HISTORY OF THE DOCUMENT

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Author</th>
<th>Type of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft 01</td>
<td>06-20-1996</td>
<td>J.DE AZEVEDO / P.FAURE GEORS</td>
<td>Initial version</td>
</tr>
<tr>
<td>Draft 02</td>
<td>08-20-1996</td>
<td>J.DE AZEVEDO / P.FAURE GEORS</td>
<td>Corrections after re-readings</td>
</tr>
<tr>
<td>Version 1</td>
<td>09-16-1996</td>
<td>J.DE AZEVEDO</td>
<td>Corrections after re-readings</td>
</tr>
<tr>
<td>Version 5</td>
<td>12/08/1998</td>
<td>N. CRAVOISY</td>
<td>Update</td>
</tr>
</tbody>
</table>

Although great care has been taken in drawing up this document, WorldFIP cannot guarantee the exactness of all the information it contains, and cannot be held responsible for any errors it might contain or any damages that could result from its use.

The presentation, operation and use of the hardware, software and services presented in this document may change at any time, and their description in this document cannot be considered binding.
PREFACE

This document provides information on all the hardware and software solutions used to equip a device with a WorldFIP connection.

You can thus use it to evaluate the effort needed to develop a product, and to choose the components, software and tools best suited to your communications needs from among all those available.

All the hardware and software solutions described in this document are distributed by:

WorldFIP Technology
BP303
92143 CLAMART CEDEX
FRANCE

Tél : (33) (0)1.46.29.17.80
Fax : (33) (0)1.46.29.17.85
e-mail : wfinfo@worldfip.imaginet.fr
internet : http://www.worldfip.org
CONTENTS

1 INTRODUCTION 6

1.1 WORLDFIP SPECIFICATIONS 6
1.2 DEFINITION OF A WORLDFIP DEVICE 7

2 WORLDFIP COMPONENTS 8

2.1 COMMUNICATIONS CONTROLLERS 8
2.1.1 FULLFIP2 8
2.1.2 MICROFIP 12
2.1.3 SUMMARY OF COMMUNICATIONS CONTROLLERS 13
2.2 LINE TOOLS 15
2.2.1 FIELDRIVE 15
2.2.2 CREOL (MTC-3055) 16
2.2.3 OPERA FIOPTIC2-TS 17
2.2.4 SUMMARY OF LINE TOOLS 17

3 COMMUNICATIONS LIBRARIES 19

3.1 FIP DEVICE MANAGER 19
3.1.1 CHARACTERISTICS 19
3.1.2 DISTRIBUTION 19
3.2 FIPULIB 20
3.2.1 CHARACTERISTICS : 20
3.2.2 DISTRIBUTION 20
3.3 MICROFIP HANDLER 20
3.3.1 CHARACTERISTICS 20
3.3.2 DISTRIBUTION 20
3.4 MICRO-MMS 21
3.4.1 CHARACTERISTICS 21
3.4.2 DISTRIBUTION 21
3.5 SUMMARY OF WORLDFIP COMMUNICATIONS LIBRARIES 21

4 DEVELOPMENT TOOLS 22

4.1 OLGA 22
4.1.1 CHARACTERISTICS 22
4.1.2 DISTRIBUTION 22
4.2 FIPACCESS 22
4.2.1 CHARACTERISTICS 22
4.2.2 DISTRIBUTION 22
4.3 THE OBSERVERS

4.3.1 FIPANALYSER
4.3.2 FIPSPY
4.3.3 FIP WATCHER
4.3.4 SUMMARY OF WORLDFIP OBSERVERS

5 WORLDFIP PRODUCTS AND SERVICES
1 INTRODUCTION

1.1 WorldFIP Specifications

The WorldFIP protocol is completely specified and is part of European fieldbus standard EN50170.

