

**GFZ-1422B B-1422B**

# **GE Fanuc CNC**

## **Open Systems** **User's Manual**



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# *GE Fanuc Automation*

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*Computer Numerical Control Products*

*Open Systems  
(Type II High Speed Serial Bus Setup  
for 32-Bit Windows 95 and Windows NT Applications)*

*User's Manual*

*GFK - 1422B*

*November 1997*

## *Warnings, Cautions, and Notes as Used in this Publication*

### **Warning**

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

### **Caution**

Caution notices are used where equipment might be damaged if care is not taken.

### **Note**

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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This publication describes the Type II High Speed Serial Bus installation and startup procedures, when used with GE Fanuc Open CNC Software for Windows 95 and Windows NT. Similar information on other Open Systems product lines may be added in future revisions of this manual.

**Throughout this manual Windows NT refers to the Windows NT version 4.0 operating system.**

**Refer to the Readme.txt file on the distribution disk for installation information on recently added CNC controls.**

## Content of this Manual

- Chapter 1. Getting Started:** identifies the hardware and software requirements.
- Chapter 2. Hardware:** describes how to identify and install the High Speed Serial Bus (HSSB) hardware.
- Chapter 3. Software Installation:** describes how to install GE Fanuc 32-Bit Open System Drivers and Libraries for Windows 95 and Windows NT.
- Chapter 4. Startup Boot and IPL Modes:** describes the mode switch setup and the Power-Up Sequencing Menu, including the Startup Menu, Boot Menu, and IPL Menu.
- Chapter 5. Troubleshooting:** provides maintenance and troubleshooting information.
- Appendix A. Open System "C" Language Functions (CNC):** identifies C language functions specific to CNC that are supported in the GE Fanuc Open System Drivers and Libraries.
- Appendix B. Open System "C" Language Functions (Power Mate D/H):** identifies C language functions specific to Power Mate D and H that are supported in the GE Fanuc Open System Drivers and Libraries.

## Related Publications

GFK-1365	<i>Windows 95/Windows NT 32-Bit Drivers and Libraries for Open CNC Systems Reference Manual</i>
GFK-1423	<i>Basic Operation Package (BOP) I for Windows 95 Environment Operator's Manual</i>
GFZ-62684EN-1	<i>Power Mate H/D Motion Controller(High Speed Serial Bus Function) Operator's Manual</i>
GFZ-62560E	<i>Series 15-Model B Parameter Manual</i>
GFZ-62073E-1	<i>Series 15-Model B Connection Manual (BMI Interface)</i>
GFZ-62450E	<i>Series 16/18-Model B Parameter Manual</i>
GFZ-62443EN-1	<i>Series 16/18-Model B Connection (Function) Manual</i>
GFZ-62760EN	<i>Series 16/18-Model C Parameter Manual</i>
GFZ-62753EN-1	<i>Series 16/18-Model C Connection (Function) Manual</i>
GFZ-62540EN	<i>Series 21-Model TB Parameter Manual</i>
GFZ-62710EN	<i>Series 21-Model MB Parameter Manual</i>
GFZ-62703EN-1	<i>Series 21-Model B Connection (Function) Manual</i>
GFZ-62884E	<i>Open CNC Ladder Editing Package Operator's Manual</i>
GFZ-62683EN	<i>Power Mate-H Connection Manual(with Parameters)</i>
GFZ-62095EN	<i>Power Mate-D Connection and Maintenance Manual</i>

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# Chapter 1

## Getting Started

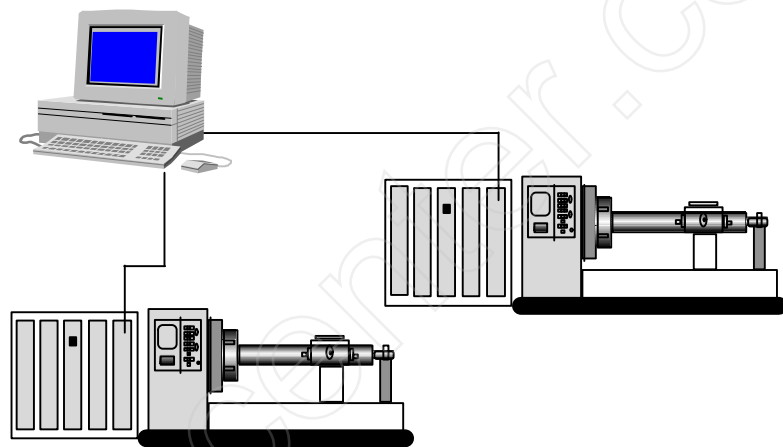


Figure 1 - 1. Typical Type II High Speed Serial Bus System

This chapter describes the hardware and software requirements for the Type II High Speed Serial Bus (HSSB) Interface. With the K730 Open System Drivers and Libraries, the system can be configured to support a single control per PC or multiple-HSSB cards per PC, as shown above.

### HSSB Card Set

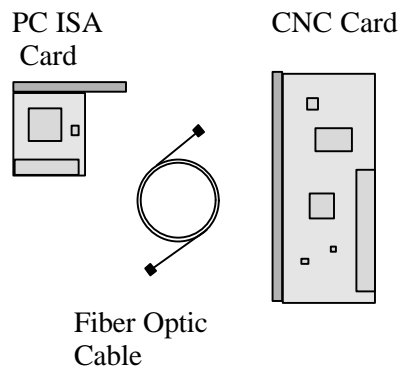


Figure 1 - 2. High Speed Serial Bus Card Set

# Hardware and Software Supplied by GE Fanuc

Table 1-1 identifies the items supplied by GE Fanuc.

Table 1 - 1. Material List

Description	Order Number
PC-Based HSSB Printed Circuit Board Single port	A20B-8001-0581
PC-Based HSSB Printed Circuit Board Dual port	A20B-8001-0580
CNC-Based High Speed Serial Bus Printed Circuit Board:	
200V PS (Board No. A20B-8001-0290)	A02B-0207-J200
24V PS (Board No. A20B-2002-0210)	A02B-0207-J201
<i>i</i> Series specific (Board No. A20B-8001-0640)	A02B-0236-J200
Power Mate D/H High Speed Serial Bus Hardware:	
HSSB Module (Board No. A20B-2902-0540)	A02B-0211-J090 (Replaces the CRT Module)**
HSSB Adapter	A02B-0211-C220
Fiber Optic Cable for PC/CNC HSSB Connection	<p><b>Old Style:</b> (before 8/1/97)</p> <p>A66L60010021#L5R003 (5 meters)</p> <p>A66L60010021#L20R003 (20 meters)</p> <p>A66L60010022#L50R003 (50 meters)</p> <p><b>New Style:</b> (after 8/1/97)</p> <p>A66L-6001-0026#L1R003(1 meter)</p> <p>A66L-6001-0026#L5R003(5 meters)</p> <p>A66L-6001-0026#L10R003(10 meters)</p> <p>A66L-6001-0026#L20R003(20 meters)</p>
CNC with correct power supply and software version	See specific CNC type description later in this chapter.
Drivers and Libraries for Windows 95 and Windows NT *	A02B-0207-K730
<b>Optional Software ***</b>	
Basic Operation Package 1 for Windows 95 or Windows NT *	A02B-0207-K750
DNC Operation Management Package	A02B-0207-K760
CNC Screen Display	A02B-0207-K770
Ladder Edit Package	A08B-9201-J510

\* Windows NT support is available starting with version 1.3.1. Power Mate Model D/H support is available starting with version 1.4.1.

\*\* When HSSB is used with the Power Mate Model H or Model D, no CRT is available.

\*\*\* Not all Optional Software is available for all control types. Please refer to page 1-4, "GE Fanuc Control Requirements."

# Host PC Requirements

## Minimum Requirements

The minimum requirements for installing any of the High Speed Serial Bus Interface software\* on a personal computer are:

### Windows 95

- 32Bit version 75MHz Pentium or higher processor with 16MB memory
- 16Bit version 50MHz CPU or higher processor with 12MB memory

### Windows NT

- 32Bit version 120MHz Pentium or higher processor with 32MB memory
- 16Bit version Not available

## Recommended Environment

The recommended environment for installing the High Speed Serial Bus Interface on a personal computer are:

### Windows 95

- 32Bit version 120MHz Pentium or higher processor with 32MB memory
- 16Bit version 75MHz CPU or higher processor with 24MB memory

### Windows NT

- 32Bit version 150MHz Pentium or higher processor with 64MB memory
- 16Bit version Not available

\* The DNC Operation Management Package (A02B-0207-K760) may require a more powerful PC than listed above. Please consult your salesperson for the PC requirements.

## Common

- One 16-bit ISA slot.
- 100 Megabyte hard disk capacity (20 required for GE Fanuc software).
- VGA (or better) monitor.

Based on a typical Microsoft Windows environment a faster CPU speed and more RAM memory equals better performance of the High Speed Serial Bus system.

## GE Fanuc Control Requirements

This section covers the required software version for the various control types that support HSSB. The versions listed here are the minimum required for using any of the GE Fanuc supplied open system software. The parameters listed are the minimum recommended parameters that should be set. To run either a custom-developed user application, the Basic Operation Package (BOP) or the ladder edit package, some optional features and parameter settings may be required. The following is a partial list that identifies some of the CNC options requiring additional parameter setup.

- Tool Offset Data
- Program Restart
- Alarm History Data
- Custom Macro Variable Data
- Work Offset Data
- Software Operator Panel
- Communications

For more information, refer to the *Windows 95/Windows NT 32-Bit Drivers and Libraries for Open CNC Systems Reference Manual* (GFK-1365) or *Power Mate H/D Motion Controller(High Speed Serial Bus Function) Operator's Manual*. (GFZ-62684EN-1).

# Series 150 CNC

## Required Series 150 Software

- Series 150-MB: A0D2 C or later
- Series 150-TB: A2D2-4 or later
- Series 150-MB (with sub CPU): AADB L or later
- Series 150-MBMA: A6DB F or later

## Required Software and Options

- Drivers and Libraries Software A02B-0207-K730
- Drivers & Library Option Bit: A02B-0207-J801

## CNC HSSB Board Options

- CNC Board for 200VAC Power Supply: A02B-0207-J200

## Optional Software and Options

### Basic Operation Package 1 (BOP)

- Basic Operation Package 1 Software: A02B-0207-K750
- Basic Operation Package Option Bit: A02B-0207-J811
- Software Operator's Panel Option Bit: A02B-0162-J917

### DNC Operation Management Package

- DNC Operation Management Package Software: A02B-0207-K760
- DNC Operation Management Package Option Bit: A02B-0207-J861
- Required Executive versions for this software are listed here.
- Required CNC executive version is not available at this time. Please contact your salesperson for the correct revision level.

### CNC Screen Display Function

- This Package Not available with this control type.

## Ladder Edit Package

- Ladder Edit Package Software\*: A08B-9201-J510
- Ladder Edit Option Bit \*: A02B-0207-J821
- PMC-NB or PMC-NB2 \*: 4048-6

\* For more information, see GFZ-62884EN, *Open CNC Ladder Editing Package Operator's Manual*.

## Parameters for Open Systems Software

Table 1 - 2. Recommended parameters for Open System Software

Parameter	Setting	Description
0 Bit 0	0	TV Check.
20	16	Allows foreground download of part programs via the HSSB.
22	16	Allows background download of part programs via the HSSB.
21	16	Allows foreground upload of part programs via HSSB.
23	16	Allows background upload of part programs via HSSB.
2200 Bit 1	1	Deletes the existing program before downloading a new program.
2200 Bit 3	1	M02 and M30 is program end.
2201 Bit 6	1	Enables program editing during memory operation.
2204 Bit 1	1	Allows the HSSB access to absolute position.
7613 Bit 0	1	Allows the HSSB access to alarm, feeds, speeds, and position data.
7613 Bit 1	1	Allows the HSSB access to actual feedrate.
7613 Bit 2	1	Allows the HSSB access to actual spindle speed.
7710 Bit 7	1	Allows the HSSB to get Check Program Display Information.

# Series 160 / 180 – Model B/C CNCs

## Required Series 160/180 – Model B/C Software

- System 160-MB: B0A1-20 or later
- System 180-MB: BDA1-6 or later
- System 160-TB: B1A1-17 or later
- System 180-TB: BEA1-5 or later
- System 160-MC: B0B1-1 or later
- System 180-MC: BDB1-1 or later
- System 160-TC: B1B1-1 or later
- System 180-TC: BEB1-1 or later
- Boot 160-MB: 60M1-6 or later
- Boot 180-MB: 60M1-6 or later
- Boot 160-TB: 60M1-6 or later
- Boot 180-TB: 60M1-6 or later
- Boot 160-MC: 60M1-9 or later
- Boot 180-MC: 60M1-9 or later
- Boot 160-TC: 60M1-9 or later
- Boot 180-TC: 60M1-9 or later

## Required Software and Options

- Drivers & Library Option Bit: A02B-0207-J800

## CNC HSSB Board Options

- CNC Board for 200VAC Power Supply: A02B-0207-J200
- CNC Board for 24VDC Power Supply: A02B-0207-J201

## Optional Software and Options

### Basic Operation Package 1 (BOP)

- Basic Operation Package 1 Software: A02B-0207-K750
- Basic Operation Package Option Bit: A02B-0207-J810
- Software Operator Panel Option Bit: A02B-0201-J960 (Model B)  
A02B-0223-J960 (Model C)
- Software Operator Panel General Purpose Switch Option Bit: A02B-0201-J961 (Model B)  
A02B-0223-J961 (Model C)

### DNC Operation Management Package (Model C only)

- DNC Operation Management Package Software: A02B-0207-K760
- DNC Operation Management Package Option Bit: A02B-0207-J860
- Required Executive versions for this software are listed here:
  - System 160-MC: BOB1 - 16 or later
  - System 180-MC: BDB1 - 14 or later
  - System 160-TC: B1B1 - 13 or later
  - System 180-TC: BEB1 - 14 or later

### CNC Screen Display Function

- This Package Not available with this control type.

### Ladder Edit Package

- Ladder Edit Package Software\*: A08B-9201-J510
- Ladder Edit Option Bit \*: A02B-0207-J820
- PMC-RB3/4 Software: 4066 -12. or later
- PMC-RC3/4 Software: 4068 - 10 or later
- PMC-RB5/6 Software (Model C only) 4067 - 5 or later

\* For more information, see GFZ-62884EN, *Open CNC Ladder Editing Package Operator's Manual*.

## Parameters for Open Systems Software

Table 1 - 3. Recommended parameters for Drivers and Libraries

Parameter	Setting	Description
0 Bit 0	0	TV Check.
3201 bit 2	1	Deletes the existing program before downloading a new program.
3201 bit 6	1	M02, M30, and M99 is program end.

# Series 210 – Model B CNC

## Required Series 210 – Model B Software

- System 210-MB: DDA1-3 or later
- System 210-TB: DEA1-1 or later
- Boot 210-MB: 60M2-4 or later
- Boot 210-TB: 60M2-4 or later

## Required Software and Options

- Drivers & Library Option Bit: A02B-0207-J800

## CNC HSSB Board Options

- CNC Board for 24VDC Power Supply: A02B-0207-J201

## Optional Software and Options

### Basic Operation Package 1 (BOP)

- Basic Operation Package 1 Software: A02B-0207-K750
- Basic Operation Package Option Bit: A02B-0207-J810
- Software Operator Panel Option Bit: A02B-0218-J960
- Software Operator Panel General Purpose Switch Option Bit: A02B-0218-J961

### DNC Operation Management Package

- This Package Not available with this control type.

### CNC Screen Display Function

- This Package Not available with this control type.

### Ladder Edit Package

- This Package Not available with this control type.

## Parameters for Open Systems Software

Table 1 - 4. Recommended parameters for Drivers and Libraries

Parameter	Setting	Description
0 Bit 0	0	TV Check.
3201 bit 2	1	Deletes the existing program before downloading a new program.
3201 bit 6	1	M02, M30, and M99 is program end.

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## Series 160*i* , 180*i*, and 210*i* – Model A CNCs

### Required Series 160*i* , 180*i*, and 210*i* – Model A Software

- System 160*i*-MA: B0F1-1 or later
- System 180*i* -MA: BDF1-1 or later
- System 210*i* -MA: DDF1-1 or later
- System 160*i* -TA: B1F1-1 or later
- System 180*i* -TA: BEF1-1 or later
- System 210*i* -TA: DEF1-1 or later
- Boot 160*i* -MA: 60M3-5 or later
- Boot 180*i* -MA: 60M3-5 or later
- Boot 210*i* -MA: 60M3-5 or later
- Boot 160*i* -TA: 60M3-5 or later
- Boot 180*i* -TA: 60M3-5 or later
- Boot 210*i* -TA: 60M3-5 or later

### Required Software and Options

- Drivers & Library Option Bit: A02B-0207-J800

### CNC HSSB Board Options

- CNC Board for *i* Series: A02B-0236-J200

### Optional Software and Options

#### Basic Operation Package 1 (BOP)

- Basic Operation Package 1 Software: A02B-0207-K750
- Basic Operation Package Option Bit: A02B-0207-J810
- Software Operator Panel Option Bit: A02B-0201-J960
- Software Operator Panel General Purpose Switch Option Bit: A02B-0201-J961

## DNC Operation Management Package

- DNC Operation Management Package Software: A02B-0207-K760
- DNC Operation Management Package Option Bit: A02B-0207-J860
- Required Executive versions for this software are listed here:
  - System 160i-MA: B0F1 - 9 or later
  - System 180i-MA: BDF1 - 9 or later
  - System 210i-MA: DDF1  
(Please consult your sales person for correct version.)
  - System 160i-TA: B1F1 - 8 or later
  - System 180i-TA: BEF1 - 8 or later
  - System 210i-TA: DEF1  
(Please consult your sales person for correct version.)

## CNC Screen Display Function

- CNC Screen Display Software: A02B-0207-K770
- CNC Screen Display Option Bit: A02B-0207-J850
- Required Executive versions for this software are listed here:
  - Required CNC executive version is not available at this time. Please contact your salesperson for the correct revision level.
  - PMC RB6 406A - 4 or later
  - PMC C Language 406C - 4 or later

## Ladder Edit Package

- Ladder Edit Package Software\*: A08B-9201-J510
- Ladder Edit Option Bit \*: A02B-0207-J820
- PMC-RB6 Software 406A - 1 or later

\* For more information, see GFZ-62884EN, *Open CNC Ladder Editing Package Operator's Manual*.

