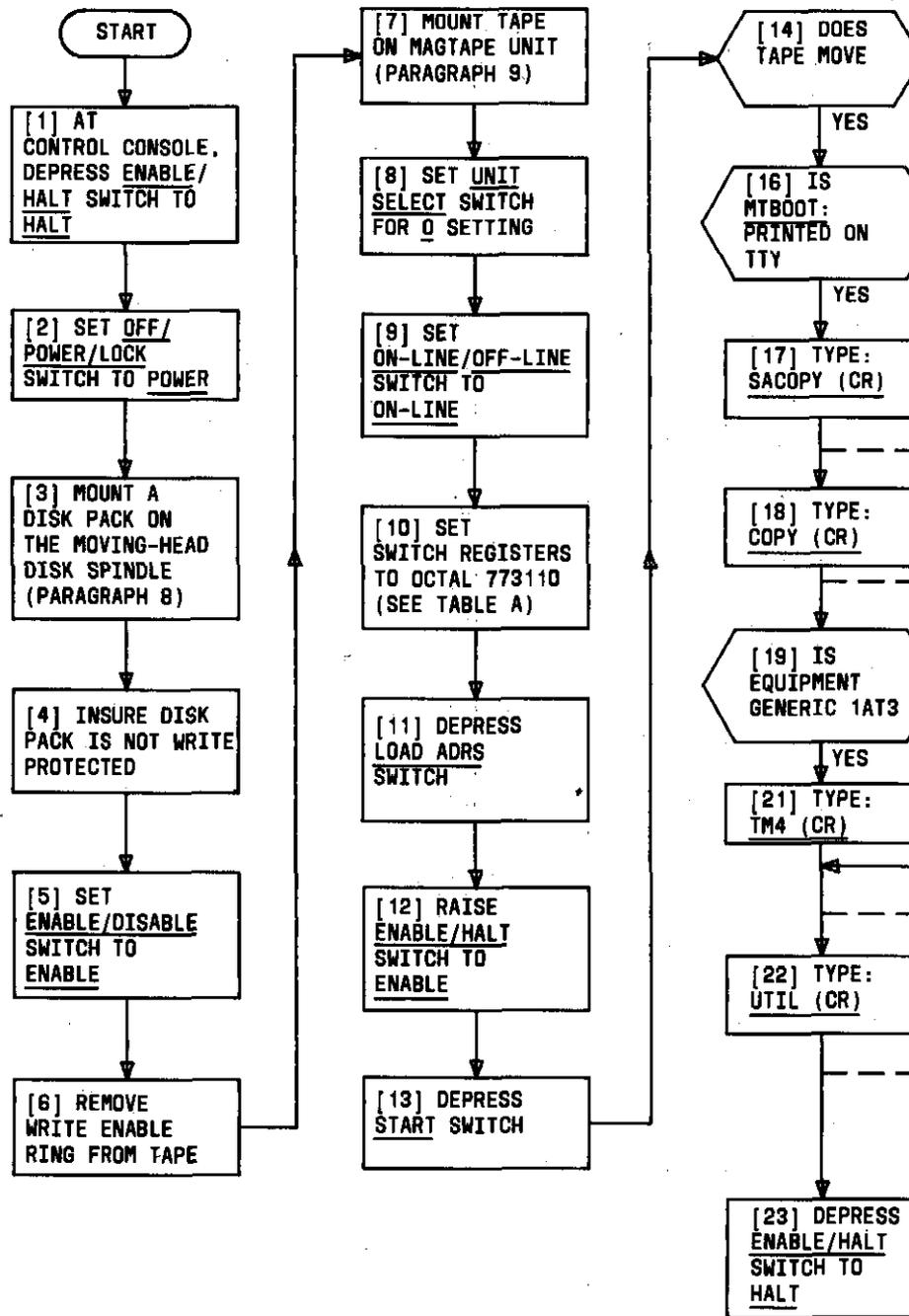
Fig. 7—File System Restoral (Sheet 1 of 3)



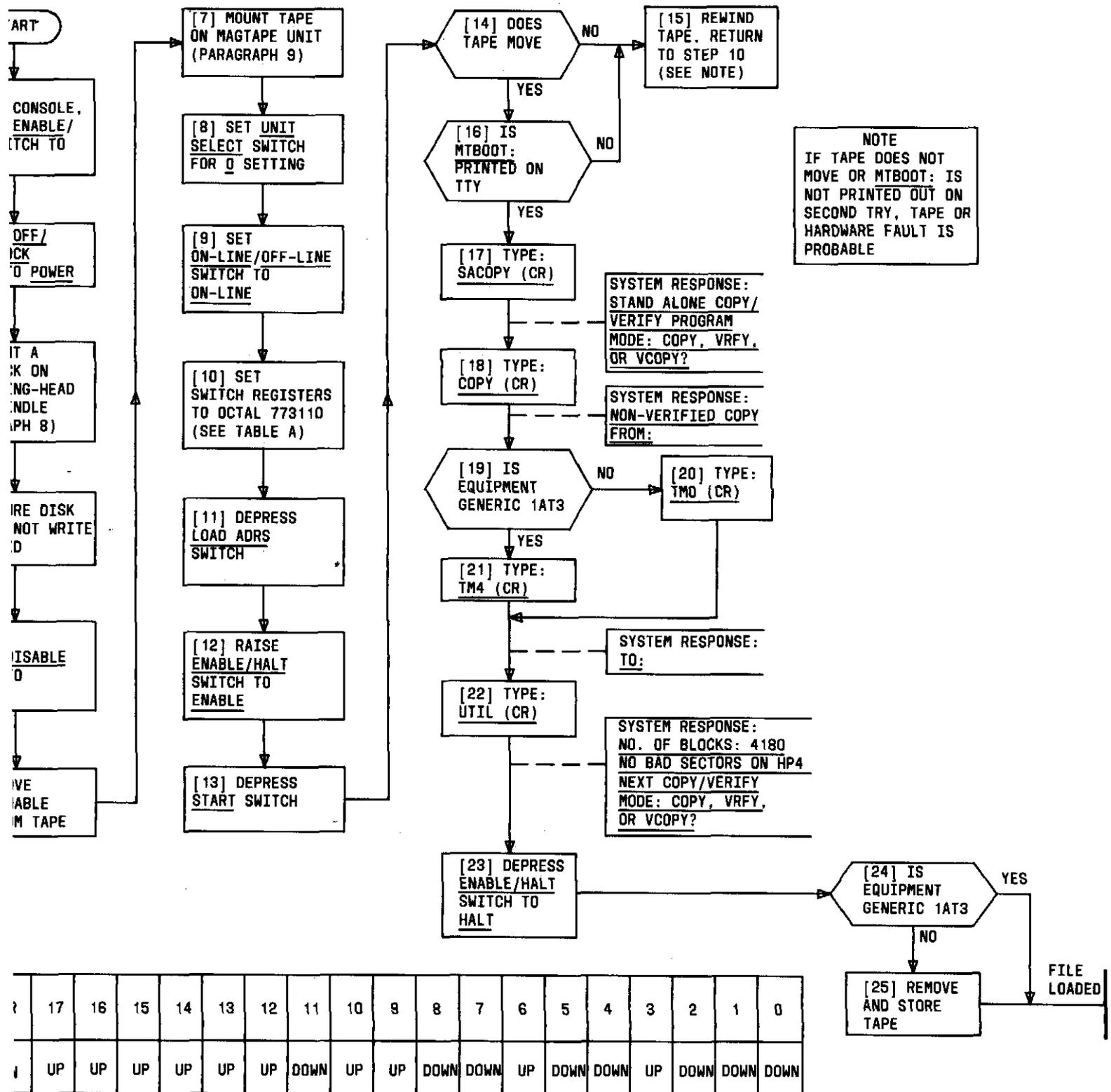
◆Fig. 7—File System Restoral (Sheet 2 of 3)◆



