ZapCode II Handbook

A Guide to Electronic ROM-code Transmittal

intel®

ZapCode II Handbook

December 1995

Contact your local Intel sales office or your distributor to obtain the latest specifications before placing your product order.

Copies of documents which have an ordering number and are referenced in this document, or other Intel literature, may be obtained from:

Intel Corporation
Literature Sales
P.O. Box 7641
Mt. Prospect, IL 60056-7641

or call 1-800-879-4683

FIGURES

TABLES

1

Guide to This Manual

CHAPTER 1
GUIDE TO THIS MANUAL

This manual describes the installation and use of ZapCode II, a software package that enables you to transmit ROM code electronically to Intel. It also includes lists of available commercial and automotive products.

This chapter describes what you'll find in this manual, lists other documents that may be useful, and explains how to access the support services we provide to help you complete your design.

1.1 MANUAL CONTENTS

This manual has 9 chapters, 2 appendixes, and an index.

This chapter, Chapter 1, provides an overview of the manual. This section summarizes the contents of the remaining chapters and appendixes. The remaining sections of this chapter provide references to related documentation, describe customer support services, and explain how to access information and assistance.

- Chapter 2 — ZapCode II Overview — describes ZapCode II and the process for using it. The chapter describes how to get started and lists the minimum hardware and software requirements for using ZapCode II.
- Chapter 3 — Product Options — describes the available 8-bit and 16-bit microcontrollers and features such as temperature and burn-in options and available package types.
- Chapter 4 — Code Security Features — contains security information for 8-bit and 16-bit microcontrollers.
- Chapter 5 — Specify the Part Marking — contains the part-marking guidelines for your device.
- Chapter 6 — Select a Packing Method — describes the packing methods available to protect your product during shipment from the factory.
- Chapter 7 — Install or Delete ZapCode II — provides the instructions for installing and deleting the ZapCode II software on your computer, for completing the Initial Setup, for using the online training course, for completing and updating your Customer Profile, and for downloading a copy of this manual.
- Chapter 8 — Transmit and Verify the ROM Code — provides the instructions for using ZapCode II to transmit your ROM code to Intel, including checksum verifications before and after the transmittal.
- Chapter 9 — Place Your Order — provides information for placing your order with your Intel distributor or sales office.
- Appendix A — Product Order Form — contains a form that can be photocopied and used as a checklist when preparing to order a product using ZapCode II.

- Appendix B — ROM Code Hex File Description — functionally describes a ROM-code hex file.
- Index — lists key topics with page number references.

1.2 RELATED DOCUMENTS

Table 1-1 lists additional documents that you may find useful.

Table 1-1. Related Documents

Title and Description	Order Number
Packaging manual	240800
Shipping and Packaging data sheet	240822
Automotive Handbook	231792
Embedded Microcontrollers manual	270646
8XC196KC/8XC196KD User's Manual	272238
8XC196Kx, 8XC196Jx, 87C196CA Microcontroller Family User's Manual	272258
8XC196NT Microcontroller User's Manual	272317
8XC196NP, 80C196NU User's Manual	272479
MCS® 48 Microcontroller Family User's Manual	272382
MCS® 51 Microcontroller Family User's Manual	272383
8XC51SA, 8XC51SB, 8XC51SP, 8XC51SQ Embedded Microcontroller Family User's Manual	272795

In addition to the documents listed in Table 1-1, the U.S. Customer Literature Guide (order number 210620) and International Literature Guide (order number E00029) contain up-to-date lists of literature related to Intel products. Refer to "Product Literature" on page 1-5 for ordering information.

1.3 ELECTRONIC SUPPORT SYSTEMS

Intel's FaxBack* service and application BBS provide up-to-date technical information. We also maintain several forums on CompuServe* and offer a variety of information on the World Wide Web. These systems are available 24 hours a day, 7 days a week, providing technical information whenever you need it.

1.3.1 FaxBack Service

FaxBack is an on-demand publishing system that sends documents to your fax machine. You can get product announcements, change notifications, product literature, device characteristics, design recommendations, and quality and reliability information from FaxBack 24 hours a day, 7 days a week.

1-800-525-3019	U.S. and Canada
916-356-3105	U.S., Canada, Japan, Asia Pacific
+44-1793-432509	Europe

Think of the FaxBack service as a library of technical documents that you can access with your phone. Just dial the telephone number and respond to the system prompts. After you select a document, the system sends a copy to your fax machine.

Each document is assigned an order number and is listed in a subject catalog. The first time you use FaxBack, you should order the appropriate subject catalogs to get a complete listing of document order numbers.

Catalogs are updated twice monthly. In addition, daily update catalogs list the title, status, and order number of each document that has been added, revised, or deleted during the past eight weeks. The daily update catalogs are numbered with the subject catalog number followed by a zero. For example, for the complete microcontroller and flash catalog, request document number 2; for the daily update to the microcontroller and flash catalog, request document number 20.

The following catalogs and information are available at the time of publication:

1. *Solutions OEM* subscription form
2. Microcontroller and flash catalog
3. Development tools catalog
4. Systems catalog
5. Multimedia catalog
6. Multibus and iRMX® software catalog and BBS file listings
7. Microprocessor, PCI, and peripheral catalog
8. Quality and reliability and change notification catalog
9. iAL (Intel Architecture Labs) technology catalog

1.3.2 Bulletin Board System (BBS)

The bulletin board system (BBS) lets you download files to your computer. The application BBS has the latest *Ap*BUILDER software, hypertext manuals and datasheets, software drivers, firmware upgrades, application notes and utilities, and quality and reliability data.

916-356-3600	U.S., Canada, Japan, Asia Pacific (up to 19200 baud)
916-356-7209	U.S., Canada, Japan, Asia Pacific (2400 baud only)
44(0)1793-496340	Europe

The toll-free BBS (available in the U.S. and Canada) offers lists of documents available from FaxBack, a master list of files available from the application BBS, and a BBS user's guide. The BBS file listing is also available from FaxBack (catalog number 6; see page 1-2 for phone numbers and a description of the FaxBack service).

1-800-897-2536	U.S. and Canada only

Any customer with a modem and computer can access the BBS. The system provides automatic configuration support for 1200- through 19200-baud modems. Typical modem settings are 14400 baud, no parity, 8 data bits, and 1 stop bit (14400, N, 8, 1).

To access the BBS, just dial the telephone number and respond to the system prompts. During your first session, the system asks you to register with the system operator by entering your name and location. The system operator will set up your access account within 24 hours. At that time, you can access the files on the BBS.

NOTE

If you encounter any difficulty accessing the high-speed modem, try the dedicated 2400-baud modem. Use these modem settings: 2400, N, 8, 1.

1.3.3 CompuServe* Forums

The CompuServe forums provide a means for you to gather information, share discoveries, and debate issues. Type “go intel” for access. For information about CompuServe access and service fees, call CompuServe at 1-800-848-8199 (U.S.) or 614-529-1340 (outside the U.S.).

1.3.4 World Wide Web

NOTE

ZapCode II can now be downloaded over the Internet from Intel’s World Wide Web site. Using this service will reduce from days to minutes the time it takes to obtain the ZapCode II software and handbook. This service is designed to increase your productivity by reducing the time it takes to get your ROM code into production.

To access Intel’s Web site and download the ZapCode II software and handbook, follow these steps:

1. Start your browser, such as Netscape or Mosaic.
2. Point your browser to the Intel home page (**http://www.intel.com/).**
3. Select “Embedded Design Products” when the home page displays.
4. Click on the Search button located at the bottom of the page (scrolling may be necessary).
5. Perform a search using the keyword **ZapCode**.
6. Download the software and the handbook when they are located.

At the time this handbook was published, the Intel Web site was being revised. The next version of this handbook will provide more specific instructions for locating and downloading ZapCode II. If you have any difficulty locating or downloading either the software or the handbook in the interim, please contact your distributor or sales office for assistance.

1.4 TECHNICAL SUPPORT

In the U.S. and Canada, technical support representatives are available to answer your questions between 5 a.m. and 5 p.m. PST. You can also fax your questions to us. (Please include your voice telephone number and indicate whether you prefer a response by phone or by fax.) Outside the U.S. and Canada, please contact your local distributor.

1-800-628-8686	U.S. and Canada
916-356-7599	U.S. and Canada
916-356-6100 (fax)	U.S. and Canada

1.5 PRODUCT LITERATURE

You can order product literature from the following Intel literature centers.

1-800-548-4725	U.S. and Canada
708-296-9333	U.S. (from overseas)
44(0)1793-431155	Europe (U.K.)
44(0)1793-421333	Germany
44(0)1793-421777	France
81(0)120-47-88-32	Japan (fax only)

2

ZapCode II Overview

CHAPTER 2
ZAPCODE II OVERVIEW

ZapCode II software is used to transmit your ROM code electronically to Intel. It is designed for ease of use, and can reduce time-to-market by shrinking design and verification time for the product and the ROM code you have written for it. It also reduces administrative costs because the software and the modem phone call are free. This chapter describes the software and the minimum hardware and software requirements to support it, and previews the ordering process.

2.1 SOFTWARE OVERVIEW

ZapCode II software is written in a Windows* software-based graphical user interface (GUI) design using Client SQL* Server technology.

The ZapCode II menu-driven software includes the following:

- a tutorial
- a field-sensitive help function
- an up-to-date electronic copy of this handbook

ZapCode II screens use prompts and field-sensitive help to guide you through the process of transmitting your product order and code to Intel. The software includes an on-line training course that lets you preview the ZapCode II software screens and learn how to interact with the software.

2.2 HARDWARE AND SOFTWARE REQUIREMENTS

You must have the following minimum hardware and software to use ZapCode II:

- an IBM AT-compatible personal computer with at least an Intel386™ microprocessor
- 2MB RAM memory
- 4MB of free hard drive space
- a Hayes-compatible 2400 baud modem (9600 or higher recommended) installed on your computer's Com 1 or Com 2 port
- an analog telephone line (tone or dial)
- DOS software, version 6.*x* or greater
- Windows software, version 3.1 or greater

2.3 PROCESS OVERVIEW

ZapCode II software is used to transmit electronically your ROM code and any encryption and configuration files that may be needed to Intel. As you fill in the menus, you identify the specific product and product features you have chosen. This section provides an overview of how you use

the ZapCode software. The following chapters provide the detailed explanations and instructions you will need.

The overview for using ZapCode II is as follows.

1. Obtain the ZapCode II software in one of the two following ways.
   - Order the ZapCode II Starter Kit from your Intel sales office or distributor.
   - Download the ZapCode II Starter Kit from Intel's World Wide Web site (see "World Wide Web" on page 1-4).
2. Select the product and the features for the product you want to order. You need this information to complete the ZapCode II screens.
   - Select a product. Chapter 3 lists available products and the following features.
     — temperature and burn-in options
     — package options
   - Decide whether to enable security, if available. Chapter 4 describes code security features.
   - Select a marking format. Chapter 5 defines Intel's standard and customized marking guidelines.
   - Select a packing method. Chapter 6 describes the packing methods available.
3. Install ZapCode II on your computer. Chapter 7 provides the instructions you will need to successfully install the software. It also includes instructions for using the ZapCode II online training course and for downloading a copy of this handbook.
4. Transmit your product information and your code to Intel. Chapter 8 provides the instructions you will need to transmit the code and to verify that it was received error-free.
5. Place your order with your local Intel sales office or distributor. Chapter 9 provides the information you will need to complete a purchase order.

NOTE

Although Intel maintains your ROM code and mask for the duration of the ordering and manufacturing process, they are not guaranteed to be maintained for an extended period of time following order fulfillment. Intel recommends that you archive your ROM code for future use in the event that it becomes unavailable at Intel. In this event, should you place another order using the same code, Intel will make another mask plate at no cost to you.

Use the steps in this procedure each time you want to order a product and transmit its ROM code file to Intel. Since you must have this information readily available when you load ZapCode II for transmittal, Intel recommends that you use a copy of Appendix A, "Product Order Form" to record your product selection decisions.

3

Product Options

CHAPTER 3
PRODUCT OPTIONS

Use this chapter to select an embedded microcontroller product and a package option for it. If you need additional information before making a selection, refer to the user's manuals and datasheets that describe the devices you are interested in (see "Related Documents" on page 1-2).

This chapter has five sections that you will use to select the product you want to order.

- "Product Nomenclature" on page 3-2 illustrates and describes the naming conventions for Intel microcontrollers.
- "Nonvolatile Memory Options" on page 3-3 defines the nonvolatile memory options.
- "8-Bit Embedded Microcontroller Products" on page 3-5 lists the memory characteristics, security features, and package options for 8-bit embedded microcontroller products.
- "16-Bit Microcontroller Products" on page 3-9 lists the memory characteristics, security features, and package options for 16-bit embedded microcontroller products.
- "Package Information" on page 3-12 describes the packaging options available for microcontroller devices.

3.1 PRODUCT NOMENCLATURE

This section describes the nomenclature for the available microcontrollers. Figure 3-1 illustrates the product nomenclature, while Table 3-1 describes the options and parameters for the nomenclature.

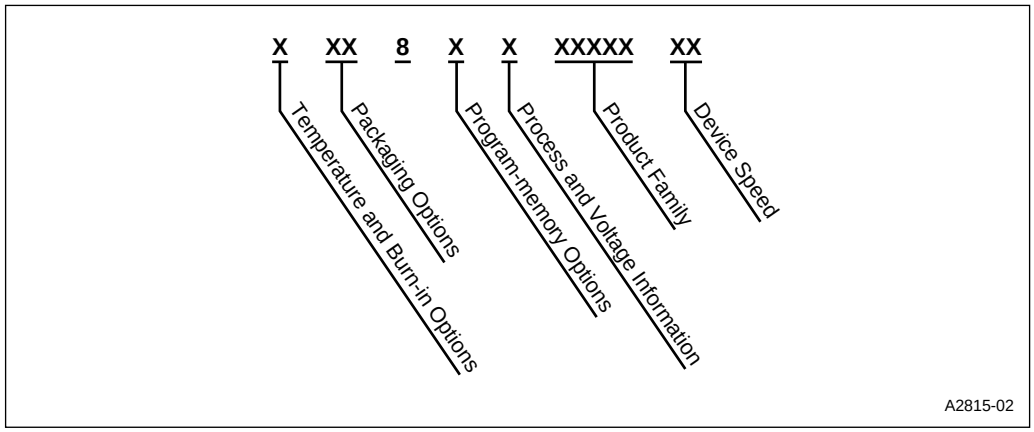


Figure 3-1. Product Nomenclature

Table 3-1. Description of Product Nomenclature

Parameter	Options	Description
Temperature and Burn-in Options	No Mark	Commercial (–0° C to +70° C ambient) with standard burn-in
	T	Extended (–40° C to +85° C ambient) with standard burn-in
	L	Extended (–40° C to +85° C ambient) with extended burn-in
	A	Automotive (–40° C to +125° C case) with standard burn-in
Packaging Options	See “Package Information” on page 3-12	
Program Memory Options	0†	No internal ROM
	3	Internal ROM
	7	Internal EPROM or OTPROM
Process or Voltage Information	No Mark	CHMOS
	C	Low voltage CHMOS
	L	
Product Family	196*xx*	A member of the MCS® 96 product family
	51*xx*	A member of the MCS® 51 product family
	251*xx*	A member of the MCS® 251 product family
Device Speed	No Mark	Standard speed

† In the CMOS UPI and 8XC5*x* microcontroller families, a zero represents internal ROM. The three is not used.

3.2 NONVOLATILE MEMORY OPTIONS

Many Intel microcontrollers are available with several nonvolatile memory options. The memory option that is most appropriate depends on lead-time constraints, minimum order quantities, cost, availability, and your stage in the product development cycle. For example, you may want to use an *erasable programmable read-only memory* (EPROM) option as you develop and debug your code. After your code is stable and your design is in full production, it is more cost-effective to switch to a *read-only memory* (ROM) option.

Table 3-2 defines the types of nonvolatile memory and includes information for minimum order quantities, mask charges, and lead times. Tables 3-3 through 3-6 list the memory options for each product. It is important to note that, while Intel offers a range of nonvolatile memory options for its products, not all memory options are available for all products. Your Intel sales office or distributor can help you make the best choice for your needs based on cost and availability.