## Parameters for Open Systems Software

Table 1 - 5. Recommended parameters for Drivers and Libraries

Parameter	Setting	Description
0 Bit 0	0	TV Check.
3201 bit 2	1	Deletes the existing program before downloading a new program.
3201 bit 6	1	M02, M30, and M99 is program end.

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# Power Mate Model D/H

## Required Power Mate Model D/H Software

- System Power Mate-H: 8880-19 or later
- System Power Mate-D: 8838-1 or later
- Boot Power Mate-H: 881A - 7 or later
- Boot Power Mate-D: N/A

## Required Software and Options

- Drivers & Library Option Bit: A02B-0211-J834

## HSSB Board (Both Required)

- HSSB Module to replace CRT: A02B-0211-J090
- HSSB LM Adapter Module: A02B-0211-C220

## Optional Software and Options

### Basic Operation Package 1 (BOP)

- Basic Operation Package 1 Software: A02B-0207-K750
- Basic Operation Package Option Bit: A02B-0211-J845

### DNC Operation Management Package

- This Package Not available with this control type.

### CNC Screen Display Function

- This Package Not available with this control type.

### Ladder Edit Package

- This Package Not available with this control type.
- Use FAPT ladder II software for the Power Mate D/H A08B-9201-J503

## Parameters for Open Systems Software

Table 1 - 6. Recommended parameters for Drivers and Libraries

Parameter	Setting	Description
0 Bit 0	0	TV Check.
3201 bit 2	1	Deletes the existing program before downloading a new program.
3201 bit 6	1	M02, M30, and M99 is program end.

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# Chapter 2

## Hardware

This chapter describes how to identify and install the High Speed Serial Bus (HSSB) hardware. Figures 2-1 through 2-5 show the currently available HSSB hardware. Table 2-1 lists the specifications for the HSSB hardware.

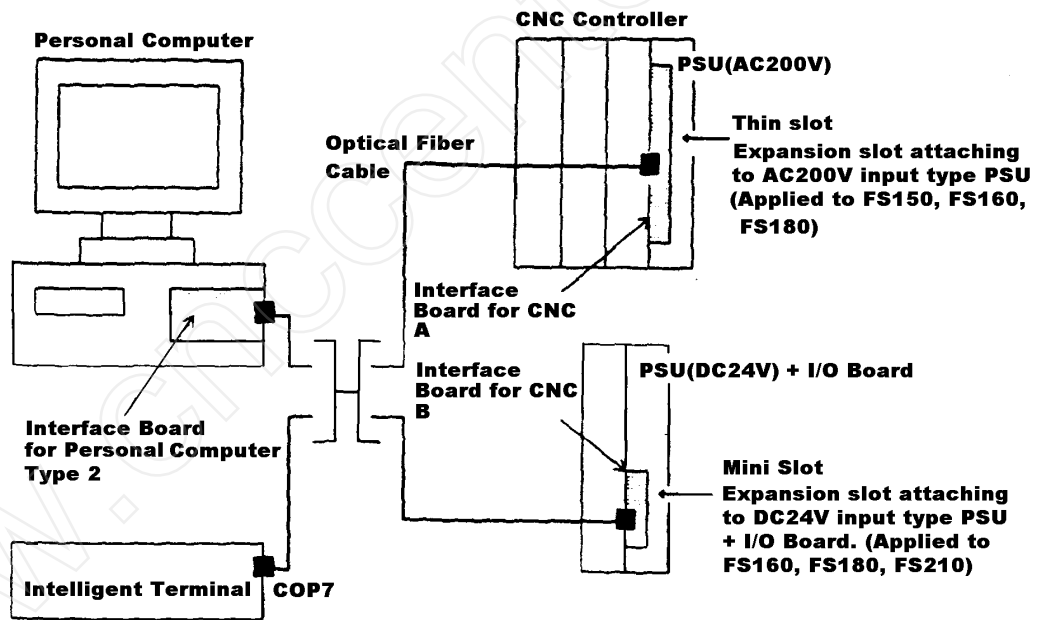


Figure 2 - 1. Total Connection overview

# Specifications

Table 2 - 1. Specification and Dimensions of HSSB hardware

Item		Specification	Remarks
Interface board for CNC A	Installed slot	Thin slot	Suitable for 150-B/C, 160-B/C, and 180-B/C A20B-8002-0290
	Board size	286 x 150 mm	
Interface board for CNC B	Installed slot	Mini slot	Suitable for 160-B/C, 180-B/C, and 210-B A20B-2002-0210
	Board size	88 x 150 mm	
Interface board for personal computer	Installed slot	ISA expansion slot	Single and dual port cards have same dimensions: Single: A20B-8100-0100 Dual: A20B-8001-0580
	Board size	155 x 122 mm	
	Power Supply	+5v from ISA slot	
Cable	Type	Optical fiber cable	See Table 1-1 for all cable numbers.
	Maximum length	50 m	

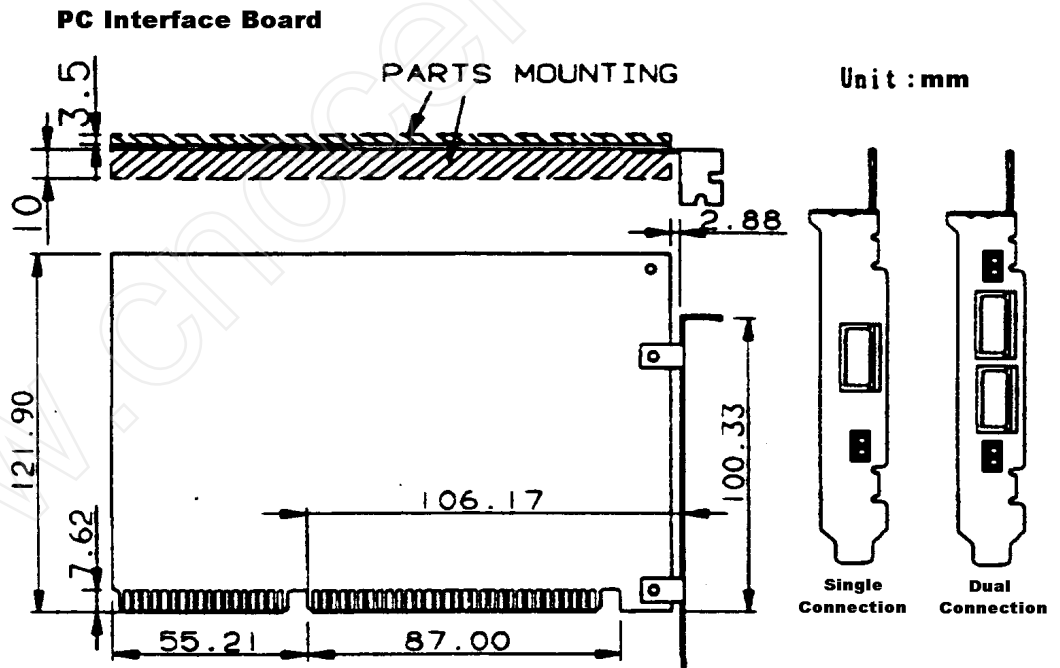


Figure 2 - 2. PC card dimensions single and dual are the same.

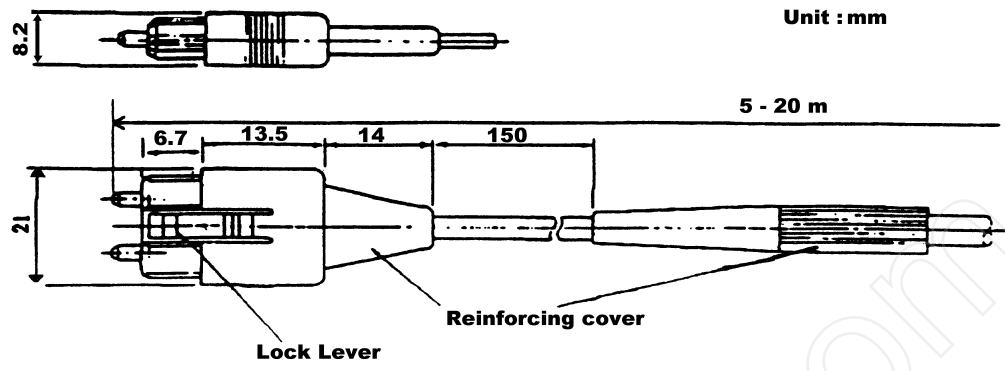


Figure 2 - 3. Fiber optic cable dimensions (Old Style)

Figure 2 - 4. Fiber optic cable dimensions (New Style)

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## Identifying HSSB Boards

There are various hardware configurations available for the open system controls. This section will show you how to identify the various components and help you in selecting the parts that are correct for you.

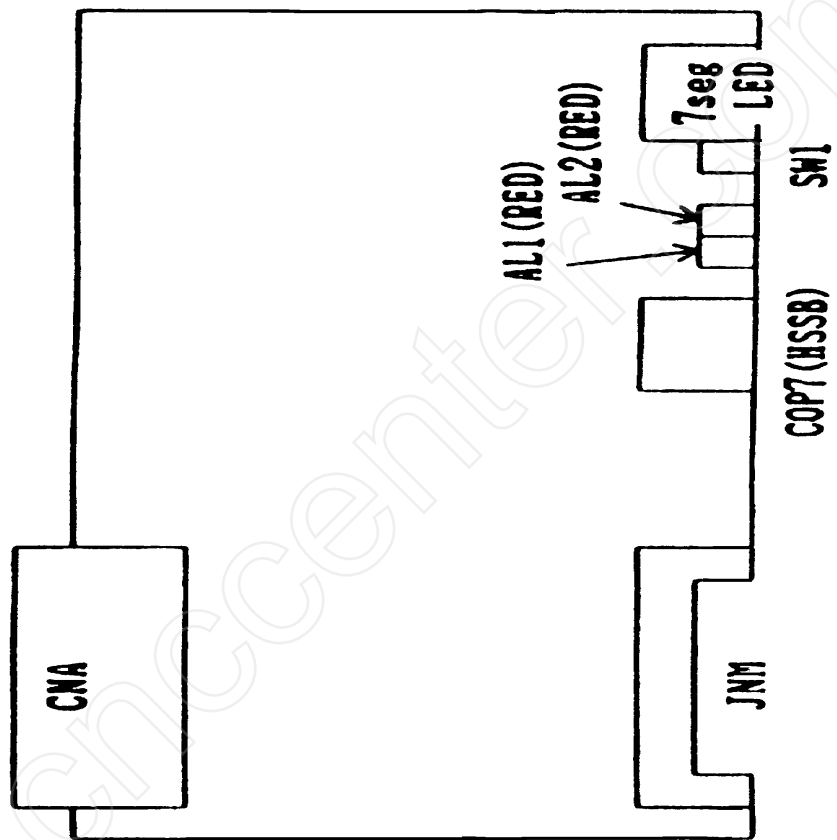


Figure 2 - 5. Interface board for CNC A (A20B-8001-0290)

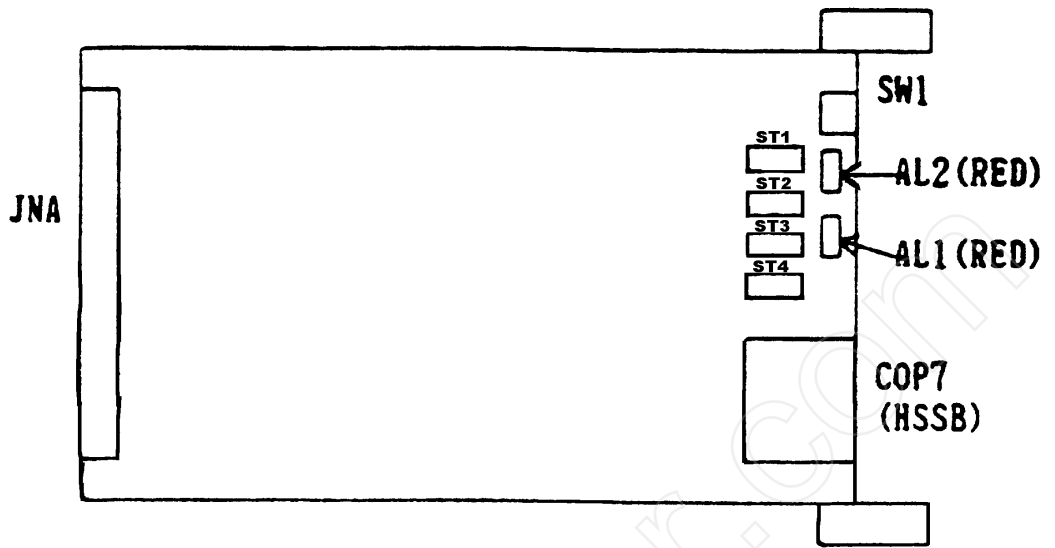


Figure 2 - 6. Interface board for CNC B (A20B-2002-0210)

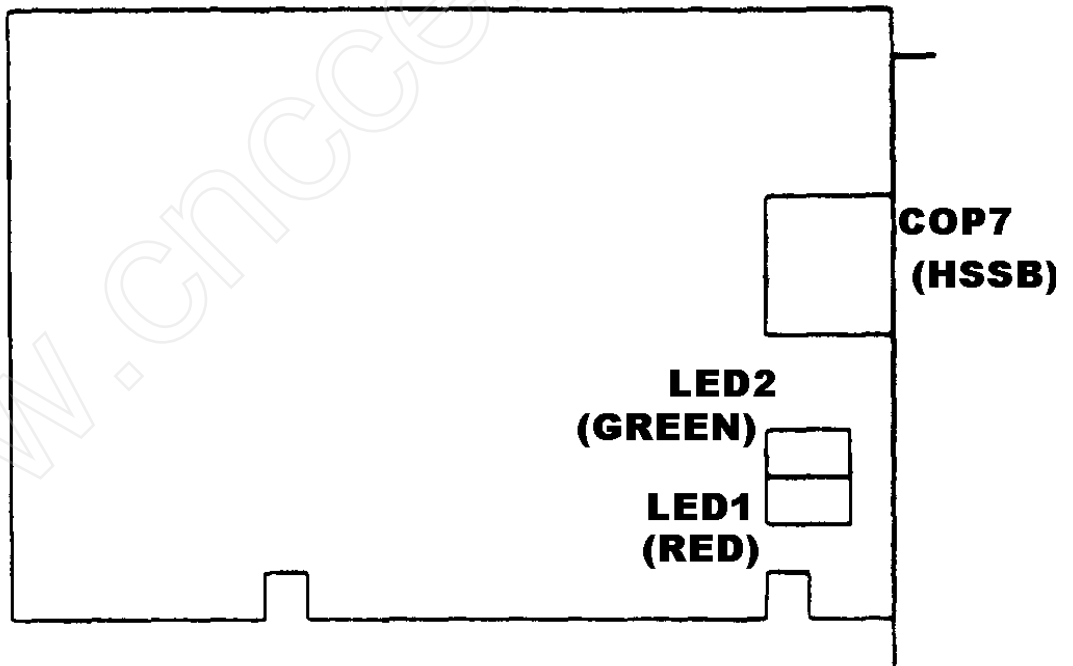


Figure 2 - 7. PC card for single HSSB connection (A20B-8100-0100)

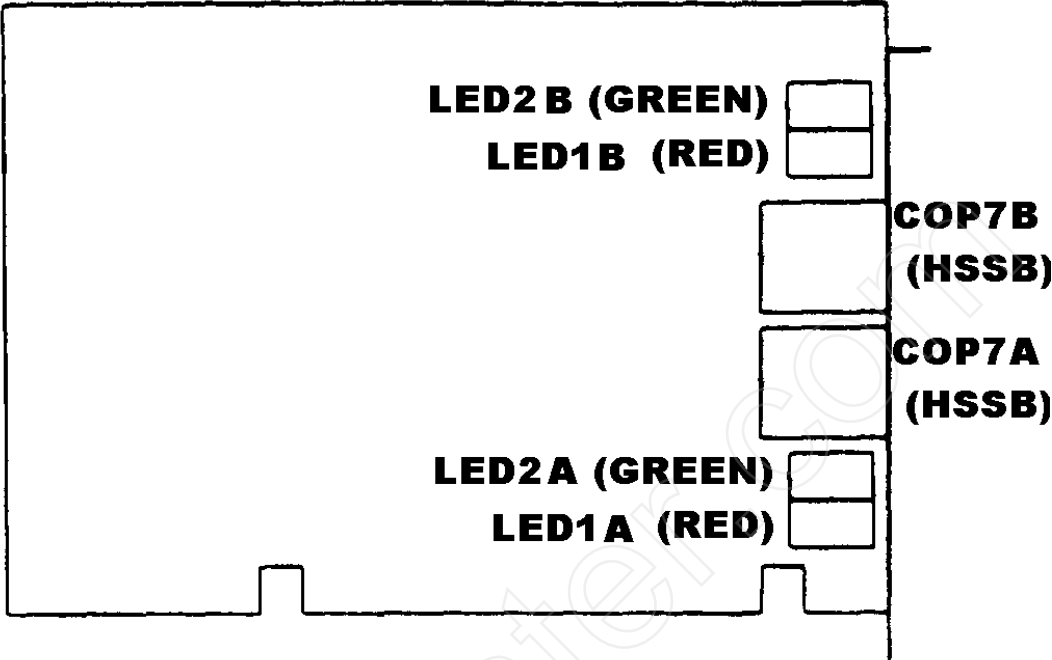


Figure 2 - 8. PC card for dual HSSB connection (A20B-8001-0580)

www.cnccenter.com

## Installing HSSB in the CNC

1. Turn off power to the target personal computer and the CNC Control.
2. Verify that your personal computer and the CNC match the hardware and software requirements identified in Chapter 1, "Getting Started."
3. Remove the plastic cover from the half slot on the power supply of the CNC.
4. Remove the anti-static packaging from the CNC-based High Speed Serial Bus (HSSB) printed circuit board.
5. Insert the CNC-based printed circuit board into the power supply slot of the CNC, as shown in the figures below.

