

1PR 881021

GETTING STARTED ON THE INTELLEC 432/100

Manual Order Number: 171819-001, Rev. A

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Getting Started on the Intellec 432/100

Preface

This document provides general information and installation instructions for the Intellec 432/100 Evaluation and Education System. In addition to the documents provided with the Intellec 432/100 system, the following documents may be helpful:

- iSBC 032/048/064 Random Access Memory Boards Hardware Reference Manual, Order Number 9800488
- Intellec Series II Microcomputer Development System Hardware Reference Manual, Order Number 98-556
- Intellec Microcomputer Development System Reference Manual, Order Number 98-129

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1.0 Introduction

The Intellec 432/100 Evaluation and Education System consists of five parts, the OPL-432 software, the predefined OPL-432 workspaces, the field confidence test, the iSBC 432/100 board, and a documentation package.

The OPL-432 software system executes in an Intellec Development System with 192K of available RAM and the iSBC 432/100 installed. The 8080 (or 8085) in the Intellec functions as an attached processor to the iSBC 432/100 through shared memory. The OPL-432 runtime system executes on the 8080 (or 8085) in the Intellec development system. The runtime system provides an interface to ISIS and terminal I/O. The OPL-432 interpreter executes on the iAPX 432.

The OPL workspaces are OPL programs which supply useful tools for OPL program development and an OPL editor.

The field confidence test verifies that the iSBC 432/100 board is functional and that 192K of memory is available to the iAPX 432.

The iSBC 432/100 is a Multibus-compatible board featuring the iAPX 43201 and iAPX 43202 General Data Processor. The board operates as a Multibus master translating multibyte memory requests from the 432 GDP into multiple 8-bit or 16-bit Multibus requests.

The documentation package includes introductory and detail material on the concepts of the iAPX 432. Section 6 of this manual provides a reader's guide to the material. Read section 6 before any of the other documents in this package.

2.0 Installation

This section provides the information necessary for installing the Intellec 432/100 Evaluation and Education System in an Intellec Development System.

2.1 Equipment Supplied

A list of the equipment supplied with the Intellec 432/100 Evaluation and Education System is provided in Table 2-1.

2.2 Equipment Not Supplied

A user terminal and a cable for connecting it to the RS-232-C serial interface on the board is not supplied.

No additional memory boards are supplied. The user is responsible for supplying the 192K of memory for Intellec 432/100 operation.

2.3 Power Requirements

Before installing additional boards in the Intellec MDS, calculate the total +5V, +12V, and -10V current requirements for all the installed modules and ensure that the additional current requirements of the modules to be installed will not exceed the capacity of the power supply.

Table 2-1 Equipment Supplied

<u>Part Number</u>	<u>Qty</u>	<u>Description</u>
172000-xxx	1	Single density diskette containing OPL-432 system files
172002-xxx	1	Single density diskette containing OPL-432 workspace files
172001-xxx	1	Double density diskette containing OPL-432 system files
172003-xxx	1	Double density diskette containing OPL-432 workspace files
171958-001	1	iSBC 432/100 board
171858-001	1	iAPX 432 Object Primer
171821-001	1	Introduction to the iAPX 432 Architecture
171873-001	1	43201/43202 GDP Data Sheet
171874-001	1	43203 IP Data Sheet
171860-001	1	iAPX 432 GDP Architecture Reference Manual
171819-001	1	Getting Started on the Intellec 432/100
171823-001	1	Object Programming Language User's Manual
171859-001	1	Object Builder User's Guide
171820-001	1	iSBC 432/100 Hardware Reference Manual
172040-001	1	iAPX 43201/43202 Component Errata Sheet

Note: xxx represents a three digit part number revision code.

2.4 General Installation Procedure

The iSBC 432/100 and additional memory boards are installed in the Intellec development system chassis. Except where noted in this manual, the jumper and switch requirements for the hardware are the default (factory) configurations. Refer to the appropriate hardware reference manual for details.

The following steps should be followed in installing the Intellec 432/100 System:

1. Note restrictions and install upgrades as required (see section 2.5).
2. Install memory, as required (see section 2.6).
3. Install iSBC 432/100 (section 2.7).
4. Run memory test (see section 4.1).
5. If required, install terminal connected to iSBC 432/100 (see section 2.8).
6. Run echo test to verify correct installation of terminal (see section 4.2).
7. Remove iSBC 432/100, configure for OPL-432 execution and reinstall board (section 3.0).
8. Repeat memory and terminal tests.

2.5 Restrictions

See Appendix B for a list of supported system options.