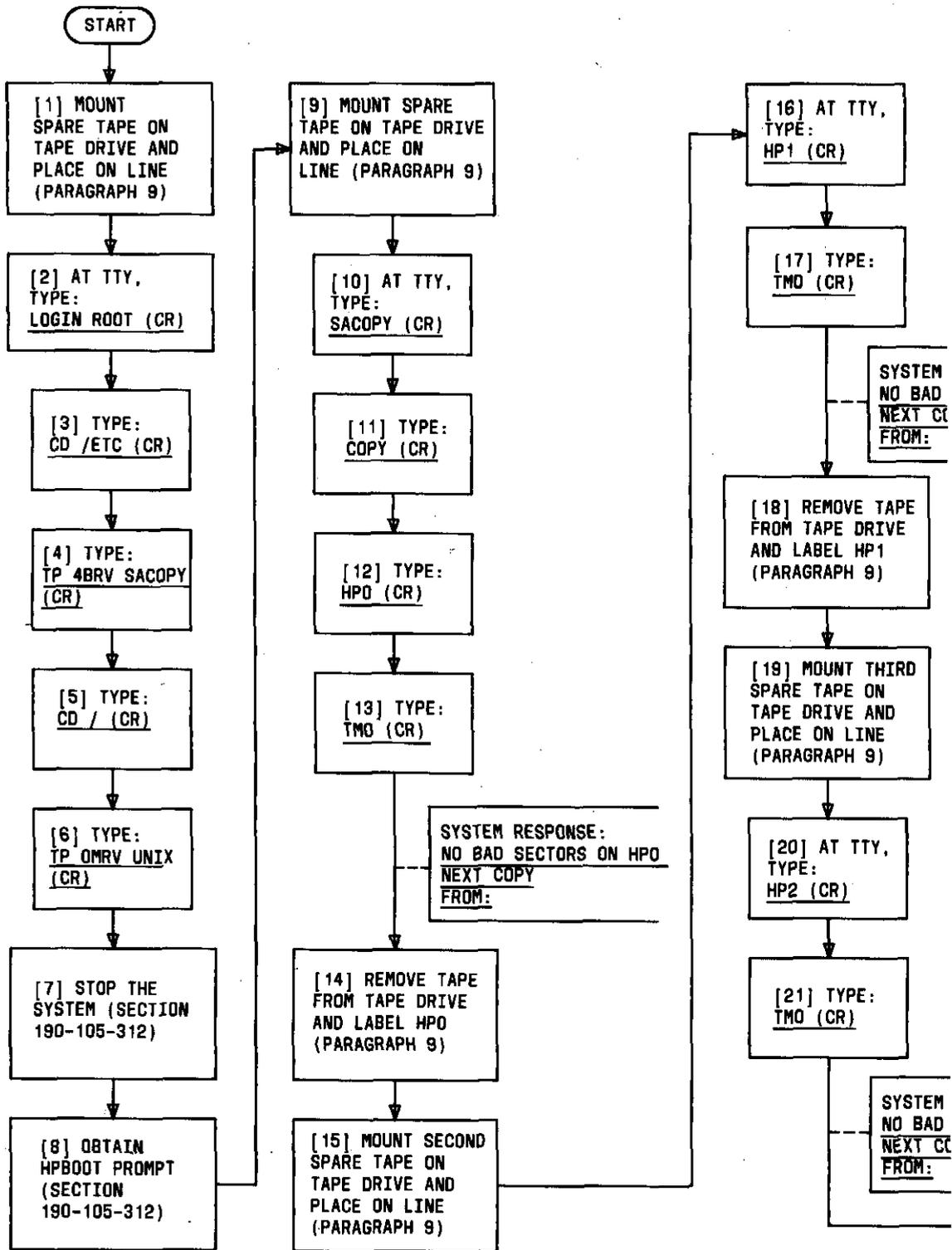
◆ Fig. 7—File System Restoral (Sheet 3 of 3)◆



