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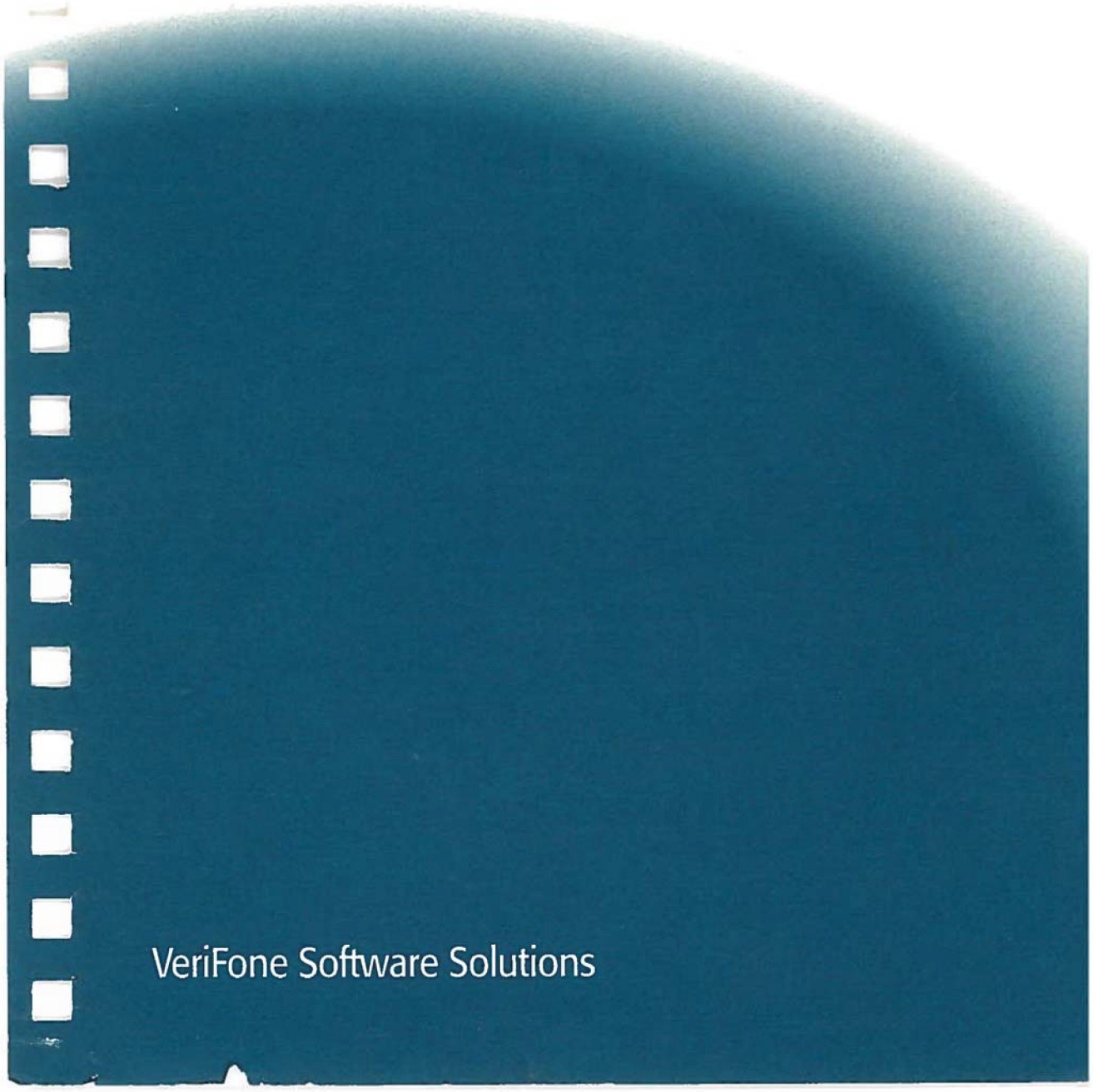
OMNI 300 Series Terminal

Programmer's Manual, Volume I



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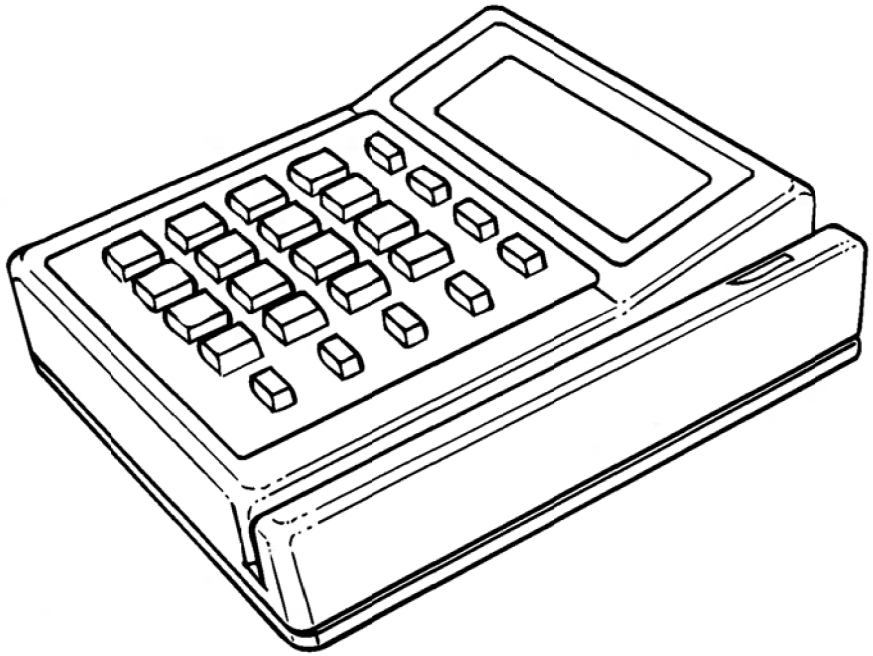
OMNI 300 Series Terminal

Programmer's Manual, Volume I

VeriFone Manual Part Number 12941, Revision B
Manual Revision 1.0
Included in software package, VeriFone Part Number 12860-02



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OMNI 300 Series Terminal Programmer's Manual, Volume I
VeriFone Part Number 12941, Revision B
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C H A P T E R

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Overview

The OMNI™ 300 Series is a family of dial-type and LAN-type transaction automation systems that are compact and efficient microcomputers capable of gathering and transferring information at high speed. Dial-type transaction automation systems are typically used as stand-alone devices which connect to host networks via modem communications. In contrast, by utilizing a single LAN gateway terminal (of the OMNI 400 Series), LAN-type transaction automation systems only require a single modem connection to the host.