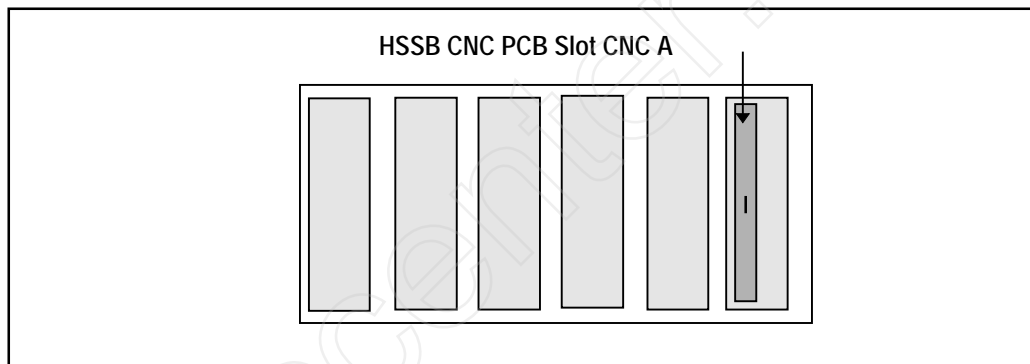


Figure 2 - 9. CNC 200VAC Power Supply Slot

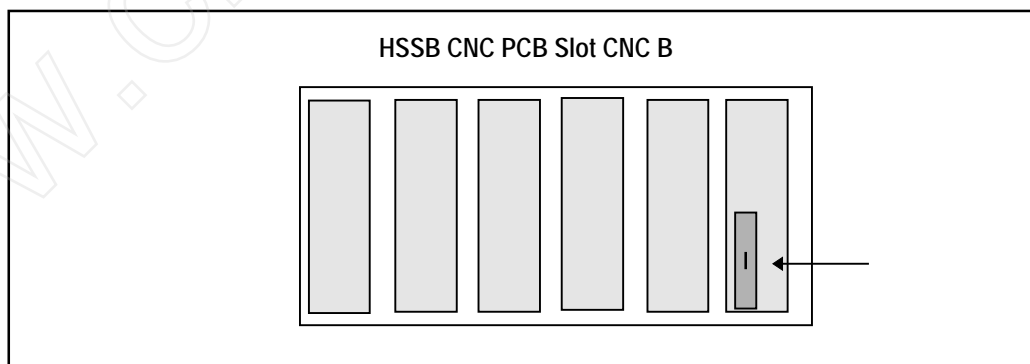


Figure 2 - 10. CNC 24VDC Power Supply Slot

## Installing HSSB in the Power Mate Model D/H

1. Turn off power to the target personal computer and the Power Mate Control.
2. Verify that your personal computer and the Power Mate match the hardware and software requirements identified in Chapter 1, "Getting Started."
3. Remove the plastic cover from the Power Mate. This is done by applying pressure to the two tabs on the left side of the Power Mate and sliding the cover forward.
4. Remove the anti-static packaging from the Power Mate High Speed Serial Bus (HSSB) module.
5. Insert the module into the third slot from the rear of the Power Mate-D/H as shown in the figures below.

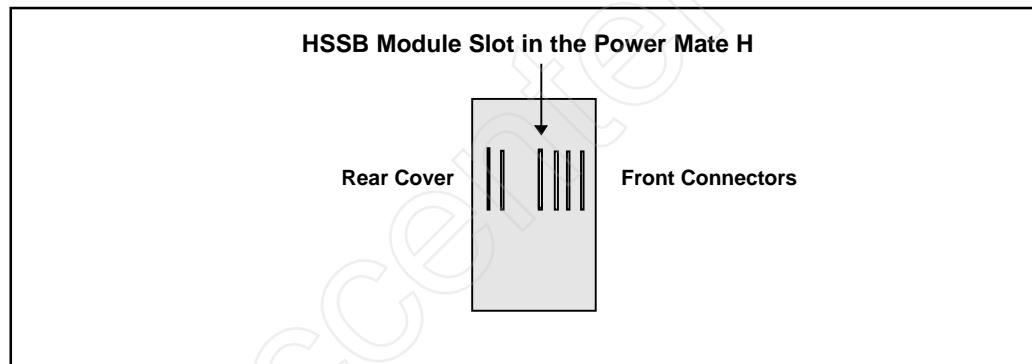


Figure 2 - 11. HSSB Module Location for a Power Mate-H

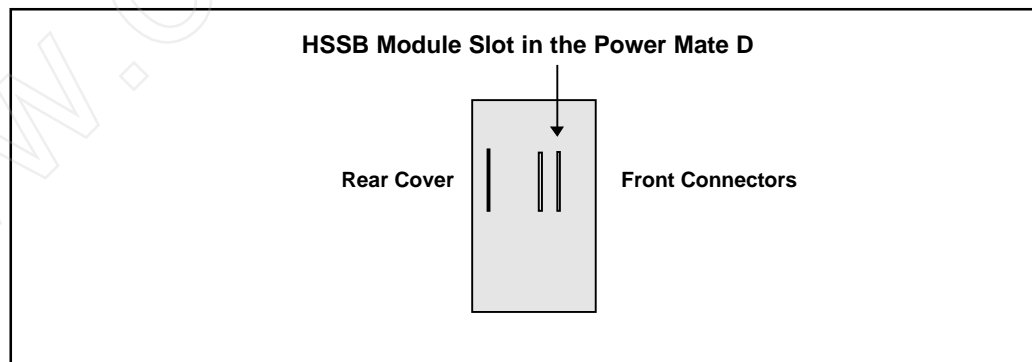


Figure 2 - 12. HSSB Module Location for a Power Mate-D

6. Reattach the Power Mate cover.
7. Attach the Power Mate HSSB LM adapter to the bottom of the Power Mate on the connector labeled M4 DPL/MDI.

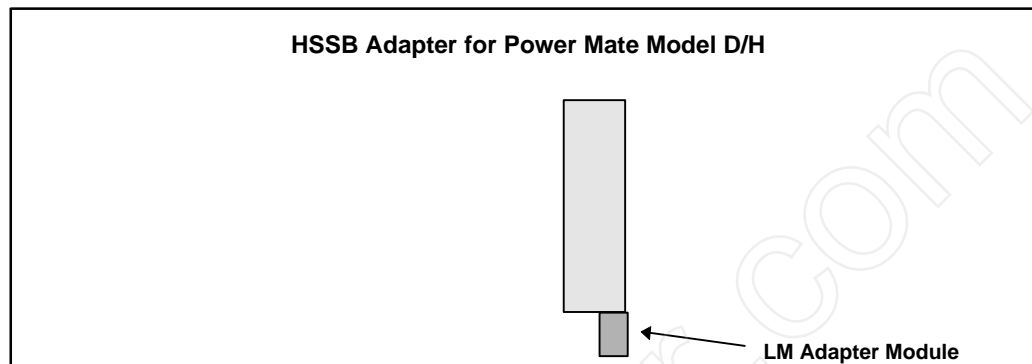


Figure 2 - 13. HSSB LM Adapter Connection for Power Mate Model D/H

## Installing HSSB in the PC

1. Open the personal computer, and locate the spare 16-bit ISA slot.
2. Remove the anti-static packaging from the PC-based High Speed Serial Bus (HSSB) printed circuit board.
3. Holding the card with the rotary switches up and facing you, the rotary switches can be seen from the side on single port cards (Figure 2-10) or from the top view on dual port cards (Figure 2-11), the address is read from right to left with the last zero implied. The card is factory set to 028 (280hex) (LMN0 to LMNF).

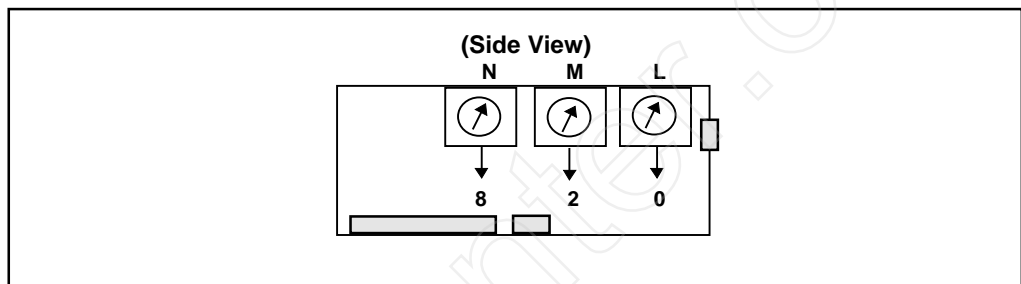


Figure 2 - 14. PC Board I/O Address Single Port

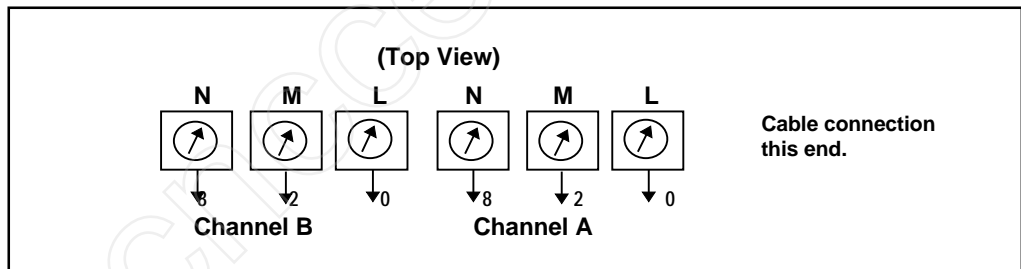


Figure 2 - 15. PC Board I/O Address Dual Port

4. Verify that no other device in the PC are set to this I/O address. If this address needs to be changed please remember the new address setting as it will be required when installing the 32-Bit Drivers and Libraries.
5. Remove the cover from the ISA slot, and insert the PC-based printed circuit board.
6. You must re-install the ISA slot setting screw in order to hold the printed circuit board firmly in place.
7. Replace the logic rack cover on your personal computer.

### Note

The green LED located on the PC-based HSSB printed circuit board will be on after the CNC/PC boot is completed. This LED is visible from the rear of the PC next to the fiber optic connection.

## Installing a Fiber Optic Cable between the PC and the CNC

### Note

During the time that the Fiber optic cable and HSSB PCB's are not being used attach the protect caps. This will help guard against failure of the equipment due to dust and stains.

### Important

**Use a clear tissue or absorbent cotton pad to clean the fiber optic connection. Cotton with ethyl alcohol is acceptable. No other organic solvent can be used.**

Please keep the follow points in mind while handling the fiber optic cable.

1. Sharp objects and heavy weights can damage the fiber optic cable.
2. When connecting or disconnecting the fiber optic cable always grasp the cable by the connector NEVER pull on the cable.
3. The fiber optic connector is automatically locked into place by the locking tab when inserted into a HSSB board. Always remember to depress the locking tab when removing the fiber optic cable.
4. Damage to the fiber optic cable may occur if the cable is inserted backwards. Verify that the locking tab on the connector and the HSSB board are on the same side before connecting the cable. Minimal effort should be required to seat the connector and the locking tab will engage if the connector is inserted properly.

1. Unpack the fiber optic cable.

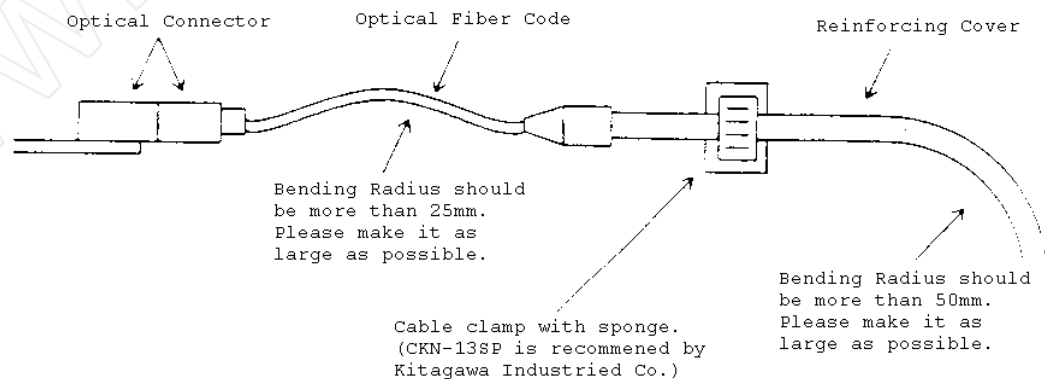


Figure 2 - 16. Fiber Optic Cable Bending Recommendations.

**Caution**

**Do not bend the fiber optic cable past the recommended bend radius. If you do, irreparable damage will occur.**

- 2. Remove the plastic protective caps from the fiber optic cable (see Figure below).

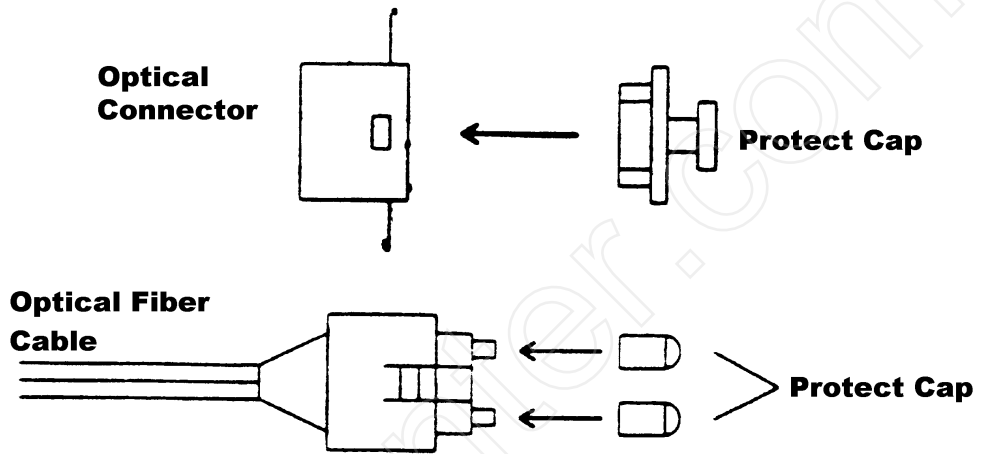


Figure 2 - 17. Protective Caps for Fiber Optic Cable

- 3. Remove the plastic protective plugs from the PC-based and the CNC-based HSSB printed circuit boards.
- 4. Plug in the two ends of the fiber optic cable. (The ends are interchangeable.)

If pulling the cable through a cable track or like fixture never pull the cable by the fiber optical connector. Using a good quality tape attach a wire with hook or a tension member to the cover of the fiber optic cable. Pull on the wire with hook or the tension member to feed the fiber optic cable along the desired path.

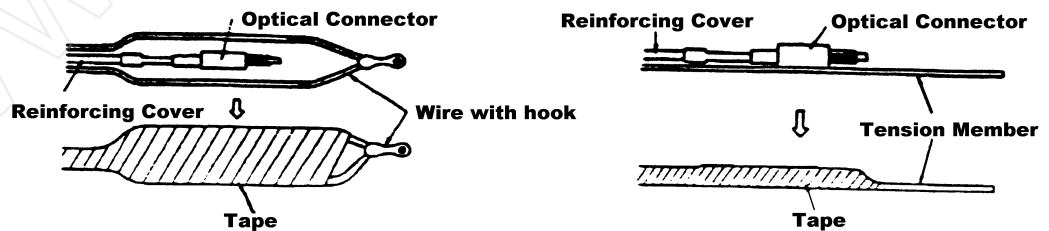


Figure 2 - 18. Fiber Optic Cable Routing Recommendations.

**The hardware installation is now complete.**

# Chapter 3

## *Software Installation*

---

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This procedure describes how to install the GE Fanuc 32-Bit Driver and Libraries (K730) for Windows 95 and Windows NT.

### Caution

**If you have previously installed the Drivers and Libraries software please read the next section carefully(Section 1) before proceeding.**

**GE Fanuc also recommends that you read all Readme.txt files on the Drivers and Libraries software disks before proceeding.**

**You must close all programs before installing any software.**

## Section 1 De-Installing Old Versions of Software

This section addresses the removal of existing versions of the drivers and libraries.

### Caution

**If any of the following software described in this section is currently installed on your PC, you must remove it before installing the new version of the 32-Bit K730 Drivers and Libraries. Failure to remove all these files will adversely affect the operation of the Drivers and Libraries. Please remove all these files from your hard disk:**

- GE Fanuc K727 16-Bit Open System Drivers and Libraries.

## GE Fanuc K727 16-Bit Open System Drivers and Libraries

1. Search the C: drive for these files, and delete them:

FWLIB.DLL	NCBOOT.EXE	FWLIB32.H
FWLIB32.DLL	NCALARM.EXE	FWLIB32.LIB
MMCNC.D.386	FWLIB.H	FWLIBV.DLL
MMCNC.D.VXD	FWLIB.LIB	HSSBSYS.EXE
NCBOOT.EXE	NCALARM.EXE	

### Note

Remove these lines from the indicated files:

```
config.sys --> c:\????\hssbsys.exe
autoexec.bat --> c:\????\ncboot.exe
autoexec.bat --> c:\????\ncalarm.exe
system.ini --> c:\????\mmcncd.386
system.ini --> c:\????\mmcncd.vxd
```

where ????? is the name of the directory where you previously placed these files.

