CRAY RESEARCH, INC.

CRAY COMPUTER SYSTEMS

FIBER OPTIC LINK (FOL-3) FUNCTIONAL DESCRIPTION MANUAL

HR-0147

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PREFACE

This is a customer publication describing the Cray Research, Inc. (CRI) FOL-3 fiber-optic link. Throughout this manual the FOL-3 fiber-optic link will be referred to as the FOL-3.

The FOL-3 is a fiber-optic connection between a CRAY X-MP or CRAY-2 computer system and a front-end interface (FEI). It is an alternative to the wire cabling between a CRAY X-MP or a CRAY-2 computer system and an FEI. The FOL-3 offers the following advantages:

- Cabling distance can be increased
- Electrical interference is eliminated
- Security is increased
- Routing fiber-optic cables is easier than routing wire cables

This publication consists of the following sections:

- Section 1 gives a general description of fiber-optic technology.
- Section 2 describes the FOL-3, its advantages and features, and how it connects a Cray computer system to an FEI.
- Section 3 provides you with information for installing an FOL-3. It describes the equipment you need to purchase and the materials you need to supply.
- Section 4 covers maintenance features available to the CRI Field Engineer. It also discusses your responsibilities for maintaining the FOL-3.

RELATED PUBLICATIONS

The following is a list of related publications. You may want to refer to these publications for additional technical information.

- HR-0080 CRAY-1 and CRAY X-MP Peripheral Equipment Site Planning Reference Manual
- HR-0088 CRAY X-MP Single-processor Mainframe Reference Manual
- HR-0032 CRAY X-MP Dual-processor Mainframe Reference Manual

- HR-0097 CRAY X-MP Four-processor Mainframe Reference Manual
- HR-0030 I/O Subsystem Model B Hardware Reference Manual
- HR-0081 I/O Subsystem Model C Hardware Reference Manual

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1. INTRODUCTION

This section provides you with:

- An introduction to fiber-optic technology
- Conventions used throughout this publication

1.1 INTRODUCING FIBER-OPTIC TECHNOLOGY

Fiber-optic technology uses thin glass fibers (optical fibers) to transmit information from one point to another. Optical fibers are used in place of wire cabling, and light pulses replace electrical charges sent over conventional wire cabling.

1.2 CONVENTIONS

In this publication, front-end system means a computer system that a CRAY X-MP or CRAY-2 computer system can support. Examples are: IBM, CDC, DEC, Sperry, or Honeywell systems.

2. DESCRIBING THE FOL-3

This section tells you:

- What the FOL-3 is
- The features of the FOL-3
- The advantages of using the FOL-3
- How a Cray computer system is configured with the FOL-3

2.1 WHAT IS THE FOL-3

The FOL-3 connects a CRAY X-MP or CRAY-2 computer system to a front-end interface (FEI) using fiber-optic technology. The FOL-3 is designed to increase the maximum distance between a Cray computer system and a front-end system, and to provide complete electrical isolation. The FOL-3 can be used with either a new or existing FEI.

The FOL-3 hardware consists of two cabinets (figure 2-1): The Fiber-optic cabinet and the IO Interface cabinet. The Fiber-optic cabinet houses fiber-optic modules and power connections. The Fiber-optic cabinet sits on top of the IO Interface cabinet. The IO interface cabinet is a standard FEI cabinet designed to accomodate FOL-3 modules.

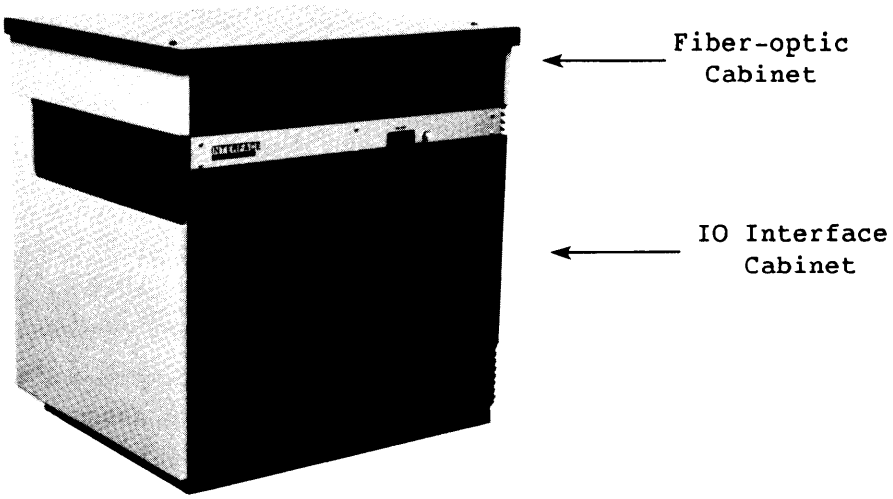

Figure 2-1. FOL-3

2.2 FEATURES OF THE FOL-3

Table 2-1 describes the features of the FOL-3.