❖ *The OMNI 460 terminal, an 8-bit terminal, is a member of the 300 Series terminal family.*

OMNI 300 Series terminals are 8-bit machines running the VeriFone® TXO® operating system. These terminals are ideal for a multitude of applications, including:

- Point of Sale/Service (POS)
- Electronic payment transfer and authorization
- Time and attendance tracking
- Balance reporting
- Inventory control
- Electronic reordering

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The OMNI 300 Series Terminals

OMNI 300 Series terminals are complete microcomputer-based systems, known as Transaction Automation Systems. They have the processing power and communications speed necessary for today's advanced Point of Sale/Service transaction requirements. Their hardware and software design, tailored to transaction processing, enables these systems to perform both transaction input/output and communications better than many machines with far more "computing horsepower." All system software is stored in either EPROM (firmware) or battery-backed RAM.

Terminology

Since Transaction Automation Systems generally connect to a host authorization network, they are commonly referred to as *terminals*. However, one should bear in mind that any OMNI 300 Series terminal is a stand-alone microcomputer system. For convenience, this manual will frequently refer to the OMNI 300 Series system as a *terminal*.

Also for convenience, this manual may use the phrase *OMNI 300 Series terminal* to refer to the entire family of OMNI 300 Series terminals—including the OMNI 460. See *Appendix C, Models Specifications* for a complete list of current terminals within this series.

OMNI 300 Series dial (or *Telco*) *terminals*, or simply *dial* or *dial-type models* refer to those models with an internal modem, thus capable of dialing out via telephone lines.

OMNI 300 Series LAN terminals refer to those terminals with internal VeriFone Peer-to-Peer LAN support.

Telco and LAN models are presently mutually exclusive—no OMNI 300 Series model contains both internal modem and LAN support.

TXO terminal or *OMNI terminal* refers to any system running the TXO operating system.

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Features

All OMNI 300 Series terminals incorporate the following standard features:

- Z180 CPU running at 6.144 MHz and the Z80 family of I/O devices
- 64K of EPROM firmware
- CMOS battery-backed RAM
- Card reader capable of reading IATA Track 1 and ABA Track 2 data, or ABA Track 2 and THRIFT (ISO 3554) Track 3 data
- Data entry keyboard (most models offer telco-style or calculator-style options)
- Display (segment type or LCD backlit, depending on model)
- Beeper
- PIN pad/bar code communications port
- Asynchronous serial communications port

In addition, various models offer one or more of the following communication features:

- Bell 212A/103 CCITT V.21/V.22 internal modem
- LAN port supporting VeriFone peer-to-peer protocol CSMA/CA
- Synchronous/asynchronous serial communications port

See Appendix C for a list of the current OMNI 300 Series terminal models and their basic features.

The TXO Operating System

OMNI 300 Series terminals run VeriFone's Transaction eXpress Option (TXO) operating system. TXO terminals cannot and were not designed to run applications written in VeriFone proprietary languages such as ZAPD™ and Terminal Control Language™ (TCL). TXO source code is

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usually written in the industry-standard C Programming Language (K & R version and ANSI C).

TXO applications are generally faster and more portable than proprietary applications, plus they allow the programmer to write code in a familiar and flexible language.

Programming Requirements

The programming requirements of OMNI 300 Series terminals are:

- TXO Workbench development environment package
- IBM AT or compatible computer with at least 2 megabytes of RAM
- Familiarity with the C Programming Language (K & R version and ANSI C)

TXO Workbench provides all the tools necessary to edit, compile, download and debug TXO applications. Contact your VeriFone representative for details on the TXO Workbench Package, Version 3.00, VeriFone part number P006-211-02. Your *Reference Manual* includes instructions for cabling your development PC to a target terminal.

300 Series Reference Manuals

For terminal-specific information, such as display type, programmable keys, RAM, and other features, consult the companion *Reference Manual* created for your target terminal. Contact your VeriFone representative for order information.

Each *Reference Manual* includes:

- Installation instructions
- Downloading instructions
- Terminal operations
- Terminal maintenance/remote diagnostics instructions
- Terminal specifications

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TXO Programming Products and Manuals	
Product/Manual	**Part Number**
TXO Workbench Kit, Version 3.00	P006-212-02
Includes	
Standard C Programming Language for TXO Reference Manual	11469
TXO Workbench User's Guide	11468
ZONTALK 2000	P014-104-00
Includes ZONTALK 2000 Reference Manual	10361
Application Construction Toolkit	P006-212-01
Includes AC Toolkit User's Guide	12124
OMNI 380 Reference Manual	11630
OMNI 385 LAN Reference Manual	12798
OMNI 390 Reference Manual	12679
OMNI 395 LAN Reference Manual	12849
OMNI 395 Reference Manual	12874
OMNI 480 Reference Manual	12012
OMNI 490 Reference Manual	12659

OMNI Terminal Direct Download Cables			
Direct Download Cables connect the development PC running the TXO Workbench Kit to a target terminal.			
Part Number	**Terminal**	**Type**	**Length**
00446-04	OMNI 330/380/390	DB-9	1M
00446-05	OMNI 330/380/390	DB-25	1M
03018-00	OMNI 480/490	DB-9	1M
03017-00	OMNI 480/490	DB-25	1M

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TXO Application Development Support

To assist the TXO programmer, VeriFone offers the *Application Construction Toolkit*, referred to as the "AC Toolkit." The AC Toolkit includes a collection of library functions designed to reduce the effort required to develop applications for VeriFone TXO terminals. Written and tested by VeriFone, these functions are highly efficient in both size and speed. Functions in the library leverage on each other to help minimize code size.

In addition to the library functions, the AC Toolkit includes a series of code engines to assist the programmer in data capture, ISO 8583 packet handling, modem routines, printing and report generation.

The *Application Construction Toolkit* may be ordered from your VeriFone representative. Order part number P006-212-01.

Programmer's Manual Typographic Conventions

This manual uses the following typographic conventions:

Example	Description

`char *strg;`
`int n;`
`FILE *strm;`
	The `Prestige Elite` typeface is used for source code, program examples, variable names, identifiers, or any C language token in general.

`%[*][width]`	Items in braces note optional usage, such as an optional function parameter or a command line option.

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`(stream,format [,argument...]);`	An ellipsis (a series of three dots, either in a column, or in a line) signifies that an item may be repeated any number of times.
0x7F	Hexadecimal values are normally denoted with a leading `0x` (zero, lower-case "x").
CONFIG.SYS	Terminal file system or terminal-related object is shown in the Helvetica typeface.
[CLEAR]	Keys on OMNI 300 Series terminal keyboards appear between square brackets.
PRESS ENTER	OMNI terminal display characters are shown in an LCD-style typeface.

All C language source code characters are case sensitive. For example, `fprint()` and `FPRINT()` are probably different functions. All source code punctuation must be included as shown.