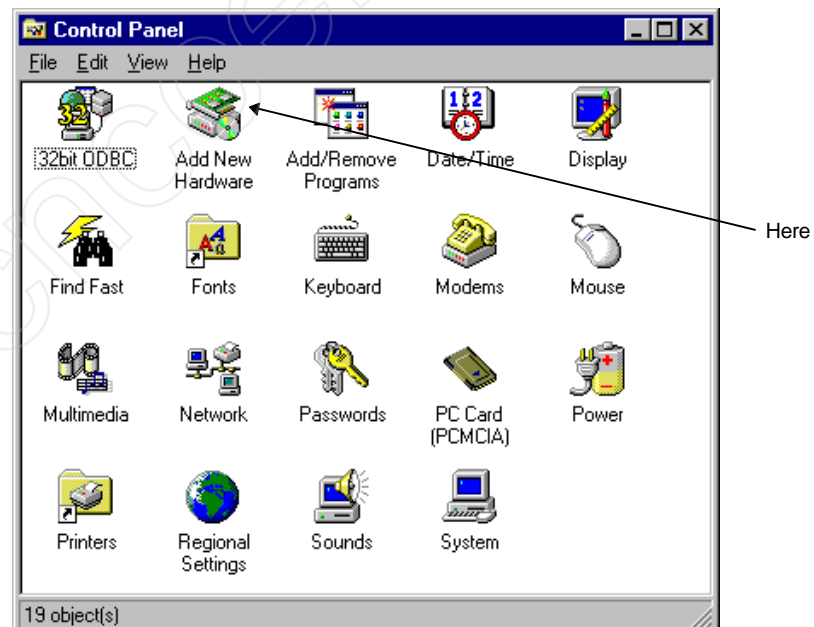
## Section 2 Installing the New K730 (Version 1.2.x and Newer) 32-Bit Drivers and Libraries for Windows 95

1. Verify that you have three disks labeled A02B-0207-K730#ZZ07 -1,-2,-3 (Drivers and Libraries).

### Note

To install the K730 Driver and Libraries to your system, you will use the Windows 95 **Add New Hardware Wizard**.

2. Before the installation, determine the I/O port address(es) for the HSSB board(s) to be installed and, in the case of HSSB multi-connection, the correspondence between nodes and connected CNCs.
3. From the Windows 95 Start menu, choose "Settings".
4. Click [Control Panel] to display the **Control Panel** window. You will access the **Add New Hardware** window through the **Control Panel** window.



5. Double-click [Add New Hardware] to display the **Add New Hardware Wizard** window.



6. Click the [Next] button. The message "Do you want Windows to search for your new hardware?" is displayed.



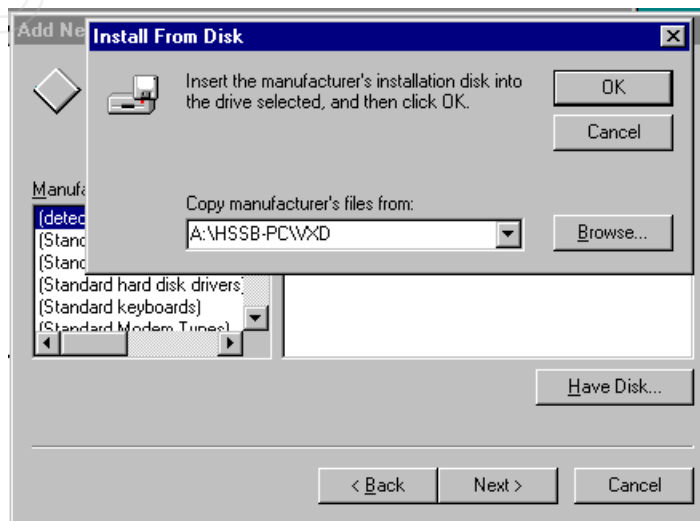
7. Click [No] and then [Next].



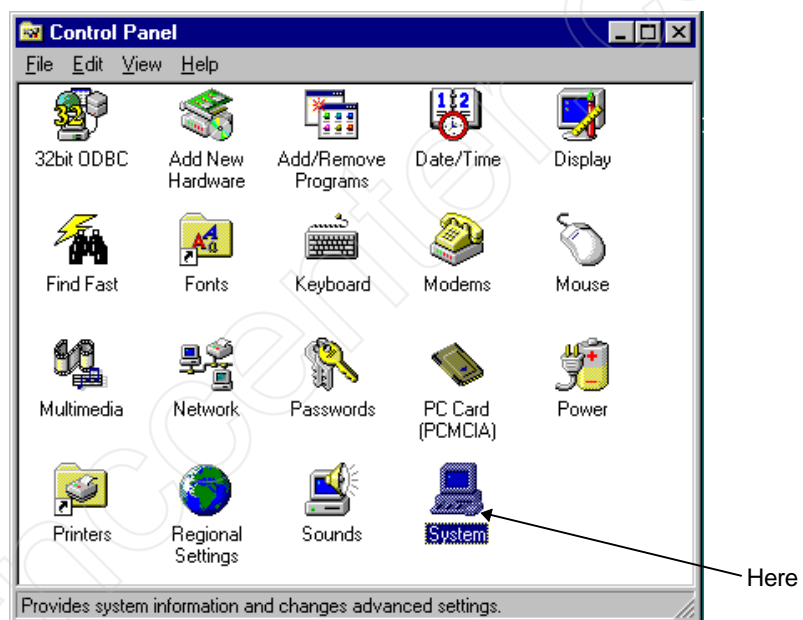
8. In the Hardware Types box, select "Other Devices", and click [Next].
9. Click [Have Disk].
10. Place Disk 1 of the A02B-0207-K730#ZZ07 software in the A: drive.
11. Enter the appropriate directory, listed below, on the **Copy Manufacturer's File From** box, and then click [OK]. "HSSB Type 2" is displayed in the **Models** box.

For version 1.2.x it is "a:\hssb-pc\vxnd"

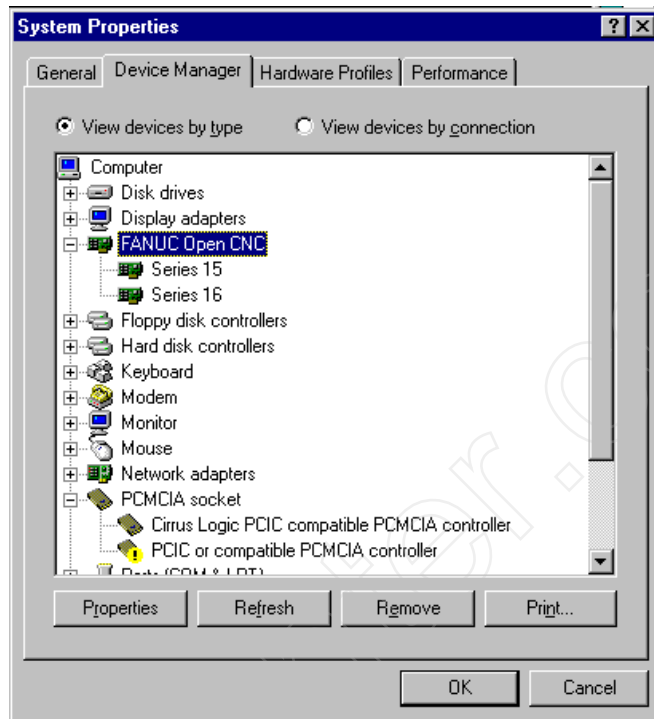
For version 1.3.x it is "a:\hssb-pc\Win95"



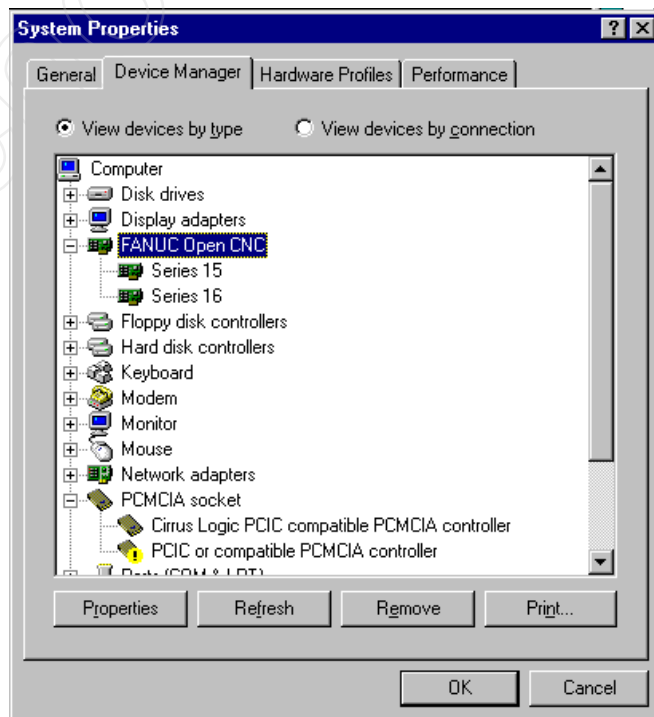
12. Click [Next]. The message "Windows can install your hardware, using the following settings" is displayed. Accept these setting; they can be changed later.
13. Click [Next]. After copying file from the disk, the message "Windows has finished installing the software necessary to support your new hardware." is displayed.
14. Click the [Finish] button. The System Setting Change window is displayed, along with the message "Do you want to shut down your computer now?".
15. Click [No].
16. Double-click [System] from the **Control Panel** window to display the **System Properties** window.



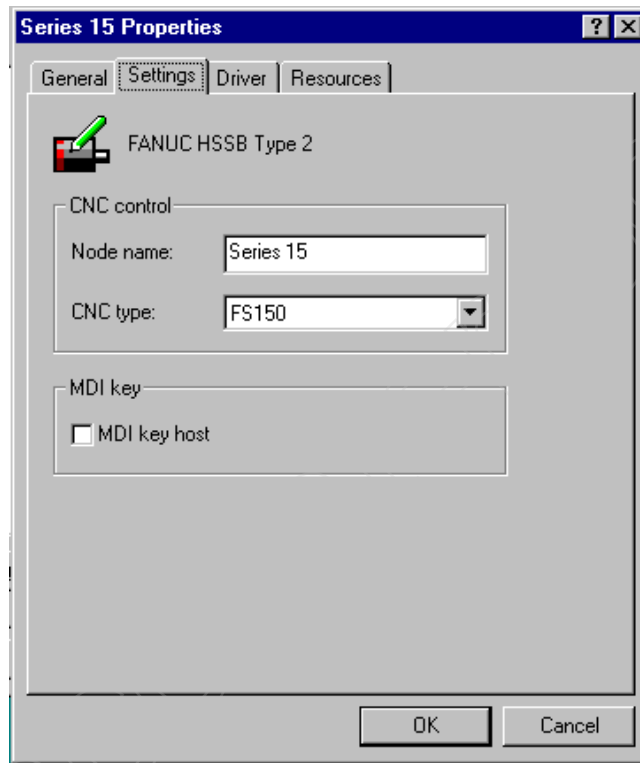
17. Click the [Device Manager] tab. Select FANUC Open CNC.



18. Double-click [HSSB Type 2] of [FANUC Open CNC]. The **HSSB Type 2 Properties** window is displayed.

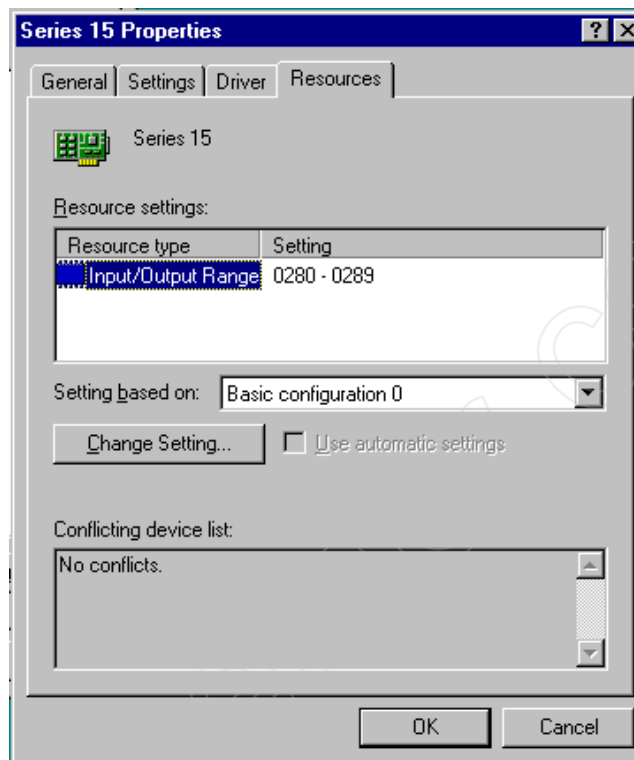


19. Click the [Settings] tab.
20. Type a proper name which indicates the machine is connected to the HSSB board, for example, "Series 15" to [Node name].



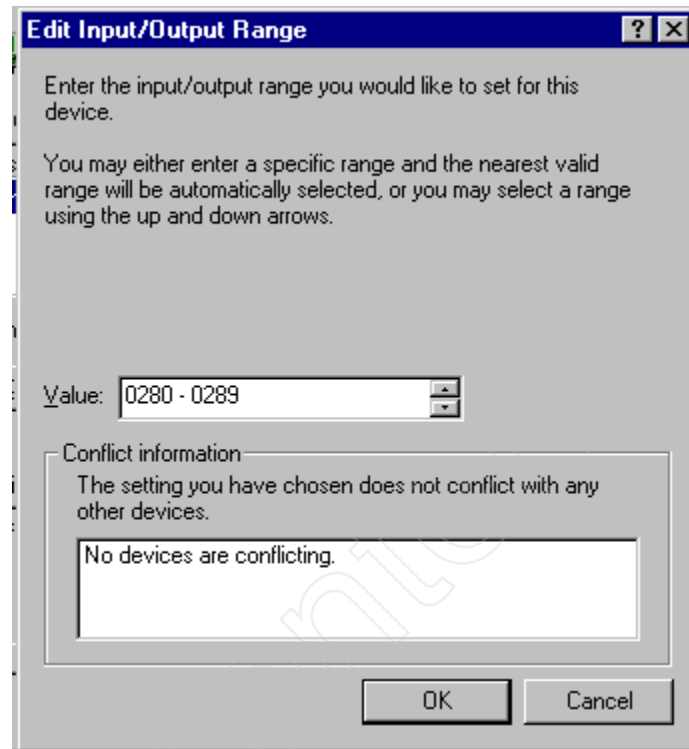
21. Choose the type of CNC connected from the **CNC Type** box.
22. Do **NOT** check the **MDI Key Host** box.

23. Click the [Resources] tab. The Resources list is displayed.



24. Proceed to step 27 if the displayed I/O port address agrees with the one you decided on previously.

25. Click the [Change Setting] button. The **Edit Input/Output Range** window is displayed.

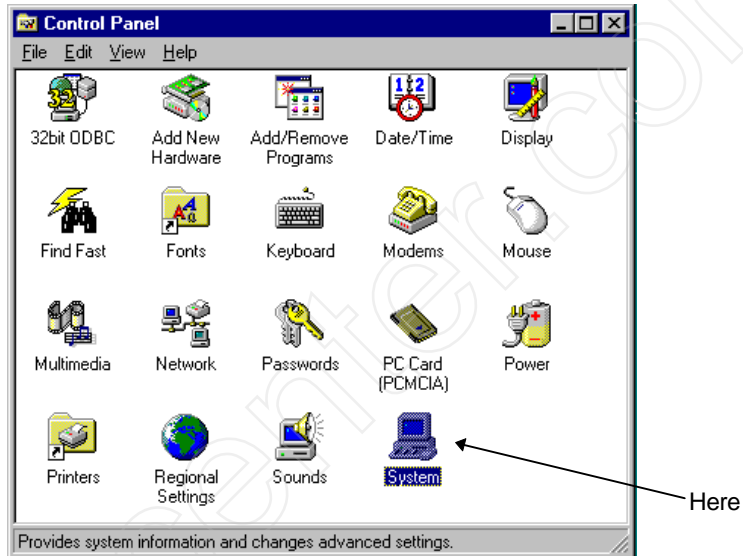


26. Change **Value** to match the address of your card, and click [OK].
27. Click [OK]. The **System Setting Change** window is displayed, along with the message "Do you want to shut down your computer now?".
28. Click [Yes] for a single HSSB connection. The installation procedure has been completed.
- A. For multiple HSSB connections, click [No] and return to Step 3 in this procedure.
  - B. Repeat these steps for each connected HSSB and CNC. When completed, click [Yes].
  - C. The second time, or later, choose **FANUC Open CNC** instead of Other Devices in step 8.

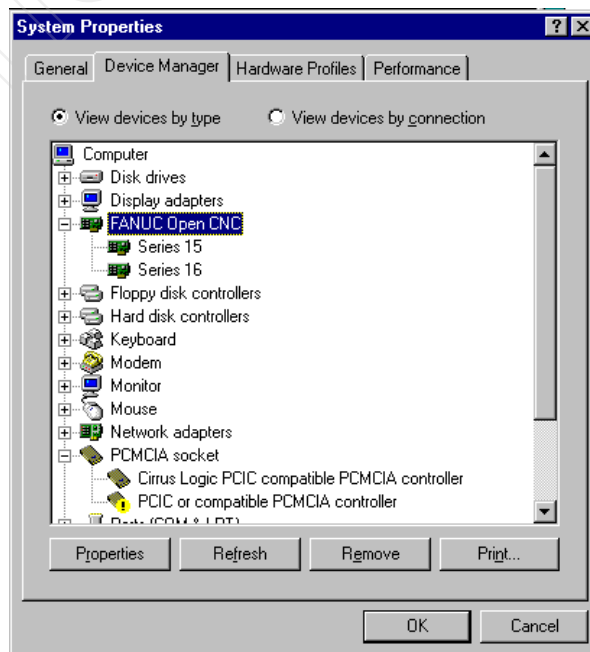
Also, copy the following files from Disk 2 to the **C:\WINDOWS\SYSTEM** directory:

## Section 3 Upgrading K730 (Version 1.2.x and Newer) 32-Bit Drivers and Libraries for Windows 95

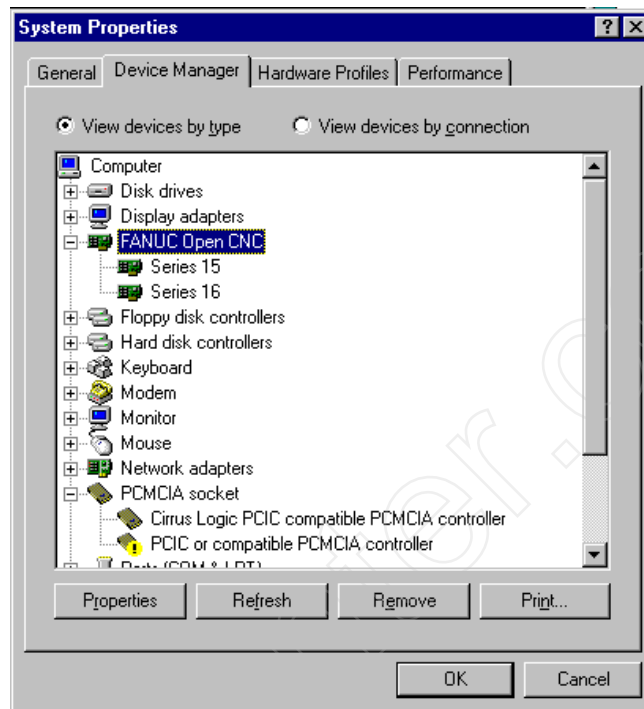
1. Double-click [System] from the **Control Panel** window to display the **System Properties** window.