Table 2-1. FOL-3 Features

Feature	Description
Fiber-optic Cable Length	3 ft (.91 m) to 3280 ft (1000 m)
Power Requirements	-5.2 V, -2.0 V, 100 W total power +5 V at 100 mA
Transfer Rate	3 Mbyte/s
Data Protection	Cyclic Redundancy Check (CRC) on link data. Parity generation and checking on channel data
Ground Isolation	Complete ground isolation between a Cray computer system and a front-end computer

2.3 ADVANTAGES OF USING THE FOL-3

The advantages of using the FOL-3 are as follows:

- Cable lengths can be increased
- Interference susceptability is decreased
- Security is increased
- Routing cables is easier
- Fiber-optic cable can be cheaper than wire cable

Cable lengths for the FOL-3 range from 3 ft (.91 m) to 3280 feet (1000 m). This allows for a maximum increase in cable length of up to 2730 ft (832 m) when compared to wire cable.

Interference susceptability is decreased with the FOL-3. Fiber-optic cables are nonconductive and do not react to external electromagnetic fields. As a result, fiber-optic cables are immune to external noise like lightning or power switch gear.

Security is increased when using the FOL-3. Fiber-optic cables do not radiate electromagnetic energy. Fiber-optic cables can also be checked at the ends to see if the cable has been damaged or tampered with in any way.

Routing fiber-optic cables is easier than routing wire cables. Fiber-optic cables are small, rugged, and weatherproof. They may be routed along power cables, run in conduit, buried, or strung aerially.

The cost of fiber-optic cabling can be cheaper than wire cabling. The longer the fiber-optic cables the better the cost advantage.

2.4 HOW THE CRAY COMPUTER SYSTEM IS CONFIGURED WITH THE FOL-3

Figure 2-2 is a general configuration of the FOL-3 with a Cray computer system. The dotted line indicates the contents of the FOL-3.

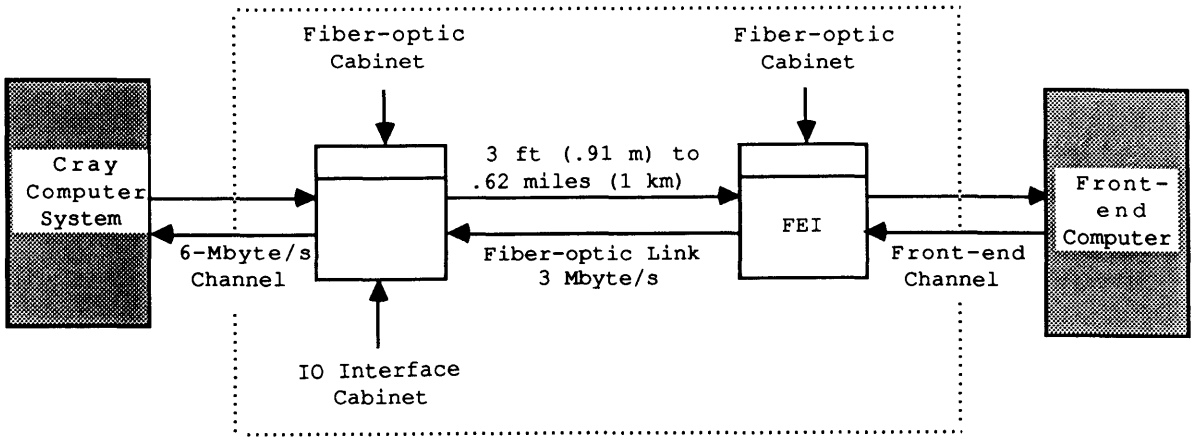

Figure 2-2. FOL-3 Connection

The following subsections describe the configuration of the FOL-3 with a CRAY X-MP and CRAY-2 computer system.