❖ *"Note" paragraph marker. When you see this graphic next to a paragraph, it indicates that the paragraph contains important information relevant to the topic under discussion. Frequently, failure to follow this text will result in a programming error or other problem.*

☞ *This is an example of a "tip" paragraph marker. When you see this graphic next to a paragraph, it indicates that the following information is a useful programming tip.*

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C H A P T E R

2

System Operation

OMNI 300 Series terminals support system functions contained in EPROM. These functions include terminal diagnostics, application downloading, setting the system date and time, and other terminal setup operations. These functions are always available and may be invoked even while an application is running.

Terminal Setup

While there are different methods to set up your terminals, the TXO system is designed to make setup extremely easy. Follow these steps to set up an uninitialized terminal:

1. Apply power to the target terminal. The operating system will detect that none of the required system files exist and display the message "DOWNLOAD NEEDED." Any key press will then cause the terminal to enter into its System Mode.
2. Connect the terminal to the serial port of an IBM or IBM-compatible AT (also referred to as the "development PC"). Download the application to the terminal

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using ZONTALK 2000 software, TXO Workbench, or Direct Load. Refer to the next section regarding downloading types. Refer to the downloading software manual for information on the following:

- Creating or changing CONFIG.SYS entries. Allows you to create or change keyed file entries in the terminal's CONFIG.SYS area.
- Time zone correction. Allows you to offset the target terminal's time relative to the PC's time stamp; for example if the programming PC resides in the Pacific time zone while the terminal is to be deployed in the Central time zone.
- Change the terminal's system password. Lets you change the target terminal's current password during the downloading session.

3. Press [#] on the terminal keypad to prepare the terminal for downloading.

4a. If you are sending a full download, start the download on the PC side.

4b. If you are sending a partial download, press the [*] key to indicate a partial download. Start the download on the PC side.

5. When completed, the terminal will show the results of the download:

`DOWNLOAD DONE`	Neither password nor clock was set
`DOWNLOAD DONE C`	Clock was set
`DOWNLOAD DONE P`	Password was set
`DOWNLOAD DONE CP`	Both clock and password were set

or

`DOWNLOAD FAILED`

6. If the download is successful, press the [CLEAR] key to exit the System Mode. If the download failed, any key press will reset the terminal to receive another download.

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Application and File Downloading

OMNI 300 Series firmware supports several methods of downloading application, data and configuration files to the terminal. These methods are described below.

Direct Download

A direct download uses a cabled RS-232 communications link between the development PC and a target terminal. The PC program Direct Load (DL.EXE, included in TXO Workbench), controls the download. Direct Load can be initiated from within the Workbench environment or from the DOS prompt. Consult the TXO Workbench manual for instructions.

Direct Load supports full or partial downloading and CONFIG.SYS manipulation. The date, time, and system password may be set via download.

ZONTALK 2000 Download

ZONTALK 2000 enables telephone-initiated downloading via asynchronous dial communications (for dial-type models) or direct connection. You must first install the ZONTALK 2000 download software (using Version 2.0 or newer) on your PC. Refer to the *ZONTALK 2000 Reference Manual*, VeriFone Part Number 10361, for installation and download instructions.

ZONTALK 2000 supports both full and partial downloading and setting CONFIG.SYS file entries. The date, time, and system password may be set via ZONTALK 2000 downloading.

ZONTALK 2000 downloads are capable of successively downloading identical applications to several terminals in a short period of time without end user action.

Terminal-to-Terminal Download

OMNI 300 Series firmware supports terminal-to-terminal downloads, in which the memory image of the sending

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terminal is copied to a receiving terminal. In addition, the date, time, and system password are set in the receiving terminal. Consult your terminal's *Reference Manual* for complete information on terminal-to-terminal downloading.

❖ *Terminal-to-terminal downloads may only be made between identical terminals having the same firmware and RAM size.*

LAN Download

OMNI 300 Series LAN terminals support application downloads via the LAN port. Prior to beginning the download, each terminal must have a particular set of parameters present in its CONFIG.SYS file. LAN downloading is covered in detail in *Chapter 10, OMNI Peer-to-Peer LAN.* Also, consult your terminal's *Reference Manual* for more information on LAN downloads.

Application-Initiated Download

Terminal applications may be programmed to initiate ZONTALK 2000 downloads (full or partial) by using the following service call:

```
result = SVC_ZONTALK(x);
```

where x is "F" for FULL download and "P" or "p" for PARTIAL. The FULL and PARTIAL (uppercase "P") downloads, when successful, force a restart of the application; the PARTIAL download specified by a lowercase "p" allows the application to resume execution. This "download and resume" feature allows partial downloads which are transparent to the end user.

If the download fails, the terminal displays a message indicating that the user must manually enter System Mode and initiate the download.

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Terminal Startup Sequence

This section describes the events that occur during terminal startup. First the normal startup sequence is presented, second a flowchart of startup events including error handling is presented, third an overview of error messages is given, and lastly a detailed description of the startup sequence with errors is provided.

When you have a problem:

1. Check the "Error Messages Overview" on page 2-18 for a list of startup error messages with brief explanations.
2. Look at the flowchart. Error messages are usually located to the right of the main flow sequence.
3. See "Startup Sequence If Errors" on page 2-18 for detailed information.

Startup Sequence If No Errors

When the terminal is started (on power up or system restart), the operating system executes the following startup sequence:

1. Check RAM
2. If graphic display terminal, display font ROM ID
3. Display EPROM ID
4. Perform EPROM checksum
5. Check file system initialization
6. Check file system "links" (Version 11 or newer)
7. Check CONFIG.SYS CHECKSUM entry
8. Verify any downloaded device driver(s)
9. Check CONFIG.SYS *CHN application restart entry (only Version 11 or earlier can set this)
10. Check CONFIG.SYS *GO application startup entry
11. Validate application header and checksum
12. Validate file checksums (conditional)
13. Check if application code file size is greater than zero
14. Display EPROM ID and application ID
15. Check application EM version

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16. Validate application stack size and CONFIG.SYS *S entry
17. Initialize data region, clear it to zeros, start the application

This sequence is interrupted if the firmware detects an error during startup.

Flowcharts of Startup Sequence

Use the following flowcharts as a quick visual guide.