Intellec MDS-800:

- MDS-016 memory boards cannot be used in the system

Intellec Series II:

- IPB-80 boards, PWA number 1001194, must be upgraded to allow for 20-bit bus addresses. This is done by installing a PWA 20-bit Address Piggyback Board, part number 1002234. Contact your field service representative for further details. Later numbered IPB-80 boards require no modifications.
- MDS-016 memory boards cannot be used in the system.
- IPB-80 boards allow the iSBC 432/100 to make only 8-bit memory accesses. See section 2.7 for details.

Intellec Series III:

- The memory on the RPB-86 board is not normally available to the iAPX 432 (see section 2.6.1 if the RPB-86 must be used as a memory board).

WARNING

Always turn off computer power before installing or removing any boards. Failure to take this precaution can result in damage to the boards.

2.6 Memory Installation

In the following discussion all iSBC memory boards must have the following jumpers (the factory defaults):

<u>Jumper</u>	<u>Terminals</u>
W6	E7 to E17
W7	E8 to E18
W8	E29 to E31
W12	T50 to L1

All iSBC-064 boards have the following jumpers (the factory defaults):

<u>Jumper</u>	<u>Terminals</u>
W1	E1 to E9
W2	E2 to E12
W3	E3 to E14
W4	E4 to E15

There are two different jumper configurations for iSBC-032 boards. These are labeled lower and upper as follows:

<u>lower:</u>	<u>Jumper</u>	<u>Terminals</u>
	W1	E1 to E9
	W2	E4 to E16

<u>upper:</u>	<u>Jumper</u>	<u>Terminals</u>
	W1	E1 to E10
	W2	E4 to E15

An additional jumper (W5) places the iSBC 032/064 boards in a particular 64K address range. Table 2-2 summarizes the possible combinations to cover 0 to 192K bytes. A single iSBC-064 may be replaced by two corresponding iSBC-032 boards.

Series II's and Series III's with IPB-80 boards will require at least one iSBC-032 board for the 32K to 64K address range. Alternately, an iSBC-064 board can be used if it is configured as an iSBC-032 upper configuration.

For more detailed information on the iSBC RAM boards see iSBC 032/048/064 RAM Hardware Reference Manual, order number 9800488.

Table 2-2 Memory Configuration
Using iSBC-032/064 Boards

iSBC 032*

<u>Address Range</u>	<u>Terminals</u>	<u>Configuration</u>
0K- 32K	E5 to E21	lower
32K- 64K	E5 to E21	upper
64K- 96K	E5 to E22	lower
96K-128K	E5 to E22	upper
128K-160K	E5 to E23	lower
160K-192K	E5 to E23	upper

iSBC 064

<u>Address Range</u>	<u>Terminals</u>
0K- 64K	E5 to E21
64K-128K	E5 to E22
128K-192K	E5 to E23

* Using only iSBC 032 boards for the memory will overload the power supply in most systems.

2.6.1 Series III RPB-86 as a Memory Board

The RAM on the RPB-86 is not normally available for use by the iAPX-432. However, the RPB-86 board from the Series III may be used as a memory board for the range 128K-192K. While in this configuration, Series III software except the debugger (DEBUG) may run incorrectly. To reconfigure the RPB-86 board, set switch S1 as follows:

<u>Off</u>	<u>On</u>	<u>#</u>
	X	1
X		2 *
X		3 *
X		4 *
X		5 *
X		6 *
	X	7 *
X		8 *

* Indicates normal RPB-86 setting not changed

Also add a jumper from terminal E125 to E126.

The use of the RPB-86 as a memory board will cause some performance degradation.

Reset the switch and remove the jumper to use the RPB-86 in the normal Series III mode.

For Engineering Sample Intellec 432/100 Software Only:
Every time the system is reset, the 8086 on the RPB-86 board begins executing the normal initialization sequence. For OPL-432 or the memory confidence test to execute correctly, the 8086 must be halted. This is done by the following sequence:

```
--:F1:RUN DEBUG
DEBUG 8086, V1.0
*PORT C2=FF
*WORD 0=F4F4
*G
--
```

Now press interrupt 0 to enter the Intellec Monitor and continue the sequence:

```
#3B9C  
.S9 DC-4A 3B-00  
.G8
```

The characters typed by the development system are underlined. The user typed spaces are significant in the line starting ".S9". The 8086 is now halted and can only be restarted by the system boot sequence.

2.7 iSBC 432/100 Installation

In an Intellec MDS-800 system or a Series III system upgraded from one, the board must be installed in an odd number backplane slot, other than slot #1. The board may be installed in any slot of the Series II (or any Series III except the above) including in an expansion chassis.