This standard can be obtained from:

- **l’UTE** (Union Technique de l’Electricité - 33, Av du Générale Leclerc - BP 23 - 92262 Fontenay aux Roses CEDEX - Tél : 01 40 93 62 00 - Fax : 01 40 93 03 96)

- as well as from:
  - **AFNOR** (Tour Europe - Cedex 7 - 92049 Paris la Défense - tel.: (1) 42 91 55 55)

The WorldFIP protocol is made up of the three communications layers shown below:

![Communications Layers Diagram]

EN 50170 -volume 3- Part 1-3: General Purpose Field Communication System

EN 50170 -volume 3- Part 2-3: PHYSICAL LAYER Specification and Service Definitions
  - Sub-Part 2-3-1: IEC Twisted Pair
  - Sub-Part 2-3-2: IEC Twisted Pair Amendment
  - Sub-Part 2-3-3: IEC Fiber Optic

EN 50170 -volume 3- Part 3-3: DATA LINK LAYER Service Definition
  - Sub-Part 3-3-1: Data Link Layer Definitions
  - Sub-Part 3-3-2: FCS Definition
  - Sub-Part 3-3-3: Bridge Definition

EN 50170 -volume 3- Part 5-3: Application Layer Service Definition
  - Sub-Part 5-3-1: MPS Definition
  - Sub-Part 5-3-2: SubMMS Definition

EN 50170 -volume 3- Part 6-3: Application Layer Protocol Specification (MCS)

EN 50170 -volume 3- Part 7-3: Network Management

Note that European standard WorldFIP EN50170 -volume 3- replaces French standards FIP C46 601 to C46 607. The essential difference between the new European standard and the French standards is the former's adoption of the international IEC standard for the physical layer (1158-2).
1.2 Definition of a WorldFIP device

A WorldFIP device may be more or less complex, depending on whether the device is a sensor, actuator, I/O rack or processing unit (PC, PLC, etc.).

Its overall architecture, however, is always defined according to the following diagram:

![Diagram of WorldFIP architecture]

The Communications Interface obtains the services of the WorldFIP protocol.

The communications components make the dialogue on the chosen communications medium possible. WorldFIP hardware interfaces are always constructed around a communications controller and a line tool. These components all conform to European regulations on Electro-magnetic Compatibility (EMC).

- The communications controller includes a set of functions from the protocol. The principal communications controllers now available are: FIPiU2, FULLFIP2 and MICROFIP.
- The line tool allows the communications controller to transmit data in WorldFIP format on a transmission medium. The line tools currently available can be used for connection to copper wire (FIELDrive, CREOL) or optical fiber (OPERA- FIOPTIC 2/TS) media.

The communications library is used to create the link between the user application and the communications controller, and it offers a set of services in conformity with the WorldFIP protocol. The communications library uses the functions integrated in the controller, and creates the additional functions required by the standard using software. Each library is dedicated to a communications component.

The user application can be broken down into two parts:
- A purely applicative part
- A part that manages access to the WorldFIP network and network checks.

Using standards and application requirements expressed, working groups have identified device profiles that describe sets of services required by families. There is a companion standard for each family of products.
2 WorldFIP COMPONENTS

The WorldFIP hardware interface is made up of two complementary components: the communications controller and line tools.

In order to best fulfill various requirements, a number of different solutions are provided for the communications controller.

The choice of these components, which manage the protocol, depends on a number of parameters such as:

- Services available with the controller (bus arbitrator, periodic variables, variable transfer, message services, requests to bus arbitrator, etc.
- Line tools and transformers associated with each controller and their functions.
- Technical parameters such as temperatures supported, size, resource consumption, ease of implementation, transmission speed, etc.
- Associated development tools.
- Cost requirements for the WorldFIP connection.

2.1 Communications controllers

The development of specific communications circuits that include a large part of the protocol has guaranteed communications interoperability. In addition, since management of the WorldFIP protocol is provided by the components, the power of the microprocessor controlling the communications circuit is of no importance to communications performance.

The first communications controller (FIP001) was created in 1987. This very simple component, a FIP communication UART, made it possible to validate the physical layer during a pilot application at the REVIN hydroelectric plant.