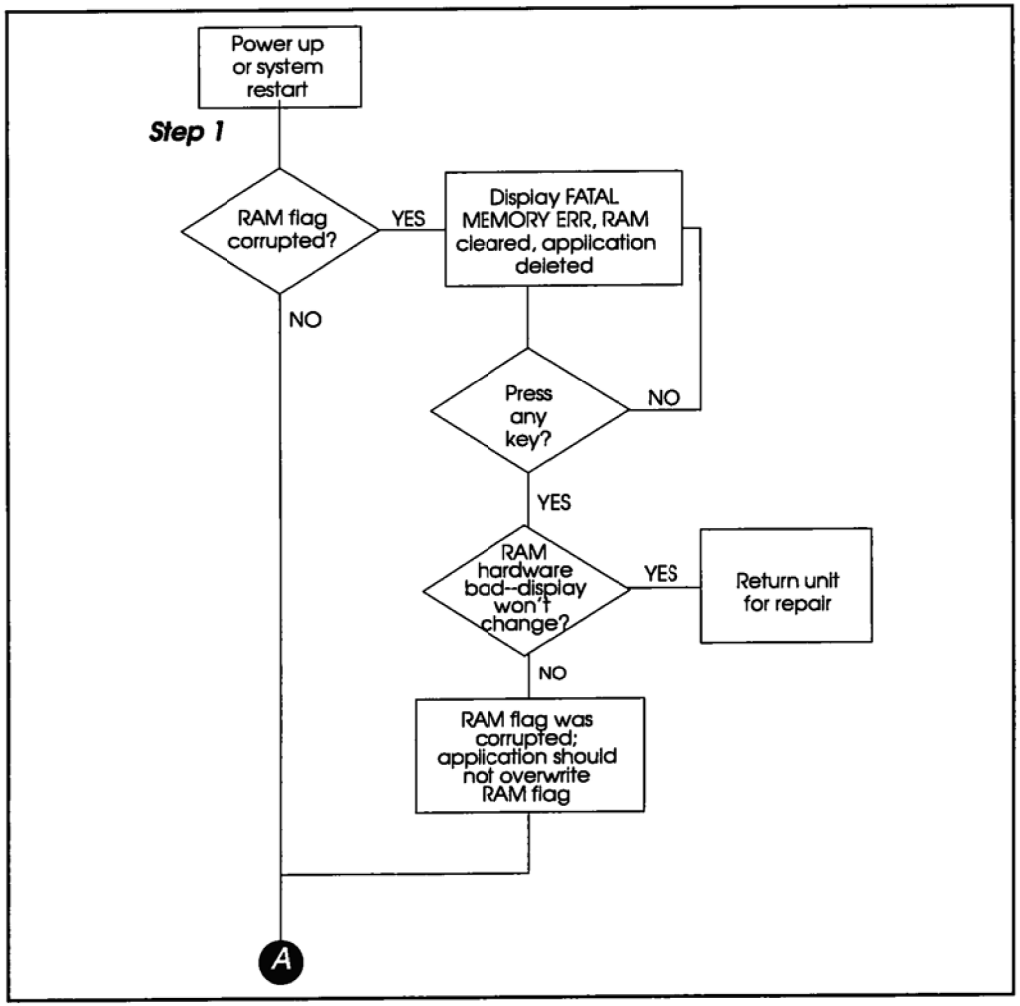

Figure 2-1. Flowchart of Startup Sequence (1 of 10)

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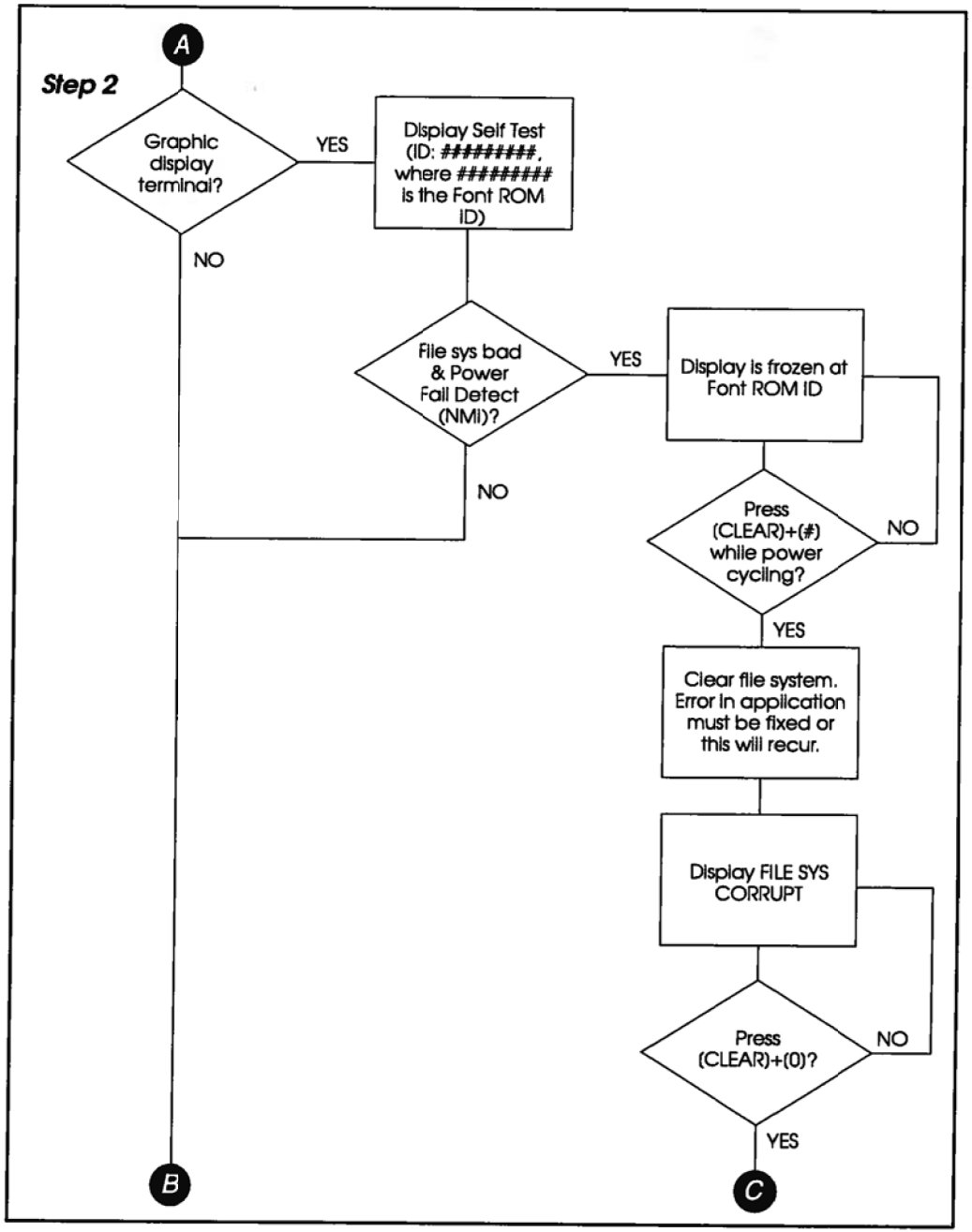

Figure 2-1. Flowchart of Startup Sequence (2 of 10)