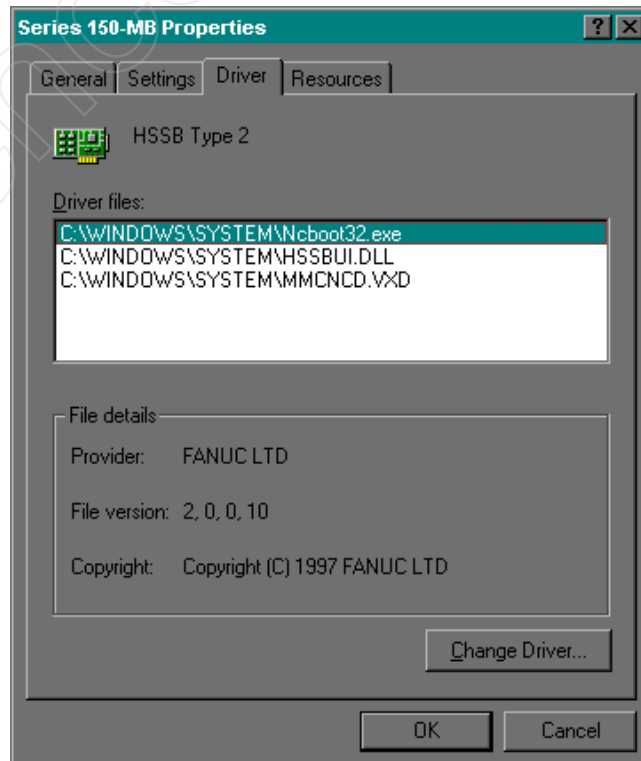
2. Click the [Device Manager] tab. Select FANUC Open CNC.



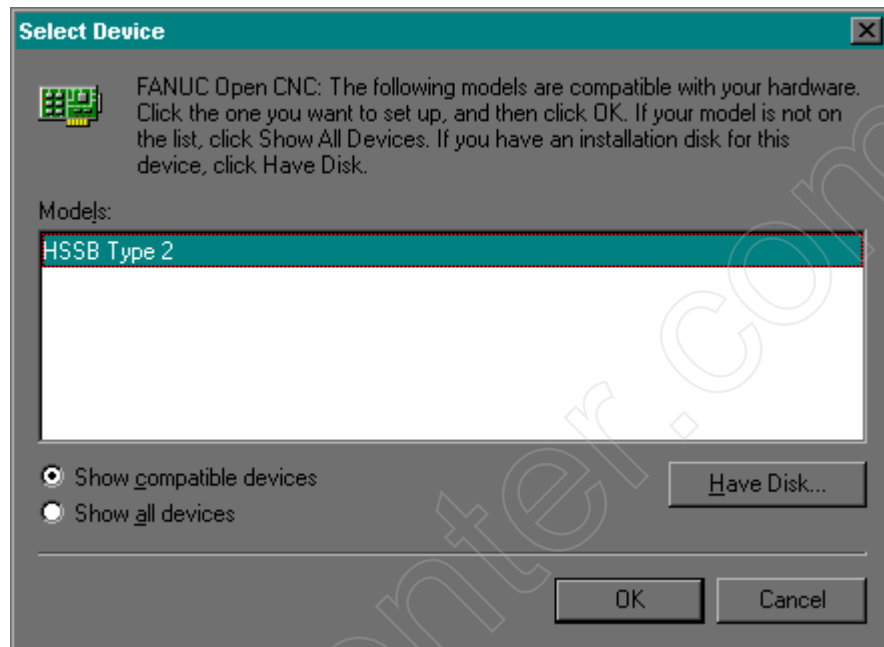
3. Double-click any of the previously installed cards under [FANUC Open CNC]. The **HSSB Type 2 Properties** window is displayed.



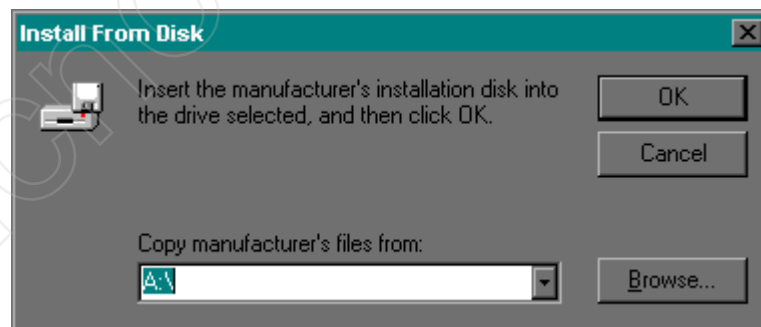
4. Click the [Drivers] tab.



5. Select Change Driver.



6. Select Have Disk.



7. Enter the appropriate directory, listed below, on the **Copy Manufacturer's File From** box, and then click [OK]. "HSSB Type 2" is displayed in the **Models** box.

For version 1.2.x it is **"a:\hssb-pc\vxid"**

For version 1.3.x it is **"a:\hssb-pc\Win95"**

8. When the system stops copying the files from the disk the upgrade is complete.

## Section 4 Installing the New K730 (Version 1.3.x) 32-Bit Drivers and Libraries for Windows NT

1. Verify that you have three disks labeled A02B-0207-K730#ZZ07 -1,-2,-3 (Drivers and Libraries).

### Note

To install the K730 Driver and Libraries to your system, you will use the **Windows NT Explorer**.

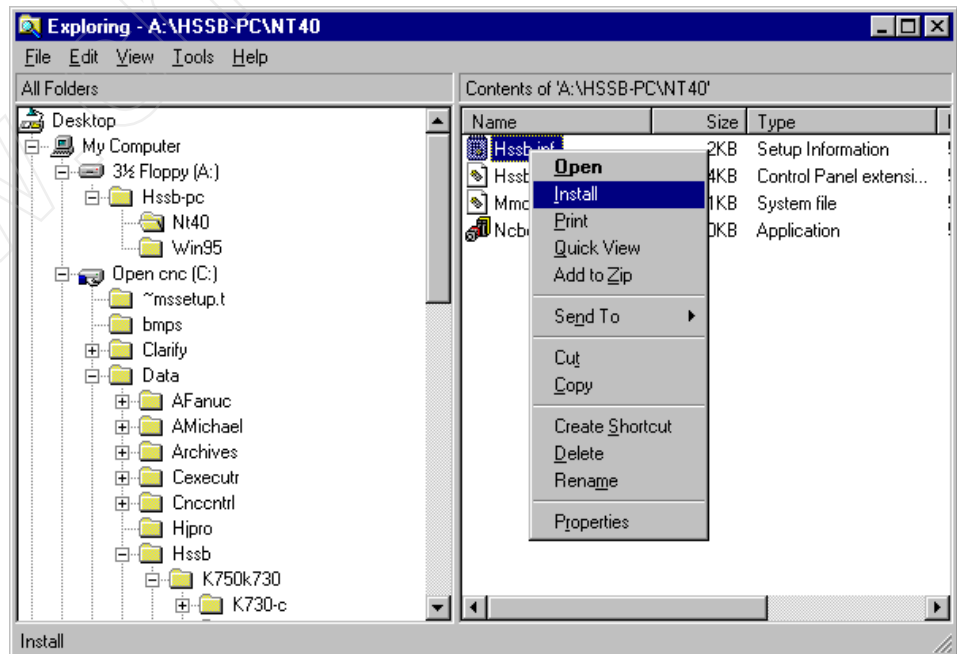
2. Before the installation, determine the I/O port address(es) for the HSSB board(s) to be installed and, in the case of HSSB multi-connection, the correspondence between nodes and connected CNCs.
3. Log on to Windows NT as the Administrator.

### Note

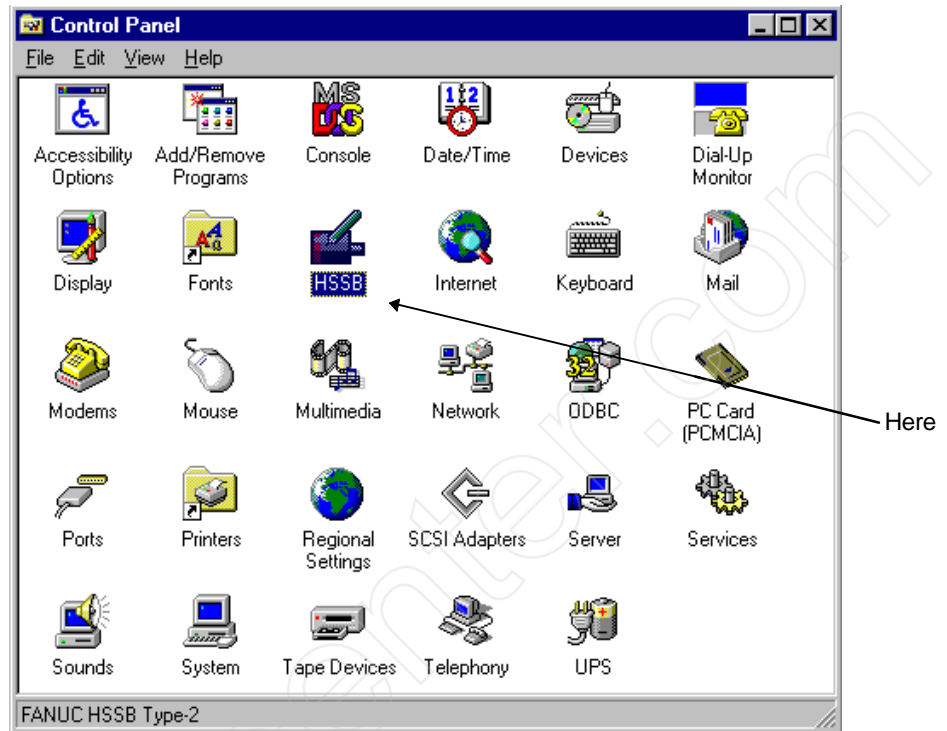
To change the HSSB driver settings, you must have the Administrator privilege.

4. Close all running applications. Most importantly, if the **Control Panel** window is open, close it.
5. Start the Windows NT Explorer.
6. Insert Disk 1 into the A: drive and open the directory **A:\hssb-pc\Nt40**.
7. Right click on the file named **HSSB.INF** and click [install] from the pop up menu.

This will copy the driver files and register them into the registry.



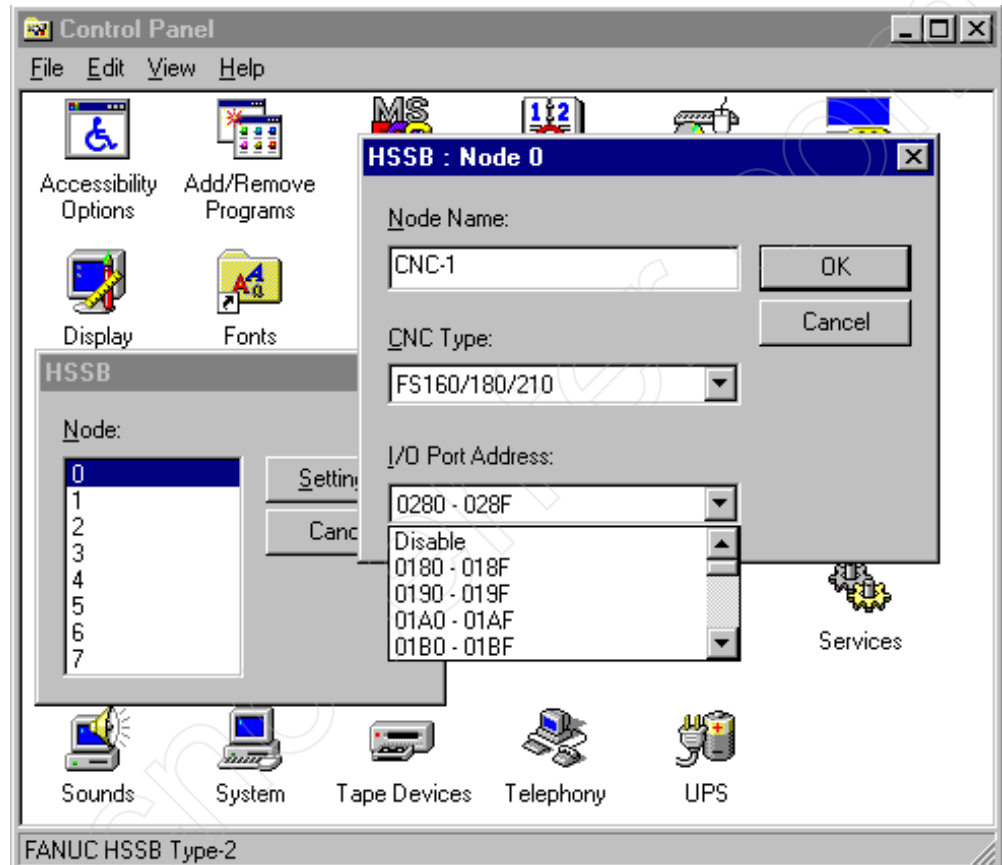
- 8. Once Windows NT is done copying the files, open the **Control Panel** window.
- 9. Double click the new [HSSB] icon.



- 10. Select the node number that you want to attach the HSSB board and click the [Setting...] button.



11. Enter proper name which indicates the machine connected to the HSSB board (for example, "FS160 - No.1", "Milling Machine") to [Node name] maximum 19 characters.
12. Select CNC type from the **CNC Type** list box.
13. Select I/O port address, that correspond to the rotary switches on the HSSB board, from the **I/O Port Address** list box.



### Note

After driver installation I/O port address 280h is set for node-0 and "Disable" is set for all other nodes as the default value. If you do not want to use node-0 you must set "Disable" for it's I/O port address.

14. Click [OK] button to close this window.
15. In case of multiple HSSB connection, go back to step 10. and repeat these steps for each connected HSSB and CNC.
16. If a node is not attached to HSSB board, select "Disable" from the **I/O Port Address** list box.
17. Click [Close] button. A dialogue window asking you to restart Windows, will open.
18. Click [YES] button to restart Windows NT.

## Section 5 Upgrading K730 (Version 1.3.x and Newer) 32-Bit Drivers and Libraries for Windows NT

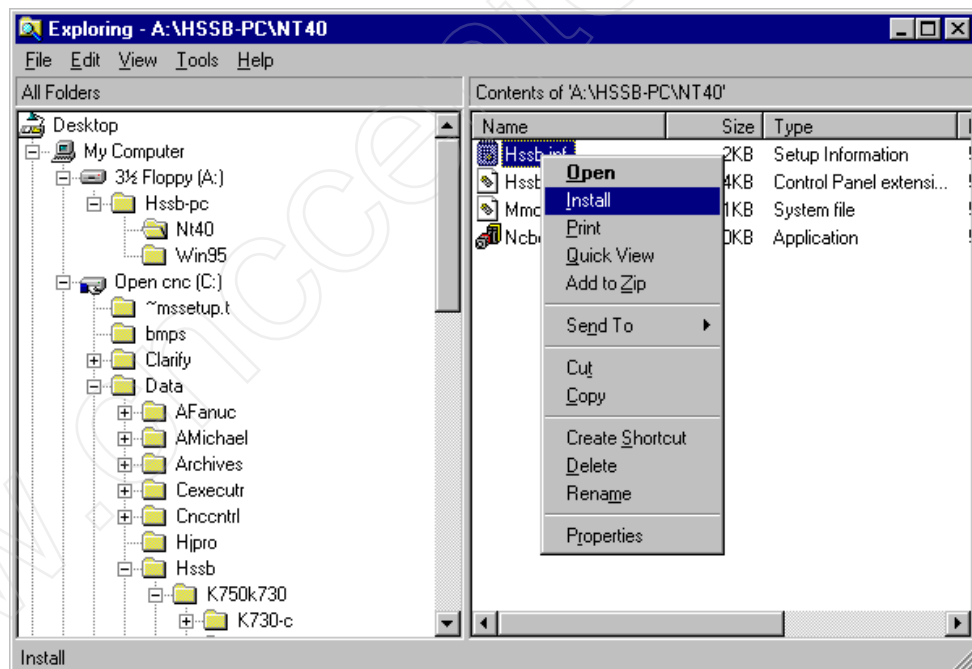
1. Log on to Windows NT as the Administrator.

### Note

To change the HSSB driver settings, you must have the Administrator privilege.

2. Close all running applications. Most importantly, if the **Control Panel** window is open, close it.
3. Start the Windows NT Explorer.
4. Insert Disk 1 into the A: drive and open the directory "A:\hssb-pc\Nt40".
5. Right click on the file named **HSSB.INF** and click [install] from the pop up menu.

This will copy the driver files and register them into the registry.



6. Once Windows NT is done copying the files the upgrade procedure is complete.

## Section 6 Installing only A02B-0207-K730 Drivers / Libraries

If you wish not to install the K750 32-Bit Basic Operation Package 1, but wish to run your own Windows application to use these drivers and libraries follow the steps below.