Table 3-2. Nonvolatile Memory Options and Descriptions

Memory Type and Name	Description	Device Minimum Order Quantity	Mask Charge per New Code	Lead Time (Weeks)†
ROM (Read-only Memory)	• Intel programs the ROM with customer-specific code, usually during the multi-layer masking process • Nomenclature example: P83C51FA,R XXXX	2,000	$3,000	8 to 9
FPROM (Factory-programmed OTPROM)	• Intel programs the OTPROM with customer-specific code during the customer's testing stage • Used when the ROM mask has not been manufactured • Nomenclature example: P87C51FA,R XXXX	2,000	$3,000	8 to 9
QROM (Quick Read-only Memory)	• Intel programs the OTPROM with customer-specific code • Subject to availability • Commercial nomenclature example: P8QC51FA,R XXXX • Automotive nomenclature example: P87C51FA,R XXXX	500	$1,500	5 to 7
EPROM (Erasable Programmable Read-only Memory)	• You program the EPROM with your code • Usually packaged in ceramic with an ultraviolet (UV) window to allow multiple programming and erasing • Normally used by customers as follows: — during the development stage when writing ROM code — in the production stage for applications requiring multiple erasing and programming — for low-volume production runs • Normally available "off the shelf" • Nomenclature example: D87C51FA	None	—	1 to 2
OTPROM (One-time Programmable Read-only Memory)	• You program the OTPROM with your code • OTPROM shares technology with EPROM • Packaged in plastic • Normally used by customers as follows: — in the prototype stage of an embedded controller application — in an unstable or multiple-code environment — for low-volume production runs — when ROM products are not available • Normally available "off the shelf" • Nomenclature example: P87C51FA	None	—	1 to 2

† Lead times in this column are estimates. Contact your local Intel distributor or sales office for a specific product lead time.

3.3 8-BIT EMBEDDED MICROCONTROLLER PRODUCTS

The high-performance, low-cost 8-bit microcontrollers included here are the CMOS UPI microcontroller families, the CMOS MCS 51 microcontroller families, and the CMOS MCS 251 microcontroller family.

Intel also has a large offering of 8-bit microcontrollers that are ideally suited for various automotive applications such as anti-lock braking systems (ABS) and engine control. Most of the information in this section applies to both commercial and automotive ROM products; however, there are a few differences, which are detailed in Table 3-4. The *Automotive Products* handbook (literature order number 231792) contains product details.

For all 8-bit microcontrollers, your code must begin at 0000H (FF0000H for the 8XC251S*x*). For microcontrollers that have encryption arrays, your encryption file must also begin at 0000H (FF0000H for the 8XC251S*x*). See the *8XC251SA, 8XC251SB, 8XC251SP, 8XC251SQ Embedded Microcontroller User's Manual* for information about the starting address for the configuration file. Certain features of the 8XC251S*x* family are configurable at reset.

3.3.1 Reference Tables

Tables 3-3 and 3-4 list the memory characteristics, security features, and package options of Intel's 8-bit microcontrollers.

Table 3-1 on page 3-2 describes the temperature and burn-in options that are available for some products. Refer to the data sheet for the product you have selected to obtain information on burn-in availability. If you have questions on temperature and burn-in options, please contact your distributor or local sales office.

Table 3-3. Commercial 8-bit Microcontroller Reference Guide

Device	Memory Characteristics			Security Features††† (X = present)			Package Options††
	Type	Size	Code Range	LB1	LB2, LB3	64-byte Encrypt.	
CMOS UPI Microcontrollers							
80C42	ROM	4K	0000–0FFFH	X	—	—	P40, N44
87C42	EPROM	4K	0000–0FFFH	X	—	—	P40, N44, S44
CMOS MCS® 51 Microcontrollers — 8XC5*x* Family							
80C51BH	ROM	4K	0000–0FFFH	X	—	X	P40, D40, N44, S44
80C51BHP	ROM	4K	0000–0FFFH	X	—	X	P40, D40, N44, S44
87C51	EPROM	4K	0000–0FFFH	X	—	X	P40, D40, N44, S44
80C52	ROM	8K	0000–1FFFH	X	—	X	P40, N44, S44
87C52	EPROM			X	X	X	P40, D40, N44, S44
80C54	ROM	16K	0000–3FFFH	X	—	X	P40, N44, S44
87C54	EPROM			X	X	X	P40, D40, N44, S44
80C58	ROM	32K	0000–7FFFH	X	—	X	P40, N44, S44
87C58	EPROM			X	X	X	P40, D40, N44, S44
CMOS MCS® 51 Microcontrollers — 8XC51F*x*, 8XC51GB, 8XC51KB, 8XC51SL, 8XC152 Family							
83C51FA	ROM	8K	0000–1FFFH	X	—	X	P40, N44, S44
87C51FA	EPROM			X	X	X	P40, D40, N44, S44, TS
83C51FB	ROM	16K	0000–3FFFH	X	—	X	P40, N44, S44
87C51FB	EPROM			X	X	X	P40, D40, N44, S44
83C51FC	ROM	32K	0000–7FFFH	X	—	X	P40, N44, S44
87C51FC	EPROM			X	X	X	P40, D40, N44, S44
83C51GB	ROM	8K	0000–1FFFH	X	—	X	N68
87C51GB	EPROM			X	X	X	N68
83C51KB	ROM	4K	0000–0FFFH	—	—	—	P40
83C51SLAH	ROM	16K	0000–3FFFH	—	—	—	KU100
87C51SLAH	EPROM			—	—	—	KU100
83C51SLAL	ROM	16K	0000–3FFFH	—	—	—	SB100
87C51SLAL	EPROM			—	—	—	SB100
83C152JA	ROM	8K	0000–1FFFH	—	—	—	P48, N68

† The 8XC251S*x* microcontroller's encryption array is 128 bytes, rather than 64 bytes.

†† The alpha character indicates the package designator. The number following the package designator indicates the number of pins. See "Package Information" on page 3-12 for details.

††† See Chapter 4, "Code Security Features," for security information.

Table 3-3. Commercial 8-bit Microcontroller Reference Guide (Continued)

Device	Memory Characteristics			Security Features††† (X = present)			Package Options††
	Type	Size	Code Range	LB1	LB2, LB3	64-byte Encrypt.	
Low-voltage CMOS MCS® 51 Microcontrollers — 8XL5*x*, 8XL51F*x* Family							
87L52	EPROM	8K	0000–1FFFH	X	X	X	N44, S44
87L54	EPROM	16K	0000–3FFFH	X	X	X	N44, S44
87L58	EPROM	32K	0000–7FFFH	X	X	X	N44, S44
87L51FA	EPROM	8K	0000–1FFFH	X	X	X	N44, S44
87L51FB	EPROM	16K	0000–3FFFH	X	X	X	N44, S44
87L51FC	EPROM	32K	0000–7FFFH	X	X	X	N44, S44
CMOS MCS® 251 Microcontrollers — 8XC251S*x* Family							
83C251SA	ROM	8K	FF0000–FF1FFFH	X	—	X†	C40, N44, P40
87C251SA	EPROM			X	X	X†	
	OTPROM						
83C251SB	ROM	16K	FF0000–FF3FFFH	X	—	X†	C40, N44, P40
87C251SB	EPROM			X	X	X†	
	OTPROM						
83C251SP	ROM	8K	FF0000–FF1FFFH	X	—	X†	C40, N44, P40
87C251SP	EPROM			X	X	X†	
	OTPROM						
83C251SQ	ROM	16K	FF0000–FF3FFFH	X	—	X†	C40, N44, P40
87C251SQ	EPROM			X	X	X†	
	OTPROM						

† The 8XC251S*x* microcontroller's encryption array is 128 bytes, rather than 64 bytes.

†† The alpha character indicates the package designator. The number following the package designator indicates the number of pins. See "Package Information" on page 3-12 for details.

††† See Chapter 4, "Code Security Features," for security information.

Table 3-4. Automotive 8-bit Microcontroller Reference Guide

Device	Memory Characteristics			Security Features (X = present)			Package Options†
	Type	Size	Code Range	LB1	LB2, LB3	64-byte Encrypt.	
CMOS MCS® 51 Microcontrollers — 8XC5*x* Family							
80C51BH	ROM	4K	0000–0FFFH	—	—	—	P40, N44
80C51BHP	ROM	4K	0000–0FFFH	X	—	—	P40, N44
87C51	EPROM	4K	0000–0FFFH	X	X	X	P40, N44
87C54	EPROM	16K	0000–3FFFH	X	X	X	P40, N44
CMOS MCS® 51 Microcontrollers — 8XC51F*x* Family							
83C51FA	ROM	8K	0000–1FFFH	—	—	—	P40, N44
87C51FA	EPROM	8K	0000–1FFFH	X	X	X	P40, N44
87C51FB	EPROM	16K	0000–3FFFH	X	X	X	P40, N44
87C51FC	EPROM	32K	0000–7FFFH	X	X	X	P40, N44

† The alpha character indicates the package designator. The number following the package designator indicates the number of pins. See “Package Information” on page 3-12 for details.

3.4 16-BIT MICROCONTROLLER PRODUCTS

The high-performance 16-bit microcontrollers included here are members of the CMOS MCS 96 microcontroller families.

Intel also has a large offering of 16-bit microcontrollers that are ideally suited for various automotive applications such as anti-lock braking systems (ABS) and engine control. Most of the information in this section applies to both commercial and automotive ROM products; however, there are a few differences, which are detailed in Table 3-6. The *Automotive Products* handbook (literature order number 231792) contains product details.

For 16-bit microcontrollers, your code must begin at 2000H (FF2000H for devices with extended addressing).

3.4.1 Reference Tables

Tables 3-5 and 3-6 list the memory characteristics, security features, and package options of Intel's 16-bit MCS 96 microcontrollers.

Table 3-1 on page 3-2 describes the temperature and burn-in options that are available for some products. Refer to the data sheet for the product you have selected to obtain information on burn-in availability. If you have questions on temperature and burn-in options, please contact your distributor or local sales office.

Table 3-5. Commercial 16-bit Microcontroller Reference Guide

Device	Memory Characteristics			Security Features††† (X = present)				Package Options††
	Type	Size	Code Range	Key	CCB	PCCB	UPROM	
CMOS MCS® 96 Microcontrollers — 8XC196KB, KC, KD Family								
83C198	ROM	8K	2000–3FFFH	X	X	—	—	N52, S80
87C198-16	OTPROM			X	X	X	—	N52, S80
83C196KB	ROM	8K	2000–3FFFH	X	X	—	—	N68, S80
87C196KB16	OTPROM			X	X	X	—	N68, S80
83C196KC	ROM	16K	2000–5FFFH	X	X	X	—	N68, S80, SB80
87C196KC	OTPROM			X	X	X	X	N68, S80, SB80
83C196KC20	ROM	16K	2000–5FFFH	X	X	—	—	N68, S80, SB80
87C196KC20	OTPROM			X	X	X	X	N68, S80, SB80
83C196KD	ROM	32K	2000–9FFFH	X	X	—	—	N68, S80, SB80
87C196KD	OTPROM			X	X	X	X	N68, S80, SB80
83C196KD20	ROM	32K	2000–9FFFH	X	X	—	—	N68, S80, SB80
87C196KD20	OTPROM			X	X	X	X	N68, S80, SB80
CMOS MCS® 96 Microcontrollers — 8XC196MC, MD, MH Family								
87C196MC	OTPROM	16K	2000–5FFFH	X	X	X	X	N84, S80, U64
87C196MD	OTPROM	16K	2000–5FFFH	X	X	X	X	N84, S80, U64
87C196MH	OTPROM	32K	2000–9FFFH	X	X	X	X	N84, S80, U64
CMOS MCS® 96 Microcontrollers — 8XC196K*x*, J*x*, CA Family								
87C196JQ†	OTPROM	12K	2000–4FFFH	X	X	X	X	N52
87C196KQ†	OTPROM			X	X	X	X	N68
87C196JR†	OTPROM	16K	2000–5FFFH	X	X	X	X	N52
87C196KR†	OTPROM			X	X	X	X	N68
87C196KT†	OTPROM	32K	2000–9FFFH	X	X	X	X	N68
87C196CA†	OTPROM	32K	2000–9FFFH	X	X	X	X	N68
CMOS MCS® 96 Microcontrollers — 8XC196N*x* Family								
87C196NT†	OTPROM	32K	FF2000–FF9FFFH	X	X	X	X	N68
83C196NP	ROM	4K	FF2000–FF2FFFH	—	X	—	—	S100, SB100
83C196NU	ROM	48K	FF2000–FFDFFFH	—	X	—	—	S100, SB100

† This product also incorporates oscillator failure detection (OFD) circuitry.

†† The alpha character indicates the package designator. The number following the package designator indicates the number of pins. See “Package Information” on page 3-12 for details.

††† See Chapter 4, “Code Security Features” for security information.

Table 3-6. Automotive 16-bit Microcontroller Reference Guide

Device	Memory Characteristics			Security Features (X = present)				Package Options††
	Type	Size	Code Range	Key	CCB	PCCB	UPROM	
CMOS MCS® 96 Microcontrollers — 8XC196EA Family								
83C196EA	ROM		2000–3FFFH	X	X	X	—	S160
CMOS MCS® 96 Microcontrollers — 8XC196KB, KC, KD Family								
83C196KB	ROM	8K	2000–3FFFH	X	X	—	—	N68
87C196KB12	ROM	8K	2000–3FFFH	X	X	—	—	N68
87C196KC	FPROM	16K	2000–5FFFH	X	X	X	X	N68
	OTPROM							
87C196KD	FPROM	32K	2000–9FFFH	X	X	X	X	N68
	OTPROM							
CMOS MCS® 96 Microcontrollers — 8XC196K*x*, J*x*, CA, CB Family								
87C196KN	OTPROM	8K	2000–3FFFH	X	X	X	X	N84
	QROM			X	X	X	X	N84
87C196KQ†	OTPROM	12K	2000–4FFFH	X	X	X	X	N68
87C196KR†	OTPROM	16K	2000–5FFFH	X	X	X	X	N68
87C196KS	OTPROM	24K	2000–7FFFH	X	X	X	X	N68
87C196KT†	OTPROM	32K	2000–9FFFH	X	X	X	X	N68
87C196JQ†	OTPROM	12K	2000–4FFFH	X	X	X	X	N52
	QROM							
87C196JR†	OTPROM	16K	2000–5FFFH	X	X	X	X	N52
87C196JT†	OTPROM	32K	2000–9FFFH	X	X	X	X	N52
	QROM							
	ROM							
87C196JV†	EPROM	48K	2000–DFFF4	X	X	X	X	N52
87C196CA	OTPROM	32K	2000–9FFFH	X	X	X	X	N68
	QPROM							
87C196CB	OTPROM	56K	FF2000–FFFFFFH	X	X	X	X	N84, S100

† This product also incorporates oscillator failure detection circuitry.

†† The alpha character indicates the package designator. The number following the package designator indicates the number of pins. See “Package Information” on page 3-12 for details.

3.5 PACKAGE INFORMATION

Intel has many options for packaging microcontroller devices. Table 3-7 describes several package types from which to make your selection. You must have this information available before launching ZapCode II to place your order.

Not all package types are available for all devices. For additional information, refer to the “Package Options” column in the appropriate table of this chapter for the product you chose.

The *Intel Packaging Handbook* (literature order number 240800) includes more detailed package information such as dimensions and performance characteristics.

Table 3-7. Package Options

Package Designator	Package Description
A	Ceramic Pin Grid Array (C-PGA)
B	Ceramic Land Grid Array (LGA)
C	Ceramic Dual In-Line Package (CerDIP)
CF	Ceramic Flat Package (FP)
D	Ceramic Dual In-Line Package (CerDIP)
E	Thin Small Outline Package, Die Up (TSOP)
F	Thin Small Outline Package, Die Down (TSOP)
FP	Plastic Flatpack Package (P-FP)
GB	Single In-Line Leaded Memory Module (SIP)
J	Cerquad Package (Cerquad)
K	Ceramic Quad Flatpack Package, Fine Pitch, Flat Leads (CQFP)
KD	Plastic Quad Flatpack Package, Fine Pitch, Die Down (PQFP)
KK	Ceramic Quad Flatpack Package, Fine Pitch, Formed Leads (CQFP)
KU	Plastic Quad Flatpack Package, Fine Pitch, Die Up (PQFP)
N	Plastic Leaded Chip Carrier (PLCC)
NG	Plastic Quad Flatpack, Fine Pitch, Die Down w/Heat Spreader (PQFP)
P	Plastic Dual In-Line Package (P-DIP)
PA	Small Outline “Gull Wing” Package (SOP)
PE	Small Outline “J” - Lead Package (SOJ)
Q	Ceramic Quad Flatpack Package (CQFP)
R	Ceramic Leadless Chip Carrier (LCC)
S	Quad Flatpack Package (QFP)
SB	Square QFP (SQFP)
U	Shrink DIP
X	Unpackaged Devices

4

Code Security Features

CHAPTER 4
CODE SECURITY FEATURES

Intel recognizes the importance of protecting customers' code from unauthorized access to the ROM contents. To help prevent unauthorized access, Intel has provided security features on many of its microcontroller products. However, even though its developers have made a substantial effort to provide reliable program protection, Intel does not guarantee that these protection methods will always prevent unauthorized access.