SWITCH REGISTER NUMBER	17	16	15	14	13	12	11	10	9	8	7	6	5
SWITCH POSITION	UP	UP	UP	UP	UP	UP	DOWN	UP	UP	DOWN	DOWN	UP	DOW



◆Fig. 8—Load Utility File System◆



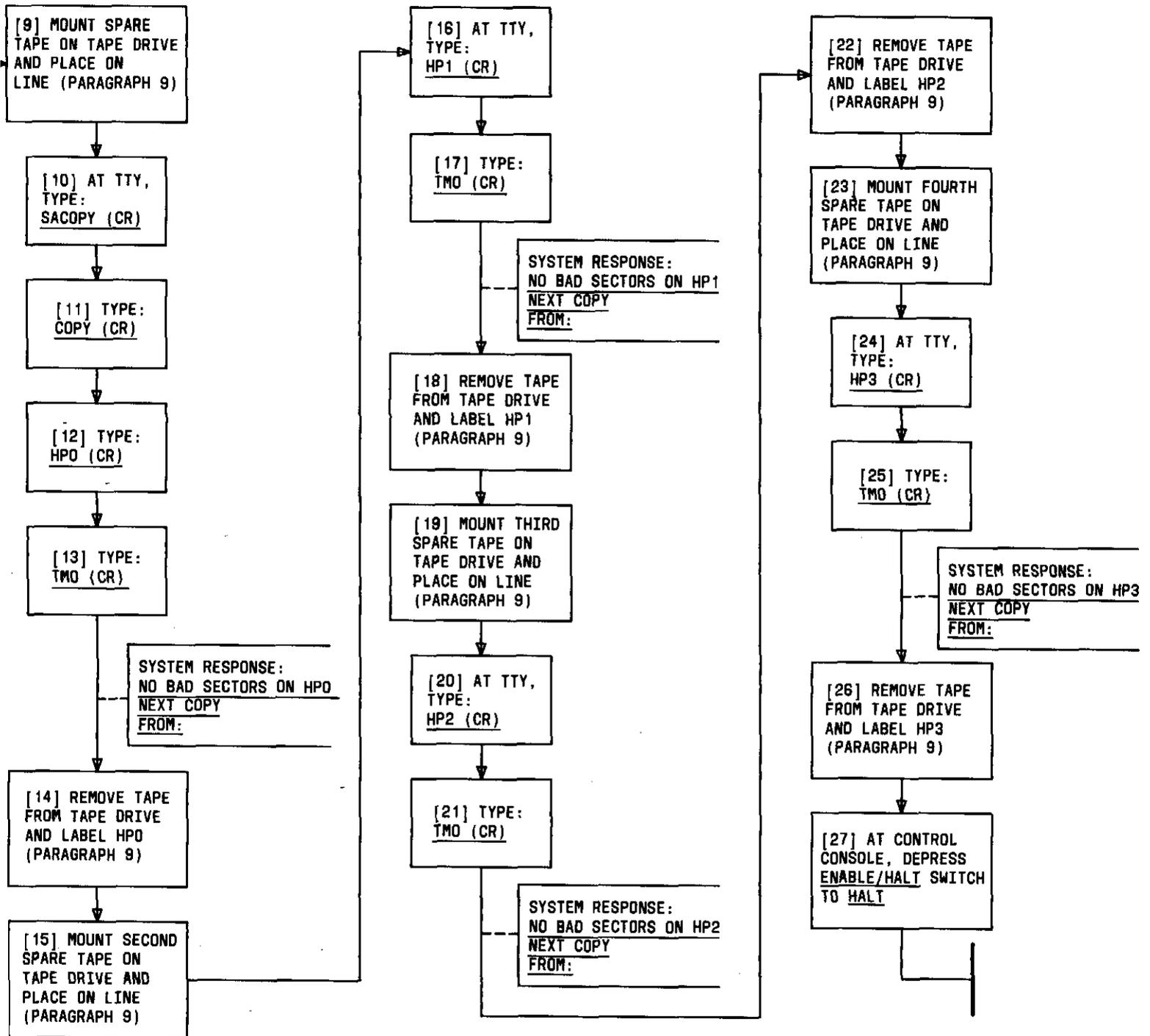
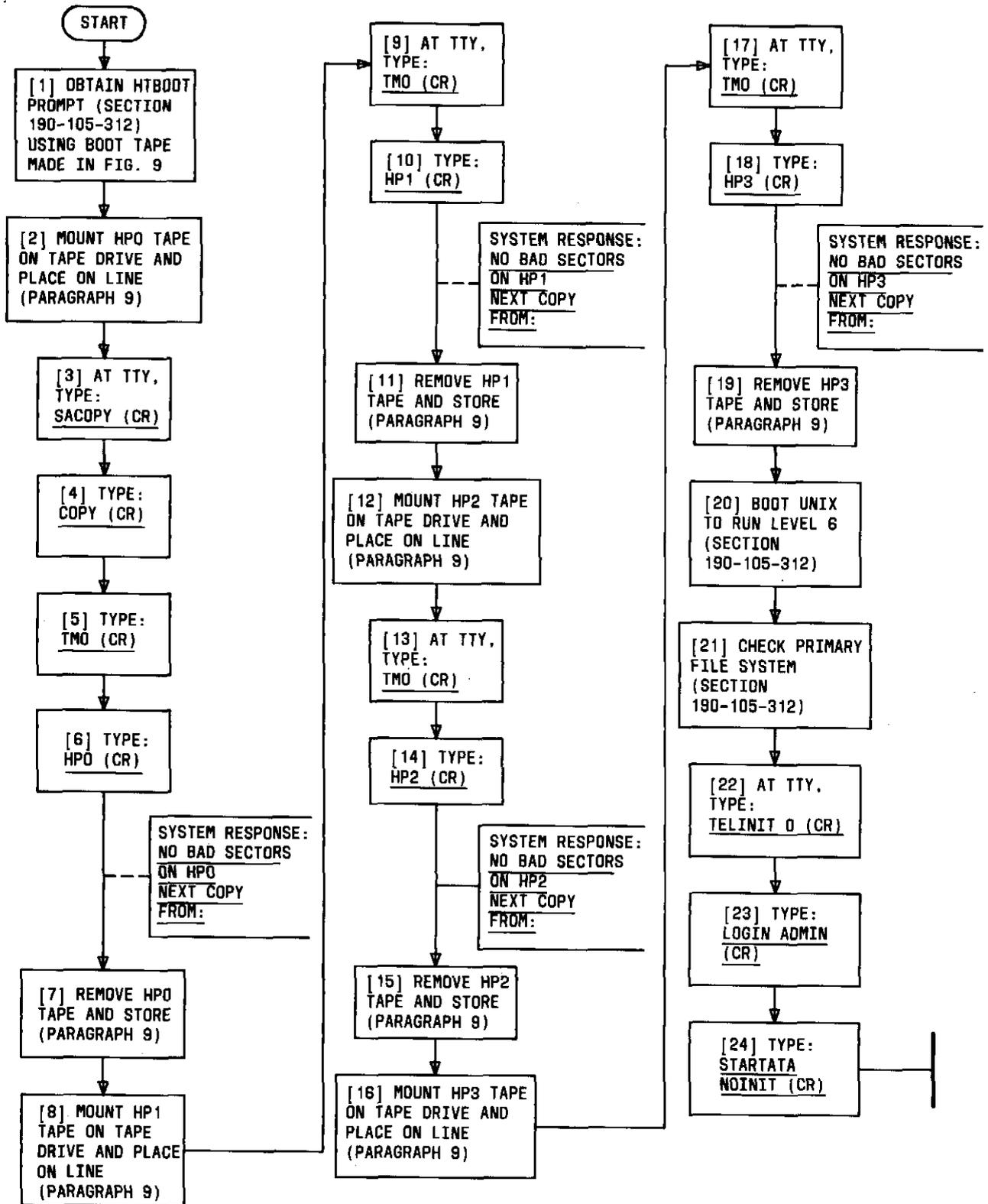
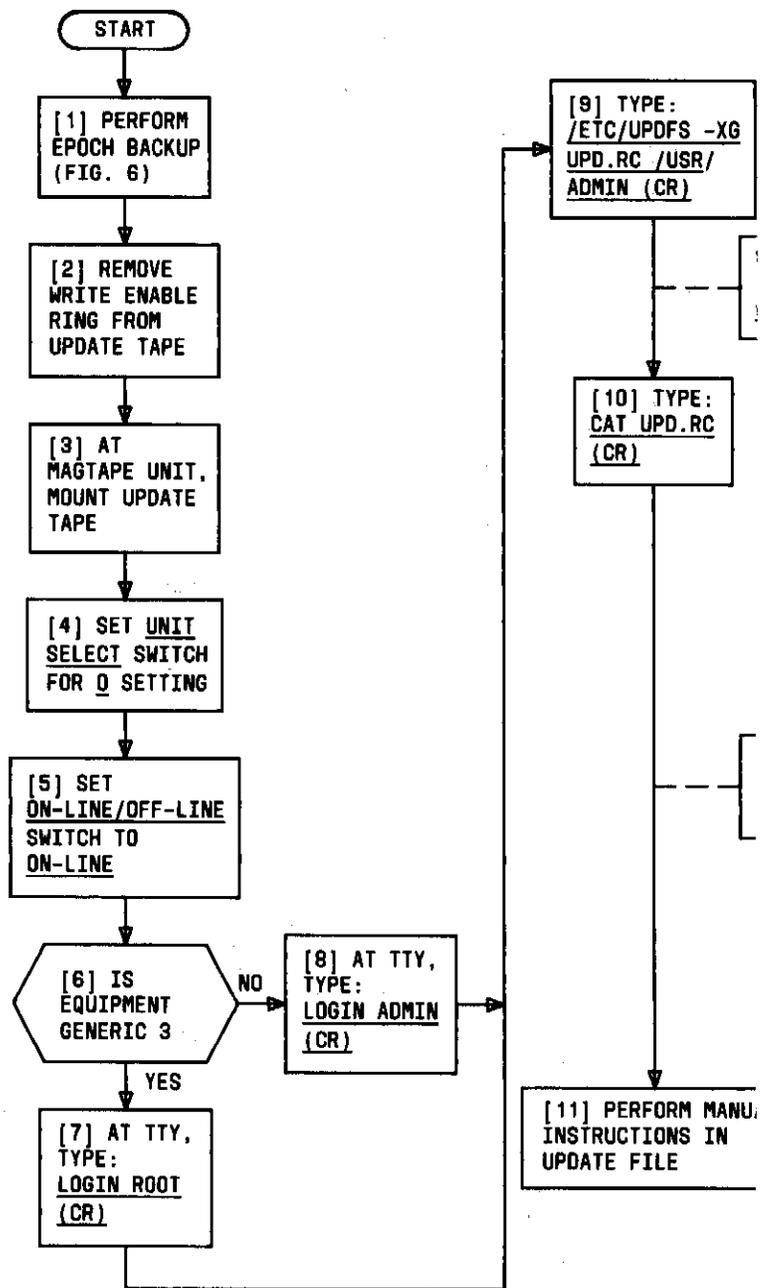
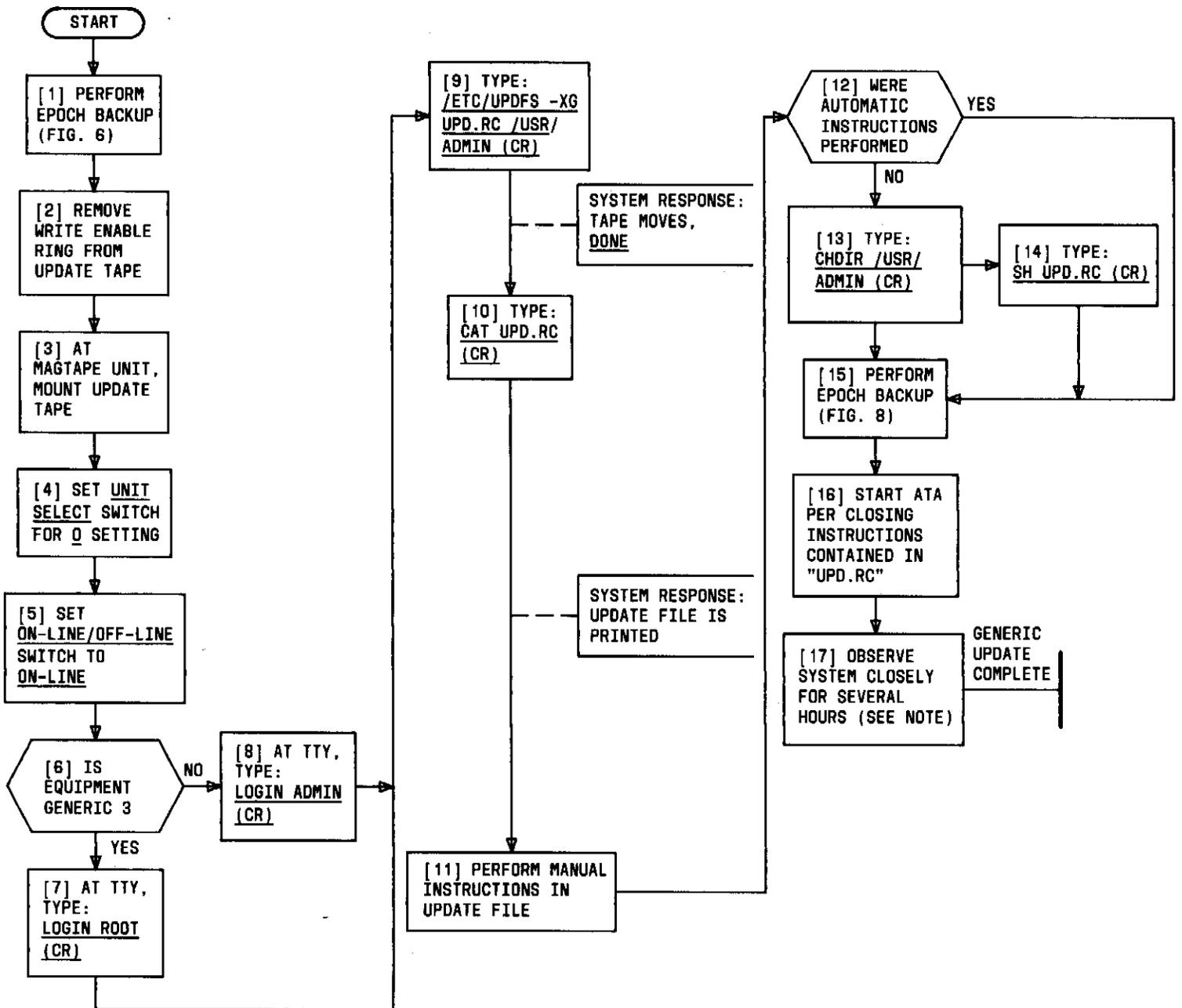