1. Install the Drivers and Libraries as described earlier in this chapter.
2. Copy the following files to your project directory from Disk 2 of the K730 Open System Drivers and Libraries:

Series 16/18/21	Power Mate D/H	Series 15
<b>Visual C++ 4.0 or Later</b>		
..\DATAWIN\FWLIB32.LIB	..\DATWIN\FWLIB32.LIB	..\DATAWIN\FWLIB32.LIB
..\DATAWIN\16\FWLIB32.H (version 1.2.x)	..\DATAWIN\PM\FWLIB32.H (version 1.4.x)	..\DATAWIN\15\FWLIB32.H (version 1.2.x)
..\DATAWIN\160\FWLIB32.H (version 1.3.x)		..\DATAWIN\150\FWLIB32.H (version 1.3.x)
<b>Visual BASIC 4.0 or Later</b>		
..\DATAWIN\16\FWLIB32.BAS (version 1.2.x)	..\DATAWIN\PM\FWLIB32.BAS (version 1.4.x)	..\DATAWIN\15\FWLIB32.BAS (version 1.2.x)
..\DATAWIN\160\FWLIB32.BAS (version 1.3.x)		..\DATAWIN\150\FWLIB32.BAS (version 1.3.x)

3. Copy the following files to the Windows System Directory from Disk 2 of the K730 Open System Drivers and Libraries:

Series 16/18/21	Power Mate D/H	Series 15
..\DATAWIN\FWLIB32.DLL	..\DATAWIN\FWLIB32.DLL	..\DATAWIN\FWLIB32.DLL
..\DATAWIN\FWLIB160.DLL	..\DATWIN\FWLIBPM.DLL	..\DATAWIN\FWLIB150.DLL

# Chapter 4

## Startup Boot and IPL Modes

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This chapter describes the rotary switch setup and power-up screens, including the Boot Functions, IPL Menu, and System Startup.

### Note

The K730 drivers **must** be installed prior to using the Boot Utility.

### Warning

**Improper use of this feature can cause loss of control software files.**

### Important

**In this chapter "CNC" represents only the 150/160/180/210 and "NC" represents both the CNC and Power Mate Controls.**

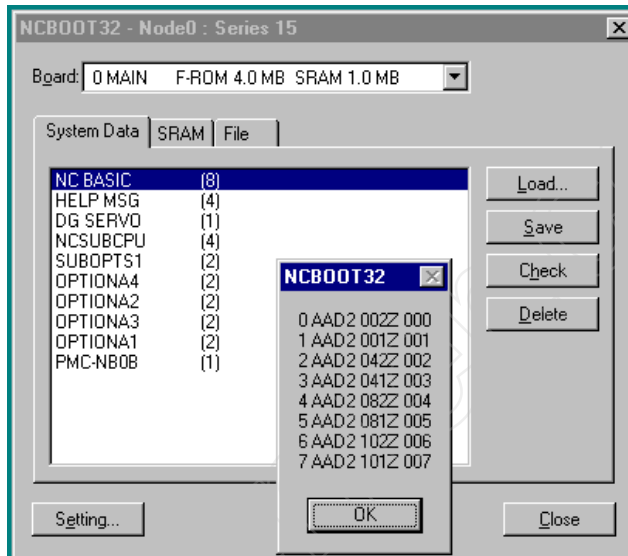
Locate the HSSB Mode switch on your control as listed in the table below:

Table 4 - 1. HSSB Mode switch locations

200V HSSB Card	Rotary Switch located at the top of the CNC HSSB board.
24V HSSB Card	Dip switch located in the center of the front panel of the CNC HSSB board.
Power Mate	Upper rotary switch labeled RSW. Located just below the led panel on the front of the Power Mate.

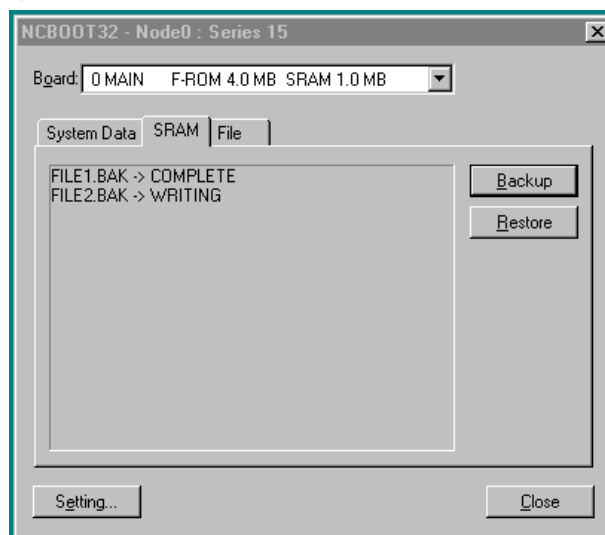
## Setting the HSSB Mode Switch to 0

This is the maintenance setting. The NC will start to power up and then wait until the PC launches the NCBOOT32 Driver. The following screen will be displayed on the PC:

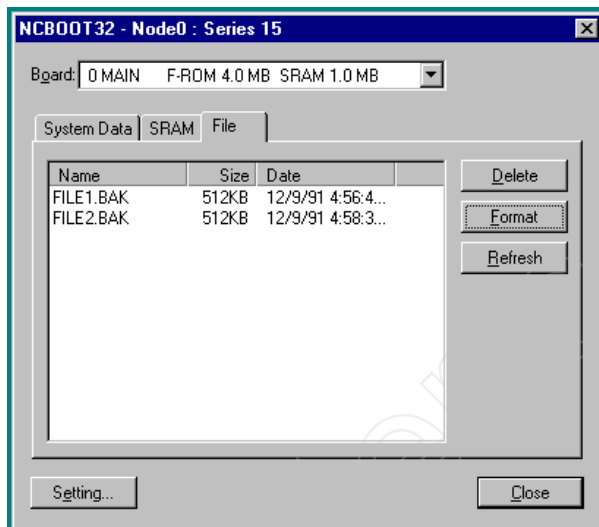


This screen allows you to view flash ROM software revisions stored in the NC. It also allows the NC executive software to be updated.

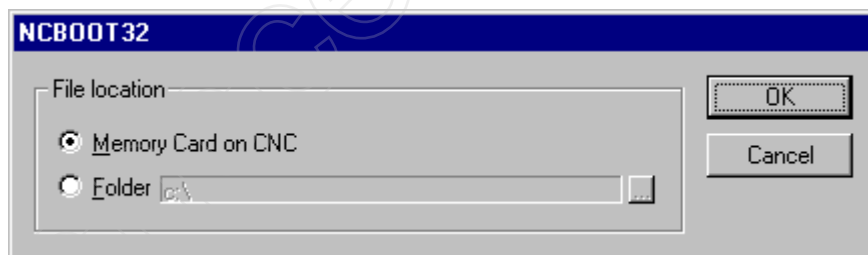
The [SRAM] tab allows you to back up SRAM data, such as part programs, tool offsets, and parameters onto a memory card as a binary image.



The [File] tab allows you to delete files from, refresh the directory of, and format the memory card.

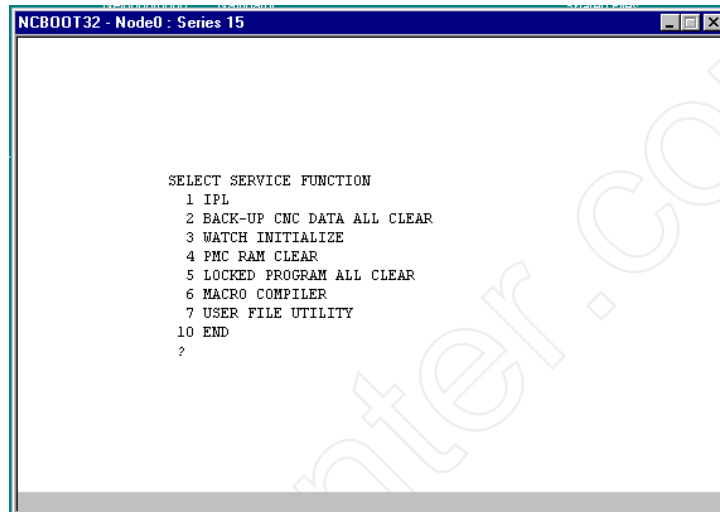


The [Setting] button allows you to select the Open CNC PC hard drive or an SRAM card as the backup target/source.



## NC IPL Menu

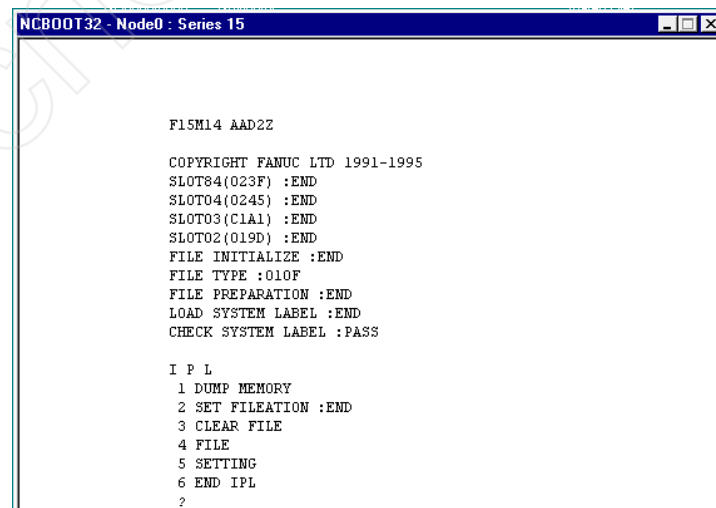
After you close **NCBOOT32** from the boot function the following screen appears. Choosing IPL provides access to NC setup data , NC file clearing, Option configuration, and server maintenance features. For more information on using these features, see the NC maintenance manual



```
NCBOOT32 - Node0 : Series 15

SELECT SERVICE FUNCTION
1 IPL
2 BACK-UP CNC DATA ALL CLEAR
3 WATCH INITIALIZE
4 PMC RAM CLEAR
5 LOCKED PROGRAM ALL CLEAR
6 MACRO COMPILER
7 USER FILE UTILITY
10 END
?
```

Once you choose IPL the IPL Service menu will appear. This menu allows maintenance personnel to clear and set up the NC software menus. It also allows access to the IPL (Initial Program Loading) mode.



```
NCBOOT32 - Node0 : Series 15

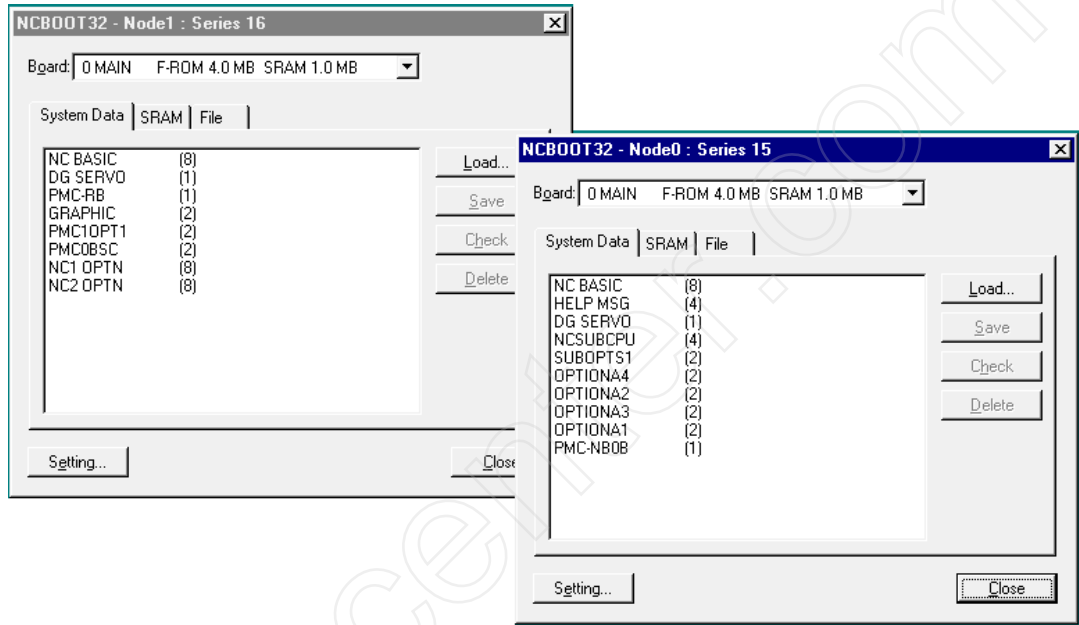
F15M14 AAD2Z

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SLOT84(023F) :END
SLOT04(0245) :END
SLOT03(01A1) :END
SLOT02(019D) :END
FILE INITIALIZE :END
FILE TYPE :010F
FILE PREPARATION :END
LOAD SYSTEM LABEL :END
CHECK SYSTEM LABEL :PASS

I P L
1 DUMP MEMORY
2 SET FILEATION :END
3 CLEAR FILE
4 FILE
5 SETTING
6 END IPL
?
```

## Multi-HSSB Card Boot Example

If the selected open system consists of multiple NC systems connected to a single PC via multiple HSSB cards, each NC can have a boot function window. This enables you to view multiple systems simultaneously.



## Setting the HSSB Mode Switch to 1

This is the normal setting. The start-up BOOT function displays are not shown, and the operator has no access to Boot or IPL mode. This mode varies depending on the control type (see below).

### CNC

In this mode the CNC will not finish the boot process until NCBOOT32 running on the host PC has connected with the control.

### Power Mate D/H

In this mode the Power Mate D/H will finish the boot process independent of the host PC's condition.

---

## Setting the HSSB Mode Switch to 2

The CNC will boot without the Open CNC PC connection. This selection can be used where a CRT/MDI is the primary operator interface and the PC is not always powered up.

This switch setting is **not** supported on the Power Mate D/H.

www.cnccenter.com

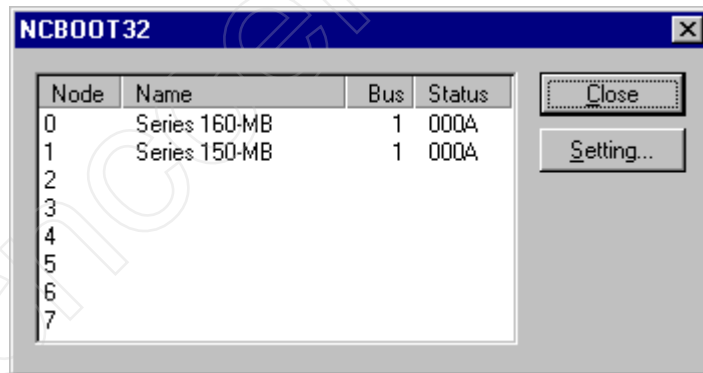
# Chapter 5

## Troubleshooting

### NCBOOT32 Status Window

#### Status Window

The status window can be opened by double-clicking the icon on the system tray, or clicking "Open" on the pop-up menu which appears when you right-click the icon.



Node: Node number

Name: Node name (Defined previously at the device manager on Windows 95 or the HSSB control panel applet on the Windows NT)

Bus: Hardware status (0:Connection error, 1:Connecting)

Status: Software status (Hexadecimal)

Bit1: Hardware switch position (0 or 1)

Bit2: BOOT has completed

Bit3: IPL has completed

Bit8: CNC system alarm occurs

## LED Status Display

### CNC HSSB Card

■ ON    □ OFF

7 Seg LED	ST4 ~ ST1	Status
8	■ ■ ■ ■	Start up status after power on.
1	■ ■ ■ □	Initializing HSSB board.
2	■ ■ □ ■	Executing boot operation by PC.
3	■ ■ □ □	Displaying CNC screen on CRT of PC.
7	■ □ □ □	Start up has been completed and the system is now in normal operation mode.
9	□ ■ ■ □	The thermal error occurred in the Intelligent Terminal.
A	□ ■ □ ■	Communication is not ready.
b	□ ■ □ □	Parity Error at common RAM is occurred.
C	□ □ ■ ■	Communication Error.
d	□ □ ■ □	Battery alarm occurred in the Intelligent Terminal.

### General LED Display

PCB Spec.	Name	LED			Status
		RED	RED	GREEN	
A20B-8001-0290	I/F board for CNC A	AL1	AL2		
A20B-2002-0210	I/F board for CNC B	AL1	AL2		
A20B-8100-0100	I/F board for PC single port	LED1		LED2	
A20B-8001-0580	I/F board for PC Dual Port	LED1x		LED2x	
		ON	----	-----	Communication is stopped.
		----	ON	-----	Parity error at common RAM.
		----	----	ON	CNC Status OKAY.

## Troubleshooting

If, after installing the Type II HSSB software, the HSSB does not operate correctly, try these troubleshooting suggestions:

1. Check to see if any other PC-vendor printed circuit board is using the HSSB assigned I/O address.
2. Check the switch settings on the CNC-based HSSB printed circuit board. The switch should be set to 1 to start up in normal mode. (If you change the setting, remember to cycle CNC power.)
3. Reboot the PC and look at Windows 95 Boot Log or Windows NT Event Log for errors that HSSB Driver(mmcncd) is not installed.
4. Verify that the target NC has the correct software and option enabled (see Chapter 1).
5. Verify that the green LED located on the HSSB PC printed circuit board is ON after the NC/PC boot. This LED is visible from the rear of the PC next to the fiber optic connection.
6. Reboot the PC and NC after changing any setup configuration data.
7. If using a 200V CNC HSSB card verify the LED display reads "7" after the CNC and PC finish booting.

## Getting Help

For more help, please contact GE Fanuc Automation at 1-800-GE FANUC or your local sales office.

## Open System C Language Functions (CNC)

This appendix identifies the C Language Open System Drivers and Library Functions available for the Type II HSSB system. For more information, see GFK-1365, *Windows 95/Windows NT 32-Bit Drivers and Libraries for Open CNC Systems Reference Manual*.