The following two sections of this chapter contain product security information for 8-bit and 16-bit microcontrollers. While the user's manual for the device you selected in Chapter 3 contains the definitive information about that device, the information in this chapter can help you make product decisions. You must have this information available before starting ZapCode II to place your order.

The memory protection described in this chapter is a general overview. However, there are exceptions. For product-specific information, please refer to the appropriate user's manual.

4.1 MEMORY PROTECTION OPTIONS FOR 8-BIT PRODUCTS

Many devices from the UPI and MCS® 51 microcontroller families provide protection features to deter unauthorized access to the internal memory. Many MCS 51 microcontrollers provide an encryption array in addition to the lock bits. Devices with encryption arrays may be manufactured in a masking process (80C54, 83C51FC) or a non-masking process (87C51FB, 87C51FC). The following sections describe some of the implications to consider when using these protection features.

4.1.1 Lock Bits

A lock bit (LB1) disables external code fetches from internal code memory. This means that a MOVC instruction executing outside the microcontroller cannot fetch code from the microcontroller's on-chip code memory.

- Microcontrollers that implement only one lock bit have LB1.
- Microcontrollers that implement three lock bits have LB3, LB2, and LB1.

Table 4-1 describes the lock bits and their effect on code security. Refer to Tables 3-3 and 3-4 in Chapter 3, "Product Options," which list the number of lock bits implemented for each 8-bit microcontroller.

Table 4-1. Lock Bit Functions

Security Level	LB3†	LB2†	LB1†	Description
1	U	U	U	No security features implemented. Unless you provide an encryption file, the factory leaves LB1 unprogrammed. The EA# pin is sampled and latched on reset, and further programming of the EPROM or OTPROM is disabled.
2	U	U	P	External code cannot fetch code bytes from on-chip code memory (MOVC disabled). If you provide an encryption file, the factory programs LB1.
3	U	P	P	Level 2 plus on-chip code memory verification is disabled. Not available for factory-programmed microcontrollers.
4	P	P	P	Level 3 plus execution from external memory is disabled. Not available for factory-programmed microcontrollers.

† U = unprogrammed; P = programmed. Other combinations of the lock bits are undefined.

Programming LB2 or LB3 makes factory testing impossible. Therefore, the factory programs only LB1.

4.1.2 Encryption Array

An encryption array allows you to protect your code from unauthorized program verification.

- Unless you provide an encryption file, program verification reads the code memory and places its contents onto the data bus in its true form.

- If you provide an encryption file, program verification exclusive-NORs (XNORs) each byte of code with the corresponding byte of the encryption array, then places the encrypted contents onto the data bus.

Table 4-2 lists each possible combination and result of the exclusive-NOR operation. You must know the contents of the encryption file in order to decipher the information on the data bus.

Table 4-2. Encryption Truth Table

Code Bit	Encryption Bit	Output
0	0	1
0	1	0
1	0	0
1	1	1

4.1.2.1 Creating an Encryption Array

Of the microcontrollers that have encryption arrays, earlier devices have 64-byte arrays, while newer ones, such as 8XC251S*x*, have 128-byte arrays. Regardless of the size, you create an encryption file in the same way. The steps are as follows:

1. Create a new text file using the editor you use for programming. The following example command invokes the MSDOS text editor and creates an MCS51 assembly language file.
   `c:\> edit key.a51`
2. Type the encryption data you have defined. Keep in mind that you should use “random” values other than FFH, and you should completely fill the size of the encryption array (either 64 bytes or 128 bytes, depending on the product).
3. Save the text file. Figure 4-1 shows a saved MCS51 assembly language example. Figure 4-2 shows a saved MCS51 ‘C’ language example.

```
keyrom: db   000h, 011h, 022h, 033h, 044h, 055h, 066h, 077h
        db   088h, 099h, 0aah, 0bbh, 0cch, 0ddh, 0eeh, 0ffh
        db   000h, 011h, 022h, 033h, 044h, 055h, 066h, 077h
        db   088h, 099h, 0aah, 0bbh, 0cch, 0ddh, 0eeh, 0ffh
        db   000h, 011h, 022h, 033h, 044h, 055h, 066h, 077h
        db   088h, 099h, 0aah, 0bbh, 0cch, 0ddh, 0eeh, 0ffh
        db   000h, 011h, 022h, 033h, 044h, 055h, 066h, 077h
        db   088h, 099h, 0aah, 0bbh, 0cch, 0ddh, 0eeh, 0ffh
        db   000h, 011h, 022h, 033h, 044h, 055h, 066h, 077h
end
```

Figure 4-1. Sample Assembly Code (key.a51) for a 64-byte Encryption Array

4. Assemble or compile the text file to create an object (*.obj*) file. The following example command assembles the file created in step 3.
   `c:\> asm51 key.a51`

```
code char keyrom[] =   {0x00, 0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77
                       0x88, 0x99, 0xaa, 0xbb, 0xcc, 0xdd, 0xee, 0xff
                       0x00, 0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77
                       0x88, 0x99, 0xaa, 0xbb, 0xcc, 0xdd, 0xee, 0xff
                       0x00, 0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77
                       0x88, 0x99, 0xaa, 0xbb, 0xcc, 0xdd, 0xee, 0xff
                       0x00, 0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77
                       0x88, 0x99, 0xaa, 0xbb, 0xcc, 0xdd, 0xee, 0xff};
```

Figure 4-2. Sample 'C' Code (key.c) for a 64-byte Encryption Array

5. Convert the object (*.obj*) file to an Intel hex (*.hex*) file. Appendix B describes the format of Intel hex files. The following example command creates an Intel hex file.
   `c:\> oh key.obj`

Figure 4-3 shows the hex file that results from the examples in Figures 4-1 and 4-2.

```
:10000000001122334455667788 99AABBCCDDEEFFF8
:10001000001122334455667788 99AABBCCDDEEFFE8
:10002000001122334455667788 99AABBCCDDEEFFD8
:10003000001122334455667788 99AABBCCDDEEFFC8
:00000001FF
```

Figure 4-3. Sample Intel Hex Format File (key.hex) for a 64-byte Encryption Array

4.1.3 Lock Bits and Encryption Array

The combination of an encryption array and a lock bit protects your code in the following two ways:

- The encryption array renders the result of program verification meaningless to anyone without knowledge of the sequence and contents of the encryption array.
- The lock bit prevents a MOVC instruction executing in external memory from fetching code from internal nonvolatile memory.

For microcontrollers that have both an encryption array and a lock bit:

- If you wish to use either security measure, you must use both.
- If you provide an encryption file, the factory programs the lock bit; otherwise, the factory leaves the lock bit unprogrammed.

4.1.4 Programming Considerations

This section lists several implications to consider when using these protection features.

- Code and the encryption files must begin at 0000H for all 8-bit microcontrollers except the 8XC251S*x*. For the 8XC251S*x*, code and the encryption files must begin at FF0000H. Please consult the documentation for your assembler or compiler to determine the directive to assemble or compile your code and encryption array at the appropriate address.

- The encryption file that you send to Intel must be in Intel hex format, and it must have valid checksum values.
  - — Appendix B describes the format of Intel hex files.
  - — ZapCode II provides checksum values both before and after transmission of your file to Intel. If the two match, the checksum is valid.
- Any encryption byte containing FFH reveals a code byte during program verification.
  - — Use “random” values other than FFH for greater code security.
- Any code byte containing FFH reveals an encryption byte during program verification.
  - — A large block of unprogrammed code bytes (greater than the size of the encryption array) reveals the entire encryption array.
  - — Program unused code bytes with “random” values other than FFH (the unprogrammed value). Otherwise, program verification will reveal all or part of the encryption array.
- A programmed lock bit cannot be erased and it makes dynamic failure analysis impossible.
  - — If you provide an encryption file, the factory programs the LB1 lock bit.

4.2 MEMORY PROTECTION OPTIONS FOR 16-BIT PRODUCTS

MCS 96 microcontrollers provide several features to deter unauthorized access to the internal nonvolatile memory. This section briefly describes the following features and their implications:

- security key
- CCB lock bits
- PCCB lock bits (EPROM and OTPROM only)
- UPROM bits (EPROM and OTPROM only)

Refer to Tables 3-5 and 3-6 in Chapter 3, “Product Options,” to determine which of these features are available on a particular product. Please read “Programming Considerations” on page 4-8 and consider the implications of implementing these security options.

4.2.1 Security Key

Programming the lock bits prevents unauthorized access to the nonvolatile memory. However, you need a means for program verification. The security key provides that means. It allows **authorized** access to the nonvolatile memory for program verification or further programming. The key, a 128-bit number that you specify, is located in internal memory (at addresses 2020–202FH for devices with 16-bit addressing, and at FF2020–FF202FH for devices with extended addressing). Once a security key is programmed, you must provide a matching key to gain access to the nonvolatile memory.

For microcontrollers with ROM, the key allows program verification after the lock bits are programmed. For microcontrollers with EPROM or OTPROM, the key allows program verification and further programming. Consult the user’s manual for your specific microcontroller to determine how to program the security key.

4.2.2 CCB and PCCB Lock Bits

Read protection is available for most MCS 96 microcontrollers with internal nonvolatile memory (ROM, EPROM, or OTPROM). Write protection is available for those with programmable nonvolatile memory (EPROM and OTPROM). This protection is controlled by two lock bits in the chip configuration register (CCR). The CCR is located at address 2018H for devices with 16-bit addressing, and at FF2018H for devices with extended addressing. Please consult the user’s manual for your specific microcontroller to determine the locations of the chip configuration byte (CCB) and the programming chip configuration byte (PCCB), and the methods for programming them.

For ROM devices, the reset sequence loads the CCR from the CCB for normal operation and for program verification.

For EPROM and OTPROM devices, the reset sequence loads the CCR from the CCB for normal operation and from the PCCB when entering programming modes. The CCB lock bits protect the internal nonvolatile memory during normal operation. The PCCB lock bits add another level of protection for EPROM and OTPROM devices entering programming modes.

4.2.2.1 CCB Lock Bits

During normal operation, the CCB lock bits control read and write accesses to internal nonvolatile memory. Table 4-3 describes the options. (The programmed state is 0; the unprogrammed state is 1.)

Table 4-3. Memory Protection for Normal Operating Mode

Read Protect LOC1 (CCR.7)	Write Protect LOC0 (CCR.6) †	Protection Status
1	1	No protection. Run-time programming is permitted, and the entire array of nonvolatile memory can be read.
1	0	Write protection only. Run-time programming is disabled, but the entire array of nonvolatile memory can be read.
0	1	Read protection. Run-time programming is disabled. If program execution is external, only the interrupt vectors and CCBs can be read. For EPROM and OTPROM microcontrollers, the security key is **write** protected.
0	0	Read and write protection. Run-time programming is disabled. If program execution is external, only the interrupt vectors and CCBs can be read.

† Write protection is applicable to EPROM and OTPROM microcontrollers only.

For ROM devices, the CCB and security key combine to deter unauthorized reading of the internal memory but allow authorized program verification (Table 4-4).

Table 4-4. ROM Protection with Authorized Program Verification

Read Protect LOC1 (CCR.7)	Security Key Programmed?	Protection Status
1	X†	No protection.
0	Yes	ROM-dump permitted with matching security key.

† X = Irrelevant (“don’t care”)

4.2.2.2 PCCB Lock Bits

EPROM and OTPROM devices require additional security to prevent unauthorized programming. For these devices entering programming modes, three levels of protection are available:

- prohibit all programming
- prohibit all programming, but permit authorized ROM dumps
- prohibit serial port programming, but permit authorized ROM dumps, auto programming, and slave programming

These protection levels are provided by the PCCB lock bits, the CCB lock bits, and the internal security key (Table 4-4). When entering programming modes, the reset sequence loads the PCCB

into the chip configuration registers. It also loads the CCB into internal RAM to provide an additional level of security.

Table 4-5. Memory Protection Options for EPROM and OTPROM Programming Modes

LOC1 (CCR.7)		LOC0 (CCR.6)		Security Key Programmed ?	Protection Status
PCCB	CCB	PCCB	CCB		
1	1	1	1	No	No protection. All programming modes allowed.
1	X	0	X	Yes	All programming disabled. ROM-dump permitted with matching security key.
X	X	X	X	Yes	Serial programming disabled.
1	0	1	0	Yes	Serial programming disabled. Auto and slave programming permitted with matching security key.
0	X	0	X	X†	All programming unconditionally disabled.

† X = Irrelevant (“don’t care”)

4.2.3 UPROM Bits

EPROM and OTPROM microcontrollers have additional protection provided by two unerasable PROM (UPROM) bits. The DEI bit prevents external instruction fetches, and the DED bit prevents external data fetches. If both bits are programmed, an attempt to fetch data or instructions from external memory causes a device reset. Setting DED disables ROM-dump (program verification) mode.

4.2.4 Oscillator Failure Detection

Some microcontrollers have circuitry than can detect an oscillator failure (frequency below approximately 100 kHz) and cause a device reset. This circuitry is enabled by the OFD bit. For EPROM and OTPROM microcontrollers, please consult the user’s manual for the procedure to program this bit. For ROM devices, if you equate location 2016H to the value 0CDEH, Intel manufacturing will program the OFD bit.

4.2.5 Programming Considerations

This section describes implications to consider when using these protection features.

- Enable the CCB lock bits only if you are submitting your ROM code electronically, using ZapCode II.
- If you enable the CCB or PCCB lock bits, you must also program a security key. Otherwise, you have no means to access the internal memory for program verification.
- UPROM bits can be programmed, but cannot be erased. For this reason, Intel manufacturing **does not** enable these features. If you wish to use the DED and DEI features, you must enable them using the procedure described in the user’s manual for your microcontroller.

- Programming the DED or DEI bit makes dynamic failure analysis impossible. If a microcontroller's DED or DEI bit is programmed, you cannot return the device to Intel for failure analysis.
- If you program the UPROM bit that disables external data fetches (DED), you cannot enter ROM-dump mode for program verification.
- For ROM devices that have oscillator failure detection (OFD) circuitry, equate location 2016H to the value 0CDEH if you want Intel to enable the OFD feature.

5

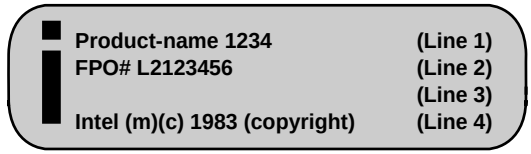
Specify the Part Marking

CHAPTER 5
SPECIFY THE PART MARKING

This chapter defines Intel's marking guidelines for the device you are ordering. You can select either Intel's standard embedded-microcontroller ROM-device part marking or choose to customize your part's marking. You must have this information available to fill in the ZapCode II menus.

5.1 INTEL STANDARD PART MARKING

Figure 5-1 shows Intel's standard part marking format for embedded microcontroller devices.



Line 1:	Product-name 1234
Where:	Product-name is the complete product name (see Figure 3-1 on page 3-2)
	1234 = ROM code ID number (see "Record the ROM Number" on page 8-17 for the source of this number)
Line 2:	FPO# L2123456
Where:	FPO# = Factory Process Order Number L2123456 is Intel's internal lot tracking number. It includes the factory ID, the test manufacturing date code, and the FAB process order number.
Line 3:	Line 3 is a blank line in this example.
Line 4:	Contains Intel copyright information. All product markings **must** include the copyright and logo.

Figure 5-1. Intel Standard Part Mark Example

5.2 CUSTOMIZED PART MARKING

If you choose to customize the marking for your device, use the guidelines in this section.

- Lines 1, 2, and 3 can all be used for your customized marking, with each line containing up to 22 characters. The maximum number of characters allowed on each of the three lines depends on the package, device, and number of leads ("Determining Maximum Characters Per Line" on page 5-2 provides details).
- Line 4 contains Intel copyright information and is required. This line may not be customized.

5.2.1 Determining Maximum Characters Per Line

To determine how many characters per line you may use for customized part marking, follow these steps:

1. Refer to the appropriate table in Chapter 3 to find the product you have already chosen. For example, if you are using a commercial 16-bit microcontroller, refer to Table 3-5 on page 3-10.
2. Find your device under the “Device” column. Example: 83C196NU
3. Select a package type from the “Package Options” column. For example, the package options for the 83C196NU are the 100-lead QFP (S100) or SQFP (SB100).
4. Find the package in Table 5-1 and read the “Characters Per Line” column. This is the maximum number of characters that you may use for any customized part marking line for that package type. Example: For package option “S” with 80 or 100 pins, the maximum number of characters per line is 15.