Fig. 9—Complete Disk Backup (Generic 3)



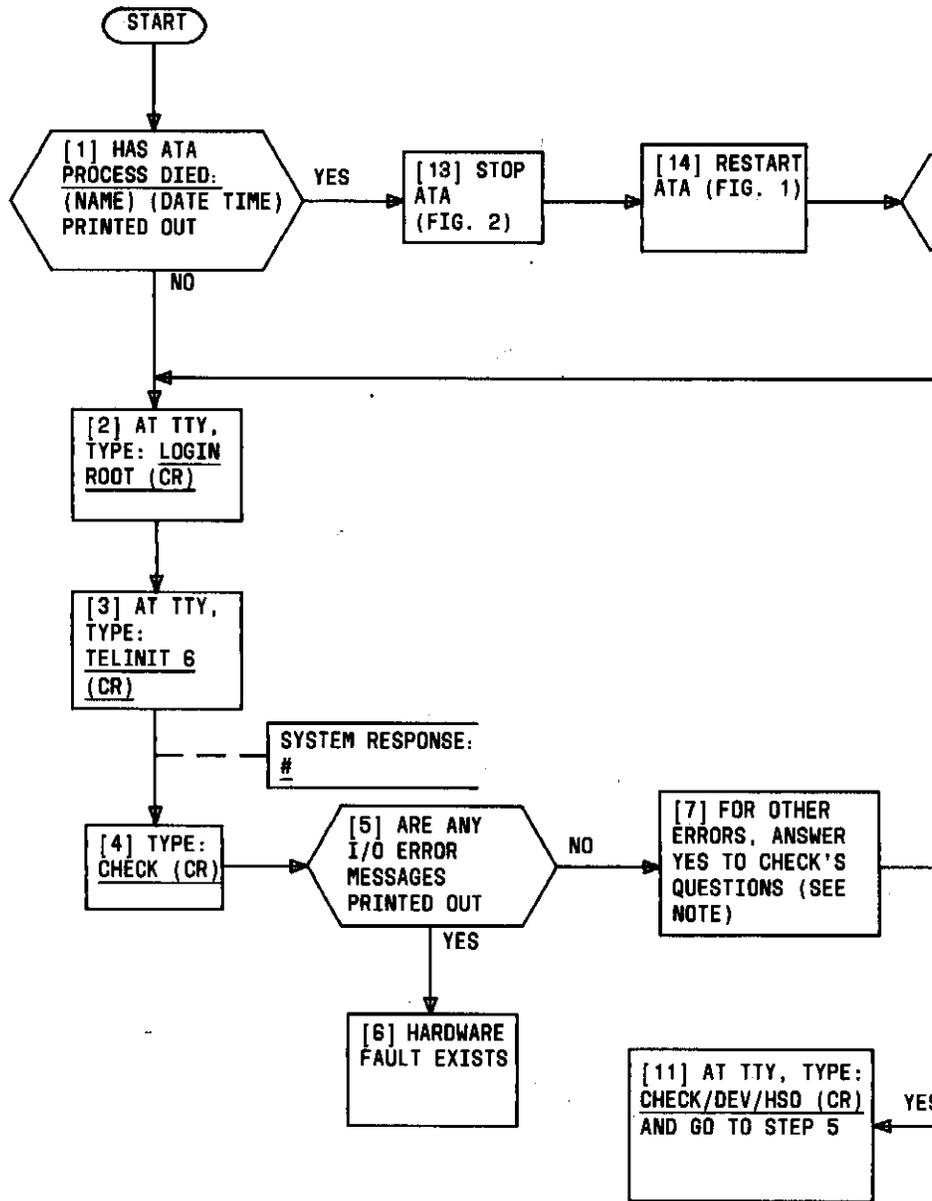
◆ Fig. 10—Complete Disk Restoral (Generic 3) ◆