The support status of each function is as follows:

15/16/IO/MEM	Function name	Brief description
O/ O/ O/ X	O : supported X : not supported	
	+-->	Memory map(MMC-IV, Intelligent Terminal, HSSB type 1)
	+----->	I/O map(HSSB type 2, NC board)
	+----->	Library for Series 160/180/210,NC board,160i/180i/210i
	+----->	Library for Series 150

## Functions Related to Controlled Axis / Spindle

	15/16/IO/MEM	Function Name	Brief Description
( 1)	0/ 0/ 0/ 0	cnc_actf	Read actual axis feedrate(F)
( 2)	0/ 0/ 0/ 0	cnc_absolute	Read absolute axis position
( 3)	0/ 0/ 0/ 0	cnc_machine	Read machine axis position
( 4)	0/ 0/ 0/ 0	cnc_relative	Read relative axis position
( 5)	0/ 0/ 0/ 0	cnc_distance	Read distance to go
( 6)	0/ 0/ 0/ 0	cnc_skip	Read skip position
( 7)	0/ 0/ 0/ 0	cnc_srvdelay	Read servo delay value
( 8)	0/ 0/ 0/ 0	cnc_accdecldly	Read acceleration/deceleration delay value
( 9)	0/ 0/ 0/ 0	cnc_rddynamic	Read all dynamic data
(10)	0/ 0/ 0/ 0	cnc_wrrelpos	Set origin / preset relative axis position
(11)	0/ 0/ 0/ 0	cnc_prstwkcd	Preset work coordinate
(12)	0/ 0/ 0/ 0	cnc_rdmovrlap	Read manual overlapped motion value
(13)	0/ 0/ 0/ 0	cnc_canmovrlap	Cancel manual overlapped motion value
(14)	0/ 0/ 0/ 0	cnc_acts	Read actual spindle speed(S)
(15)	0/ 0/ 0/ 0	cnc_rdspload	Read load infomation of serial spindle
(16)	0/ 0/ 0/ 0	cnc_rdspmaxrpm	Read maximum r.p.m. ratio of serial spindle
(17)	0/ 0/ 0/ 0	cnc_rdspgear	Read gear ratio of serial spindle
<b>(Version 1.3.x only)</b>			
(18)	0/ X/ 0/ X	cnc_rd3dtooltip	Read tool tip coordinates
(19)	0/ X/ 0/ X	cnc_rd3dpulse	Read handle interrupt pulse amount
(20)	0/ X/ 0/ X	cnc_rd3dmovrlap	Read handle interrupt move amount
(21)	0/ X/ 0/ X	cnc_rd3dofschg	Read modification tool length compensation
(22)	0/ X/ 0/ X	cnc_clr3dplsmov	Clear handle interrupt pulse & move amount

## Functions Related to a CNC Program

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_dwnstart	Start downloading NC program
( 2)	O/ O/ O/ O	cnc_download	Download NC program
( 3)	O/ O/ O/ O	cnc_cdownload	Download NC program(conditional)
( 4)	O/ O/ O/ O	cnc_dwnend	End of downloading NC program
( 5)	O/ O/ O/ O	cnc_vrfstart	Start verification of NC program
( 6)	O/ O/ O/ O	cnc_verify	Verify NC program
( 7)	O/ O/ O/ O	cnc_cverify	Verify NC program(conditional)
( 8)	O/ O/ O/ O	cnc_vrfend	End of verification
( 9)	O/ O/ O/ O	cnc_dncstart	Start downloading DNC program
(10)	O/ O/ O/ O	cnc_dnc	Download DNC program
(11)	O/ O/ O/ O	cnc_cdnc	Download DNC program(conditional)
(12)	O/ O/ O/ O	cnc_dncend	End of downloading DNC program
(13)	O/ O/ O/ O	cnc_upstart	Start uploading NC program
(14)	O/ O/ O/ O	cnc_upload	Upload NC program
(15)	O/ O/ O/ O	cnc_cupload	Upload NC program(conditional)
(16)	O/ O/ O/ O	cnc_upend	End of uploading NC program
(17)	O/ O/ O/ O	cnc_buff	Read buffer status for downloading/ verification NC program
(18)	O/ O/ O/ O	cnc_search	Search specified program
(19)	O/ O/ O/ O	cnc_delall	Delete all programs
(20)	O/ O/ O/ O	cnc_delete	Delete specified program
(21)	O/ O/ O/ O	cnc_rdprogdir	Read program directory
(22)	O/ O/ O/ X	cnc_rdprogdir2	Read program directory(2)
(23)	O/ O/ O/ O	cnc_rdproginfo	Read program information
(24)	O/ O/ O/ O	cnc_rdprgnum	Read program number under execution
(25)	O/ O/ O/ O	cnc_rdseqnum	Read sequence number under execution
(26)	O/ O/ O/ O	cnc_seqsrch	Search specified sequence number
(27)	O/ O/ O/ O	cnc_rewind	Rewind cursor of NC program
(28)	O/ O/ O/ O	cnc_rdblkcount	Read block counter
(29)	O/ O/ O/ O	cnc_rdexecprog	Read program under execution
(30)	O/ O/ O/ O	cnc_wrmdiprog	Write program for MDI operation
(31)	O/ O/ O/ O	cnc_rdmipntr	Read execution pointer for MDI operation
(32)	O/ O/ O/ O	cnc_wrmdipntr	Write execution pointer for MDI operation
(33)	O/ O/ O/ X	cnc_rdproctime	Read processing time stamp data
(34)	O/ O/ O/ X	cnc_rdrprgdirtime	Read directory for processing time stamp data

## Functions Related to CNC File Data

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_rdtofs	Read tool offset value
( 2)	O/ O/ O/ O	cnc_wrtofs	Write tool offset value
( 3)	O/ O/ O/ O	cnc_rdtofsr	Read tool offset value(area specified)
( 4)	O/ O/ O/ O	cnc_wrtofsr	Write tool offset value(area specified)
( 5)	O/ O/ O/ O	cnc_rdtofsinfo	Read tool offset information
( 6)	O/ O/ O/ O	cnc_rdzofs	Read work zero offset value
( 7)	O/ O/ O/ O	cnc_wrzofs	Write work zero offset value
( 8)	O/ O/ O/ O	cnc_rdzofsr	Read work zero offset value(area specified)
( 9)	O/ O/ O/ O	cnc_wrzofsr	Write work zero offset value( " )
(10)	O/ O/ O/ O	cnc_rdzofsinfo	Read work zero offset information
(11)	O/ O/ O/ O	cnc_rdparam	Read parameter
(12)	O/ O/ O/ O	cnc_wrparam	Write parameter
(13)	O/ O/ O/ O	cnc_rdpapar	Read parameter(area specified)
(14)	O/ O/ O/ O	cnc_wrparas	Write parameter(area specified)
(15)	O/ O/ O/ O	cnc_rdpainfo	Read parameter information
(16)	O/ O/ O/ O	cnc_rdparanum	Read minimum, maximum, total number of parameter
(17)	O/ O/ O/ O	cnc_rdset	Read setting data
(18)	O/ O/ O/ O	cnc_wrset	Write setting data
(19)	O/ O/ O/ O	cnc_rdssetr	Read setting data(area specified)
(20)	O/ O/ O/ O	cnc_wrssets	Write setting data(area specified)
(21)	O/ O/ O/ O	cnc_rdssetinfo	Read setting data information
(22)	O/ O/ O/ O	cnc_rdssetnum	Read minimum, maximum, total number of setting data
(23)	O/ O/ O/ O	cnc_rdpitchr	Read pitch error compensation data (area specified)
(24)	O/ O/ O/ O	cnc_wrpitchr	Write pitch error compensation data( " )
(25)	O/ O/ O/ O	cnc_rdpitchinfo	Read pitch error compensation data information
(26)	O/ O/ O/ O	cnc_rdmacro	Read custom macro variable
(27)	O/ O/ O/ O	cnc_wrmacro	Write custom macro variable
(28)	O/ O/ O/ O	cnc_rdmacr	Read custom macro variables(area specified)
(29)	O/ O/ O/ O	cnc_wrmacr	Write custom macro variables( " )
(30)	O/ O/ O/ O	cnc_rdmacroinfo	Read custom macro variable information
(31)	O/ O/ O/ O	cnc_getmactype	Get type of custom macro variable
(32)	O/ O/ O/ O	cnc_setmactype	Set type of custom macro variable
(33)	O/ O/ O/ O	cnc_rdpmacro	Read P code macro variable
(34)	O/ O/ O/ O	cnc_wrpmacro	Write P code macro variable
(35)	O/ O/ O/ O	cnc_rdpmacr	Read P code macro variables(area specified)
(36)	O/ O/ O/ O	cnc_wrpmacr	Write P code macro variables( " )
(37)	O/ O/ O/ O	cnc_rdpmacroinfo	Read P code macro variable information
(38)	O/ O/ O/ O	cnc_getpmactype	Get type of P code macro variable
(39)	O/ O/ O/ O	cnc_setpmactype	Set type of P code macro variable
(40)	O/ O/ O/ X	cnc_rdmgrpdata	Read M code group data
(41)	O/ O/ O/ X	cnc_wrmgrpdata	Write M code group data
(42)	O/ X/ O/ X	cnc_rdexecmcode	Read M code group data(executing, executed M code)
(43)	O/ X/ O/ X	cnc_rdrstrmcode	Read M code group data(for program restart)
(44)	O/ O/ O/ X	cnc_rdintchk	Read interference check data (area specified)
(45)	O/ O/ O/ X	cnc_wrintchk	Write interference check data( " )
(46)	O/ O/ O/ X	cnc_rdsintinfo	Read interference check data information
(47)	O/ X/ O/ X	cnc_rdhpcset	Read setting data for High-speed and high-precision machining
(48)	O/ X/ O/ X	cnc_wrhpcset	Write setting data for HPCC
(49)	O/ X/ O/ X	cnc_hpccatset	Set setting data for HPCC automatically
(50)	O/ X/ O/ X	cnc_rdhpcctupr	Read tuning data(parameter input) for HPCC
(51)	O/ X/ O/ X	cnc_wrhpcctupr	Write tuning data(parameter input) for HPCC
(52)	O/ X/ O/ X	cnc_rdhpcctuac	Read tuning data(acc./dec. input) for HPCC
(53)	O/ X/ O/ X	cnc_wrhpcctuac	Write tuning data(acc./dec. input) for HPCC
(54)	O/ X/ O/ X	cnc_hpccattune	Tune up tuning data for HPCC automatically
(55)	O/ X/ O/ X	cnc_hpccactfine	Read fine level for HPCC
(56)	O/ X/ O/ X	cnc_hpccselfine	Select fine level for HPCC
(57)	O/ X/ O/ X	cnc_rdsactfixofs	Read active fixture offset
(58)	O/ X/ O/ X	cnc_rdsfixofs	Read fixture offset value(area specified)
(59)	O/ X/ O/ X	cnc_wrsfixofs	Write fixture offset value(area specified)

(60)	X/	O/	O/	X	cnc_rdwkcdshft	Read work coordinate shift value
(61)	X/	O/	O/	X	cnc_wrwkcdshft	Write work coordinate shift value
(62)	X/	O/	O/	X	cnc_rdwkcdsfms	Read work coordinate shift measured value
(63)	X/	O/	O/	X	cnc_wrwkcdsfms	Write work coordinate shift measured value
(64)	X/	O/	O/	X	cnc_rdbtfsr	Read tool offset value for B axis (area specified)
(65)	X/	O/	O/	X	cnc_wrbtfsr	Write tool offset value for B axis( " )
(66)	X/	O/	O/	X	cnc_rdbtfsinfo	Read tool offset information for B axis
(67)	X/	O/	O/	X	cnc_rdbaxis	Read command data for B axis

## Functions Related to Tool Life Management Data

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_rdgrrpid	Read tool life management data (tool group number)
( 2)	O/ O/ O/ O	cnc_rdngrp	Read " (number of tool groups)
( 3)	O/ O/ O/ O	cnc_rdnrtool	Read " (number of tools)
( 4)	O/ O/ O/ O	cnc_rdlife	Read " (tool life)
( 5)	O/ O/ O/ O	cnc_rdcnt	Read " (tool lift counter)
( 6)	O/ O/ O/ O	cnc_rdl1length	Read " (tool length number-1)
( 7)	O/ O/ O/ O	cnc_rdl2length	Read " (tool length number-2)
( 8)	O/ O/ O/ O	cnc_rdlradius	Read " (cutter compensation num.-1)
( 9)	O/ O/ O/ O	cnc_rdl2radius	Read " (cutter compensation num.-2)
(10)	O/ O/ O/ O	cnc_tlinfo	Read " (tool information-1)
(11)	O/ O/ O/ O	cnc_t2info	Read " (tool information-2)
(12)	O/ O/ O/ O	cnc_toolnum	Read " (tool number)
(13)	O/ O/ O/ O	cnc_rdtoolrng	Read " (tool number, tool life, tool life counter)(area specified)
(14)	O/ O/ O/ O	cnc_rdtoolgrp	Read " (all data within group)
(15)	O/ O/ O/ O	cnc_wrcountr	Write " (tool life counter) (area specified)
(16)	O/ O/ O/ O	cnc_rdusegrrpid	Read " (used tool group number)
(17)	O/ O/ O/ O	cnc_rdmxgrp	Read " (max. number of tool groups)
(18)	O/ O/ O/ O	cnc_rdmxtool	Read " (max. number of tool within group)
(19)	O/ O/ O/ O	cnc_rdusetlno	Read " (used tool number within group)
(20)	O/ O/ O/ O	cnc_rdl1lifedata	Read " (tool data1)
(21)	O/ O/ O/ O	cnc_rdl2lifedata	Read " (tool data2)
(22)	O/ O/ O/ O	cnc_wrl1lifedata	Write " (tool data1)
(23)	O/ O/ O/ O	cnc_wrl2lifedata	Write " (tool data2)
(24)	O/ O/ O/ O	cnc_rdgrrpinfo	Read " (tool group information)
(25)	O/ O/ O/ O	cnc_wrgrrpinfo	Write " (tool group information)
(26)	O/ O/ O/ O	cnc_deltlifegrp	Delete " (tool group)
(27)	O/ O/ O/ O	cnc_instlifedt	Insert " (tool data)
(28)	O/ O/ O/ O	cnc_deltlifedt	Delete " (tool data)
(29)	O/ O/ O/ O	cnc_clrrentinfo	Clear " (tool life counter, tool information)(area specified)

## Functions Related to History Data

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_stopophis	Stop logging operation history data
( 2)	O/ O/ O/ O	cnc_startophis	Restart logging operation history data
( 3)	O/ O/ O/ O	cnc_rdophisno	Read number of operation history data
( 4)	O/ O/ O/ O	cnc_rdophistry	Read operation history data
( 5)	O/ O/ O/ O	cnc_rdalhmhisno	Read number of alarm history data
( 6)	O/ O/ O/ O	cnc_rdalhmistry	Read alarm history data
( 7)	O/ O/ O/ O	cnc_clearophis	Clear operation history data
( 8)	O/ O/ O/ O	cnc_rdhissgnl	Read signals related operation history
( 9)	O/ O/ O/ O	cnc_wrhissgnl	Write signals related operation history
(10)	X/ O/ O/ X	cnc_stopomhis	Stop logging external operator's message history data
(11)	X/ O/ O/ X	cnc_startomhis	Restart logging external operator's message history data
(12)	X/ O/ O/ X	cnc_rdomhisinfo	Read external operator's message history data information
(13)	X/ O/ O/ X	cnc_rdomhistry	Read external operator's message history data
(14)	X/ O/ O/ X	cnc_clearomhis	Clear external operator's message history data

## Functions Related to Servo / Spindle

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_rdloopgain	Read loop gain for servo adjustment
( 2)	O/ O/ O/ O	cnc_rdcurent	Read real current for servo adjustment
( 3)	O/ O/ O/ O	cnc_rdsrvspeed	Read real speed for servo adjustment
( 4)	O/ O/ O/ O	cnc_rdnspd1	Read number of spindle
( 5)	O/ O/ O/ O	cnc_rdpomode	Read operation mode for spindle setting
( 6)	O/ O/ O/ O	cnc_rdposerrs	Read position deflection S for spindle adjustment
( 7)	O/ O/ O/ O	cnc_rdposerrs2	Read position deflection S1, S2 for spindle adjustment(synchronous control mode)
( 8)	O/ O/ O/ O	cnc_rdposerrz	Read position deflection Z of tapping axis for spindle adjustment(rigid tapping mode)
( 9)	O/ O/ O/ O	cnc_rdsynerrsy	Read synchronous error for spindle adjustment(synchronous control mode)
(10)	O/ O/ O/ O	cnc_rdsynerrrg	Read synchronous error for spindle adjustment(rigid tapping mode)
(11)	O/ O/ O/ O	cnc_rdspdlalm	Read spindle alarm for spindle monitor
(12)	O/ O/ O/ O	cnc_rdctrldi	Read control input signal for spindle monitor
(13)	O/ O/ O/ O	cnc_rdctrldo	Read control output signal for spindle monitor
(14)	O/ O/ O/ O	cnc_rdwaveprm	Read waveform diagnosis parameter
(15)	O/ O/ O/ O	cnc_wrwaveprm	Write waveform diagnosis parameter
(16)	O/ O/ O/ O	cnc_wavestart	Start sampling waveform diagnosis data
(17)	O/ O/ O/ O	cnc_wavestop	Stop sampling waveform diagnosis data
(18)	O/ O/ O/ O	cnc_wavestat	Read sampling status of waveform diagnosis data
(19)	O/ O/ O/ O	cnc_rdwavedata	Read waveform diagnosis data