Table 5-1. Part Marking Limits

Package Description	Package Designator	Characters Per Line
40L P-DIP	P	18
48L P-DIP	P	22
44L PLCC	N	11
52L PLCC	N	12
68L PLCC	N	12
44L QFP	S	8
80/100L QFP	S	15
64L SDIP	U	18

6

Select a Packing Method

CHAPTER 6
SELECT A PACKING METHOD

Intel has devised several packing methods to protect your product during shipping. The packing-method choices are somewhat dependent upon the device package you chose.

A brief description of some packing options are described in the following sections. For additional information on transport media and packing, please refer to the *Shipping and Packaging* data sheet (literature order number 240822).

6.1 CARRIERS

Plastic carriers hold each unit. Loaded carriers are placed in tubes.

Carriers are either coated with antistatic surface treatment or are intrinsically static dissipative.

Carriers are available for QFP and SQFP packages.

Flatpack packages are shipped flat to be trimmed and formed at the customer site. They have fragile leads that need a carrier's additional protection.

6.2 TAPE AND REEL

The tape and reel packing system places surface-mount devices (SMT) in a tape that is embossed with individual carrier pockets. A cover-tape seal helps retain and protect the devices. The loaded tapes are wound onto a reel.

Tape and reel packaging is growing in popularity, especially for PLCCs, because it preserves lead integrity and lends itself to easy automation at board-level usage. TSOPs and PQFPs may also be available in tape and reel.

The number of devices per reel (or capacity per reel) will vary depending on the lead count of the devices involved. A product must be ordered in appropriate tape and reel increments.

6.3 TRAY

Shipping trays comply with JEDEC standard dimensions. All JEDEC trays have the same outside dimensions and are easily stacked for storage and manufacturing.

Trays are constructed of polyethersulfone (PES) or equivalent because of its high deflection temperature, superior strength, and dimensional stability. High-temperature trays can be baked to 125.5^0 C. Low-temperature trays can withstand a maximum sustained temperature of 60.5^0 C.

Table 6-1 lists the packages for which trays are available.

Table 6-1. Tray Package Options

Package	Number of Leads
PQFP	84-lead, 100-lead, 132-lead, 164-lead, 196-lead
PGA	68-lead, 88-lead, 132-lead, 168-lead, 208-lead, 240-lead
PLCC	28-lead sq, 28-lead rec, 44-lead sq, 68-lead sq, 84-lead sq
TSOP	32-lead, 40-lead
SOP	32-lead, 44-lead
CQFP	196-lead flat, 164-lead flat

6.4 TUBE

Plastic shipping and handling tubes are manufactured from PVC with an antistatic surfactant treatment. Standard tubes for most package types are translucent and allow visual inspection of units within the tube. Carbon-impregnated, black conductive tubes are available for all parts where device or use characteristics require them. Most device package types are available in tubes.

6.5 WAFFLE PACK

A waffle pack is a plastic container designed to protect sorted die during shipment.

6.6 WAFER BOAT

A wafer boat is a plastic container designed to protect vertically aligned wafers during shipment.

7

Install or Delete ZapCode II

CHAPTER 7
INSTALL OR DELETE ZAPCODE II

This chapter contains instructions for installing and deleting ZapCode II. It also contains instructions for using the ZapCode II online training course, for completing or updating the Initial Setup screen, and for completing or updating the Customer Profile screen.

- If you have already installed ZapCode II, and do not need to update the Initial Setup or Customer Profile screens, and do not want to delete ZapCode II, skip to the next chapter.
  - — If you want to update the Initial Setup screen, skip to “Complete or Update the Initial Setup” on page 7-6.
  - — If you want to update the Customer Profile screen, skip to “Complete or Update the Customer Profile and Password” on page 7-9.
- If you have already installed ZapCode II, and want to delete it, skip to “Delete ZapCode II” on page 7-13.
- If you have received your ZapCode II Starter Kit and are ready to begin installation, skip to “Installation Requirements” below.
  - — If you do not have a Starter Kit you can download it from the Internet (see “World Wide Web” on page 1-4).

7.1 INSTALLATION REQUIREMENTS

To successfully install ZapCode II, you must have the minimum hardware and software requirements listed in “Hardware and Software Requirements” on page 2-1.

You must also have a username and password, both of which are included with the ZapCode II Starter Kit. If you do not have a username and password, phone Intel at 602 554-8618 and they will be provided over the phone.

7.2 CHOOSE AN INSTALLATION METHOD

ZapCode II loads drivers that conflict with most network and many hardware device drivers. To prevent permanent changes to your system configuration files, ZapCode II lets you choose between two alternative boot configuration methods. Each method allows you to switch back and forth between your usual configuration and the ZapCode II configuration. Whichever method you choose, your usual configuration is not affected when you access ZapCode II. You can boot or re-boot to either configuration.

The two methods available for installing ZapCode II are the boot diskette method and the multiple boot configuration method.

7.2.1 Boot Diskette Method

This method loads a ZapCode II directory and certain program files to your system, and then creates a ZapCode II **boot diskette**. You use the boot diskette in Drive A to boot your system when you want to start ZapCode II. You remove the diskette from Drive A and re-boot to your normal configuration after using ZapCode II. Intel recommends this method.

The boot diskette method has the following advantages and disadvantages:

- Advantages:
  - — safest in terms of preserving your existing system configuration files
  - — easiest to install
- Disadvantages:
  - — slower operation than using the multiple boot configuration method
  - — diskette can be lost and thus unavailable when you need it

7.2.2 Multiple Boot Configuration Method

This method creates a new DOS 6.*x* **multiple-boot** configuration menu, or modifies an existing one. This method is the easiest to use, but is more difficult to install than the boot diskette method.

When booting using this method, your system will display a menu giving you the option of running either ZapCode II or some other configuration, including your normal configuration.

- If you already use a DOS 6.*x* multiple-boot menu and select this method, the ZapCode II setup will give you additional options for modifying your existing menu.
- If you do not already use a DOS 6.*x* multiple-boot menu and you select this method, the ZapCode II setup will create the multiple-boot menu for you.

The multiple boot configuration method has the following advantages and disadvantages:

- Advantages:
  - — easier to use than the boot diskette method
  - — faster operation than the boot diskette method
  - — always available on-line; no diskettes to lose
- Disadvantages:
  - — more difficult to install than the boot diskette method
  - — makes major manipulations of your existing system configuration files
  - — If you install ZapCode II and then delete it some time later, after making changes to your *autoexec.bat* and *config.sys* files (e.g., adding a CD ROM driver), you will lose those changes unless you delete ZapCode II manually (rather than using the Delete ZapCode II icon in the ZapCode II program group).

7.3 INSTALL THE ZAPCODE II SOFTWARE

Perform the following steps to install ZapCode II.

1. Start the Windows software.
2. Open the Program Manager.
3. If you have an external modem, turn it on.
4. Insert the ZapCode II for Windows HD Disk (Disk 1) into drive A.
5. From the Program Manager, select **Run...** in the File menu.
6. Type **a:\setup** and press the Enter key. The Initializing Setup message box will display followed by the ZapCode II Setup box, showing the default installation path.
   a. The default installation path is **C:\ZapCode**. Enter a different path if you wish. Do not change the name of the directory.

   WARNING

   The installation path must be to a local drive, such as C:\. Attempting to install ZapCode II to a network location will disable ZapCode II, requiring you to begin the installation process again from step 5.

7. Click on the **Continue** button in the Setup box. A screen message to start your modem will appear. Start your modem if you have not already done so.
8. Click on the **Start Test** button in the message box. ZapCode II Setup will test your modem and verify that it is working and on either COM1 or COM2. Setup will alert you if there are problems and then terminate the installation. The ZapCode II Setup screen will display after the test is completed.

   If Setup terminates, phone the number which displays on the screen for assistance.
9. Click on the **OK** button in the message box that identifies your Com port. A setup message will display asking for your workstation name.
10. Enter a workstation name composed of six alphanumeric characters (letters and/or numbers only). Both upper and lower case will work.
11. Click on the **Continue** button in the Setup box. A screen message regarding ZapCode II's configuration requirements will appear.
12. Click on the **OK** button in the message box. The Boot Options screen will appear.
13. **For DOS 5.*x* users**:
    a. Select the boot diskette method (it is the only choice available).
    b. Click on the **Continue** button. A message box will display advising you to have a blank diskette ready.
    c. Skip to step 16.

14. **For DOS 6.*x* users**:
    a. Select your boot method of choice.
    b. Click on the **Continue** button.
15. If you chose the multiple boot configuration method, skip to step 17.
16. If you chose the boot diskette method:
    a. Click on the OK button in the Setup message box. The ZapCode II program files on disk 1 will be copied to your hard drive.
    b. Insert installation disk 2 when prompted and click on the OK button. Installation will complete and display a message that AUTOEXEC.ZC2 has been created, leaving your original AUTOEXEC.BAT file unchanged.
    c. Click on the OK button in the message box. A message will display that CONFIG.ZC2 has been created, leaving your original CONFIG.SYS file unchanged.
    d. Click on the OK button in the message box. A message will display that WIN.ZC2 has been created, leaving your original WIN.INI file unchanged.
    e. Click on the OK button in the message box. A message will display that SYSTEM.ZC2 has been created, leaving your original SYSTEM.INI file unchanged.
    f. Click on the OK button. A message to insert a diskette in drive A will appear.
    g. Insert a formatted disk (labeled ZapCode II Startup) in drive A when prompted.

    WARNING

    The disk inserted in drive A must not be write protected. A write protected disk will abort the setup and require you to start the installation process again from step 5.

    h. Wait while ZapCode II startup files are copied to the startup disk in Drive A. A screen message saying this phase of the installation is complete will display when completed.
    i. Click on the **OK** button in the message box.
    j. Exit Windows software.
    k. Reboot your computer with the ZapCode II Startup disk in drive A. Your computer will boot in the ZapCode II configuration.
    l. Skip to “The ZapCode II Program Group” on page 7-5.
17. Wait while the ZapCode II program files are copied to your hard drive. The ZapCode II Setup box will display the copy status and prompt you to change diskettes to complete the installation process. If you receive an error message during this process, write down the indicated problem and call the number which displays on the screen.
18. If you do not already have a multiple configuration menu on your computer:
    a. Wait until ZapCode II displays a message advising you that AUTOEXEC.ZC2, CONFIG.ZC2, and WIN.ZC2 files have been created, leaving your original AUTOEXEC.BAT, CONFIG.SYS, and WIN.INI files unchanged.
    b. Skip to step 20.

19. If you do already have a multiple configuration menu:
    a. Wait until ZapCode II displays a message telling you that WIN.ZC2 was successfully installed, leaving your original WIN.INI file unchanged.
    b. Click on the **OK** button. Another message will display telling you that SYSTEM.ZC2 was successfully installed, leaving your original SYSTEM.INI file unchanged.
    c. Click on the **OK** button. The Modification Options screen will display. It offers four configuration options. Option 1 (Insert ZapCode II item into Main Menu) is the default and is the option recommended by Intel. Options two, three, and four are provided only for advanced users. If you wish to select options two, three, or four, and have questions regarding their functionality, please phone Intel at (602) 554-8618 for assistance.
    d. Select your option of choice and click on the **Continue** button.
    e. If you selected option two, three, or four, proceed according to instructions displayed on the screen and/or received by phone from Intel, then skip to step 22.
    f. If you selected option 1, a message box will display telling you that AUTOEXEC.BAT and CONFIG.SYS updates are complete, and that their backup files are AUTOEXEC.ZAP and CONFIG.ZAP.
20. Click the **OK** button in the message box. A new message will display telling you that installation is complete.
21. Click the **OK** button in the message box.
22. Exit Windows.
23. Reboot your computer, selecting ZapCode II in the multiple boot configuration menu.

7.3.1 The ZapCode II Program Group

The ZapCode II installation creates a ZapCode II program group with two icons:

- The ZapCode II icon, which is used to open the ZapCode II interface and display the welcoming screen.
- The Delete ZapCode II icon, which is used to delete the ZapCode II software from your computer.

7.4 HOW TO USE THE ONLINE TRAINING COURSE

If this is the first time you have used the ZapCode II software, you may want to use the Online Training Course to preview the ZapCode II software screens and learn how to interact with the software.

If you do not wish to use the Online Training Course:

1. Click on the **Exit** button in the welcoming screen.
2. Skip to “Complete or Update the Initial Setup” on page 7-6.

To use the Online Training Course, perform the following steps.

1. Click on the **Online Training Course** button.

2. Perform the instructions provided by the on-screen prompts. Exercises and help windows provide you with experience completing all screens (both required and optional) that you will need for using ZapCode II to transmit your ROM code to Intel.
3. Click on the **Close** button when you have completed the online training course.
4. Click on the **OK** button to return to the welcoming screen.

7.5 COMPLETE OR UPDATE THE INITIAL SETUP

If you have already completed the Initial Setup, and do not need to change any of the Initial Setup entries, skip to “Complete or Update the Customer Profile and Password” on page 7-9.

If you have **not** already completed and saved the initial ZapCode II setup, perform each of the following steps in the order given. Your entry or a system default entry must appear in each response box in the Initial Setup before the ZapCode II interface on your computer will connect you to the ZapCode II system at Intel. After all of your responses have been entered and saved, Initial Setup is completed. You complete the entire Initial Setup only the first time you use ZapCode II.

If you want to make a change to any response that has been previously entered and saved, perform step 2, update the appropriate response(s), and then skip to step 9.

1. Launch ZapCode II by double-clicking on the ZapCode II icon in the ZapCode program group. The ZapCode II welcoming screen will open (Figure 7-1).

Figure 7-1. The ZapCode II Welcoming Screen

2. Click on the **Initial Setup** button. The Initial Setup screen (Figure 7-2) will display.

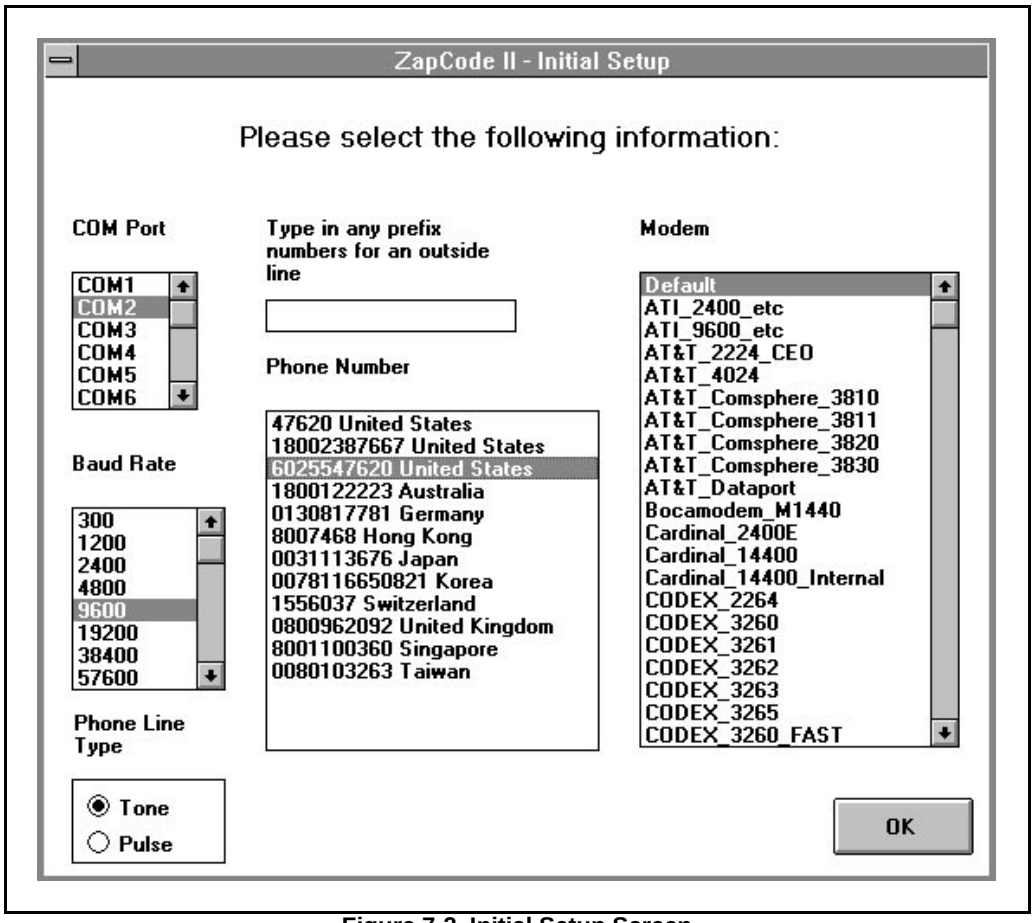


Figure 7-2. Initial Setup Screen

3. **Com Port**: Click on COM1 or COM2, whichever port the installer identified for your system in step 8 of “Install the ZapCode II Software” on page 7-3.
4. **Baud Rate**: Click on the baud rate for your modem. The maximum speed supported is 19,200.
5. **Phone Line Type**: Click on the phone line type your modem will use.
6. **Phone Number**: Select the phone number for the location to which you will send your ROM code. This number must be selected **before** entering the prefix number in step 7.
7. **Type In Any Prefix Numbers For An Outside Line**: Enter the prefix (if any) that your modem will have to dial to get an outside line (example: 9,). This entry must be made **after** selecting the phone number in step 6.
8. **Modem**: Click on the name of your modem type or leave it set to Default.