The first generation of components (FiPART, FULLFIP, FIPIU) was then created. These components, which are no longer available, were in conformity with the FIP physical layer (NF C 46-604). They have been replaced by a second generation of components that conform to the EN50170 physical layer. These components are: FULLFIP2, FIPIU2 and MICROFIP.

In order to ensure compatibility with FIP devices already installed, and to guarantee durability, the new generation of components includes FIP and EN50170 physical layers. The appropriate physical layer is selected simply by setting a parameter.

The communications components described in this document are all in conformity with the EN50170 physical layer and with the FIP physical layer (NF C 46-604).

The communications controllers include protocol mechanisms. Each component proposes a list of services organized in three categories:

- Services related to the bus arbitrator function
- Services related to the station function
- Network management services

The FIPIU2 and FULLFIP2 components make it possible to use all these services. They are designed for advanced equipment capable of leading the network (bus arbitrating) and using the various possibilities of exchanges provided by the protocol to manipulate from small to very large amounts of information.

MICROFIP provides only some of these services. However, it does include application services such as input/output peripheral units. It is designed mostly for simple devices that require a high level of integration.

2.1.1 FULLFIP2
FULLFIP2 provides a data link layer and an MPS application layer interface. This component can carry out the functions of a station (producer/consumer) and a bus arbitrator simultaneously.

### 2.1.1.1 Services

**Physical layer services:**
- choice between EN50170 standard and FIP

**Data link layer services:**
- Variable transfer services
- Variable updating requests services
- Message transfer services

**MPS application layer services**
- Management of refreshment and promptness statuses
- Verification of variable type and size

**Network management services**
- Management of medium redundancy if FULLFIP2 is linked to its FIELDUAL peripheral unit.
- Management of error counters and performance on both media.

**Additional functions**
- Synchronization with specialized interruption
- Distribution of precise time

### 2.1.1.2 Architecture

The private memory of the component (16-bit words) contains:
- the buffers of produced and consumed variables
- queues of messages waiting for reception or transmission
- bus arbitrator tables (if any)
- the FIPCODE microcode

The FIPCODE microcode used by FULLFIP2 can be loaded in the FULLFIP2 private memory by the microprocessor or it can be stored in the ROM of the communications component's private bus.
FULLFIP2 can manage medium redundancy when associated with FIELDUAL.

FIELDUAL provides the following functions:

- automatic selection of the receiving channel
- inhibition of one of the two channels upon transmission
- memorization of communications errors on both channels
- indication of the receiving channel
- internal looping for tests

FULLFIP2 is compatible with all INTEL and MOTOROLA microprocessor architecture.

2.1.1.3 FIPIU2

FIPIU2 offers a data link layer interface and mechanisms that are useful for the MPS application layer. This component can simultaneously perform station (producer/consumer) and bus arbitrator functions.

2.1.1.4 Services

Physical layer services:
- choice between the EN50170 standard and FIP

Data link layer services:
- Variable transfer services
- Variable updating requests services (free and specified)
- Message transfer services

Network management services
- Indication of errors
- Management of performance counters

Additional functions
- Dating of variable reception for calculating promptness status
- Real time clock
- Watchdog for application microprocessor
- Vectored interrupt checker
- Serial acquisition of station address
- Input/output ports dedicated to LEDS management
2.1.1.5 Architecture

Mono-Processor Architecture
Two types of architectures can be created using this component: monoprocessor architectures and dual processor architectures.

**Monoprocessor architecture**

When FIPIU2 is used in this type of architecture the single microprocessor handles both the application layer of the protocol and the user application.

The RAM contains the communications objects: buffers, message queues, bus arbitrating tables (if any) and the application variables. This 8-bit memory is shared between the microprocessor and the FIPIU2 component.

**Dual processor architecture**

The FIPIU component can be used in a dual processor architecture. With this type of architecture a part of WorldFIP communication can be integrated in the existing architecture.