On any Series II or Series III which uses an IPB-80 board, the iSBC 432/100 should be installed without modifying any of the factory set jumpers (except as described in section 3). All other systems should remove the jumper from terminal E46 to E47 and install a jumper from terminal E45 to E46. This will allow the iSBC 432/100 to make 16-bit Multibus memory requests. This significantly improves performance.

While the Intellec 432/100 system will run with IPB-80 equipped systems, it is highly recommended that they be upgraded with the IPC-85, part number MDS-505. This will almost double the Intellec 432/100 system performance.

2.8 Terminal Installation

This section describes the installation of a terminal using the iSBC 432/100 serial I/O port. This is not necessary with the Intellec MDS-800 systems. Instead, the OPL terminal should be installed as the standard Intellec CRT console device. Refer to the final two paragraphs concerning an appropriate extension cable and terminal switch settings.

Installation of the terminal requires a cable assembly consisting of a 25-conductor cable with a 26-pin printed circuit board edge connector at one end and a 25-pin RS-232-C interface connector at the other end. The Intel iSBC 955 cable set includes a correct cable, part number 4000677-01. A list of equivalent cables is given in the iSBC 432/100 Hardware Reference Manual Table 2-1. If another cable is used, refer to Table 2-3 to verify it is properly constructed.

Note: Table 2-3 is different than Table 2-9 of the iSBC 432/100 Hardware Reference. Table 2-3 gives a correspondence of the pin numbers on the two connectors on the cable.

Viewed from the component side of the board, the serial I/O connector is on the edge with the extractor handles, at the right. Install the cable with pin 2 of the cable's edge connector mated to pin 1 of the board's edge connector. Pin 1 is on the component side of the board at the far right when viewed as above. The cable should then be routed to the back panel of the Intellec Development System and the RS-232-C interface connector installed in one of the spare connector holes. In the Series II, it may be convenient to route the cable out the side of the chassis, through the space between the front panel and the cabinet. See the hardware reference manual for the appropriate Intellec Development System model for details.

The terminal is connected to the RS-232-C connector directly or by an extension cable (not supplied with the iSBC 955 assembly). The extension should be a 25 conductor cable with the appropriate gender RS-232-C connectors at each end. This cable is constructed with direct correspondence between the pins (pin 1 to pin 1, pin 2 to pin 2, etc.). Most terminals (including those supported by OPL) require only a ten conductor extension cable connecting pins 1, 2, 3, 5, 6, 7, 8, 14, 20, and 23. The serial I/O cable in the iSBC 957 assembly, part number 4000417-01, is an appropriate cable.

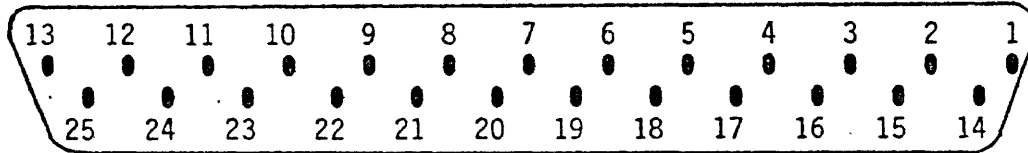
The serial interface is programmed for use with:

- Full duplex, upper/lower case
- 9600 baud
- 8-bit character length
- Parity inhibited
- 1 stop bit

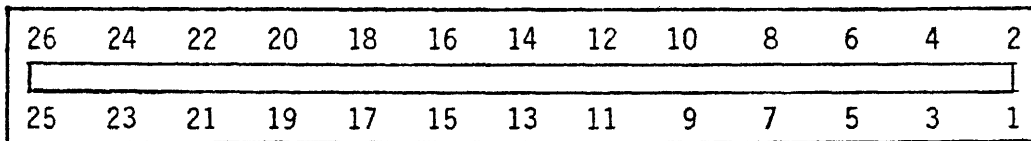
The terminal option switches should be set accordingly.

Table 2-3

RS-232-C Connector



Cable Edge Connector



Pin Correspondence

<u>Cable Connector</u>	<u>RS-232-C Connector</u>	<u>Cable Connector</u>	<u>RS-232-C Connector</u>
1	1	14	20
2	14	15	8
3	2	16	21
4	15	17	9
5	3	18	22
6	16	19	10
7	4	20	23
8	17	21	11
9	5	22	24
10	18	23	12
11	6	24	25
12	19	25	13
13	7	26	N/C

3.0 Configuring for OPL

There are three jumpers on the iSBC 432/100 board which are used to supply OPL with information concerning the location of the OPL screen and the type of terminal being used for the screen.