## Functions Related to Data Server, DNC1, DNC2, OSI-Ethernet

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ X	cnc_dtsvftpget	Transfer file from host to data server
( 2)	O/ O/ O/ X	cnc_dtsvftpput	Transfer file from data server to host
( 3)	O/ O/ O/ X	cnc_dtsvftpstat	Read status of file transfer between host and data server
( 4)	O/ O/ O/ X	cnc_dtsvrpgdir	Read directory in data server
( 5)	O/ O/ O/ X	cnc_dtsvdelete	Delete file in data server
( 6)	O/ O/ O/ X	cnc_dtsvdownload	Download from data server to CNC
( 7)	O/ O/ O/ X	cnc_dtsvupload	Upload from CNC to data server
( 8)	O/ O/ O/ X	cnc_dtsvcnclupdn	Cancel upload/download between data server and CNC
( 9)	O/ O/ O/ X	cnc_dtsvupdnstat	Read upload/download status between data server and CNC
(10)	O/ O/ O/ X	cnc_dtsvgetdncpg	Get DNC operation file name in data server
(11)	O/ O/ O/ X	cnc_dtsvsetdncpg	Set DNC operation file name in data server
(12)	O/ O/ O/ X	cnc_dtsvrset	Read setting data for data server
(13)	O/ O/ O/ X	cnc_dtsvwrset	Write setting data for data server
(14)	O/ O/ O/ X	cnc_dtsvchkdsk	Check hard disk on data server
(15)	O/ O/ O/ X	cnc_dtsvhdfmt	Format hard disk on data server
(16)	O/ O/ O/ X	cnc_dtsvsavecram	Save I/F buffer for data server
(17)	O/ O/ O/ X	cnc_dtsvrdcram	Read I/F buffer for data server
(18)	O/ O/ O/ X	cnc_dtsvmntinfo	Read maintenance information for data server
(19)	O/ O/ O/ X	cnc_dtsvgetmode	Get mode of data server
(20)	O/ O/ O/ X	cnc_dtsvsetmode	Set mode of data server
(21)	O/ O/ O/ X	cnc_dtsvrerrmsg	Read error message for data server
(22)	O/ O/ O/ X	cnc_rddncfname	Read DNC file name for DNC1,DNC2, OSI-Ethernet
(23)	O/ O/ O/ X	cnc_wrdncfname	Write DNC file name for DNC1,DNC2, OSI-Ethernet
(24)	O/ O/ O/ X	cnc_rdcocomparam	Read communication parameter for DNC1, DNC2,OSI-Ethernet
(25)	O/ O/ O/ X	cnc_wrcocomparam	Write communication parameter for DNC1, DNC2,OSI-Ethernet
(26)	O/ O/ O/ X	cnc_rdcocomlogmsg	Read logging message for DNC2
(27)	O/ O/ O/ X	cnc_rdcocompmsg	Read operator's message for DNC1,DNC2
(28)	O/ O/ O/ X	cnc_rdrvcmsg	Read receipt message for OSI-Ethernet
(29)	O/ O/ O/ X	cnc_rdsndmsg	Read sending message for OSI-Ethernet
(30)	O/ O/ O/ X	cnc_sendmessage	Send message for OSI-Ethernet
(31)	O/ O/ O/ X	cnc_clrmsgbuff	Clear message buffer for OSI-Ethernet
(32)	O/ O/ O/ X	cnc_rdrvcstat	Read receipt status of message for OSI-Ethernet

## Functions Related to Punch Press

	15/16/IO/MEM	Function Name	Brief Description
( 1)	X/ O/ O/ X	cnc_rdtlctldata	Read tool control data
( 2)	X/ O/ O/ X	cnc_wrtlctldata	Write tool control data
( 3)	X/ O/ O/ X	cnc_rdtooldata	Read tool data
( 4)	X/ O/ O/ X	cnc_wrtooldata	Write tool data
( 5)	X/ O/ O/ X	cnc_rdmultitldt	Read multiple tool data
( 6)	X/ O/ O/ X	cnc_wrmultitldt	Write multiple tool data
( 7)	X/ O/ O/ X	cnc_rdsafetyzone	Read safety zone data
( 8)	X/ O/ O/ X	cnc_wrsafetyzone	Write safety zone data
( 9)	X/ O/ O/ X	cnc_rdtoolzone	Read tool zone data
(10)	X/ O/ O/ X	cnc_wrtoolzone	Write tool zone data
(11)	X/ O/ O/ X	cnc_rdacttlzone	Read actual tool zone data
(12)	X/ O/ O/ X	cnc_rdsetzone	Read number of automatic setting zone
(13)	X/ O/ O/ X	cnc_wrsetzone	Write number of automatic setting zone

## Functions Related to Laser

	15/16/IO/MEM	Function Name	Brief Description
( 1)	X/ O/ O/ X	cnc_rdpdscdproc	Read cutting condition file(cutting data)
( 2)	X/ O/ O/ X	cnc_wrpscdproc	Write cutting condition file(cutting data)
( 3)	X/ O/ O/ X	cnc_rdpdscdpirc	Read cutting condition file(piercing data)
( 4)	X/ O/ O/ X	cnc_wrpscdpirc	Write cutting condition file(piercing data)
( 5)	X/ O/ O/ X	cnc_rdpdscdedge	Read cutting condition file (edge cutting data)
( 6)	X/ O/ O/ X	cnc_wrpscdedge	Write cutting condition file (edge cutting data)
( 7)	X/ O/ O/ X	cnc_rdpdscdslop	Read cutting condition file (slope control data)
( 8)	X/ O/ O/ X	cnc_wrpscdslop	Write cutting condition file (slope control data)
( 9)	X/ O/ O/ X	cnc_rdlpwrddy	Read duty data for power control
(10)	X/ O/ O/ X	cnc_wrlpwrddy	Write duty data for power control
(11)	X/ O/ O/ X	cnc_rdlpwrdat	Read laser power data
(12)	X/ O/ O/ X	cnc_rdlpwrpst	Read power compensation coefficient
(13)	X/ O/ O/ X	cnc_wrlpwrpst	Write power compensation coefficient
(14)	X/ O/ O/ X	cnc_rdlagslt	Read assist gas selection
(15)	X/ O/ O/ X	cnc_wrlagslt	Write assist gas selection
(16)	X/ O/ O/ X	cnc_rdlagst	Read assist gas flow
(17)	X/ O/ O/ X	cnc_wrlagst	Write assist gas flow
(18)	X/ O/ O/ X	cnc_rdlcdgprc	Read laser power for contouring
(19)	X/ O/ O/ X	cnc_wrlcdgprc	Write laser power for contouring
(20)	X/ O/ O/ X	cnc_rdlprcprc	Read laser power for piercing
(21)	X/ O/ O/ X	cnc_wrlprcprc	Write laser power for piercing
(22)	X/ O/ O/ X	cnc_rdlcmdat	Read command data of laser
(23)	X/ O/ O/ X	cnc_rdlcmdplc	Read command data of reference displace
(24)	X/ O/ O/ X	cnc_wrlcmdplc	Write command data of reference displace
(25)	X/ O/ O/ X	cnc_rdlerrz	Read error of Z-axis tracing
(26)	X/ O/ O/ X	cnc_rdlactnum	Read active cutting number/piercing number /slope number
(27)	X/ O/ O/ X	cnc_rdlcmmt	Read comment data
(28)	X/ O/ O/ X	cnc_rdlpwrslt	Read laser power selection
(29)	X/ O/ O/ X	cnc_wrlpwrslt	Write laser power selection
(30)	X/ O/ O/ X	cnc_rdlpwrctrl	Read laser power control
(31)	X/ O/ O/ X	cnc_wrlpwrctrl	Write laser power control

## Functions Related to Others

	15/16/IO/MEM	Function Name	Brief Description
( 1)	O/ O/ O/ O	cnc_sysinfo	Read CNC system information
( 2)	O/ O/ O/ O	cnc_sysconfig	Read CNC configuration information
( 3)	X/ O/ O/ X	cnc_rdsyssoft	Read series/version of CNC system software
( 4)	X/ O/ O/ X	cnc_rdmndlconfig	Read module configuration of CNC system
( 5)	X/ O/ O/ X	cnc_rdmndlconfig2	Read module configuration of CNC system(2)
( 6)	O/ O/ O/ O	cnc_stainfo	Read CNC status information
( 7)	O/ O/ O/ O	cnc_alarm	Read alarm status
( 8)	O/ O/ O/ O	cnc_rdalminfo	Read alarm information
( 9)	O/ O/ O/ O	cnc_modal	Read modal data
(10)	O/ O/ O/ O	cnc_diagnoss	Read diagnosis data
(11)	O/ O/ O/ O	cnc_diagnosr	Read diagnosis data(area specified)
(12)	O/ O/ O/ O	cnc_rddiaginfor	Read diagnosis data information
(13)	O/ O/ O/ O	cnc_rddiagnum	Read minimum, maximum, total number of diagnosis data
(14)	O/ O/ O/ O	cnc_adcnv	Read A/D conversion data
(15)	O/ O/ O/ O	cnc_rdropmsg	Read operator's message
(16)	O/ O/ O/ O	cnc_rdprstrinfo	Read program restart information
(17)	O/ O/ O/ O	cnc_rstrseqsrch	Search sequence number for program restart
(18)	O/ X/ O/ O	cnc_rstrseqsrch2	Search sequence number for program restart(2)
(19)	O/ X/ O/ X	cnc_rdbbrstrinfo	Read block restart information
(20)	O/ O/ O/ O	cnc_rdropnlsnrl	Read output signal image of software operator's panel
(21)	O/ O/ O/ O	cnc_wropnlsnrl	Write output signal of software operator's panel
(22)	O/ O/ O/ O	cnc_rdropnlgnr1	Read general signal image of software operator's panel
(23)	O/ O/ O/ O	cnc_wropnlgnr1	Write general signal image of software operator's panel
(24)	O/ O/ O/ O	cnc_rdropnlgname	Read general signal name of software operator's panel
(25)	O/ O/ O/ O	cnc_wropnlgname	Write general signal name of software operator's panel
(26)	O/ X/ O/ X	cnc_rdmensuswitch	Read menu switch signal
(27)	O/ X/ O/ X	cnc_wrmenuswitch	Write menu switch signal
(28)	O/ X/ O/ X	cnc_rdradofs	Read internal position compensation data (cutter compensation/tool nose radius compensation)
(29)	O/ X/ O/ X	cnc_rdlenofs	Read internal position compensation data (tool length compensation)
(30)	O/ X/ O/ X	cnc_rdfixcycle	Read " (canned cycle)
(31)	O/ X/ O/ X	cnc_rdcrotate	Read " (coordinate rotation)
(32)	O/ X/ O/ X	cnc_rd3dcncv	Read " (3-D coordinate conversion)
(33)	O/ X/ O/ X	cnc_rdmirimage	Read " (programmable mirror image)
(34)	O/ X/ O/ X	cnc_rdsclng	Read " (scaling)
(35)	O/ X/ O/ X	cnc_rd3dtofs	Read " (3-D tool compensation)
(36)	O/ X/ O/ X	cnc_rdpsofs	Read " (tool position compensation)
(37)	O/ O/ O/ O	cnc_getfigure	Read maximum valid figures, number of decimal places
(38)	O/ O/ X/ O	cnc_getcrntscrn	Get current screen
(39)	O/ O/ X/ O	cnc_slctscrn	Select screen
(40)	O/ O/ O/ O	cnc_getpath	Get path number(for 4 axes lathes, multi-path)
(41)	O/ O/ O/ O	cnc_setpath	Set path number( " )
(42)	O/ O/ O/ O	cnc_allclibhdl	Allocate library handle
(43)	O/ O/ O/ O	cnc_freelibhdl	Free library handle
(44)	O/ O/ O/ O	cnc_getdtaillerr	Get detail error for CNC
(45)	O/ O/ O/ X	cnc_allclibhdl2	Allocate library handle (for multi-connection)
(46)	O/ O/ O/ X	cnc_rdnodenum	Read number of node
(47)	O/ O/ O/ X	cnc_rdnodeinfo	Read information of node
(48)	O/ O/ O/ X	cnc_setdefnode	Set default node number

## Functions Related to PMC

	15/16/IO/MEM	Function Name	Brief Description
( 1)	0/ 0/ 0/ 0	pmc_rdmsg	Read message from PMC to MMC
( 2)	0/ 0/ 0/ 0	pmc_wrmsg	Write message from MMC to PMC
( 3)	0/ 0/ 0/ 0	pmc_crdmsg	Read message from PMC to MMC(conditional)
( 4)	0/ 0/ 0/ 0	pmc_cwrmsg	Write message from MMC to PMC(conditional)
( 5)	0/ 0/ 0/ 0	pmc_rdpmcrng	Read PMC data(area specified)
( 6)	0/ 0/ 0/ 0	pmc_wrpmcrng	Write PMC data(area specified)
( 7)	0/ 0/ 0/ 0	pmc_rdpmcinfo	Read PMC data information
( 8)	0/ 0/ 0/ 0	pmc_rdcntldata	Read control data of PMC data table
( 9)	0/ 0/ 0/ 0	pmc_wrcntldata	Write control data of PMC data table
(10)	0/ 0/ 0/ 0	pmc_rdcntlgrp	Read the sum total group of control data
(11)	0/ 0/ 0/ 0	pmc_wrcntlgrp	Write the sum total group of control data
(12)	0/ 0/ 0/ 0	pmc_rdkpm	Read data from extended backup memory
(13)	0/ 0/ 0/ 0	pmc_wrkpm	Write data to extended backup memory
(14)	0/ 0/ 0/ 0	pmc_kpmsiz	Read maximum size of extended backup memory
(15)	0/ 0/ 0/ 0	pmc_getdtailerr	Get detail error for PMC

# Appendix **B**

## *Open System C Language Functions (Power Mate D/H)*

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This appendix identifies the C Language Open System Drivers and Library Functions available for the Type II HSSB system. For more information, see GFZ-62684EN-1, *Power Mate H/D Motion Controller(High Speed Serial Bus Function) Operator's Manual*.

### Functions Related to Communication

<b>Function Name</b>	<b>Brief Description</b>
( 1) cnc_allclibhdl	Allocate library handle
( 2) cnc_allclibhdl2	Allocate library handle2
( 3) cnc_freelibhdl	Free library handle

### Functions Related to the Control Axis

<b>Function Name</b>	<b>Brief Description</b>
( 1) cnc_actf	Read actual axis feedrate(F)
( 2) cnc_absolute	Read absolute axis position
( 3) cnc_machine	Read machine axis position
( 4) cnc_relative	Read relative axis position
( 5) cnc_distance	Read servo delay value
( 8) cnc_accdecldly	Read acceleration/deceleration delay value
( 9) cnc_rddynamic	Read all dynamic data
(10) cnc_wrrelpos	Set origin / preset relative axis position

## Functions Related to the Program

<b>Function Name</b>	<b>Brief Description</b>
( 1) cnc_dwnstart	Start downloading NC program
( 2) cnc_download	Download NC program
( 3) cnc_dwnend	End of downloading NC program
( 4) cnc_upstart	Start uploading NC program
( 5) cnc_upload	Upload NC program
( 6) cnc_upend	End of uploading NC program
( 7) cnc_search	Search specified program
( 8) cnc_delall	Delete all programs
( 9) cnc_delete	Delete specified program
(10) cnc_rdprogrdir	Read program directory
(11) cnc_rdprogrinfo	Read program information
(12) cnc_rdprgnum	Read program number under execution
(13) cnc_rdseqnum	Read sequence number under execution
(14) cnc_rdexecprog	Read program under execution
(15) cnc_wrmdiprog	Write program for MDI operation
(16) cnc_rdmipntr	Read execution pointer for MDI operation
(17) cnc_wrmdipntr	Write execution pointer for MDI operation
(18) cnc_seqsrch	Search specified sequence number
(19) cnc_rewind	Rewind cursor of NC program

## Functions Related to the NC Data File

Function Name	Brief Description
( 1) cnc_rdtofs	Read tool offset value
( 2) cnc_wrtofs	Write tool offset value
( 3) cnc_rdtofsr	Read tool offset value(area specified)
( 4) cnc_wrtofsr	Write tool offset value(area specified)
( 5) cnc_rdtofsinfo	Read tool offset information
( 6) cnc_rdparam	Read parameter
( 7) cnc_wrparam	Write parameter
( 8) cnc_rdpapar	Read parameter(area specified)
( 9) cnc_wrparas	Write parameter(area specified)
(10) cnc_rdpainfo	Read parameter information
(11) cnc_rdsetr	Read setting data(area specified)
(12) cnc_wrsets	Write setting data(area specified)
(13) cnc_rdmacro	Read custom macro variable
(14) cnc_wrmacro	Write custom macro variable
(15) cnc_rdmacor	Read custom macro variable(area specified)
(16) cnc_wrmacor	Write custom macro variable(area specified)
(17) cnc_rdmacroinfo	Read custom macro variable information
(18) cnc_getmactype	Get type of custom macro variable
(19) cnc_setmactype	Set type of custom macro variable

## Functions Related to Operation History Data

Function Name	Brief Description
( 1) cnc_stopphis	Stop logging operation history data
( 2) cnc_startphis	Restart logging operation history data
( 3) cnc_rdophisno	Read number of operation history data
( 4) cnc_rdohistory	Read operation history data
( 5) cnc_rdalphisno	Read number of alarm history data
( 6) cnc_rdalhistory	Read alarm history data
( 7) cnc_clearphis	Clear operation history data
( 8) cnc_rdhissgnl	Read signals related operation history
( 9) cnc_wrhissgnl	Write signals related operation history

## Functions Related to Axis Movement Control

Function Name	Brief Description
*( 1) cnc_opdi	Signal operation command
*( 2) cnc_refpoint	Reference point return
*( 3) cnc_abspoint	Absolute movement
*( 4) cnc_incpoint	Incremental movement
*( 5) cnc_dwell	Dwell
*( 6) cnc_coordre	Coordinate establishment
*( 7) cnc_exebufstat	Reading of the executive buffer condition
*( 8) cnc_finstate	Reading of the complete executive condition
*( 9) cnc_setfin	The release of the complete executive condition

\* This function cannot be used with Power Mate-D.

## Other Functions

Function Name	Brief Description
( 1) cnc_sysinfo	Read CNC system information
( 2) cnc_sysconfig	Read CNC configuration information
( 3) cnc_statinfo	Read CNC status information
( 4) cnc_alarm	Read alarm status
( 5) cnc_rdalminfo	Read alarm information
( 6) cnc_modal	Read modal data
( 7) cnc_diagnoss	Read diagnosis data
( 8) cnc_diagnosr	Read diagnosis data(area specified)
( 9) cnc_getfigure	Read maximum valid figures, number of decimal places
(10) cnc_rdcurent	Read real current for servo adjustment
(11) cnc_rdrsvspeed	Read real speed for servo adjustment
(12) cnc_rdloopgain	Read loop gain for servo adjustment
(13) cnc_rdropmsg	Read operator's message
(14) cnc_rdropnlsgnl	Read output signal image of software operator's panel
(15) cnc_wropnlsgnl	Write output signal of software operator's panel
(16) cnc_rdropnlgnr1	Read general signal image of software operator's panel
(17) cnc_wropnlgnr1	Write general output signal of software operator's panel
(18) cnc_rdropnlgname	Read general signal name of software operator's panel
(19) cnc_wropnlgname	Write general signal name of software operator's panel

# Functions Related to the PMC

Function Name	Brief Description
( 1) pmc_rdpmcng	Read PMC data(area specified)
( 2) pmc_wrpmcrng	Write PMC data(area specified)
( 3) pmc_rdmcinfo	Read PMC data information

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