9. Click on the **OK** button to save your changes. A screen prompt will appear telling you that your settings are saved and that you need to input your username and password.
10. Click the **OK** button in the prompt box to return to the welcoming screen.

7.6 COMPLETE OR UPDATE THE CUSTOMER PROFILE AND PASSWORD

If you have already completed the Customer Profile, and do not need to change any of its entries or your password, skip to “How To Download the ZapCode II Handbook” on page 7-12.

7.6.1 Connect to Intel

Perform the following steps to connect your modem to Intel.

1. Enter your username and your current password in the spaces provided on the welcoming screen.
2. Click on the **OK** button. Your modem will activate and connect you to the Intel-resident ZapCode II system.
3. Wait while the ZapCode II system automatically compares the ZapCode II files on your hard drive to the Intel-resident ZapCode II system files.
   - A “Working...No User Input Needed” message will appear during this comparison. This check will determine whether or not you have the most current ZapCode II software loaded on your system. If you do not, ZapCode II will automatically download the most current files to your system, replacing the old files.
   - Screen messages will display to name any files that are being replaced.
   - Following authentication, the Main Menu (Figure 7-3) will display on your screen.

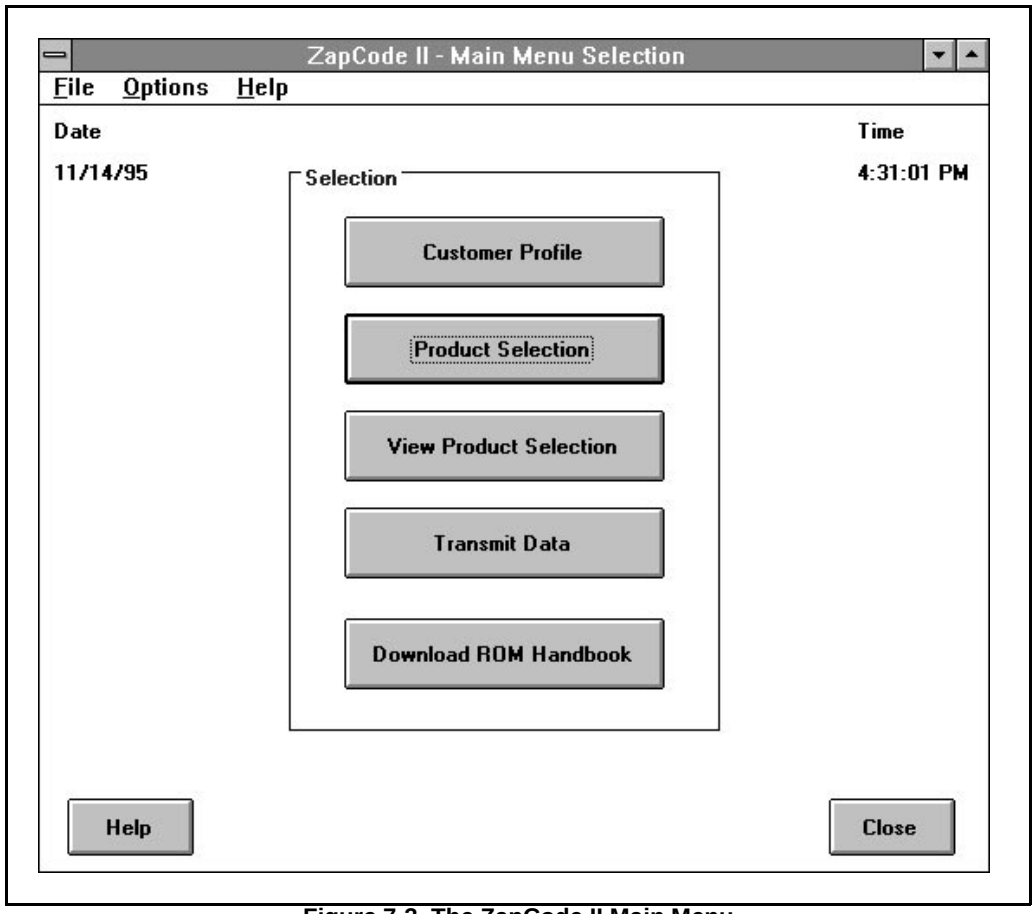


Figure 7-3. The ZapCode II Main Menu

7.6.2 Complete the Customer Profile

If you have already completed the Customer Profile and want to change only your password, skip to Section 7.6.3.

Perform each of the following steps in the order given. You must complete all **required** entries in each Customer Profile field before you can advance to the next screen. After all of the required responses for each field have been entered and saved, the Customer Profile is completed. **Optional** questions may or may not be answered, at your discretion. You must complete the Customer Profile only the first time you use ZapCode II.

If you want to make a change to any Customer Profile response that has been previously entered and saved, perform step 1, update the appropriate response(s), and then skip to step 4.

1. Click on the **Customer Profile** button. The ZapCode II Customer Profile screen is displayed (Figure 7-4).

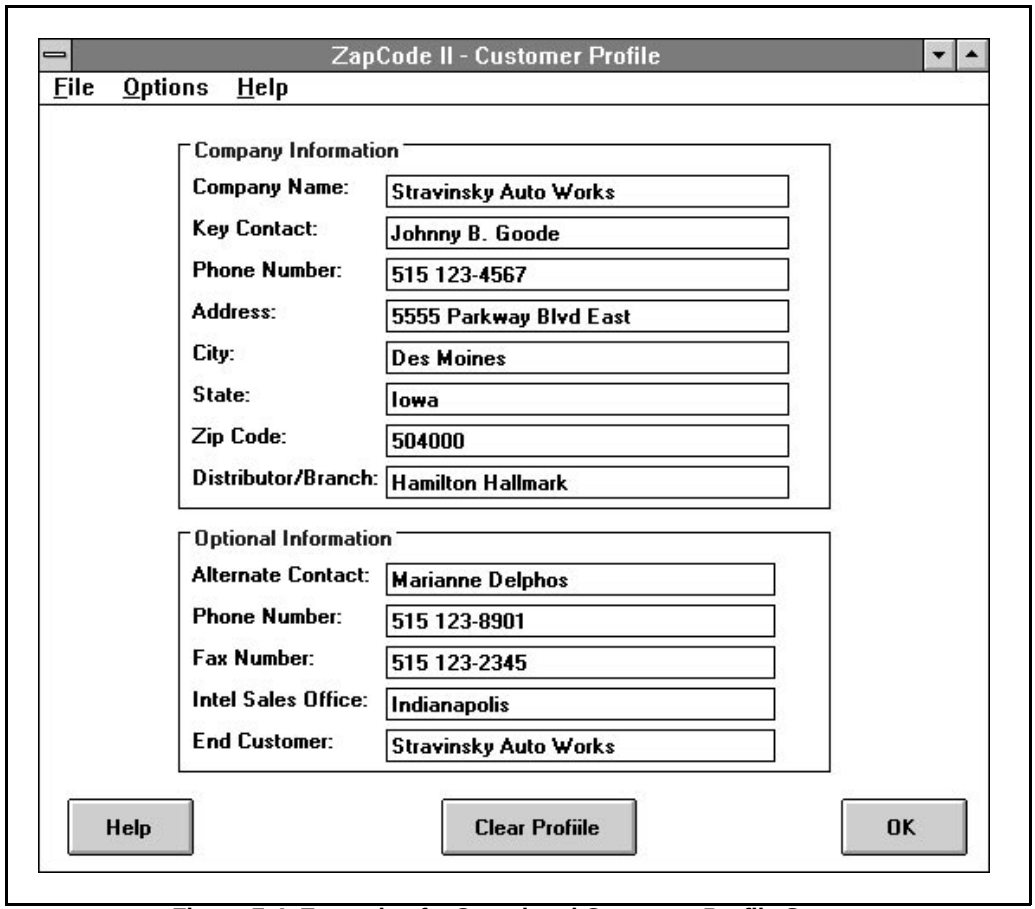


Figure 7-4. Example of a Completed Customer Profile Screen

2. Complete the Company Information block. This is required information.
   a. **Company Name**: Enter the name of your company. Do not use apostrophes in the name.
   b. **Key Contact**: Enter your name or the name of the person Intel should contact for any issues on your new code.
   c. **Phone Number**: Enter the phone number of the key contact. It is helpful to enter the area code for U.S. customers and country and city code for international customers.
   d. **Address**: Enter the street address of your company.
   e. **City**: Enter the city where your company is located.
   f. **State**: Enter the state where your company is located.
   g. **Zip Code**: Enter the zip code where your company is located.

h. **Distributor/Branch**: Enter your distributor or branch name. If this field is not applicable to you, enter "NA."

3. Complete the Optional Information block (if desired).
   a. **Alternate Contact**: Enter the name of the person Intel should contact for any issues on your new code when the key contact is not available.
   b. **Phone Number**: Enter the phone number of the alternate contact. It is helpful to enter the area code for U.S. customers and country and city code for international customers.
   c. **Fax Number**: Enter the fax number for either the key contact or the alternate contact. It is helpful to enter the area code for U.S. customers and country and city code for international customers.
   d. **Intel Sales Office**: Enter the name of your Intel sales office (if applicable).
   e. **End Customer**: Enter the end customer name. This is generally defined as the company that is receiving the finished product, and is usually the same as the company name you entered in step 2a. ZapCode II autofills this information for you when you complete step 2a.
4. Click on the **OK** button.
5. Wait while the system displays a "Working" screen message and saves your entries. The Main Menu will display on the screen when the save is completed.

7.6.3 Change Your Password

If you do not want to change your password, skip to "How To Download the ZapCode II Handbook" on page 7-12.

Perform the following steps to change your password.

1. Select **Change Password** on the **Options** menu. A box for entering your new password will display on your screen.
2. Enter your new password in the box. There is a 15-character limit.
3. Click on the **OK** button. A screen message displays confirming your new password and advising you to make a record of it.
4. Click on the message box **OK** button. The Main Menu returns.

7.7 HOW TO DOWNLOAD THE ZAPCODE II HANDBOOK

If you do not want to download the most current copy of this handbook, skip to "Delete ZapCode II" on page 7-13.

If you do want to download the most current copy of this handbook, perform the following steps to transfer the most current electronic copy of this handbook to your computer.

1. Click on the **Download ROM Handbook** button on the Main Menu. A screen message asking you if you want the documentation downloaded will display on your screen.
2. Click on the **Yes** button in the message box and follow instructions in the dialog box.

3. Click on the **OK** button.
4. Wait while ZapCode II downloads/updates your documentation.

7.8 DELETE ZAPCODE II

If you do not wish to delete ZapCode II from your computer, skip to Chapter 8.

If you wish to delete ZapCode II from your computer, use one of two methods:

- **Automated** — use the Delete ZapCode II icon in the ZapCode II program group. This icon is used to delete the ZapCode II software from your computer. Using this icon does **not** delete any ZapCode II subdirectories. Your ROM code data files are not affected by any deletion.
- **Manual** — select and delete individual files and icons, and the ZapCode II directories.

7.8.1 Automated Method

CAUTION

If you use the multiple boot configuration method, and have made changes to the *c:\autoexec.bat* and the *c:\config.sys* files that you do not want to lose, use the manual method (see “Manual Method” on page 7-14).

Perform the following instructions to remove ZapCode II from your hard drive using the automated method.

1. Start Windows.
2. Double-click on the **Delete ZapCode II** icon in the ZapCode II program group. A message welcoming you to the ZapCode Deinstall setup will display.
3. Click on the **OK** button in the welcoming message box. A verification message will display asking you to confirm that you want to delete ZapCode II from your computer.
4. Click on the **Yes** button in the verification message box.
   - ZapCode II program files will automatically be deleted from the ZapCode directory on your hard drive.
   - The *c:\autoexec.bat* and the *c:\config.sys* files saved when ZapCode II was installed will be restored.
   - The Deinstall message box will appear telling you that ZapCode program files have been deleted from your computer.
5. Click on the **OK** button in the Deinstall message box. The screen display will return to the ZapCode II program group.
6. Delete the **Delete ZapCode II** icon in the ZapCode II program group.
7. Delete the **ZapCode II** icon in the ZapCode II program group.
8. Delete the **ZapCode II** program group.

9. Go to the drive where you installed ZapCode II.
10. Delete the **ZCdelete** directory and its contents.
11. Open the **ZapCode** directory.
12. If there are any transmission subdirectories in the ZapCode directory:
    a. Review the transmission subdirectories.
    b. Delete the subdirectories you do not want to save.
13. If there are no transmission subdirectories remaining in the ZapCode directory (the ZapCode directory is now empty), delete the ZapCode directory.
14. If there are transmission subdirectories remaining in the ZapCode directory, you have the following choices:
    a. Leave the ZapCode directory as is. ZapCode II will put its program files into the directory the next time you install ZapCode II.
    b. Rename the directory. ZapCode II will create a new ZapCode directory the next time you install it.

ZapCode II has now been deleted from your computer.

7.8.2 Manual Method

If you choose the manual method, you select and delete files, icons, directories, and the ZapCode II program group just as you would any other file, icon, directory, or program group. All changes you have made to your *c:\autoexec.bat* and *c:\config.sys* files since installing ZapCode II will be preserved.

Perform the following instructions to remove ZapCode II from your hard drive using the manual method.

1. Start the Windows software.
2. Go to the drive where you installed ZapCode II.
3. Delete the ZCdelete directory and its contents.
4. Open the ZapCode directory.
5. Select and delete all ZapCode II program files in the ZapCode directory.
6. If there are any transmission subdirectories in the ZapCode directory:
    a. Review the transmission subdirectories.
    b. Delete the subdirectories you do not want to save.
7. If there are no transmission subdirectories remaining in the ZapCode directory (the ZapCode directory is now empty), delete the ZapCode directory.
8. If there are transmission subdirectories remaining in the ZapCode directory, you have the following choices:

a. Leave the ZapCode directory as is. ZapCode II will put its program files into the directory the next time you install ZapCode II.
b. Rename the directory. ZapCode II will create a new ZapCode directory the next time you install it.

9. Go to the Program Manager.
10. Delete the Delete ZapCode II icon in the ZapCode II program group.
11. Delete the ZapCode II icon in the ZapCode II program group.
12. Delete the ZapCode II program group.
13. Go to the File Manager.
14. Select **By File Type...** in the View menu.
15. Click on **Show Hidden/System Files** to select it.
16. Click on the **OK** button.
17. Go to the root directory (e.g., C:\).
18. Locate and delete the file named ZCCURDIR.TXT.
19. Select **By File Type...** in the View menu.
20. Click on **Show Hidden/System Files** to unselect it.
21. Click on the **OK** button.
22. If you use the multiple boot configuration method:
    a. Edit the *c:\autoexec.bat* and *c:\config.sys* files to remove all ZapCode II configuration statements. If you need any assistance identifying these statements phone Intel at 602 554-8618.
    b. Go to the File Manager and delete the following files:
       - *c:\Windows\Win.ZC2*
       - *c:\Windows\System.ZC2*
       - *c:\autoexec.zap*
       - *c:\config.zap*

ZapCode II has now been deleted from your computer.

8

Transmit and Verify the ROM Code

CHAPTER 8
TRANSMIT AND VERIFY THE ROM CODE

This chapter contains instructions for performing the following activities:

- Starting ZapCode II
- Creating an initial checksum (optional)
- Identifying the product you are ordering and its features
- Transmitting the ROM code, encryption file (if applicable), and configuration file (if applicable) to Intel
- Editing files returned to your computer from Intel following transmission

8.1 START ZAPCODE II

Start ZapCode II using one of the following two methods.