OPL will detect completely invalid jumper configurations. However, if a valid configuration is used with the wrong terminal or system, OPL will output data to the wrong screen and/or in the wrong format.

The following terminal families are supported for use with OPL (with restrictions as specified).

- LSI ADM3: Must have upper/lower case option, screen clear and home functions, and direct cursor addressing. Upward compatible terminals (e.g., ADM3A and 3A+) are also acceptable.
- Hazeltine 1500: Upper/lower case enabled, screen clear and home functions, and direct cursor addressing. Upward compatible terminals (e.g., 1510 and 1520) are also acceptable. Note: If switch selectable, the lead-in character is to be set to tilde (ASCII code 126 decimal).

There are two possible locations for the OPL screen, the ISIS CRT console and a stand alone terminal connected directly to the iSBC 432/100 board as described in the section 2.8.

3.1 ISIS CRT Console

Remove the jumper from E40 to E41 for this mode. On the Intellec MDS-800 hardware, ISIS must have the console set to the CRT port (i.e., must be booted from the CRT terminal prior to using OPL, not from the TTY). The other two jumpers then have the following meanings:

<u>E36 to E37</u>	<u>E38 to E39</u>	<u>Terminal</u>
Removed	Removed	Invalid
Installed	Removed	LSI ADM3 family
Removed	Installed	Hazeltine 1500 family
Installed	Installed	Invalid

This is the preferred mode for use on an Intellec MDS-800.

3.2 Stand-Alone Terminal

Install jumper from E40 to E41 (factory default) for this mode. Before attempting to run OPL in this mode, verify that the terminal is correctly installed and tested (see sections 2.8 and 4.2). The other jumpers have the following meanings:

<u>E36 to E37</u>	<u>E38 to E39</u>	<u>Terminal</u>
Removed	Removed	Reserved/invalid
Installed	Removed	LSI ADM3 family
Removed	Installed	Hazeltine 1500 family
Installed	Installed	Invalid

This mode must be used with the Series II and Series II based Series III.

The engineering sample version of the confidence test software includes functionality intended for use in manufacturing tests. That functionality is not intended for field use and is not documented here.

4.1 Memory Test - Monitor Command R

The following dialog illustrates the use of the memory test function of the monitor. Characters typed by the test monitor are underlined. The notation ↵ indicates a user typed carriage return.

```
*RAM TEST, 64K THROUGH 192K ↵  
TESTING...
```

If all the memory responds correctly, "OK" will be written on the same line as "TESTING..." and the monitor will prompt for a new command.

The memory test actually does two tests. It first writes 0 into the 32-bit word and reads it back. If a failure is detected, say at 128K, a failure message of the form:

```
FAILS AT ADDRESS 0002 0000 EXPECTED= 0000 0000 RECEIVED= FFE3 0100
```

would be given after the testing message. If the first test completes successfully the second test writes the 32-bit address of the word into the word and reads it back. If a failure is detected, say at 128K, a failure message of:

```
FAILS AT ADDRESS 0002 0000 EXPECTED= 0002 0000 RECEIVED= 0000 0000
```

would be given after the testing message. The test is terminated immediately if a failure is detected and the test monitor issues a prompt. Check the offending board and retry the memory test.

Special considerations:

- Systems which contain MDS-016 memory boards will fail with unspecified results. ISIS is overwritten with address data in this case.
- Since the test is designed to work in Intellec MDS-800 systems, it does not check the last 2K bytes of each 64K page, thus avoiding the monitor ROM.
- If the memory test is run on a Series II with an IPB-80, PWA 1001194, without the 20-bit piggyback board, the system will fail with unspecified results. ISIS is overwritten with address data in this case. See section 2.5.

- The memory test will fail if the RPB 86 is being used as a memory board and the 8086 is not halted. See section 2.6.1.

4.2 Terminal Installation Test - Monitor Command E

This test need not be run if OPL is to be configured for use with the Intellec MDS-800 console.

The following dialog illustrates the use of the terminal echo test function of the monitor. Characters typed by the monitor are underlined. The notation ↵ indicates a user typed carriage return.

```
*ECHO TEST, ON-BOARD SERIAL PORT,  
CHARACTERS WILL BE ECHOED FROM/TO ON BOARD SERIAL PORT, UNTIL ^C.
```

Characters typed on the stand-alone terminal should now be echoed on its screen. Carriage return is echoed as a carriage return - line feed pair. If the echoed characters are not correct, verify the terminal is set at 9600 baud. If no response is received, verify that the cabling is correctly constructed and installed. A good empirical test of the terminal and extension cable is to change to 2400 baud and use the terminal as an Intellec MDS-800 console.