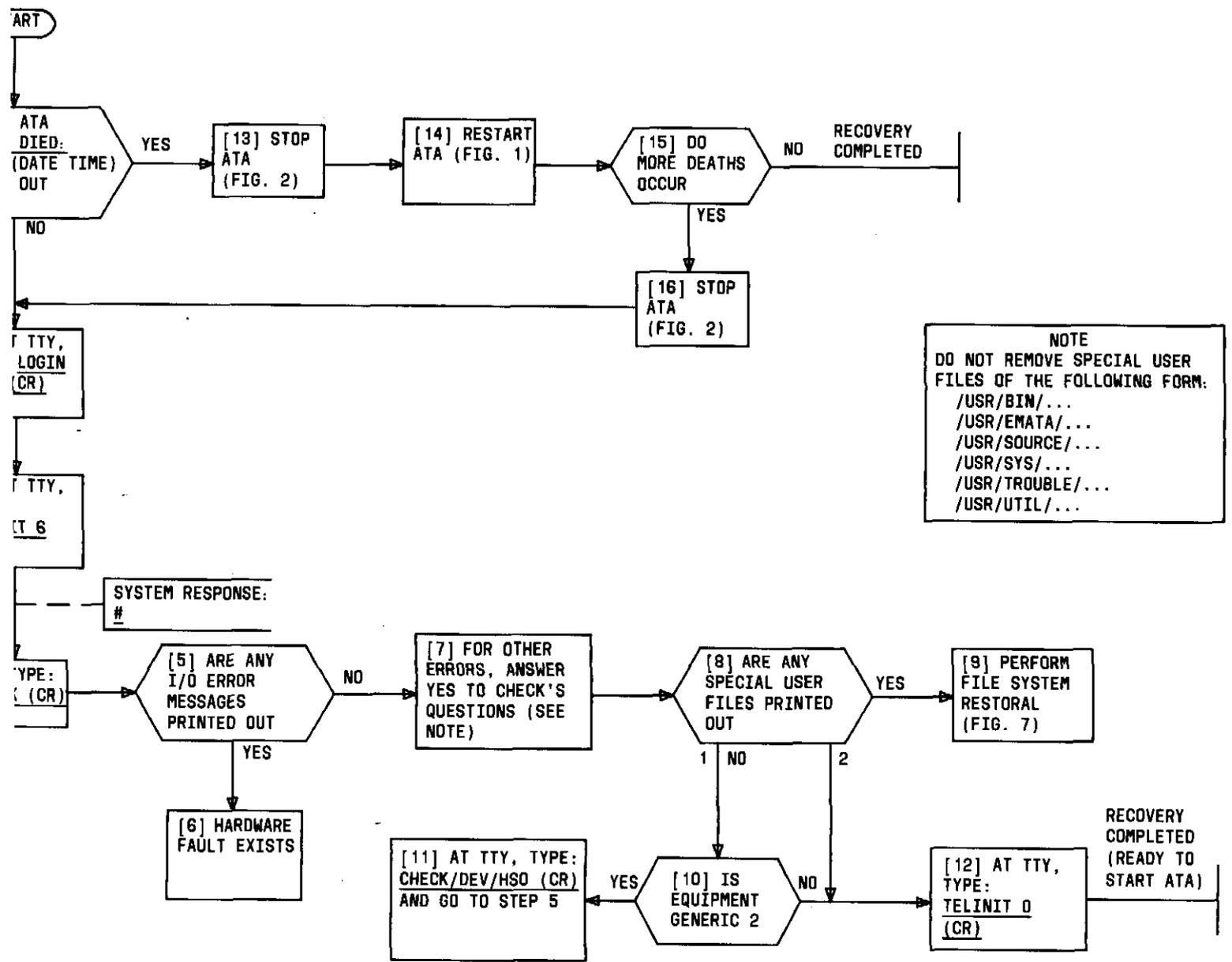




NOTE
 IF ANYTHING ABNORMAL OCCURS, STOP ATA (FIG. 2). RESTORE THE EPOCH TAKEN IN STEP 1. PERFORM PROCEDURES IN STEPS 2 THROUGH 17. IF PROBLEMS STILL EXIST, RESTORE SYSTEM USING THE EPOCH TAKEN IN STEP 1 AND ABANDON THIS UPDATE PROCEDURE