8.1.1 Boot Disk Method

1. If your system is already running in some configuration other than ZapCode II, exit to the DOS prompt.
2. Insert your ZapCode II startup disk in drive A.
3. Boot or reboot your computer. It will start up in ZapCode II and display the welcoming screen (Figure 7-1 on page 7-7).
4. Skip to “Create A Checksum Optional)” on page 8-2.

8.1.2 Multiple Configuration Menu Method

1. If your computer system is already running in some configuration other than ZapCode II, exit to the DOS prompt.
2. Boot or re-boot your computer.
3. Select either the ZapCode II configuration or some other configuration.
   - If ZapCode II created a multiple configuration menu when you loaded it (you did not have a multiple configuration menu before loading ZapCode II), your initial screen will display a counter counting down from 15 seconds. If you do not select ZapCode II within 15 seconds and press the Return key, your computer will automatically boot up in the Normal configuration and display the welcoming screen (Figure 7-1 on page 7-7).
   - If ZapCode II added itself to an existing multiple configuration menu (you had a multiple configuration menu before loading ZapCode II), select **Load ZapCode II**

either by using the down arrow key and then pressing the Return key, or by typing the ZapCode II option number and pressing the Return key. Your computer will boot in the ZapCode II configuration and display welcoming screen (Figure 7-1 on page 7-7).

8.2 CREATE A CHECKSUM OPTIONAL)

Before transmitting your ROM code file to Intel, the ZapCode II welcoming screen gives you the option of converting it to hex and creating a pre-transmittal checksum. This option to produce a translated, filled hex file is provided so that you may compare the hex file to your ROM code, or so that you may load it into your device (tester). You may also use the checksum for comparison with your device's checksum (for example, from a data I/O).

If you do not choose to create the optional checksum, skip to "Connect to Intel" on page 8-5.

Perform the following steps to create your pre-transmittal checksum.

1. Click on the **Translate Hex File** button on the welcoming screen. The Product Information for Translation screen will display (Figure 8-1). When first opened, this screen does not display the "Enable Security Bit" field. This field appears only after you select a product for which security features are offered. Figure 8-2 illustrates the "Enable Security Bit" field when a product offering security features is selected.

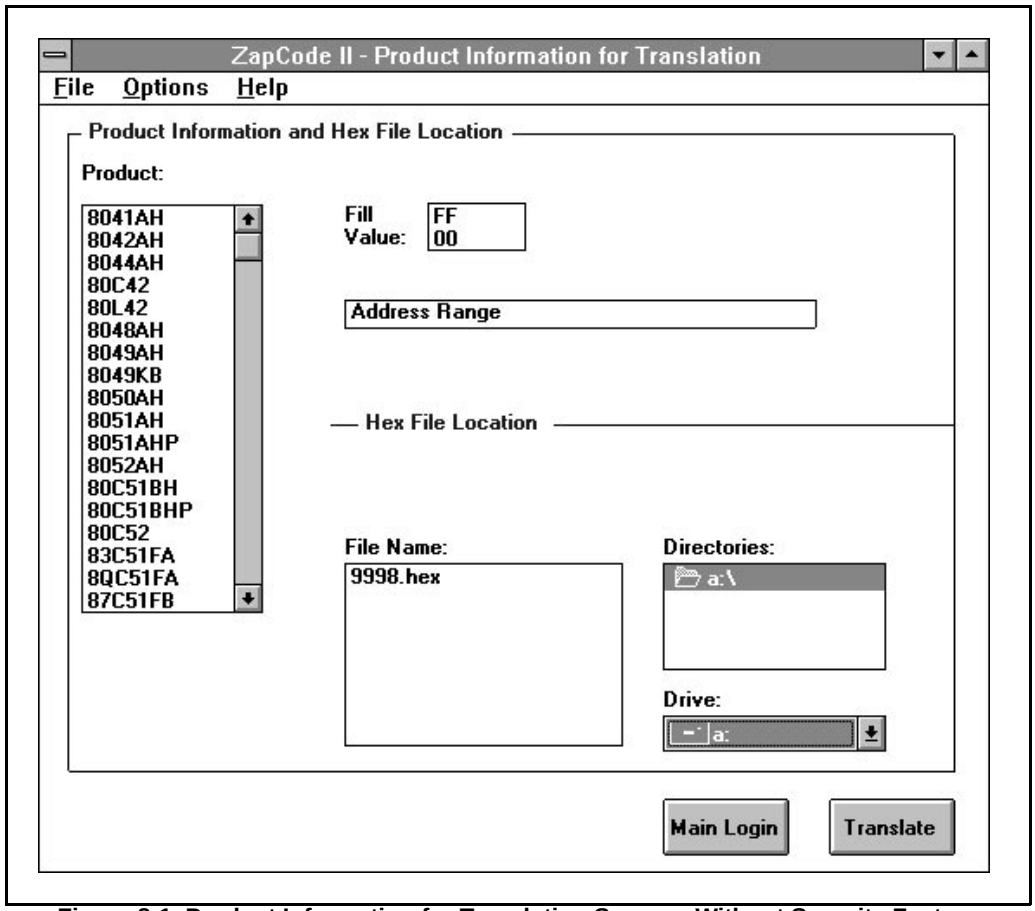


Figure 8-1. Product Information for Translation Screen - Without Security Feature

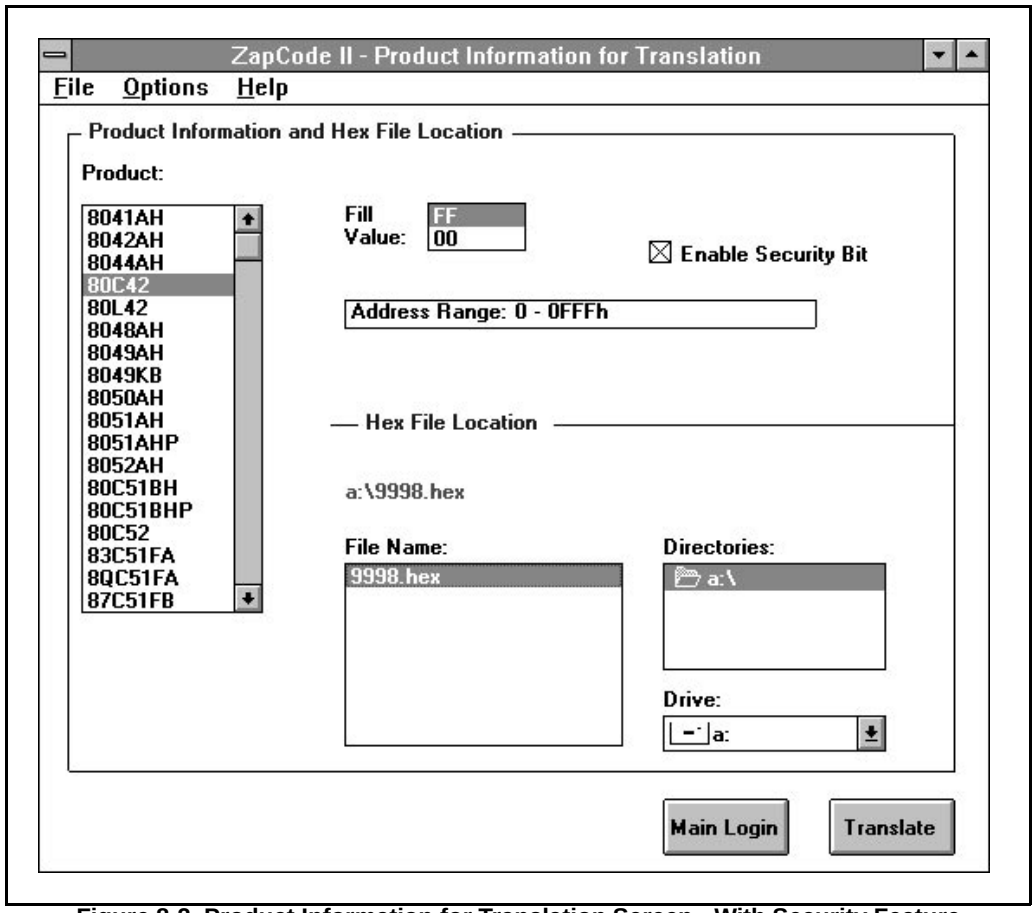


Figure 8-2. Product Information for Translation Screen - With Security Feature

2. Enter the Product Information data.
   a. **Product**: Select a product in the scroll list by clicking on it.
   b. **Fill Value**: Select a fill value, either FF or 00. This selection tells Intel how you want the undefined or blank sections of the ROM array filled.
   c. **Enable Security Bit**: Not all Intel products offer security features. If you selected a product that offers security features, an Enable Security Bit box will be added to the screen (Figure 8-2). Click on this box if you want security features enabled for your product option.
   d. **Address Range**: This field is automatically filled when a product is selected. There is no user input to this field.
3. Enter the Hex File Location information.
   a. **Drive**: Select the drive where your hex file is located

b. **Directories**: Select the directory where your hex file is located

c. **File Name**: Select the hex file by clicking on its name. The name of the file and its path will appear in red above the File Name scroll box.

4. Click on the **Translate** button. ZapCode II will save the translated file to the ZapCode directory on your hard drive. A message will be displayed showing the path to this directory. A "Z" suffix is appended to the file name, followed by a number representing the number of times the file has been translated. Figure 8-3 shows an example of this message (the file has been translated four times).

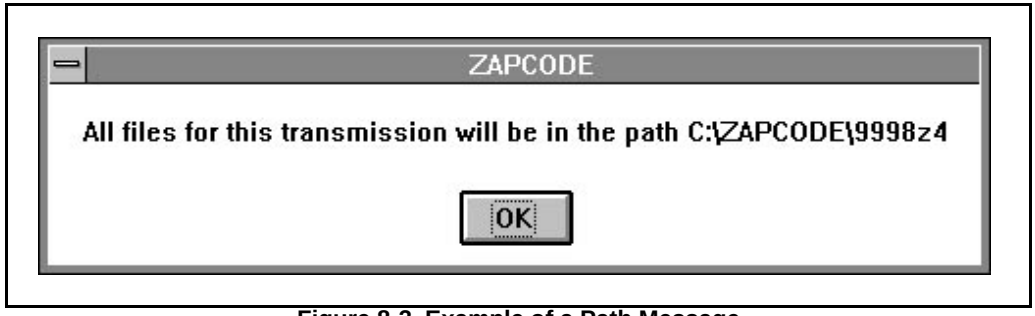


Figure 8-3. Example of a Path Message

5. Click on the **OK** button in the message box. The file will be translated and a checksum message will be displayed on the screen (Figure 8-4).

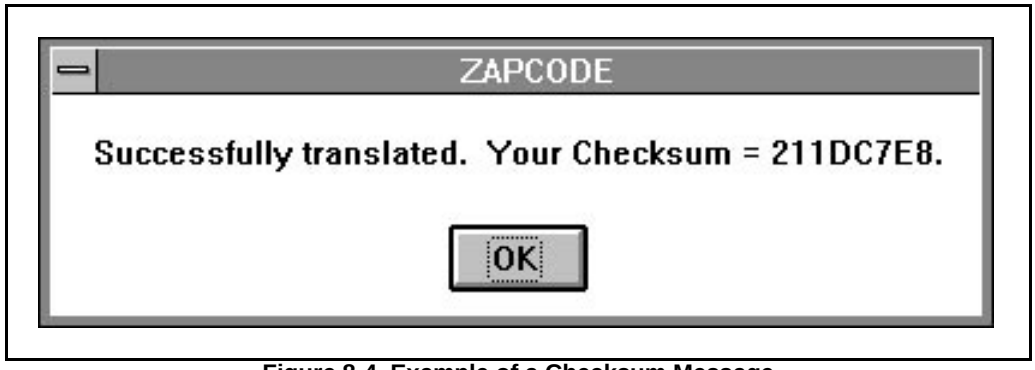


Figure 8-4. Example of a Checksum Message

6. Click on the **OK** button in the message box. The Product Information for Translation screen will return.

7. Click on the **Main Login** button. The display will return to the ZapCode II welcoming screen.

8.3 CONNECT TO INTEL

1. Enter your username and your password in the spaces provided on the welcoming Screen.

2. Click on the **OK** button. Your modem will activate and connect you to the Intel-resident ZapCode II system. Following authentication, the Main Menu (Figure 8-5) will display on your screen.

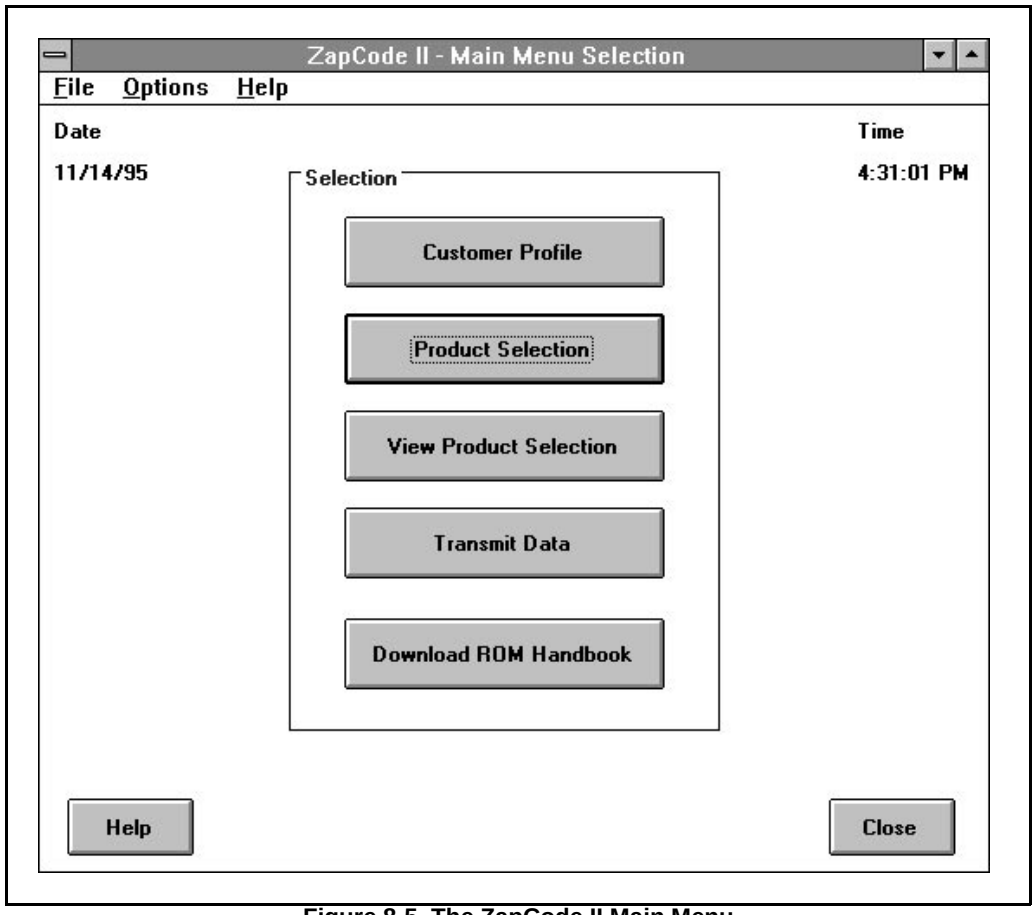


Figure 8-5. The ZapCode II Main Menu

3. Wait while the ZapCode II system automatically compares the ZapCode II files on your hard drive to the Intel-resident ZapCode II system files. A “Working...No User Input Needed” message will appear during this comparison. This check will determine whether or not you have the most current ZapCode II software loaded on your system. If you do not, ZapCode II will automatically download the most current files to your system, replacing the old files. A message box will display identifying the name of each file as it is updated.

8.4 SELECT A PRODUCT AND PRODUCT FEATURES

The Product Selection menu is used to describe your order to Intel. This includes providing information to identify the following items:

- an embedded microcontroller product
- a part-marking option
- a package type
- a packing option
- temperature/burn-in choice
- special stepping instructions (if applicable)
- security features (if applicable)
- MHz if the product offers a choice of speeds

These choices give Intel the necessary information to manufacture your product.

Complete the following steps to select your product and the features you have chosen. Each screen you enter has prompts and field-sensitive help to guide you through the process steps. Each screen also has a Help button that accesses general information about the screen function.

1. Click on the **Product Selection** button in the Main menu. The Product Information screen will be displayed (Figure 8-6).