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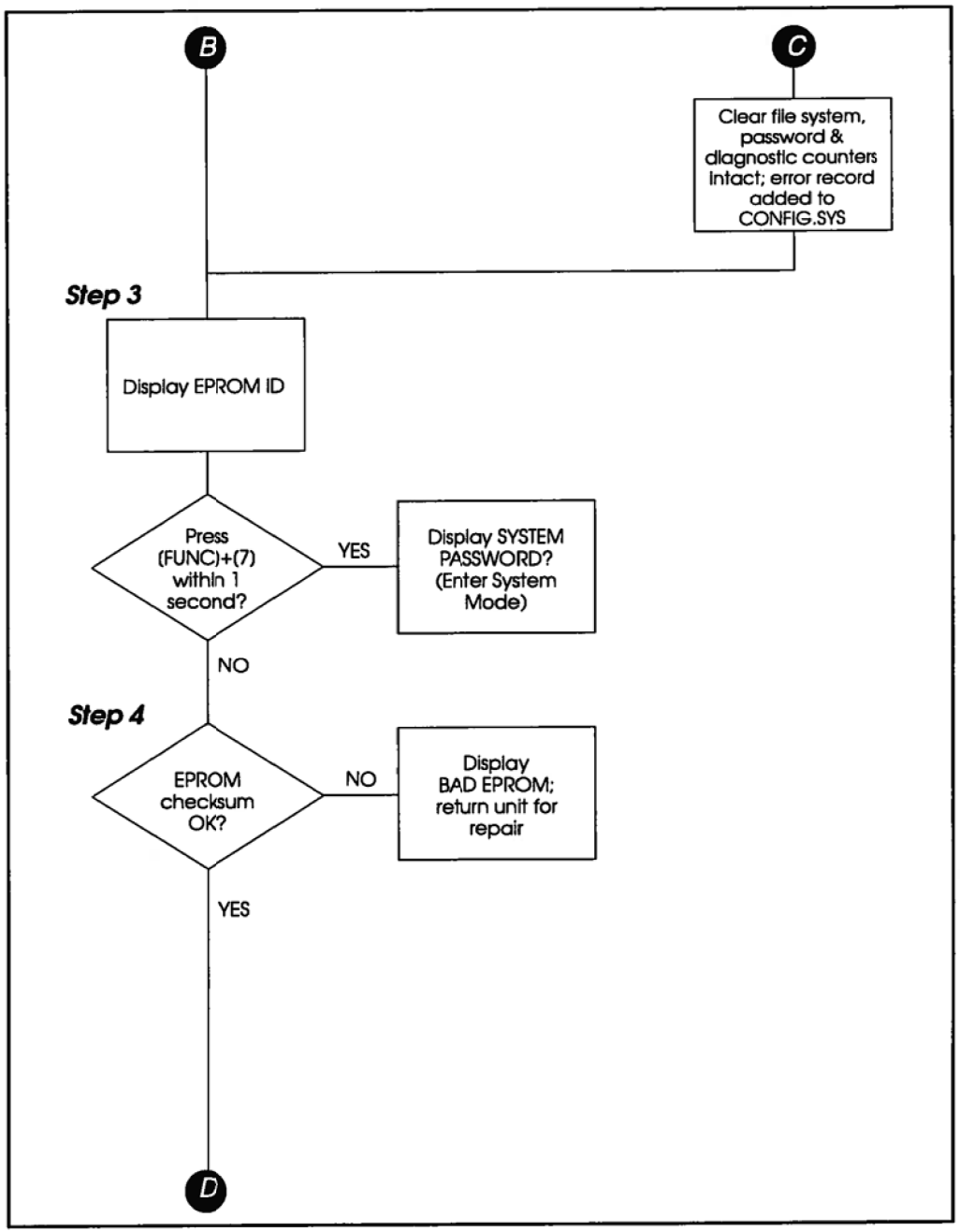

Figure 2-1. Flowchart of Startup Sequence (3 of 10)

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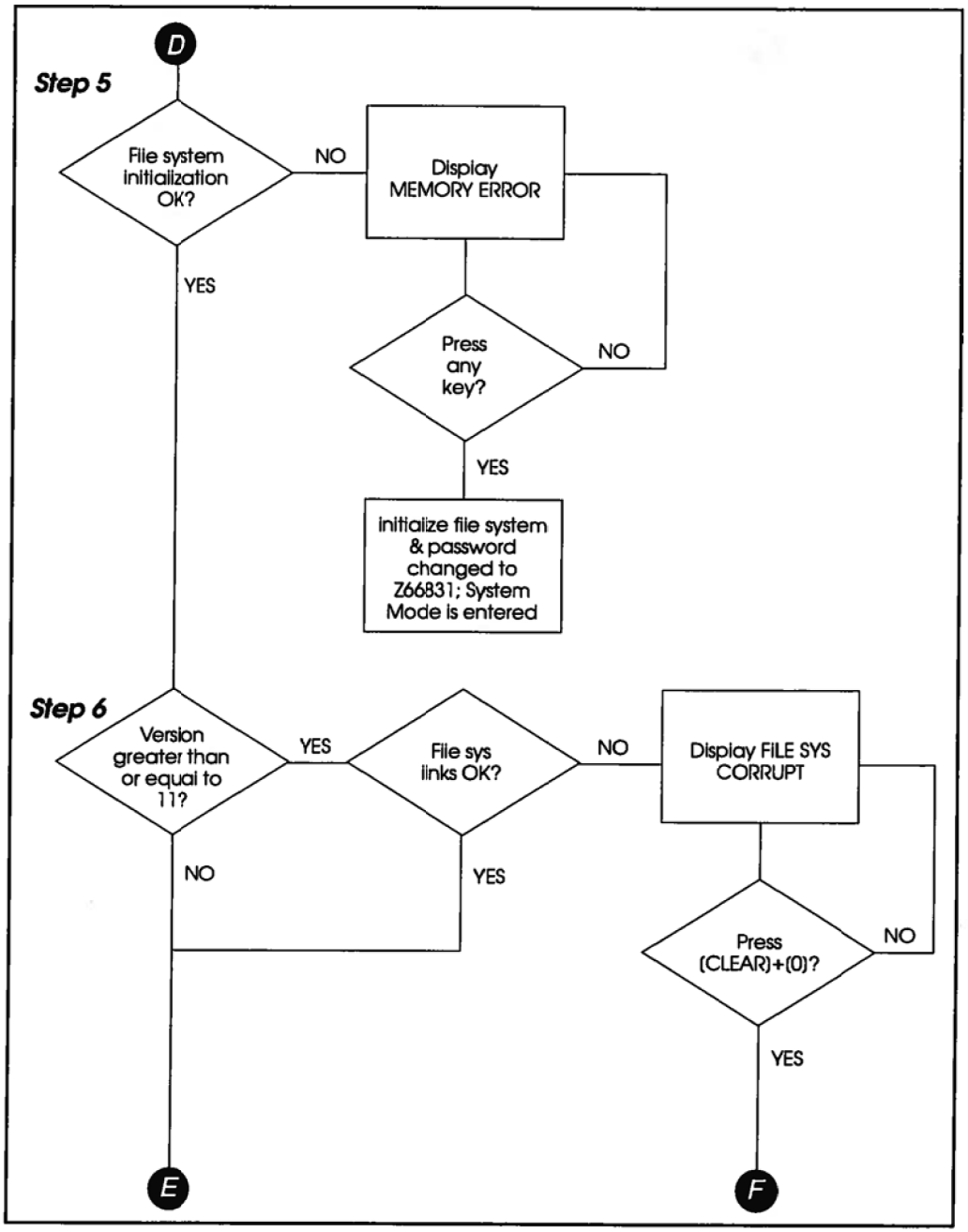