2.4.1 CONFIGURING THE FOL-3 WITH A CRAY X-MP COMPUTER SYSTEM

Figure 2-3 shows how the FOL-3 connects a CRAY X-MP computer system to four front-end computers. The 6-Mbyte/s channel coming out of the I/O Subsystem (IOS) connects to the IO Interface cabinet. The fiber-optic cables come out of the IO Interface cabinet and are routed to the FEIs. The FEIs are connected to the front-end system by the front-end channel. The CRAY X-MP computer system can support up to seven front-end systems.

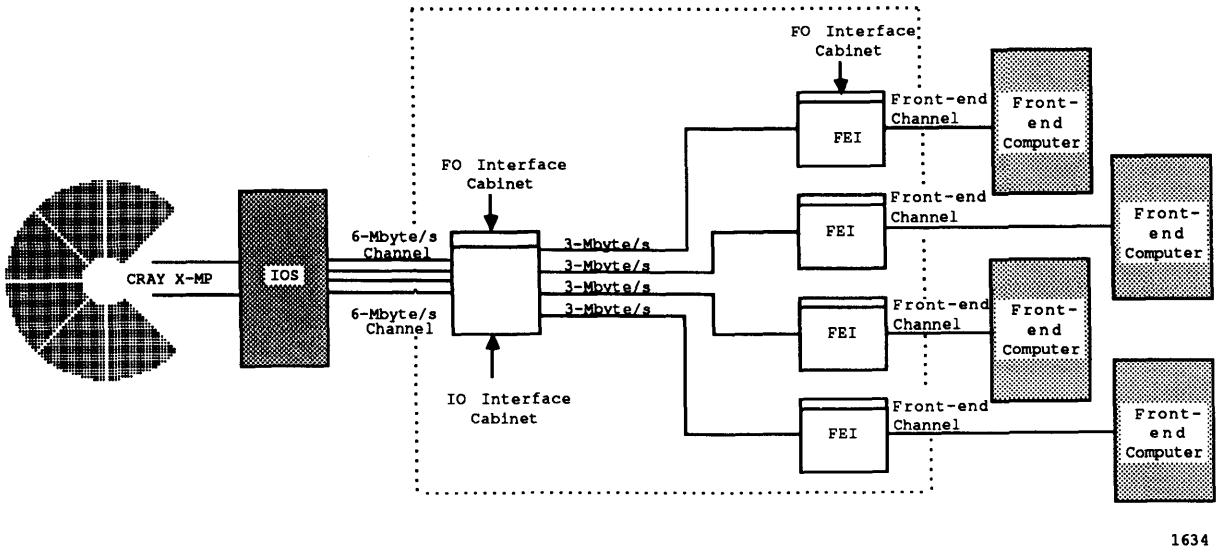

Figure 2-3. FOL-3 Configured with a CRAY X-MP Computer System

2.4.2 CONFIGURING THE FOL-3 WITH A CRAY-2 COMPUTER SYSTEM

Figure 2-4 shows how the FOL-3 connects a CRAY-2 computer system to four front-end computers. The 6-Mbyte/s channel coming out of the mainframe connects to the CRAY-2 IA Module cabinet or IO Interface cabinet. The fiber-optic cables come out of the IA Module cabinet or IO Interface cabinet and are routed to the FEIs. The FEIs are connected to the front-end computers by the front-end channel. The CRAY-2 computer system can support up to 16 front-end systems.