◆Fig. 11—Generic Updates◆





◆Fig. 12—System Recovery◆

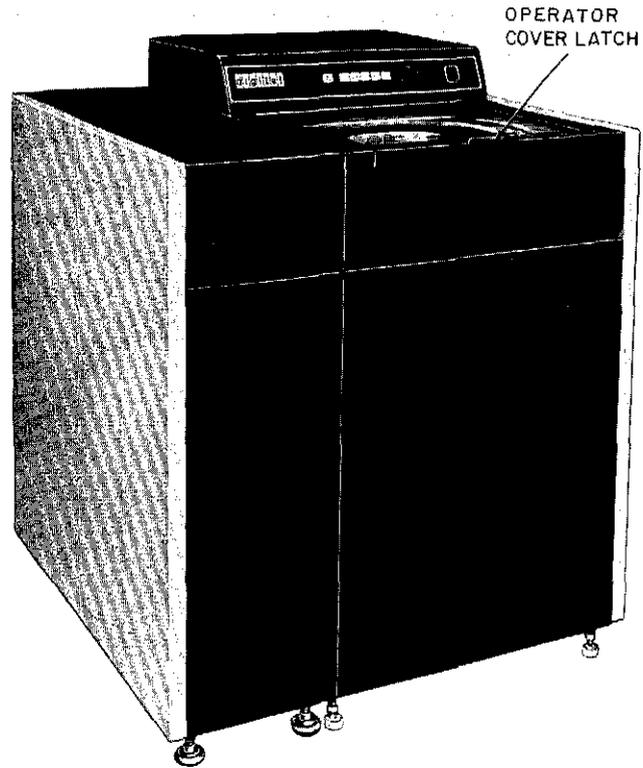


Fig. 13—RP04 Disk Pack

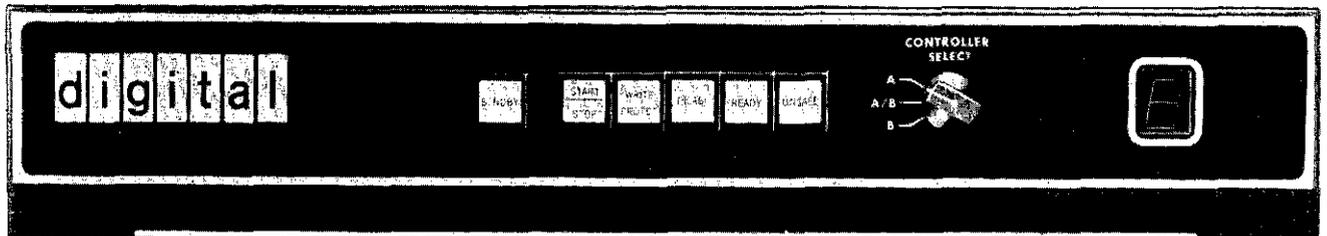


Fig. 14—RP04 Disk Pack Controls and Indicators

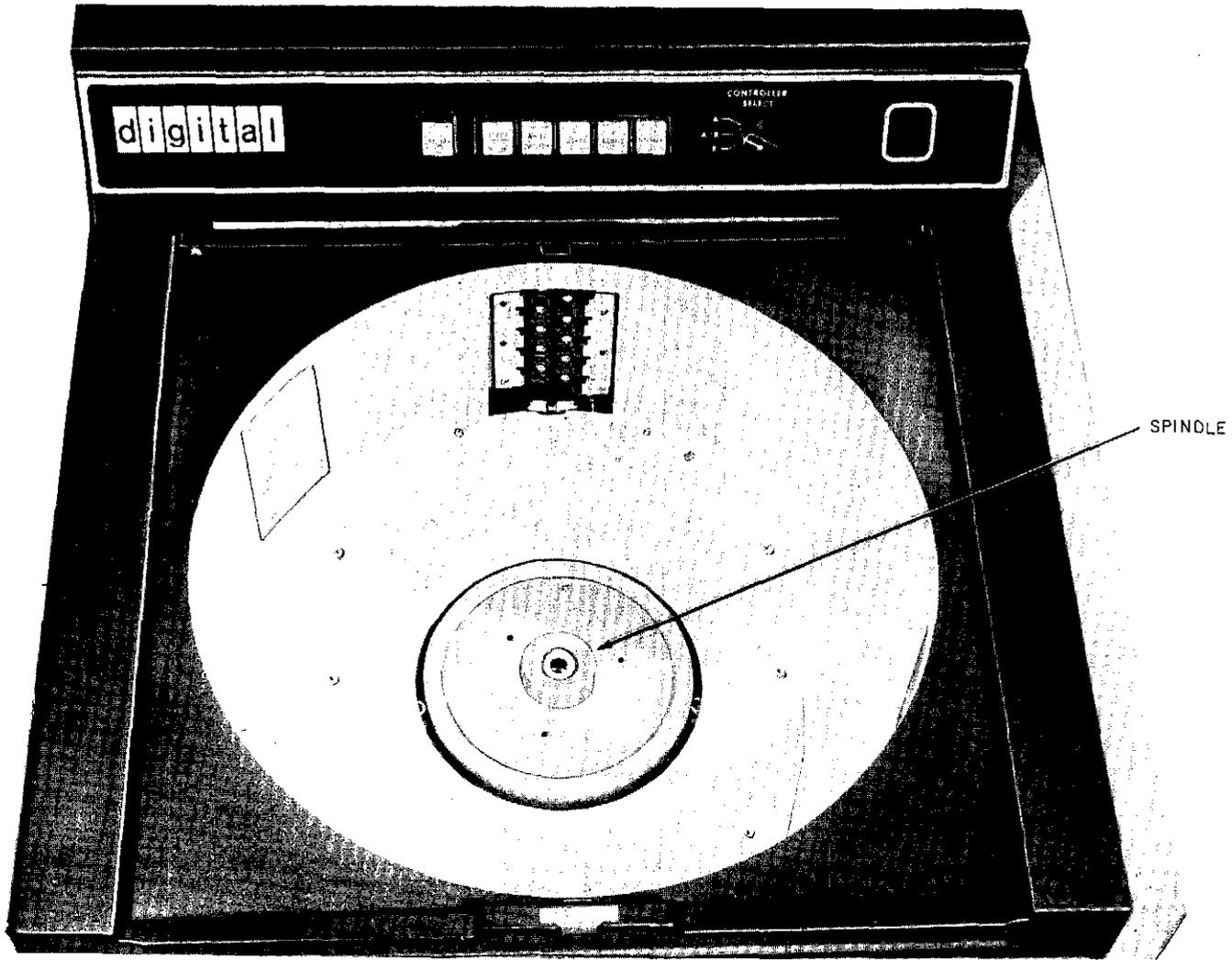


Fig. 15—RP04 Disk Pack Spindle



Fig. 16—RP04 Disk Pack Cover

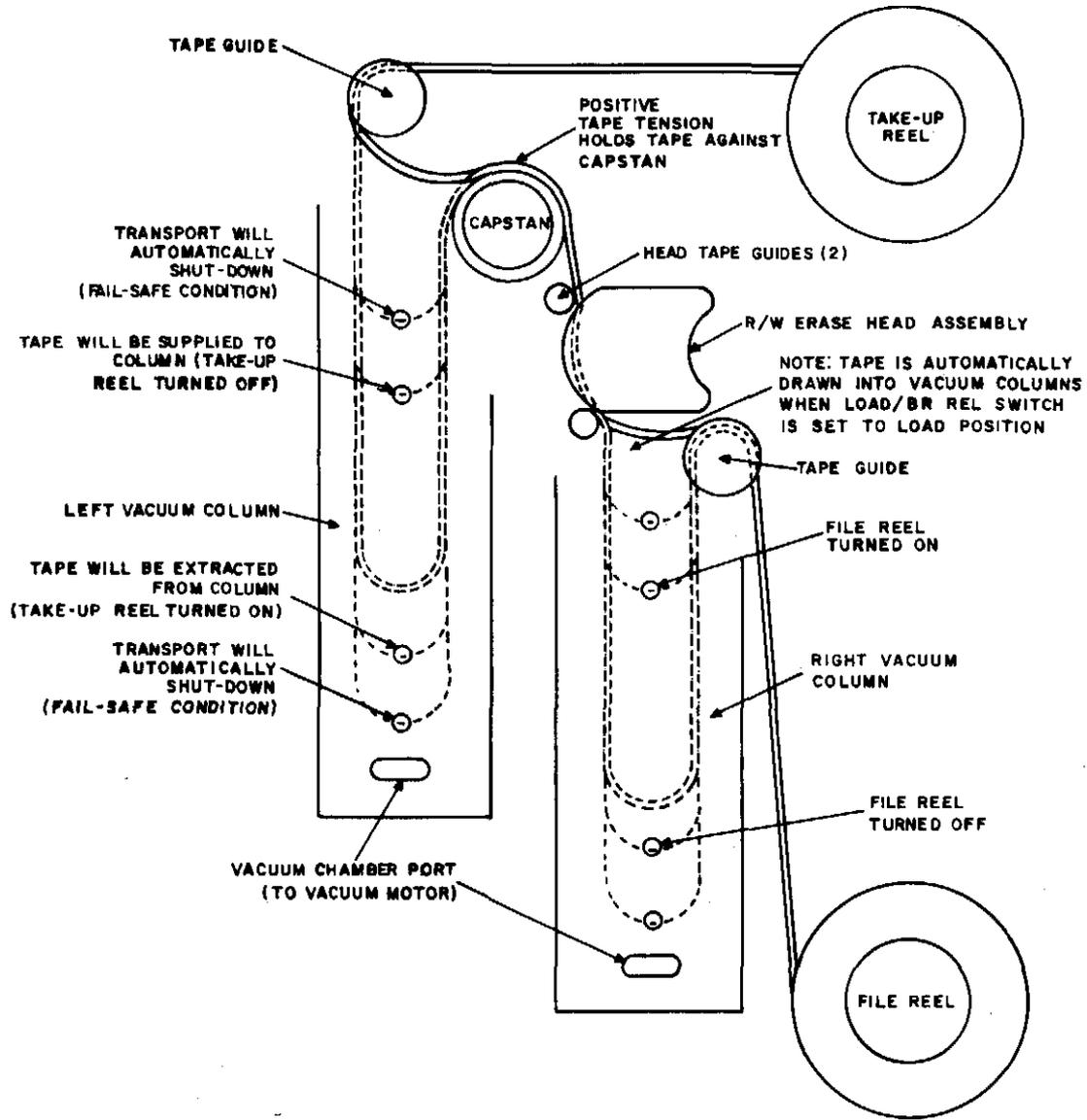


Fig. 17—DEC TU10 Magtape Threading

TABLE A

RP04 DISK PACK CONTROLS AND INDICATORS

CONTROL OR INDICATOR	FUNCTION
<p>START/STOP Switch/Indicator</p> <p>START Position</p> <p>STOP Position</p>	<p>Enables the drive power-controlled network to remotely respond to the system power control signals (sequence pick, sequence enable, and controlled ground) to execute the drive power-up and power-down sequences when a disk pack is installed, the operator cover is closed, the drive is not in a standby mode, and the primary circuit breaker (CB1) is on.</p> <p>Removes ac power from the drive motor and initiates the power off sequence.</p>
<p>STNDBY Switch/Indicator</p>	<p>The standby (STNDBY) indicator is lighted when the DCL transmits a Device IN Standby pulse to inhibit the drive ready mode, retract the heads, and stop the spindle. The operator can take the drive out of standby by operating the STNDBY switch. When the drive is in the STNDBY mode and the STNDBY switch is operated, the STNDBY indicator will extinguish and the drive will cycle up to the file ready level and light the READY indicator.</p>
<p>WRITE PROTECT Switch/Indicator</p>	<p>The WRITE PROTECT switch sets the write protect latch if the drive is not selected or when the drive is negated after the switch is set to establish the drive write protect mode. The WRITE PROTECT indicator lights when the write protect mode is established in the drive. The write protect mode prevents the execution of write commands.</p>
<p>CONTROLLER SELECT A, A/B, or B Switch</p> <p>A Position</p> <p>A/B Position</p> <p>B Position</p>	<p>Enables the dual-control A locked line on the drive/DCL (MDLI) interface.</p> <p>Asserts a high dual-control A locked line and a high dual-control B locked line on the drive/DCL (MDLI) interface.</p> <p>Enables the dual-control B locked line on the drive/DCL (MDLI) interface.</p>
<p>DISABLE Switch/Indicator</p>	<p>Operation of the DISABLE switch with the drive not selected will cause the RP04 to go off-line immediately. If the drive is selected when the DISABLE switch is operated, the drive will go off-line when the drive is negated. The DISABLE indicator is lighted when the DISABLE switch is operated. The drive may be returned to the on-line mode by restoring the DISABLE switch. When the DISABLE switch is operated, a disable switch status is asserted on the drive/DCL (MDLI) interface.</p>

TABLE A (Contd)

RP04 DISK PACK CONTROLS AND INDICATORS

CONTROL OR INDICATOR	FUNCTION