Figure 2-1. Flowchart of Startup Sequence (4 of 10)

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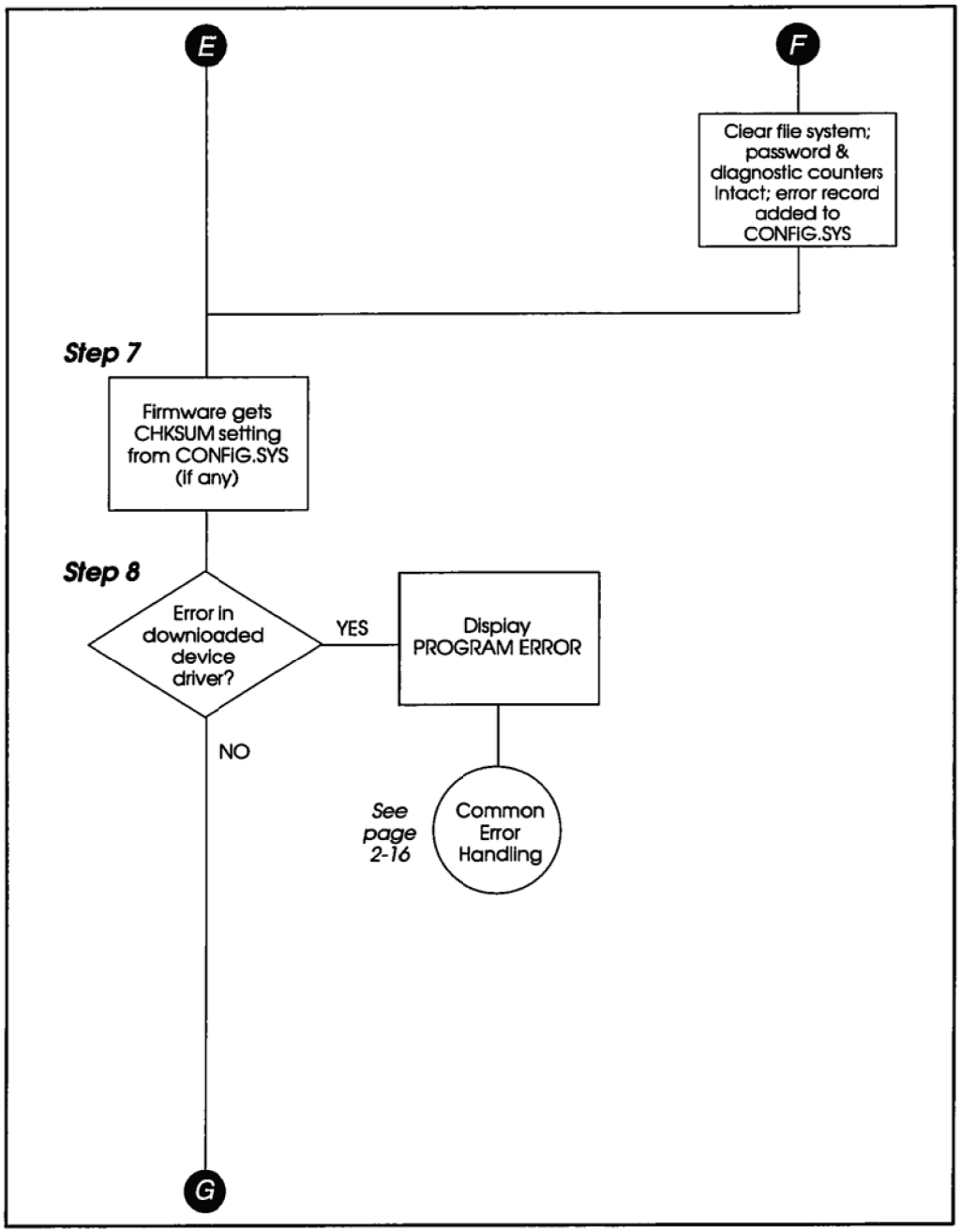

Figure 2-1. Flowchart of Startup Sequence (5 of 10)

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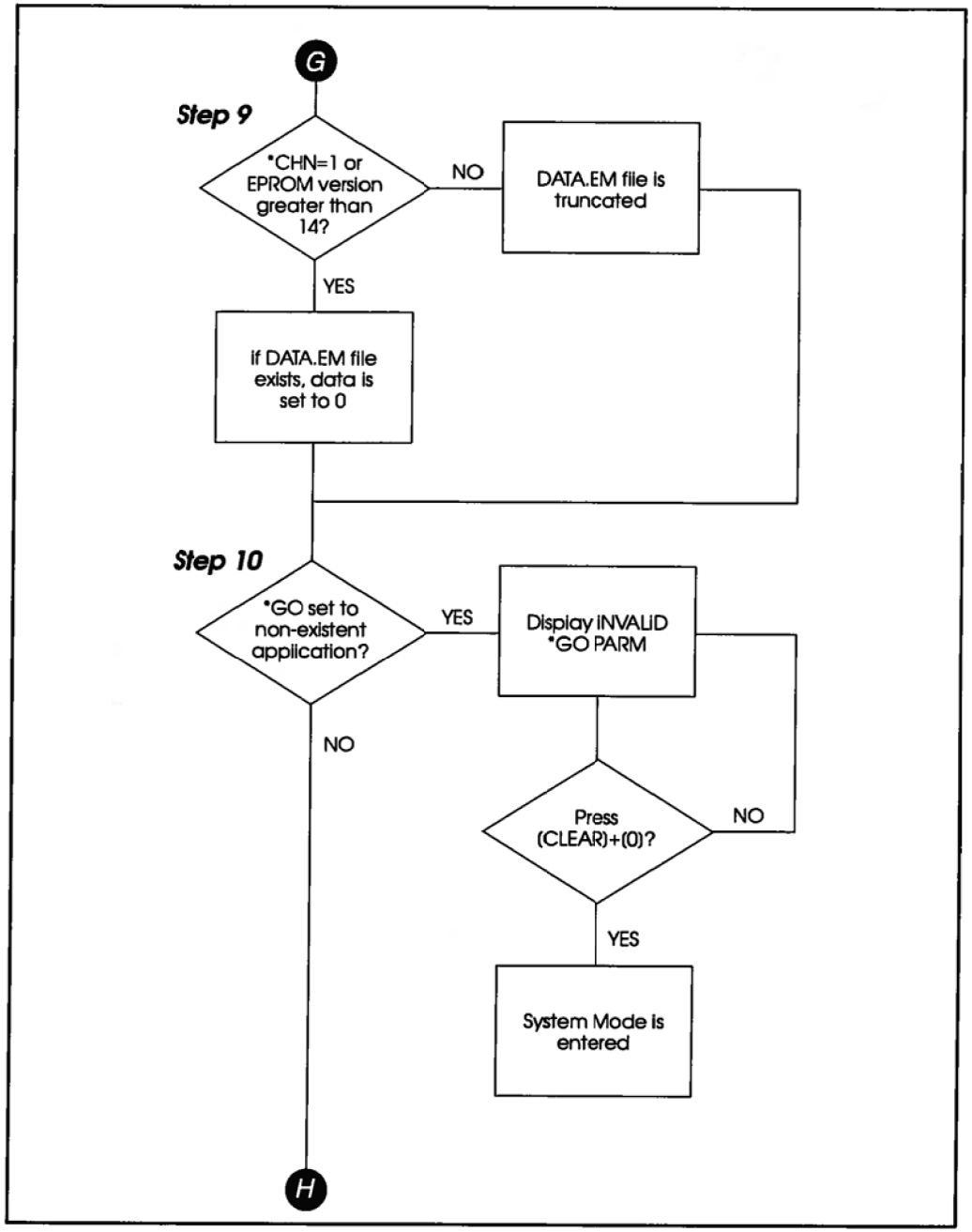