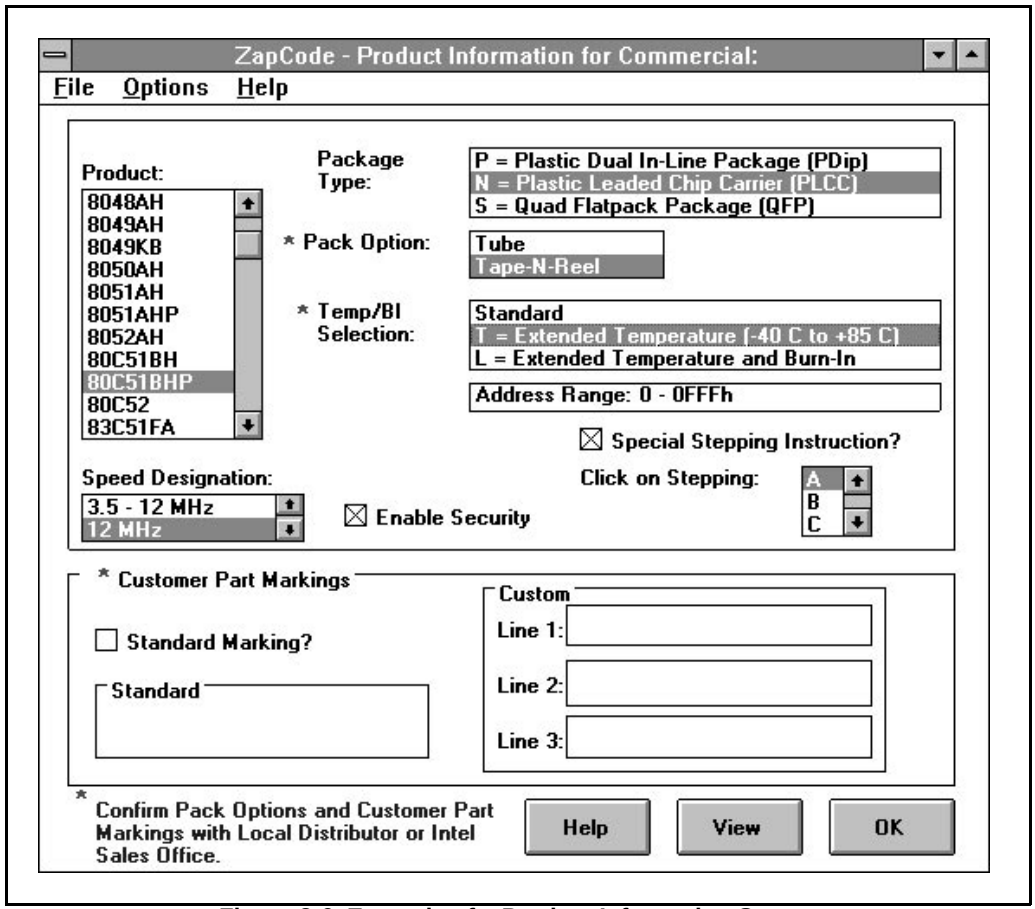


Figure 8-6. Example of a Product Information Screen

2. **Product**: Click on the product that you chose in Chapter 3. Use the vertical scroll bar to go up and down through the list.

3. **Package Type**: This field is populated when you select a product. Click on the package type that you chose in Chapter 3. Use the vertical scroll bar to go up and down through the list.

4. **Speed:** This box will appear only if the device selected offers different MHz versions.

5. **Pack Option**: The packing field is automatically filled in when a product is selected. Click on the packing method you chose in Chapter 8. Use the vertical scroll bar to go up and down through the list.

6. **Temp/BI Selection**: The available temperature and burn-in option box is automatically filled in when you select a product. Click on a temperature and burn-in option to select it. Use the vertical scroll bar to go up and down through the list.

7. **Address Range**: The address range is automatically filled in when a product is selected. There is no user input to this field.
8. **Special Stepping Instruction**: A stepping product is either the original design or any change in the original design of a device which improves its functionality. This information is required only if you have been notified by Intel that the product is currently undergoing a production change; otherwise the standard product will be provided.
   a. **Click on Stepping**: Click on the appropriate stepping, if required. Use the vertical scroll bar to go up and down through the list.
9. **Enable Security**: This field will appear only if you select a product that offers security features. Check this box if you want the security features enabled for your product, if they are available. Refer to Chapter 4 for security information.
10. **Customer Part Markings**: Choose either Standard or Custom marking.
    a. **Standard Marking**: This is the default for marking. Click on the **Standard Marking?** box and the Custom entry boxes disappear from the screen, and the standard marking for the device appears in the **Standard** box. Figure 8-7 shows an example of a selection for Standard marking with the Custom boxes hidden.
    b. **Custom (Line 1/Line 2/Line 3)**: Enter the markings you created in Chapter 5 for each line. Figure 8-6 shows the entry boxes that appear when **Standard Marking?** is not selected.

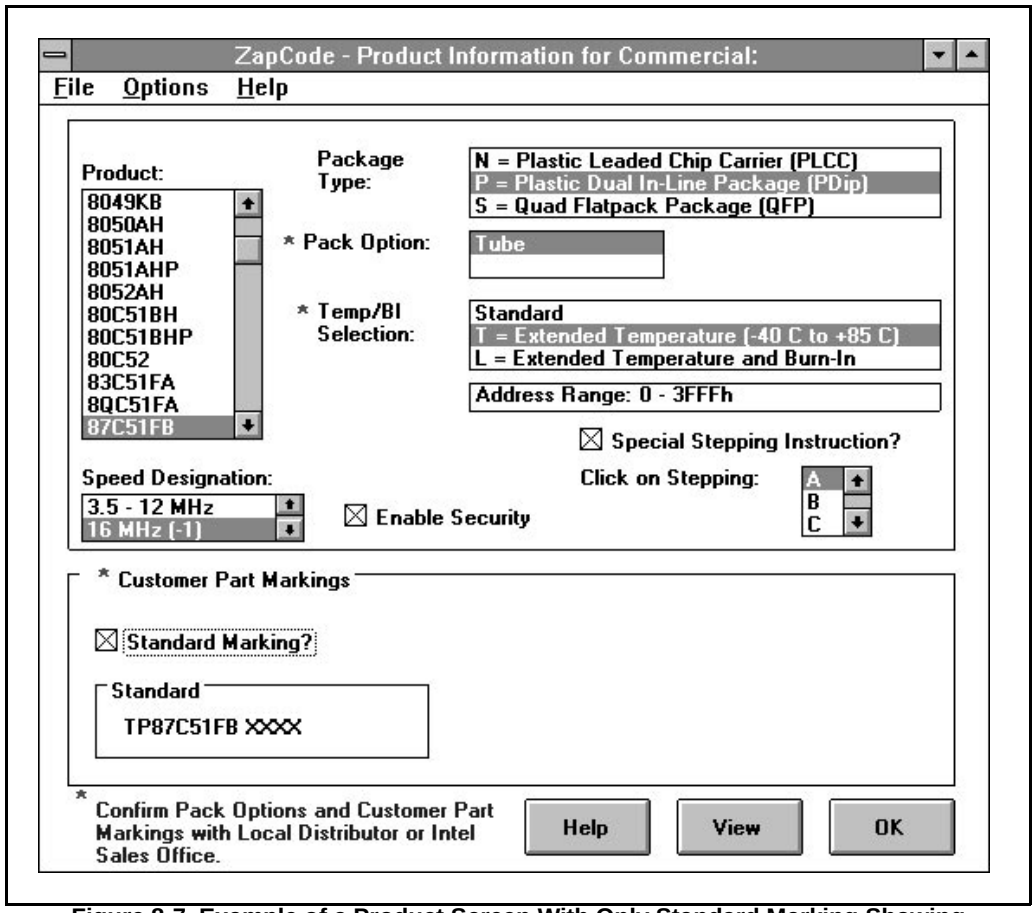


Figure 8-7. Example of a Product Screen With Only Standard Marking Showing

11. Click on the **View** button. The Current Product Selection screen shows the options you have selected, including the part marking. Figure 8-8 shows an example.

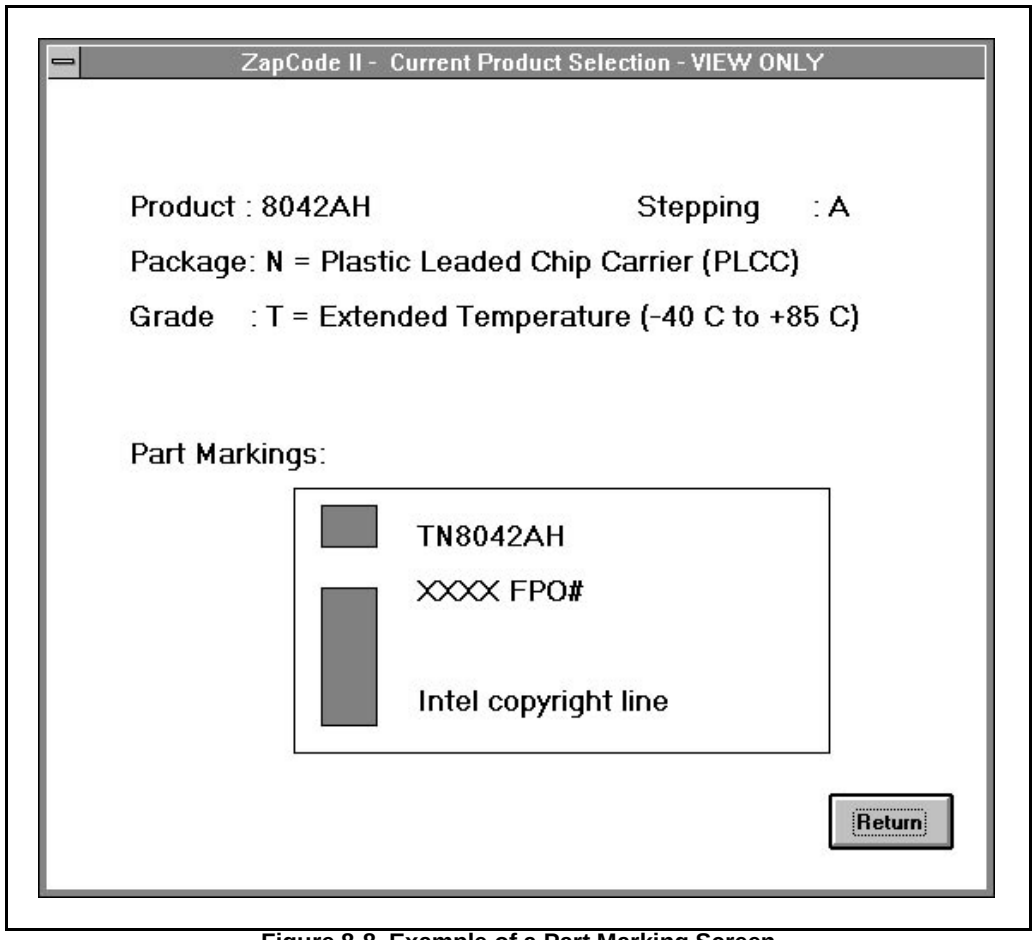


Figure 8-8. Example of a Part Marking Screen

12. Click on the **Return** button when you have finished viewing the illustration. The screen returns to the Product Information window.
13. Click on the **OK** button. Your settings will be saved and the screen will return to the Main Menu.

8.5 VERIFY YOUR PRODUCT SELECTION

After completing and closing the Product Selection screen, you can review and verify your part marking at any time (without entering the Product Selection screen) by clicking on the **View Product Selection** button on the Main Menu.

The **View Product Selection** screen shows the options you have selected, including the part marking. Figure 8-8 shows an example.

Click on the **Return** button to close the window and return to the Main Menu.

8.6 TRANSMIT THE DATA TO INTEL

After you have verified your selection of product and product features, this information is ready for transmittal to Intel. Perform the following steps to transmit the data.

1. Click on the **Transmit Data** button on the Main menu. The Transmit Data window will display on your screen. This window is used to locate the files you are transmitting to Intel.
   - These files must be located on your hard drive or on a diskette in drive A.
   - The Transmit Data window adjusts itself to provide individual selection boxes for locating the hex file, the encryption array file, and the configuration file, depending on the product you selected. For example, Figure 8-9 illustrates a typical Transmit Data window for a product which requires only a hex file, while Figure 8-10 illustrates a Transmit Data window for a product requiring a hex file, an encryption array file, and a configuration file.
   - The Display Information box at the top of the Transmit Data window shows your customer name and the identifies the product you selected.

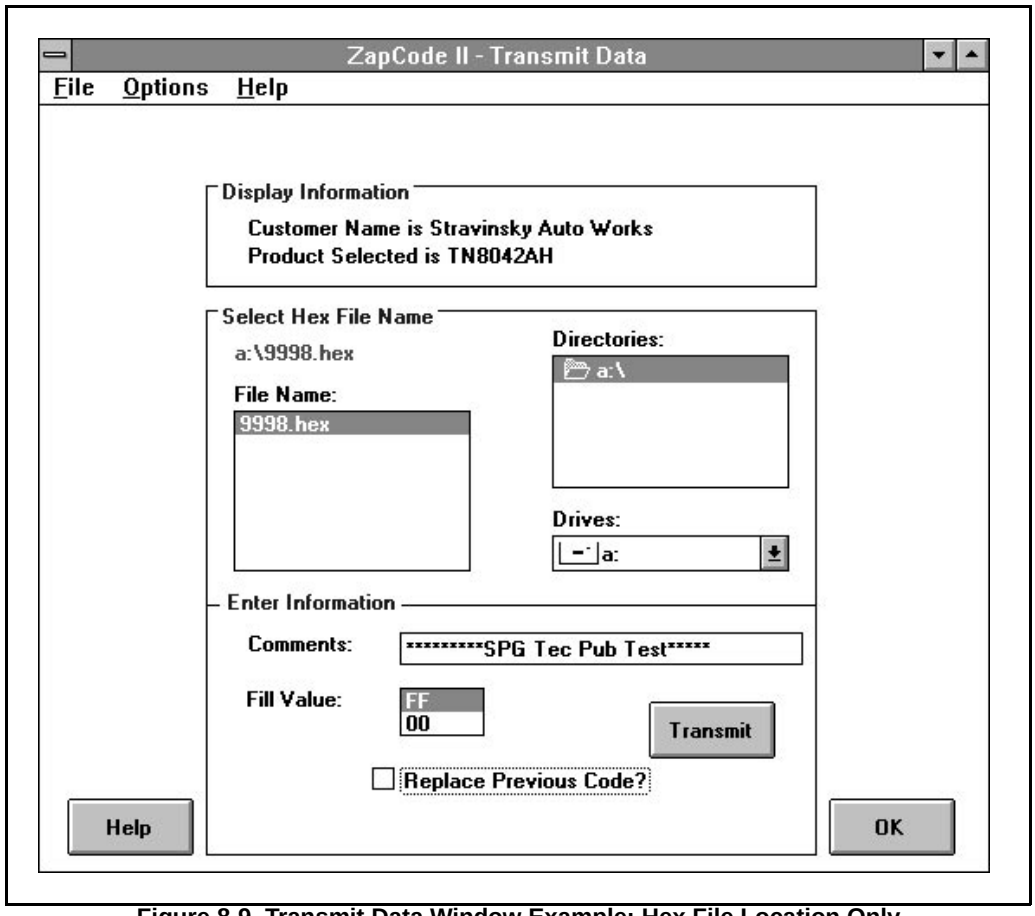


Figure 8-9. Transmit Data Window Example: Hex File Location Only

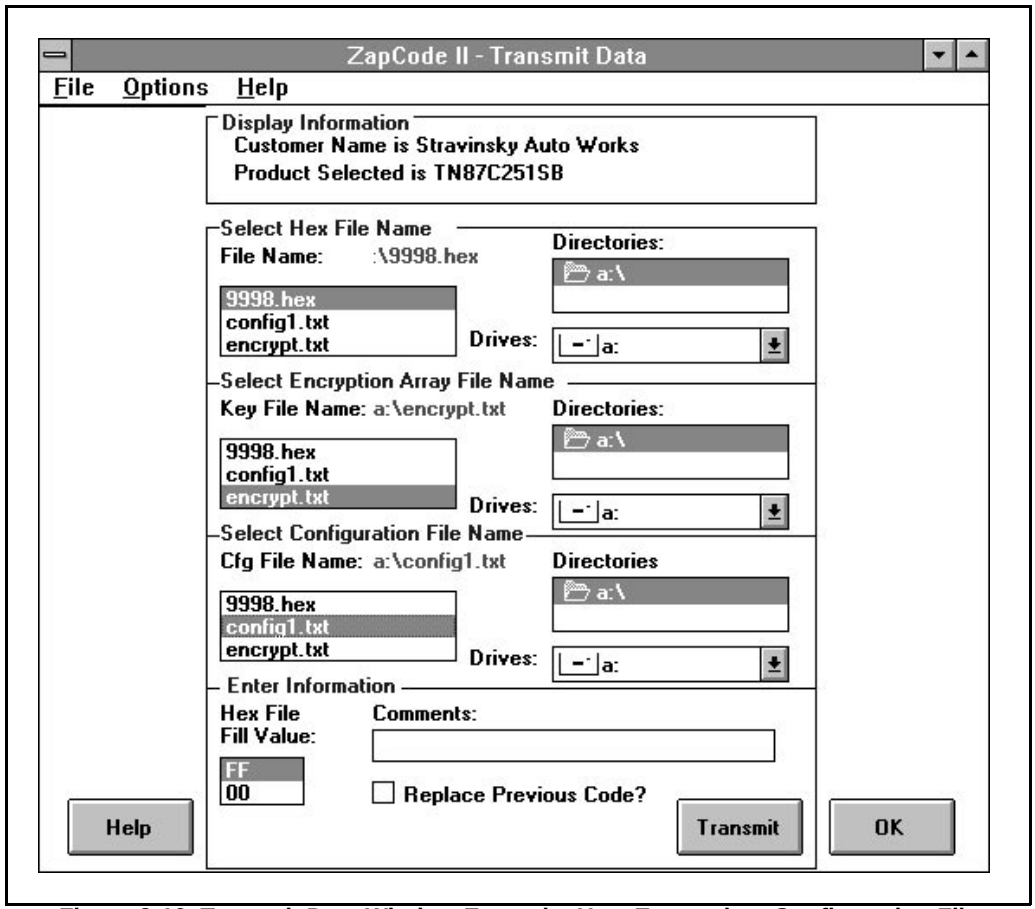


Figure 8-10. Transmit Data Window Example: Hex, Encryption, Configuration File Locations

2. Use the Drives, Directories, and File Name scroll boxes to select the name(s) of the file(s) to be transmitted to Intel. The selections will appear in red above the applicable selection boxes.