One microprocessor handles the communications protocol, whose code is located in the associated ROM. The other microprocessor handles the user application and thus has its own ROM.

The RAM connected to FIPIU2 is shared by both microprocessors and FIPIU2 itself.

FIPIU2 is compatible with all INTEL and MOTOROLA microprocessor architecture.

### 2.1.2 MICROFIP

**MICROFIP** provides a data link and MPS application layer interface. This component is designed for devices that are not required to perform the bus arbitrator function and that do not have a large volume of communication. It provides the station function (producer/consumer).

#### 2.1.2.1 Services

**Physical layer services:**
- choice between the EN50170 standard and FIP.

**Data link layer services:**
- Variable transfer services
- Message transfer services

**Network management services**
- MICROFIP includes management of medium redundancy

**Additional functions**
- Input/output ports
- Acquisition of station address through a parallel port
2.1.2.2 Architecture

MICROFIP can operate autonomously or under the control of a standard micro-controller. When MICROFIP is in the micro-controlled mode, MICROFIP is compatible with all INTEL and MOTOROLA microprocessor architecture.

When operating with a voltage of 5 volts or 3.3 volts, the device satisfies intrinsic security requirements for explosive atmospheres.

2.1.3 Summary of communications controllers

2.1.3.1 Electrical Characteristics

<table>
<thead>
<tr>
<th></th>
<th>FULLFIP2</th>
<th>FIPU2</th>
<th>MICROFIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIELDUAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communica-tions speeds supported</td>
<td>31.25 kbps 1 Mbps 2.5 Mbps</td>
<td>31.25 kbps 1 Mbps 2.5 Mbps</td>
<td>(31.25 kbps) consult us 1 Mbps (2.5 Mbps) consult us 31.25 kbps 1 Mbps 2.5 Mbps</td>
</tr>
<tr>
<td>Packaging</td>
<td>84 PLCC 100MQFP</td>
<td>PLCC44</td>
<td>100PQFP 100MQFP</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40°C / +85°C</td>
<td>-40°C / +85°C</td>
<td>-40°C / +93°C</td>
</tr>
<tr>
<td>Technology</td>
<td>0.8 µCMOS 0.6 µCMOS</td>
<td>0.8 µCMOS 0.6 µCMOS</td>
<td>0.6 µCMOS</td>
</tr>
<tr>
<td>Input / output</td>
<td>TTL Compatible C-MOS level</td>
<td>TTL Compatible C-MOS level</td>
<td>TTL Compatible C-MOS level</td>
</tr>
</tbody>
</table>
### 2.1.3.2 Functional Characteristics

<table>
<thead>
<tr>
<th></th>
<th>FULLFIP2</th>
<th>FIPIU2</th>
<th>MICROFIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode</td>
<td>Mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stand-Alone</td>
<td>piloté</td>
<td>mContrôleur</td>
</tr>
<tr>
<td>Number of variables</td>
<td>4095 2000 8</td>
<td>128-byte 2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>128-byte variables with 16000 16-byte variables with</td>
<td>128-byte with 1 Mb of RAM</td>
<td>128-byte (including 6 for addresses)</td>
</tr>
<tr>
<td></td>
<td>2Mb of RAM</td>
<td>1 Mb of RAM</td>
<td>1 Mb of RAM</td>
</tr>
<tr>
<td>Request for transfer of an aperiodic variable</td>
<td>supported</td>
<td>supported</td>
<td>not supported</td>
</tr>
<tr>
<td>Management of Refreshment Status</td>
<td>integrated</td>
<td>by software</td>
<td>integrated</td>
</tr>
<tr>
<td>Management of Promptness Status</td>
<td>integrated</td>
<td>(variable dating)</td>
<td>integrated</td>
</tr>
<tr>
<td>Number of message transmission channels</td>
<td>8 + 1 aperiodic</td>
<td>2000 with 128 bytes or 16000 with 16 byte with 1 Mb of RAM</td>
<td></td>
</tr>
<tr>
<td>Number of message reception queues</td>
<td>1</td>
<td>max.32</td>
<td></td>
</tr>
<tr>
<td>Message size</td>
<td>256 bytes</td>
<td>256 bytes</td>
<td>128 bytes (including 6 for addresses)</td>
</tr>
<tr>
<td>Management of routing and broadcasting</td>
<td>by software</td>
<td>integrated</td>
<td>by software</td>
</tr>
<tr>
<td>Lsap management</td>
<td>by software</td>
<td>integrated</td>
<td>by software</td>
</tr>
</tbody>
</table>
2.2 Line tools