Figure 2-1. Flowchart of Startup Sequence (6 of 10)

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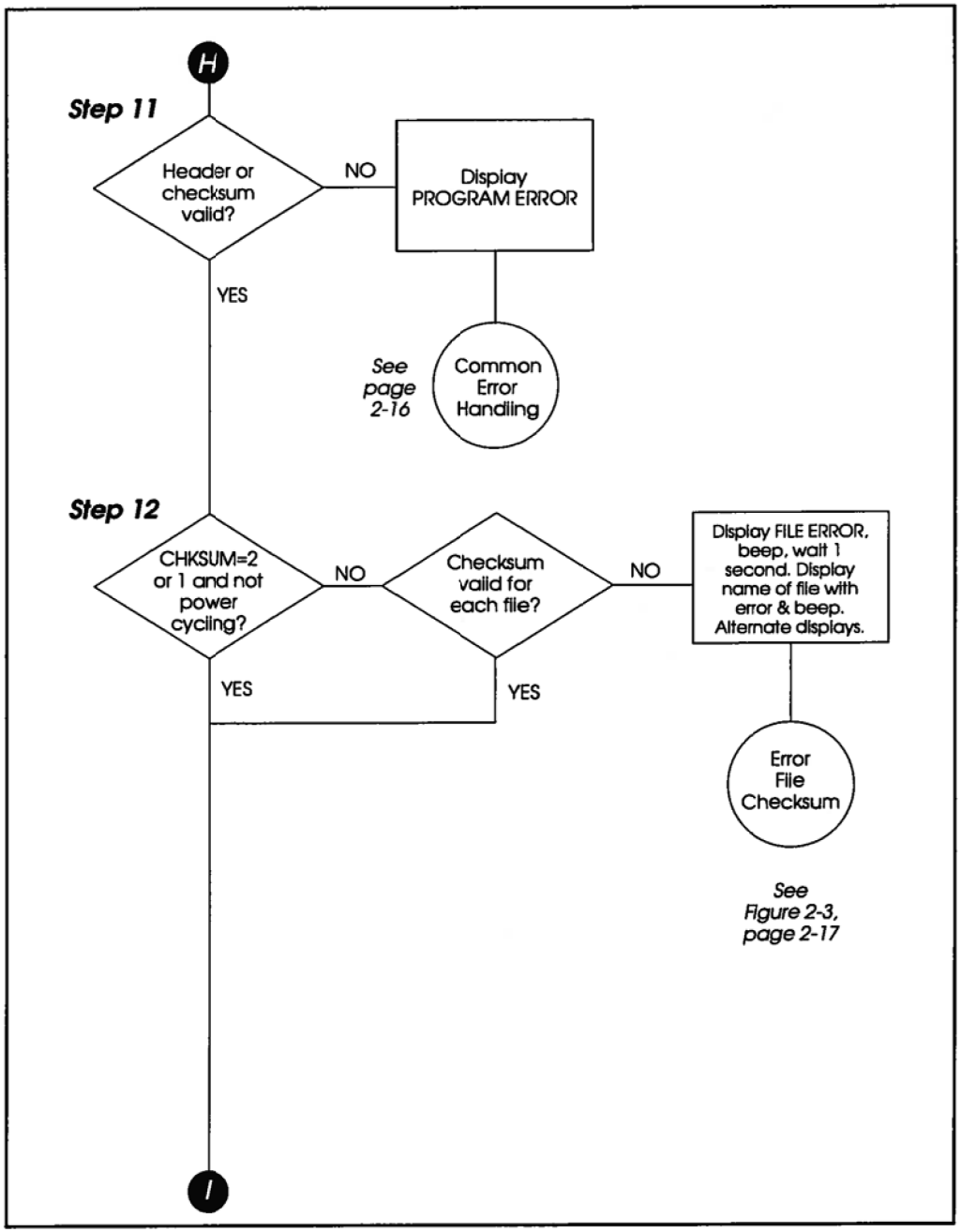

Figure 2-1. Flowchart of Startup Sequence (7 of 10)