READY Indicator	The READY indicator is lighted when the power-on sequence is completed and when the drive is ready to accept commands. The READY indicator is extinguished if the START/STOP switch is operated to the STOP position, system power is dropped, or the drive is placed in the standby mode.
UNSAFE Indicator	The UNSAFE indicator is lighted when an unsafe condition exists within the drive. An unsafe condition prevents the drive from performing a read or write command. The unsafe conditions can be reset by stopping and starting the drive or by the device initialize signal. The unsafe status will be set again if the condition still exists after the power on/reset or device initialize pulse is issued.
Drive Number Display	The drive number LED display converts the binary logical address of the drive (DCL display 1, 2, and 4) into a numeric display from 0 to 7. The drive numeric address does not perform any other function in the drive.

TABLE B

DEC MAGTAPE CONTROLS AND INDICATORS

CONTROL OR INDICATOR		FUNCTION
CONTROLS	PWR ON/PWR OFF	Applies power to entire TU10. Also, supplies power to the bus terminators if the tape transport is the most remote unit on the bus.
	LOAD/BR REL LOAD Position Center Position BR REL	Enables vacuum motor, which draws tape into the buffer columns. Disables vacuum motor; brakes are full-on. Releases brakes.
	ON-LINE/OFF-LINE ON-LINE Position OFF-LINE Position	Selects remote operation. Selects local operation.
	FWD/REW/REV FWD Position REW Position REV Position	Selects, but does not initiate, forward tape motion when transport is off-line. Selects, but does not initiate, tape rewind when transport is off-line. Selects, but does not initiate, reverse tape motion when transport is off-line.
	START/STOP START Position STOP Position UNIT SELECT	Initiates tape motion selected by FWD/REW/REV switch when transport is off-line. Clears any motion commands when transport is off-line. Selects the tape transport unit by number (0-7). This number is used in the program to address the tape transport.
	INDICATORS	PWR
LOAD		Indicates that vacuum is on and the tape is loaded into the buffer columns.
RDY		Indicates that the tape transport is ready (vacuum on and settle-down delay complete); there is no tape motion.
LD PT		Indicates that the tape is at load point (beginning of tape)
END PT		Indicates that the tape is at end point (end of tape).
FILE PROT		Indicates that write operations are inhibited because the write enable ring is not mounted on the file reel.
OFF-LINE		Indicates local operation by the control box.
SEL		Indicates the tape transport is selected by the controller (program).
WRT		Indicates that the program has initiated a write operation in the tape transport.
FWD		Indicates that a forward command has been issued.
REV		Indicates that a reverse command has been issued.
REW	Indicates that a rewind command has been issued.	