Line tools cover the part of the physical layer that depends on the communications medium used. WorldFIP has a number of line tools that can be used to manage the various standardized binary speeds for shielded twisted pair or fiber optical lines. 

With the copper line tools FIELDRIVE and CREOL a transformer must be used to provide galvanic insulation.

FIELDRAVE is used with a FIELDTR31.25, FIELDTR1 or FIELDTR2.5 transformer for transmission speeds of 31.25 kbps, 1Mbps and 2.5Mbps respectively.

CREOL is used with a TRANSFOFIP 1FC1007, 1Mbps.

2.2.1 FIELDRIVE

The FIELDRIVE component is an integrated line tool that provides an interface between a communications component and a galvanic insulation transformer.

On the reception line the differential signal is first filtered. Then FIELDRIVE generates the CD activity detection signal that informs FULLFIP2 of the presence of a signal on the network.

The FIELDRIVE transmission level is made up of a differential 3-state line driver. This level manages 4 functions:

- Management of the line drivers’ 3-state outputs
- Activation of an error signal indicating that the circuit has detected an UPLOAD or UNDERLOAD in transmission (Verification of power of the output driver)
- Activation of an error signal indicating the presence of a stable state (saturated signal) on the medium for more than 4 TempsBits (1 TempsBits = 1/Transmission Speed).
- Activation of a WatchDog signal (designed to inhibit transmission) when the signal is transmitted for longer than 8128 TempsBits.

This circuit also has a line re-read mode that can be used to verify the accuracy of the signal transmitted.

1500v galvanic insulation transformers available:

- FIELDTR1 (1 Mbps)
• FIELDTR2.5 (2.5 Mbps)
• FIELDTR31.25 (31.25 kbps).

### 2.2.2 CREOL (MTC-3055)

The CREOL component is an integrated line tool that provides an interface between a communications controller and a galvanic insulation transformer. This component is also known as the MTC-3055 (Alcatel Mietec).

![CREOL diagram]

The CREOL transmission level is made up of a differential 3-state line driver. This level manages the following functions:

- Management of the line drivers' 3-state outputs
- Activation of an error signal indicating that the circuit has detected an UPLOAD or UNDERLOAD in transmission. (Verification of power of the output driver.)
- Activation of an error signal indicating that the clock signal is defective.

**1500v galvanic insulation transformer** available:
- TRANSFOP 1FC1007 (1 Mbps).

Detection signal that informs FIPIU2 of the presence of a signal on the network.
2.2.3 OPERA FIPOPTIC2-TS

This line tool is a component used to transmit and receive frames in the WorldFIP format on plastic (TP) or silicon (TS) fiber optic transmission media.

This component was developed by SAGEM using LFAST II technology.

FIPOPTIC-TS Signals

- **Wavelength:** 850 nm (Typ.)
- **Fibers used:** 50/125 - core diam. 50mm - 62.5/125 - core diam. 62.5mm -
- **Power transmitted fiber 50/125(FO.OUT):** -16dBm(Min.) and –13 dBm (Max)
- **Power transmitted fiber 62.5/125(FO.OUT):** -13dBm(Min.) and –10 dBm (Max)
- **Reception dynamic (FO.IN):** -31dBm(Min) and -11dBm(Max.)
- **Optical budget of link - fiber 50/125:** -9 dB
- **Optical budget of link - fiber 62.5/125:** -9 dB

On the reception line the optical signal is first converted to an electrical signal, then amplified and filtered. Then FIPOPTIC generates the CD carrier wave detection signal that informs the communications controller of the presence of a signal on the network.