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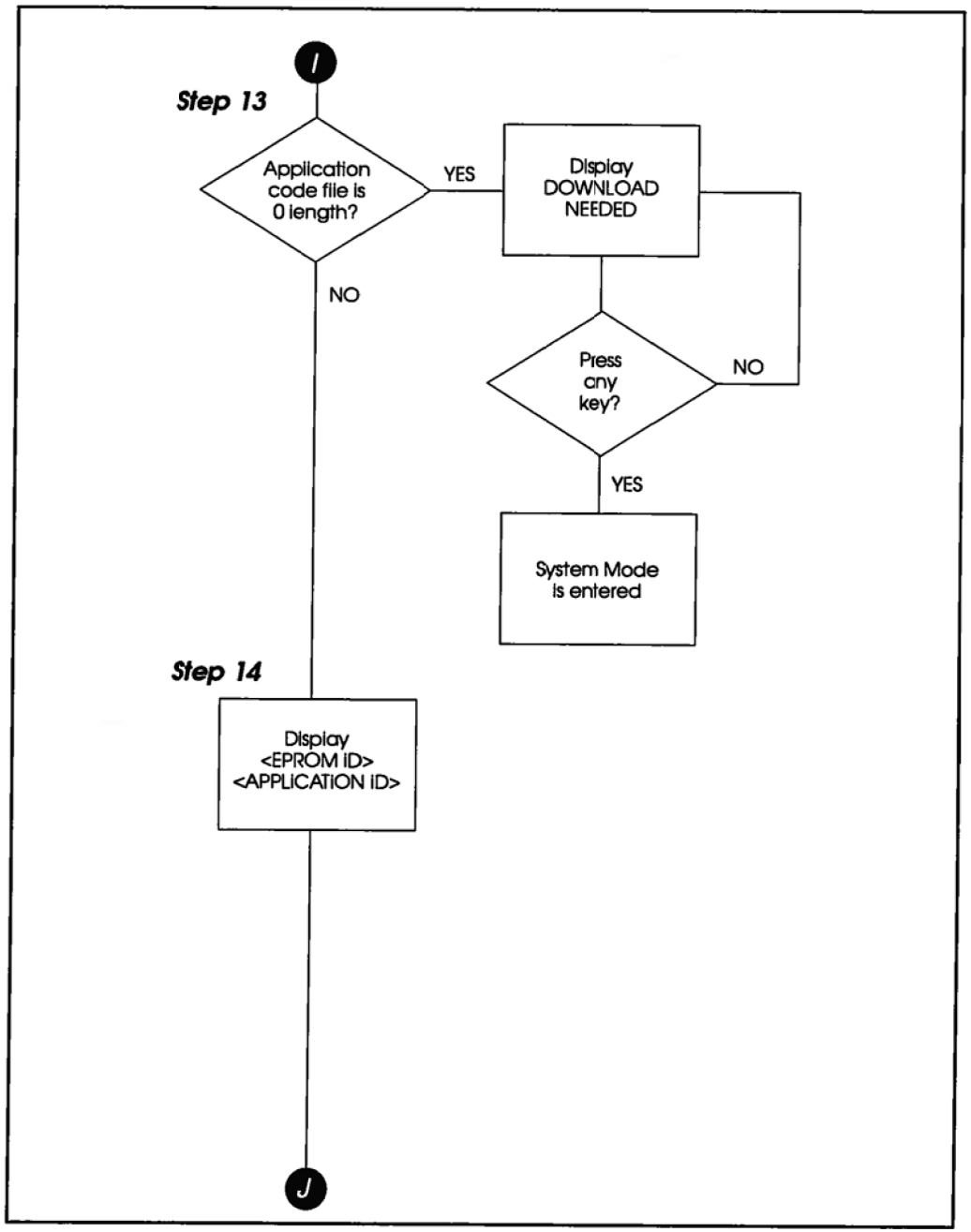

Figure 2-1. Flowchart of Startup Sequence (8 of 10)

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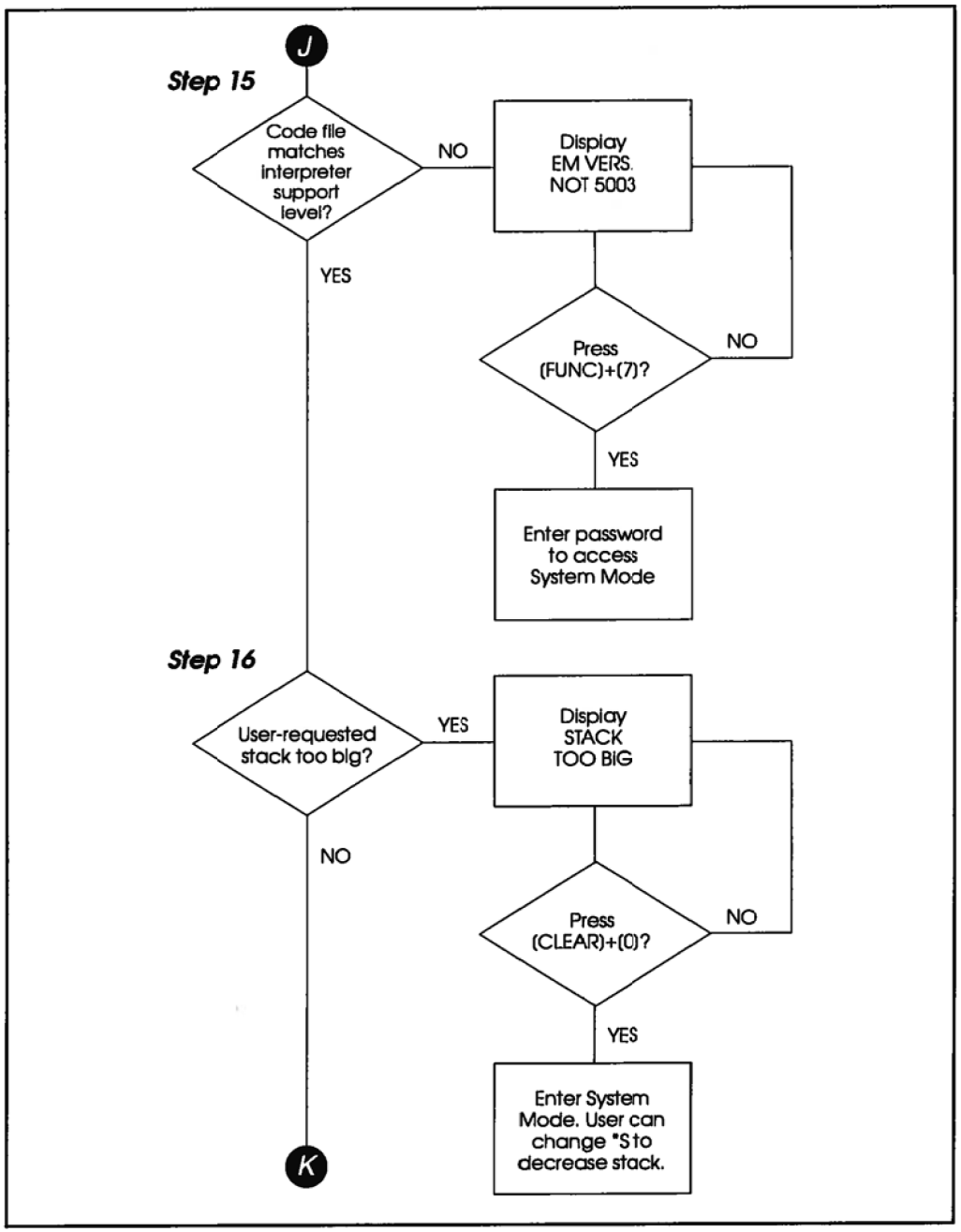

Figure 2-1. Flowchart of Startup Sequence (9 of 10)

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