The control C must be typed on the stand alone terminal.

4.3 Exiting the Test Monitor

To exit the test monitor and return to ISIS, type control X on console.

5.0 OPL-432 Operation

This section presents all the information necessary to begin using OPL-432. It assumes the reader is familiar with the use of ISIS-II on the Intellec development system. It does not discuss OPL programming, but rather the invocation of OPL on the various development systems.

OPL is distributed on two diskettes labeled "System Files" and "Workspace Files." These diskettes are standard ISIS-II "non-system diskettes." The use of the files is discussed in the next sections.

5.1 OPL-432 System Files Diskette

If OPL is to be used on a hard disk equipped system, copy all files on this diskette, except FCT432, to the hard disk. If the OPL is to be used from a diskette, make two diskettes, of appropriate density, as follows:

- Diskette A: containing OPL432 and OPL432.432
- Diskette B: containing OPLDMP.432 (see section 5.5)

If desired, these diskettes may be ISIS-II "system diskettes." However, with single density diskettes, almost all the ISIS-II cusps must be removed from the diskettes. Diskette B must have enough space remaining to accommodate an approximately 1400 block file.

The file OPL432 is a combined 8080/iAPX 432 program in standard ISIS-II loader format. It automatically loads OPL432.432, which is the OPL-432 interpreter in a special format. The file OPLDMP.432 is a dump program in this same format. This program is loaded as an overlay if a hardware error or OPL-432 implementation error is detected (see section 5.5).

5.2 OPL-432 Workspace Files Diskette

For a discussion of the concept of a workspace, refer to Object Programming Language User's Manual section 1.5. Two workspace files are included on the diskette:

- UTIL.WRK
- EDITOR.WRK

The function of the workspaces UTIL.WRK and EDITOR.WRK is described in Object Programming Language User's Guide Appendix B.2 and Chapter 4, respectively.

If space permits (as with double density diskettes), UTIL.WRK and EDITOR.WRK can be placed on diskette A of the previous section. In any case, make a back-up copy of the workspace diskette immediately.

5.3 Invoking OPL-432

With diskette A loaded in drive n, OPL-432 is invoked by typing a command to ISIS of the form:

```
:Fn:OPL432 [workspace]
```

As with all ISIS commands, :Fn: may be omitted and :F0: is assumed. The square brackets indicate an optional portion of the command. If it is omitted, OPL is invoked with a "clean" workspace containing only the objects defined in Appendix A of the Object Programming Language User's Guide and the OPL Extensions Appendix of the Object Builder User's Guide.

If a workspace is given, OPL432 loads as above, then automatically loads the specified workspace exactly as if the user had typed the OPL command in the initial window:

```
load "workspace"!
```

The ! represents the OPL doit key.

Note especially that workspace may be a full ISIS file name including device specification and file extension or it may be an abbreviated name with the file extension omitted. OPL will automatically supply the extension .WRK if the extension is omitted.

IMPORTANT: A workspace may not be loaded from a write protected diskette.

The following examples assume all the Intel supplied files have been copied to :F0:.

To invoke OPL with the class editor as the initial workspace, type:

```
:F0:OPL432 :F0:EDITOR
```

Or OPL432 EDITOR

Or OPL432 EDITOR.WRK

To invoke OPL with a user created workspace called MYSPAC.001 on drive 1, type:

```
OPL432 :F1:MYSPAC.001
```

On invocation, OPL will type on the ISIS console

```
ISIS-II OPL-432 RUNTIME SYSTEM, Vx.yy
```

where x.yy represents a version number (e.g., 1.00). If the Intellec MDS-800 console is being used as the OPL screen the message:

```
Switch your terminal to 9600 baud, then press RETURN
```

will appear on the screen. If the normal baud rate of the console terminal is 2400 baud (factory default), this message is exactly correct. If the default baud rate has been changed by moving the jumpers on the Intellec Monitor Card, the terminal should be set to four times the normal baud rate (e.g., normal baud of 1200 implies reset rate of 4800). For the terminals supported, this requires that the normal baud rate be at most 4800 baud.

On entry, OPL clears the screen and draws an initial window with a signon at the top of:

```
Object Programming Language-432, Vx.yy
```

where x.yy is the version number as before. The time from OPL-432 invocation until the initial window appears should be less than 1 minute on all systems. Worst case load time is on Series II systems, with IPB-80 boards, loading from the single density integral drive.

When OPL is running on the 432, the 8080 is halted. Thus, the Intellec run light will blink. The LED on the iSBC 432/100 board is connected to the 432 fatal line. Thus, if it is lit, the components have signaled fatal. Note: With the current chip release, fatal is indicated when any computational fault occurs. The components continue to run, however. See the 43201/43202 Component Errata Sheet for details.