3. Complete the entries in the **Enter Information** area of the window.
   a. **Comments**: Enter any comments you would like Intel to see. There is a 29-character limit.
   b. **Fill Value**: Select a hex fill value, either FF or 00. This selection tells Intel how you want the undefined or blank sections of the ROM array filled.
   c. **Replace Previous Code**: If selected, an additional entry field for entering the part number is displayed in the window. Figure 8-9 illustrates the Transmit Data window when Replace Previous Code is not selected. Figure 8-11 illustrates the window when it

is selected. Enter the part number for the replacement in this box if Replace Previous Code is selected.

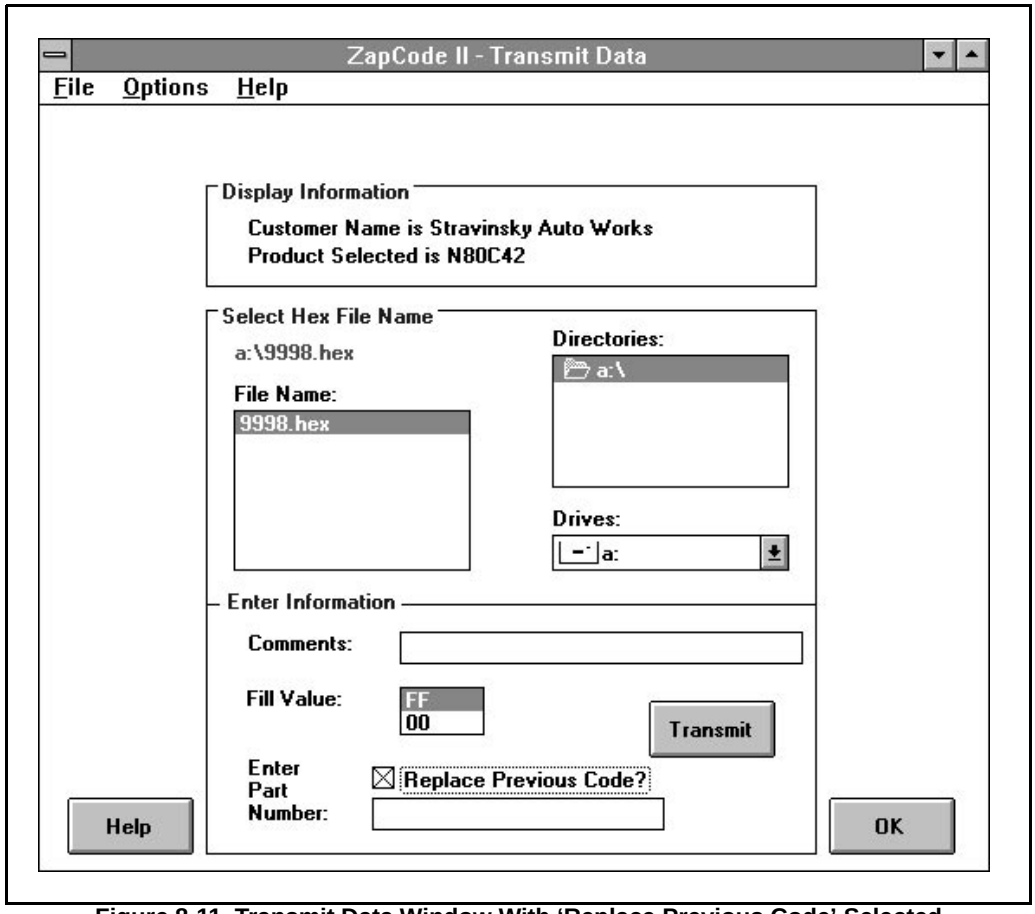


Figure 8-11. Transmit Data Window With 'Replace Previous Code' Selected

4. Click on the **Transmit** button. The Intel disclaimer is displayed on your screen.
5. Read the disclaimer and then click the **OK** button to continue. A screen message will appear giving the path to the directory on your hard drive to which files created for this transmission are copied. Figure 8-12 shows an example of this message.

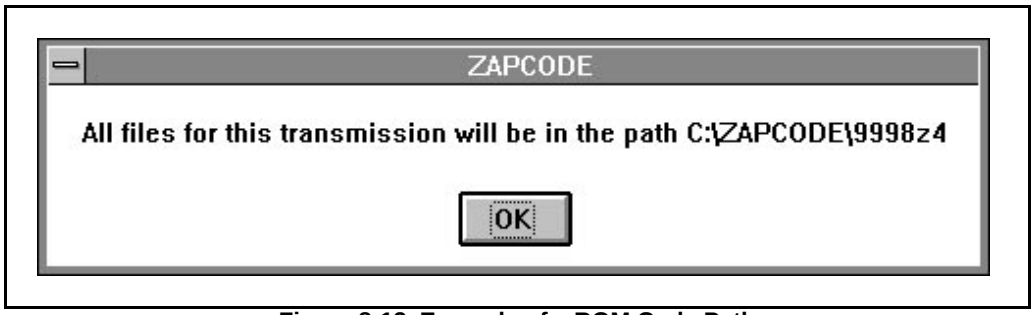


Figure 8-12. Example of a ROM Code Path

6. Click on the **OK** button in the ZapCode message box.
7. Click on the **OK** button of the Transmit Data window. This invokes the ZapCode II translation software, which does the following:
   - translates your ROM code into an 8080 Intelec hex format
   - fills the blank ROM area with your choice of FFH or 00H
   - transfers your code to Intel's database
   - creates the final checksum for the file
   - assigns a unique ROM code record number to your transmittal

8.7 VERIFY THE CHECKSUM

After the transmission is completed, ZapCode II locates the transmitted hex file on your computer and creates a checksum for it. It then creates a checksum for the same hex file as it was received at Intel. A comparison of the two checksums follows, with the results displayed in an information window on your computer.

- If the checksums on your computer and at Intel are the same, ZapCode II will display a screen message like the example in Figure 8-13.

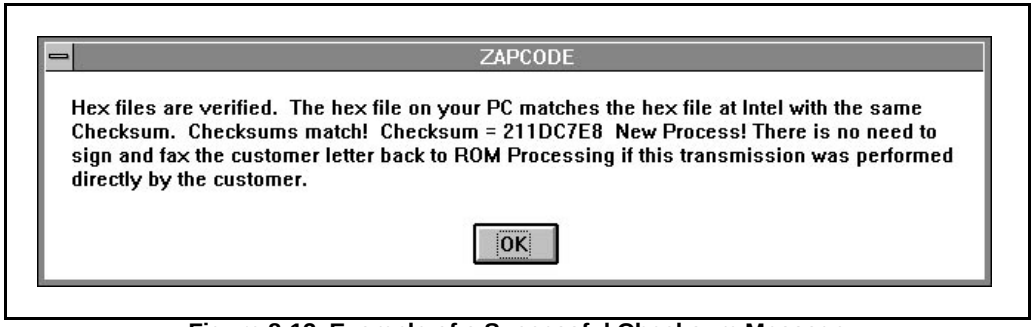


Figure 8-13. Example of a Successful Checksum Message

- If the checksums on your computer and at Intel do not compare, ZapCode II will display a message in the following example format: “Hex files did NOT compare. Checksum on hex file located on your PC = 211DC7E8. Checksum at Intel = FFEEAADD. Please try transmitting again.”

Click on the **OK** button to close the ZapCode message window.

If you received the message that the checksums on your computer and at Intel do NOT compare, repeat sections 8.2 through 8.7.

- If the checksums do NOT compare after retransmitting, contact your distributor or local sales office for assistance.

8.8 RECORD THE ROM NUMBER

After you have verified the checksum and clicked on the OK button in its message box, ZapCode II displays an information window that shows the ROM code record number assigned to your hex file. Figure 8-14 shows an example of a ROM code record number message.

Record the ROM code record number for future use, such as when you place your order with your distributor or sales office.

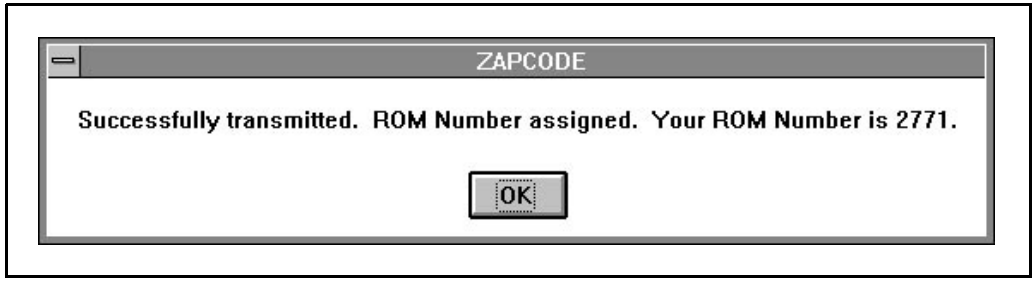


Figure 8-14. Example of a ROM Number Message

Click on the **OK** button to return to the Main Menu.

8.9 EXIT ZAPCODE II

Perform the following instructions to exit ZapCode II and reboot to your normal configuration.

1. Click on the **Close** button of the Main Menu.
2. Click on the **OK** button to exit ZapCode II. A departing message box will appear.
3. Click on the **OK** button in the message box.
4. If you loaded ZapCode II using the boot diskette method:
   a. Remove the boot diskette from drive A.
   b. Reboot to return to your normal configuration.
   c. Return the boot diskette to storage.
5. If you loaded ZapCode II using the multiple menu method:

a. Exit to the DOS prompt.

b. Perform steps 2 and 3 of “Multiple Configuration Menu Method” on page 8-1 to reboot to your normal configuration.

8.10 EDIT THE FILES RETURNED FROM INTEL

1. Go to the ZapCode directory on your hard drive. This directory holds the transmission files returned to your computer by ZapCode II following your transmittal. The following files are located in the directory.

   - **<*filename*>.hex**: Contains the original code file that you transmitted to Intel.
   - **<*ROMcodeNumber*>.hex**: Contains the new ROM code file after processing by Intel. The ROM code record number is the number your recorded in Section 8.8.
   - ***cust.txt**:* Contains the Customer Confirmation letter. This file summarizes the entries you made in Section 8.4.
   - **<ROM #> config.hex**: Optional depending on the part you selected.
   - **<ROM #> key.hex**: Optional depending on the part you selected.

2. Open and verify the information in the files named in step 1.

   - If there are any errors, contact Intel at the number shown in the *cust.txt* file.

9

Place Your Order

CHAPTER 9
PLACE YOUR ORDER

After you transmit your ROM code and verify information in the Customer Confirmation Letter, ask your local Intel distributor to help you prepare a purchase order for the product you are ordering. The purchase order will include the following minimum information.

- The size (quantity) of your order. There are minimum order size requirements for various commercial and automotive products. See Table 3-2 on page 3-4.
- The mask and set-up charges for your order. See Table 3-2 on page 3-4.
- A lead-time option. This will determine when your order enters the manufacturing process. See Table 3-2 on page 3-4.

After receiving this completed purchase order, Intel will schedule your ROM manufacturing.

A

Product Order Form

APPENDIX A
PRODUCT ORDER FORM

CUSTOMER INFORMATION

Company Name _____

Contact Name _____ **Phone Number: (____)** _____

Address_____ **Fax Number: (____)** _____

City _____ **State** _____ **Zip Code** _____

Distributor (if applicable) _____

Sales Office (if applicable)_____

PRODUCT

Intel Product Name: _____

Package Type :_____

Refer to Table 3-7 on page 3-12 *for a listing of package options.*

Operating Temperature† :_____

Refer to Table 3-1 on page 3-2 *for a listing of temperature and burn-in options.*

† Default is standard as specified in the Data Sheet. No character required.

Fill Value _____ (Fill value for unused address locations can be FF or 00.)

Packing Method _____ (Refer to Chapter 6, “Select a Packing Method” for a listing of packing method options.)

PART MARKINGS

Commercial QROM devices can use 1 line only for part marking.

Automotive devices can use 3 lines for part marking.

D package (C-DIP)	maximum 10 characters per line (1 line)
P package (P-DIP)	maximum 18 characters per line (3 lines)
N package (PLCC)	maximum 11 characters per line (3 lines)
S package (QFP)	maximum 07 characters per line (1 line)

For Commercial Devices:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

For Automotive Devices:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

TRANSMITTAL AND SECURITY INFORMATION

Intel's preferred method of media transportation (in order):

1. ZapCode II (Electronic)
2. Federal Express (Floppy, EPROMs)

Your ROM code method of transportation _____
(For example: Floppy, 2764A EPROM)

Hex Code Labeled _____

MCS® 51 Security (if applicable):	**MCS® 96 Security (if applicable):**
Set Security Bit: [ ] YES [ ] NO	**Set LOC0 Bit:** [ ] YES [ ] NO
Encryption File Labeled _____	**Set LOC1 Bit:** [ ] YES [ ] NO

SIGNATURE

Customer Signature_____ Title:_____ Date: _____

B

ROM Code Hex File Description

APPENDIX B
ROM CODE HEX FILE DESCRIPTION

The ZapCode transmission program takes a ROM-code hex file as input and calculates the checksum. The ROM must be in multiples of 4K and can be any value from 4K to 32K. The transmission program expects a certain format for the hex code.
Each ROM code line must follow this format:

```
:10001000FE352FCD454BAEFFE43E5D55AAE435EEEF
:
```

The first character is a colon.

```
: 10
```

The next two characters specify in hex the number of bytes in that line. (For this example, the number of bytes is 10H or 16 decimal.)

```
:10 0010
```

The next four characters specify the starting address of the first byte in the line (0010H = 16 decimal).

```
:100010 00
```

The next two characters indicate the record type. (The 00 indicates a “normal” record; that is, a line of hex code that is other than the last line in the file. The record type of the last line in the file is 01.)

```
:10001000 FE352FCD454BAEFFE43E5D55AAE435EE
```

The next several characters are the actual hex bytes of the ROM. (The 16 data bytes of this line are FE, 35, 2F, CD, 45, 4B, AE, FF, E4, 3E, 5D, 55, AA, E4, 35, and EE.)

```
:10001000FE352FCD454BAEFFE43E5D55AAE435EE EF
```

The last two characters are a hex checksum (or parity byte) for the line of code. The checksum value is a value that, when added to the sum of the record, equals zero. It is the sum that has been negated.

Index

INDEX

R

S

T

U

W

Z