The FIPOPTIC transmission level includes a processing and transmission verification level. It is used for:

- Management of the optical output
- Activation of a WatchDog signal when the signal is transmitted for longer than 4 ms +/-20%

2.2.4 Summary of line tools

2.2.4.1 Electrical Characteristics

<table>
<thead>
<tr>
<th></th>
<th>CREOL</th>
<th>FIELDRIVE</th>
<th>OPERA FIPOPTIC 2/TS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication speeds supported</td>
<td>(31.25 kbps consult us)</td>
<td>31.25 kbps</td>
<td>1 Mbps</td>
</tr>
<tr>
<td></td>
<td>1 Mbps (2.5 Mbps consult us)</td>
<td>2.5 Mbps</td>
<td>2.5 Mps</td>
</tr>
<tr>
<td>Packaging</td>
<td>SO 20</td>
<td>PLCC 28</td>
<td>Daughter board</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C / +70 °C</td>
<td>-40°C / +85°C</td>
<td>-25°C / +70°C</td>
</tr>
<tr>
<td>Inputs/Outputs</td>
<td>CMOS / analog</td>
<td>TTL / analog</td>
<td>TTL / optic</td>
</tr>
<tr>
<td>Voltage of power supply</td>
<td>5V +/- 10%</td>
<td>5V +/- 5%</td>
<td>5V +/- 10%</td>
</tr>
<tr>
<td>Consumption</td>
<td>max. 10 mA (1 Mbps Rx Mode)</td>
<td>max. 40 mA (1 Mbps Rx Mode)</td>
<td>max. 120 mA (1 Mbps Tx mode)</td>
</tr>
<tr>
<td></td>
<td>max. 170 mA (1 Mbps Tx mode)</td>
<td>max. 40 mA (1 Mbps Rx Mode)</td>
<td>typical: 180 mA (TP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>typical: 230 mA (TC)</td>
</tr>
</tbody>
</table>
### 2.2.4.2 Compatibility Table

<table>
<thead>
<tr>
<th></th>
<th>FULLFIP2</th>
<th>FIPIU2</th>
<th>MICROFIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIELDRIVE FIELDTR</td>
<td>Compatible</td>
<td></td>
<td>Compatible</td>
</tr>
<tr>
<td>FIELDUAL FIELDRIVE FIELDTR</td>
<td>Compatible</td>
<td></td>
<td>Compatible</td>
</tr>
<tr>
<td>CREOL TransfFIP 1FC 1007</td>
<td>Compatible</td>
<td>Compatible</td>
<td>Compatible</td>
</tr>
<tr>
<td>OPERA FIPOFacic 2/TS</td>
<td>Compatible</td>
<td>Compatible</td>
<td>Compatible</td>
</tr>
</tbody>
</table>
3 COMMUNICATIONS LIBRARIES

A communications library is used to create a link between the user application and the communications controller. The communications library provides a set of services in conformity with the WorldFIP protocol. It uses functions integrated in the controller, and with the help of software performs the additional services required by the standard.

Each library is dedicated to a communications component, and there may be several solution for a single component.

The criteria for choosing a library will depend first of all on the functionalities required (bus arbitrating, periodic variables, aperiodic exchanges, message services, network management, related services, etc.) and secondly on development requirements, whether they be:

- characteristics related to the communications controller.
- technical parameters such as code size, ease in implementing, portability on client targets, or configuration method.
- associated development tools.
- connection cost requirements.

3.1 FIP DEVICE MANAGER

3.1.1 Characteristics

FIP DEVICE MANAGER (or FDM) is a communications library developed in C ANSI with a C-language programming interface.

FDM manages access to the FULLFIP2 component and includes FIPCODE (FULLFIP Microcode).
Configuration is by program and is dynamic.