5.4 Exiting OPL-432

OPL should always be exited by the OPL command:

```
isis!
```

The ! represents the OPL doit key.

OPL will then respond by clearing the screen and placing the cursor at the home position. If the Intellec MDS-800 console is used as the screen, the message:

```
Switch your terminal to 2400 baud, then press RETURN
```

will appear. As discussed, this is correct for factory jumpered systems. Other systems should reset the terminal to their normal rate.

WARNING

DO NOT EXIT OPL by pressing interrupt 1 or 0. Doing so will leave the baud rate wrong and leaves the iSBC 432/100 executing. On some systems, this will cause the loading of ISIS to fail due to contention between the iAPX 432 and the diskette controllers. If it is necessary to abort OPL execution in a drastic fashion, reboot the system. Similarly, if a fatal ISIS error occurs during execution (e.g. diskette full), the system should be rebooted. Check ISIS console baud rate on reboot.

5.5 Unexpected Faults and OPLDMP.432

The dump program, OPLDMP.432, is invoked automatically when an unexpected fault is detected by the iAPX 432. Normal faults, such as divide by zero and invalid instructions in a user generated instruction segment, are reported back to OPL and an OPL error message is given. Unexpected faults result from either a hardware error or an implementation error in the OPL interpreter. Possible hardware errors include memory corruption due to noise or soft errors, power line fluctuations, bus errors, and an RPB-86 used as memory with the 8086 running.

An unexpected fault is announced on the ISIS console by the messages:

```
>>>The 432 faulted unexpectedly.  
>>>Please specify dump file:
```

Before giving a file name, read the important note in this section. Any valid ISIS file name may be given. If the file cannot be opened, the message:

```
>>>Cannot open that file, please try another:
```

will appear. This message will be repeated until a file is correctly specified.

Note that if the ISIS console is being used as the OPL screen, the first message line will appear starting wherever the terminal cursor happens to be.

As soon as the dump file is correctly specified, the following actions are taken:

- The runtime system writes out the portion of the 432 image between 16K and 64K to the specified file
- OPLDMP.432 is loaded into this space
- OPLDMP begins execution to dump 64K to 192K
- Normal OPL exit dialog occurs (see section 5.3)

IMPORTANT

OPLDMP.432 is loaded from the drive from which OPL432 was invoked. The named dump file is approximately 1400 blocks of data, plus some overhead. Thus, it is likely that adequate space will not be available on any of the normal user diskettes. This is the purpose of diskette B described in section 5.1. Load this diskette into the OPL drive and specify a dump file on that drive.

Unless the error is clearly identifiable as a hardware problem (e.g., power fade, static discharge, board failure, etc.), a new copy of diskette B (see section 5.1) should be made immediately. On hard disk systems, the dump file should be immediately copied to a diskette. File a problem report as described in section 7, using the diskette with dump file as part of the included material.

5.6 Miscellaneous Errors

If the OPL configuration jumpers are in an invalid configuration as defined in section 3, the message:

>>>Your terminal-type jumpers are wrong.

will appear on the ISIS console and OPL exits. This message appears at the time the OPL initial window should appear on the screen. Thus, normal OPL invocation and exit is done, including baud rate changes.

If OPL begins execution but the screen is written with random patterns, check the terminal baud rate and the configuration jumpers.

If OPL fails to load without any error message being reported, check the Intellec run light on the front panel. If it goes out and stays out almost immediately after invoking OPL, verify that the 432/100 board is not jumpered for 16-bit Multibus accesses in a Series II with an IPB-80 board (see section 2.7). Note that the test monitor RAM test will function correctly even if this jumper is incorrectly set. If that is not the problem, run the confidence test as described in section 3. If this reveals no problems, see section 7.

6.0 Getting Started with the Documentation

The goal of the Intellec 432/100 software and documentation is two-fold: to allow the user to learn about, experiment with, and evaluate the iAPX 432 architecture, and to provide a tool useful in gaining experience with and understanding of object-oriented programming techniques. This section presents a suggested progressive order for reading the documentation and using the software.

6.1 Architectural Evaluation

The documents included with the Intellec 432/100 system, combined with the system's software, provide all the tools necessary to perform complex architectural evaluation. By following the outline presented here, the user unfamiliar with the iAPX 432 will gradually gain understanding of the architecture.

The first document to read is the iAPX 432 Object Primer. The understanding of objects and object-oriented design is critical to understanding the iAPX 432 architecture. The Object Primer provides an overview of object oriented design, in general, and iAPX 432 objects in particular. It describes how iAPX 432 system objects are interrelated and how they can be extended with user defined objects.