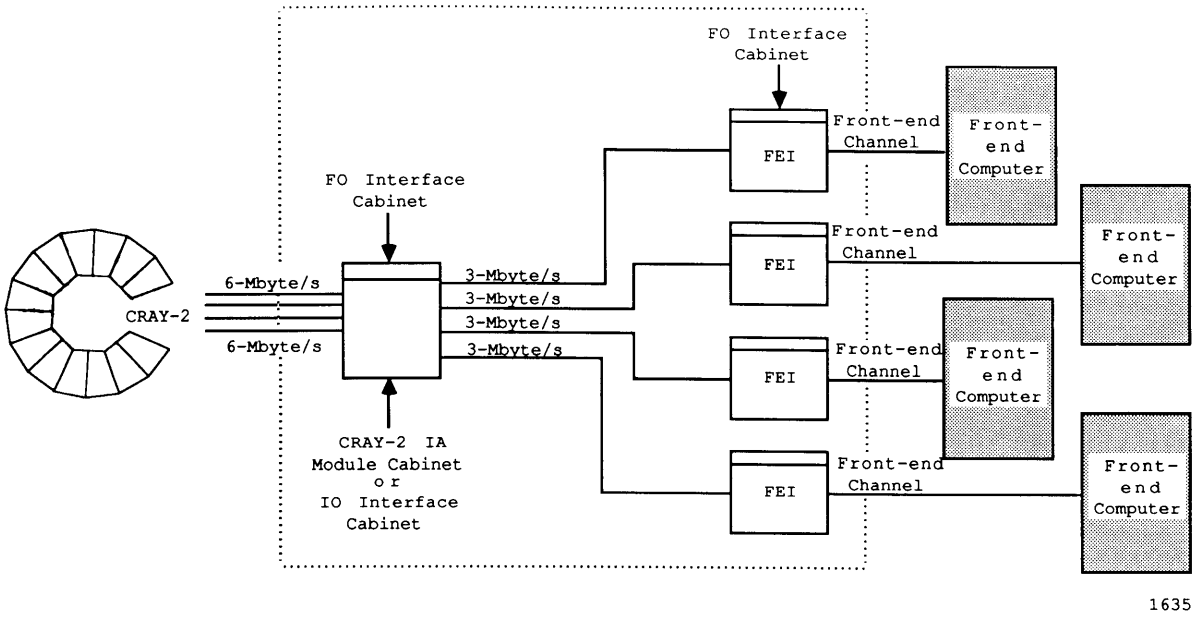

Figure 2-4. FOL-3 Configured with a CRAY-2 Computer System

3. INSTALLING THE FOL-3 WITH A CRAY COMPUTER SYSTEM

This section provides information on installing the FOL-3. It tells you:

- What equipment you need to purchase
- What materials you need to supply

3.1 EQUIPMENT YOU NEED TO PURCHASE

There are three types of kits that you need to purchase for the FOL-3:

- Electrical
- IO Interface cabinet
- Fiber-optic cabinet

The Electrical kit contains the fiber-optic modules, and power and logic interconnections. One electrical kit is needed for each front-end interface.

The IO Interface cabinet is similar to an FEI cabinet. The IO Interface cabinet sits next to the Cray computer system and contains FOL-3 modules.

The Fiber-optic cabinet houses the fiber-optic modules and power connections. One Fiber-optic cabinet sits on the IO Interface cabinet and a separate Fiber-optic cabinet sits on an FEI.

Table 3-1 lists the FOL-3 equipment that needs to be purchased for a new or existing CRAY X-MP or CRAY-2 computer system. The number of kits you need to purchase may vary for each Cray computer system. The number is dependent on site and system configuration.

Table 3-1. FOL-3 Equipment List

FOL-3 Kit	CRAY X-MP Computer System	CRAY-2 Computer System
Electrical kit	1 kit per front-end computer	1 kit per front-end computer
Fiber-optic Cabinet	2 kits initially. 1 per FEI thereafter	2 kits initially. 1 per FEI thereafter
IO Interface Cabinet	1 kit	CRAY-2 IA module cabinet will be used in place of the IO interface cabinet

3.2 MATERIALS YOU NEED TO SUPPLY

You are responsible for suppling and installing the fiber-optic cables. There are a variety of cable types and cable vendors. Refer to the CRAY-1 and CRAY X-MP Peripheral Equipment Site Planning Reference Manual, publication number HR-0080, for cable specifications and recommended cable vendors.

4. MAINTAINING THE FOL-3

This section provides you with FOL-3 maintenance information. This section includes:

- CRI Field Engineer responsibilities for maintaining the FOL-3 hardware
- Customer responsibilities for maintaining fiber-optic cables

4.1 THE CRI FIELD ENGINEER'S RESPONSIBLITY FOR MAINTAINING THE FOL-3

The CRI Field Engineer is responsible for maintaining the hardware in the Fiber-optic cabinet and the IO interface cabinet. The CRI Field Engineer is not responsible for maintaining or repairing fiber-optic cables.

The CRI Field Engineer can troubleshoot the FOL-3 by using diagnostics designed for Cray computer system hardware. Diagnostics used with FEIs and 6-Mbyte/s channels have been modified for the FOL-3.

The FOL-3 incorporates a special loopback mode that can be used to isolate hardware problems. The loopback mode allows the CRI Field Engineer to check electrical data before it is converted to light pulses. Electrical data and components can be checked at the Cray computer system end or the front-end interface (FEI) end of the FOL-3.

4.2 THE CUSTOMER'S RESPONSIBLITY FOR MAINTAINING THE FOL-3

You are responsible for repairing and maintaining the fiber-optic cables. Refer to the CRAY-1 and CRAY X-MP Peripheral Site Planning Reference Manual, publication HR-0080, for cable vendors and cable specifications.

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