FDM can be used to manage the communications entity (AE/LE or AESEI) dynamically.

FDM can be used to constitute a second image of the configuration and thus switch from one configuration to another instantaneously.

Configuration of the bus arbitrator function is by program.

FDM includes FIPDIAG, a set of services for self-testing the component's hardware resources and the integrity of configuration data.

FDM manages medium redundancy and includes an interface for managing several FULLFIP2 (multi-network).

SM-MPS network management is integrated in and managed entirely by FDM.

3.1.2 Distribution

FIP DEVICE MANAGER is distributed in the form of C source or object code and associated documentation with the possibility of porting by WorldFIP Association technicians.
No porting is necessary with CC120, CC121 and CC122 boards in a PC environment under MS-DOS or Windows.
3.2  FIPIULIB

3.2.1  Characteristics :

FIPIULIB is a communications library developed in C ANSI with a C language programming interface.

FIPIULIB manages access to the FIPIU2 component and allows re-entrant accesses.

FIPIULIB can be used to manage the communications entity (AE/LE or AESEI) dynamically.

The device is configured by a configurator (OLGA).

An other station configuration can be loaded from a file.

The Bus Arbitrator architecture can be also loaded from a file.

SM-MPS network management is supplied and can be adapted by the user.

3.2.2  Distribution

FIPIULIB and DWFLIB are distributed in the form of C source or object code and associated documentation with the possibility of porting by WorldFIP Association technicians.

No porting is necessary with TSX FPC10 boards in a PC MS-DOS or Windows environment.

3.3  MICROFIP HANDLER

3.3.1  Characteristics

MICROFIP-HANDLER is a communications library developed in C ANSI with a C language programming interface.

MICROFIP-HANDLER operates with MICROFIP.

Configuration is by program.

MICROFIP-HANDLER can be used to develop a WorldFIP device equipped with MICROFIP in pilot mode (with microprocessor).

MICROFIP-HANDLER have in option a programming interface identical for all common services of the FIPIULIB. This option is also used to work with the OLGA configurator ;

3.3.2  Distribution

MICROFIP-HANDLER is distributed in C source with documentation.
3.4 MICRO-MMS

3.4.1 Characteristics

MICRO-MMS is a sub-set of SUB-MMS: read, write and information report. It is made up of a set of functions in C language and can be client, server or both. MICRO-MMS is based on layer 2 message services.

3.4.2 Distribution

MICRO-MMS is provided as an option with FIPIULIB or FIP DEVICE MANAGER (source + documentation).

3.5 Summary of WorldFIP communications libraries

<table>
<thead>
<tr>
<th>FIP DEVICE MANAGER</th>
<th>FIPIULIB</th>
<th>MICROFIP HANDLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version studied</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Communica. controller</td>
<td>FULLFIP2</td>
<td>FIPIU2</td>
</tr>
<tr>
<td>Source code</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Object code</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Code size</td>
<td>42 to 110 Kb</td>
<td>15 to 35 Kb</td>
</tr>
<tr>
<td>Equipment profiles possible</td>
<td>1,2,3,4 (c.f. Interop. Guide)</td>
<td>1,2,3,4 (c.f. Interop. Guide)</td>
</tr>
<tr>
<td>Possible w/manager device</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Configur.</td>
<td>By program and OLGA (option)</td>
<td>OLGA</td>
</tr>
<tr>
<td>Manage-ment of medium redundancy</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>SM-MPS agent variables managed by the library</td>
<td>presence, report, identification, presence check</td>
<td>presence, report, identif., pres. check, segment parameters, remote control, load, check, read</td>
</tr>
<tr>
<td>SM-MPS manager Variables managed by the library</td>
<td>presence check</td>
<td>presence check</td>
</tr>
<tr>
<td>Manage-ment of SM-MPS variables not handled by library</td>
<td>By application software</td>
<td>By application software</td>
</tr>
<tr>
<td>AESEI or AE/LE mgmt</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Configuration of the BA</td>
<td>dynamic by program (without BA shut-down)</td>
<td>dynamic by OLGA or BAGEN (with BA shut-down)</td>
</tr>
<tr>
<td>Micro MMS Option</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Application mgmt</td>
<td>By appl. software</td>
<td>By appl. software</td>
</tr>
</tbody>
</table>
4 DEVELOPMENT TOOLS

4.1 OLGA

4.1.1 Characteristics

OLGA is a tool used to generate on a PC under Windows the configuration of a WorldFIP device using FIPIULIB.