The next document to read is the Introduction to the iAPX 432 Architecture. It contrasts the iAPX 432 architecture with traditional register oriented machine architecture. It also provides an overview of the iAPX 432 architecture focusing on the address and protection model, the instruction set, and basic architectural concepts. An understanding of this material, particularly addressing, is critical to using the Object Builder software.

The Object Builder software consists of a set of extensions to OPL. These extensions allow the creation and manipulation of actual iAPX 432 hardware objects. Included is the ability to create iAPX 432 instruction objects. Instructions can then be inserted into the object a byte at a time. This programming is similar to that provided by a traditional Intel SDK kit. However, Object Builder provides a much higher level interface to system data structures, such as access descriptors.

To use Object Builder, it is necessary to understand OPL. The Object Programming Language User's Manual provides a tutorial on OPL. Reading this manual and performing the exercises in it should provide a sufficient understanding of OPL for using Object Builder.

Finally, before creating hardware objects, it is necessary to become familiar with the iAPX 432 General Data Processor Architectural Reference Manual (iAPX 432 GDP ARM), and the iAPX 43201/43202 Errata Sheet. The Errata Sheet describes limitations in the current release of the components. It should be sufficient to read the overview section at the beginning of each chapter of the iAPX 432 GDP ARM. That should provide enough familiarity with the document's organization to allow the user to look up the answers to detailed questions as they arise.

Once the user is comfortable with OPL and the iAPX 432 GDP ARM, the user can now use Object Builder to build 432 objects. The basic Object Builder facilities are included in OPL. Thus, running OPL automatically gives access to them. The Object Builder User's Guide documents the object creation and manipulation facilities. It also gives an example of building and executing a simple iAPX 432 instruction object. By referring to the iAPX 432 GDP ARM for details of instruction encodings, the user can build more complex programs in the same manner.

6.2 Object Oriented Programming

The second purpose of the Intellec 432/100 product is to provide a vehicle for learning object-oriented design and programming. Understanding of object-oriented methods is not only crucial to understanding and appreciating the 432's architecture, but can also serve as a high-productivity design methodology for general software development. For those interested in learning object-oriented design, first read the iAPX 432 Object Primer and the programming environment support section of the Introduction to the iAPX 432 Architecture. These two documents provide an introduction to object-oriented concepts. OPL allows experimentation with object-oriented programming in a friendly, powerful interpretive environment. OPL is a message based object-oriented language. In fact, everything in OPL is an object. All objects are members of some class. Programming is simply defining classes, creating instances (objects), and sending them messages. No 432 architectural knowledge is needed to program in OPL.

By studying OPL and writing some simple programs, you will become familiar with the object oriented way of thinking about programming. To use OPL, simply begin with the OPL User's Guide and write some simple programs. After writing a few OPL programs, you should appreciate the difference between object oriented programming and more traditional programming methodologies.

7.0 Problem Reporting

Before reporting problems, especially on initial installation, verify that the jumpers and switches are correctly set. Also, make sure the system configuration is a supported one (see Appendix B).

If the problem is with the iSBC 432/100 board, contact the local Field Service office. If local service is not available, follow the directions in the iSBC 432/100 Hardware Reference Manual section 5.4 concerning the Intel Product Service Hotline.

All other problems should be reported using the Problem Report form, part number 172043-001. Fill out the form completely. In the operating environment section mark the appropriate hardware environment. If the system is a Series III, indicate if it is an upgrade from a Series II or Intellec MDS-800. The 432 execution vehicle is the iSBC 432/100. The component version is indicated by a release number next to the component identification number. For example:

C43201-5 Rel. 1

The Rel. 1 is the release number. Give the component version numbers for both the 43201 and 43202. You may have to remove the clips on the sockets to read these numbers on some components. If no release number is evident, even after the clips are removed (see Appendix A on chip removal procedure), write down all the markings on the components (this should never be required). The configuration information should include a list of all the boards in the system and, in the case of Series II based systems, which boards are located in the expansion chassis. Also list the terminal being used and how it is connected to the system. Finally, list all the jumpers on the iSBC 432/100 board.

OPL-432 problem reports should give the version number of both OPL and the runtime system. It should be accompanied by a diskette and a list of OPL commands which illustrate the problem. The contents of the diskette should be a saved workspace to which the commands are to be applied. If the commands apply to an Intel supplied workspace, only the workspace name is needed.

If the problem manifests itself as an unexpected fault (as described in section 5.5), the dump file produced must be on the diskette. It is especially important in this case to provide a workspace which demonstrates the problem. Otherwise, it is difficult to differentiate between an implementation error and a fault resulting from a transient hardware failure.

Appendix A - iAPX 432 Component Removal and Insertion

Figure A-1 shows the recommended procedures for removing and inserting components in the sockets. The component is mounted in the socket with the metal lid down and aligned with the socket alignment posts.

Removal of the component is achieved simply by using a small screwdriver to lever off the retaining clip. Insertion is achieved by placing the clip over one end of the socket and sliding a finger firmly down the clip. It is important to verify that both ends of the clip are completely secure. This should be done by pressing on both ends of the clip and visually checking that the clip is clipped under the socket. The clip sometimes catches in the center of the socket rather than under it. If this occurs, use a small screw driver to level the clip into secure position. Take care not to bend the clip permanently.

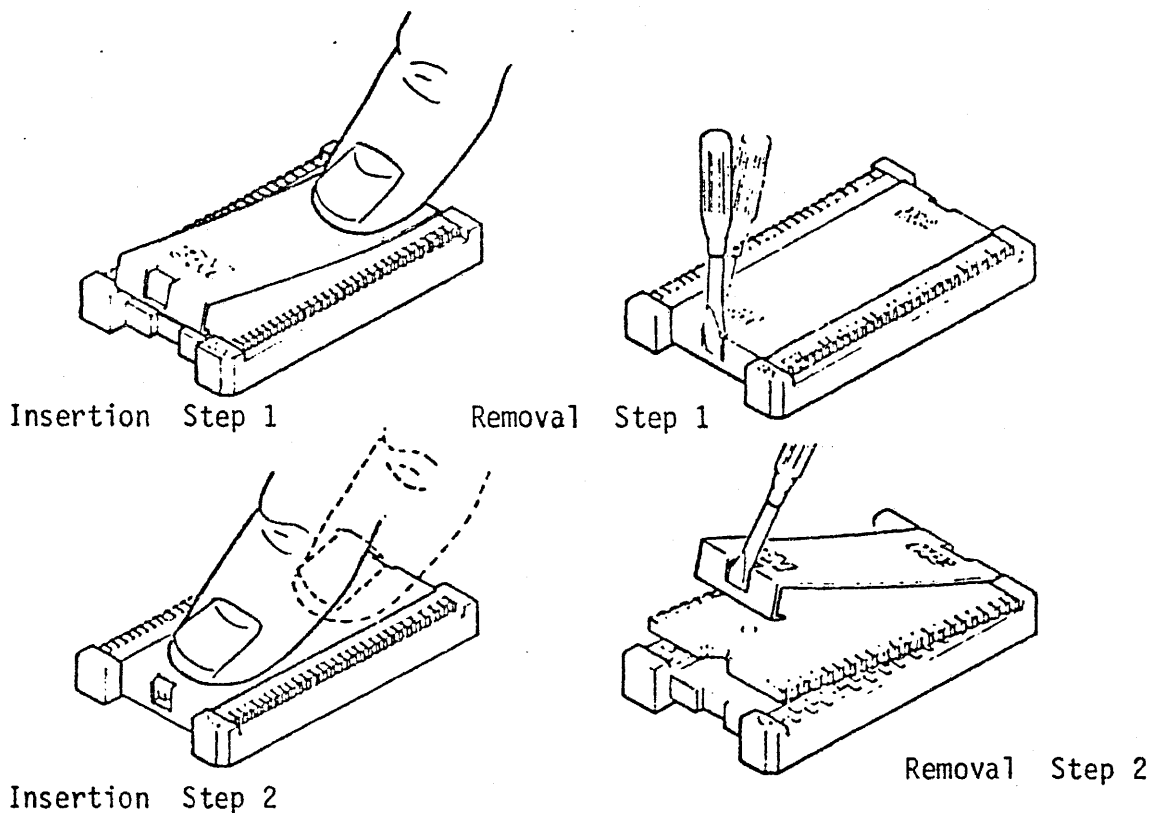


Figure A-1 - Insertion and Removal

Appendix B - Supported System Configurations

The following system configurations have been tested and are supported for use with the Intellec 432/100 system. They are listed by the Intellec Development System model and its options. The additional boards for using the Evaluation system are then listed. In many cases, several possible configurations are listed. In Series II's and Series III's the notation "(exp)" indicates the board should be in an expansion chassis. The notation 032K and 64K indicate iSBC 032 and iSBC 064 boards, respectively.

Note that in Intellec MDS-800 systems, memory configurations are given for all 192K. However, in Series II and Series III systems, only the boards required for 64K and above are listed.