OLGA is used to perform the following operations:

- application description of an agent device (physical node, logical nodes, functional blocks, application interface variables) and semi-automatic translation of the application on WorldFIP and its personalization (choice of services used, periodicities, etc.)
- creation of an agent by generating configuration files, a neutral file and a file that depends on the development system (FIP DEVICE MANAGER, FIPIULIB or MICROFIP HANDLER). The latter file is then used to construct the agent by compiling with the application program (written in C language by the developer) and the communications library (FIP DEVICE MANAGER, FIPIULIB or MICROFIP HANDLER).
- create a manager by generating configuration files that contain all the objects needed to manage the application (application management objects and network management objects).
- manipulation of resources on the network with a PC board (CC121, TSX FPC10 or CC165).
- creation of the bus arbitrator.

4.1.2 Distribution

OLGA is distributed in object code.

4.2 FIPACCESS

4.2.1 Characteristics

FIPACCESS is a tool designed to assist with all the coupling development phases. It is built around an FDM library whose services can be accessed through a user-friendly man-machine interface. It can be used under MS-DOS on a PC with a CC120, CC121 or CC122 communications board.

FIPACCESS is used to perform the following operations:

- description of the WorldFIP application (choice of variables and message service resources)
- creation and start-up of the bus arbitrator
- access to information exchanged on the network
- hosting of a test application linked to the resident library

4.2.2 Distribution

FIPACCESS is distributed in object code.
4.3 The observers

4.3.1 FIPAnalyser

FIPAnalyser is a WorldFIP protocol analyzer that operates in a DOS environment.

FIPAnalyser includes a TSX-FPC10 communications board and software.

It has three operating modes:
- Views of error counters.
- Traffic capture with manual or triggered start.
- Continuous view of traffic on the network with the possibility of selecting frame types by using a filter.

4.3.2 FIPSPY

FIPSPY is a WorldFIP protocol analyzer that operates in a UNIX-SCO environment with the user-friendly MOTIF interface.

FIPSPY includes a CC12x communications board and software.

It is a high-performance tool that can be used to combine advanced filters and triggers.

It has many functionality as follows:
- Management of several observation sessions
- Capture of traffic with application of filters and trigger conditions
- Statistics on errors (line) and performance (frame totals, periodicity, load, etc.)
- Viewing and filing of observation records
- Records can be printed out.

4.3.3 FIP WATCHER

FIPWATCHER is a FIP/WorldFIP analyzer that operates in Windows environment (Windows 3.11 and Windows 95).

FIPWATCHER includes a FIPWATCHER communication board and software.

It has many functionality as follows:
- Automatic detection of the frame format (FIP or WorldFIP).
- Programmable starting of the acquisition (max depth : 3 frames).
- Time and date stamping of the frames.
- Interpreting of the frames.
- Filtering of the stuffing frames.
- Transfer of the captured frames into text format files.
- Size of the memory : 32 Ko
### 4.3.4 Summary of WorldFIP observers

<table>
<thead>
<tr>
<th></th>
<th>FIPSPY</th>
<th>FIPAnalyser</th>
<th>FIP WATCHER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Board</strong></td>
<td>CC-120, CC-121</td>
<td>TSX FPC10</td>
<td>FIP WATCHER</td>
</tr>
<tr>
<td></td>
<td>1Mb, 31.25kb</td>
<td>1Mb</td>
<td>31.25 kb, 1Mb, 2.5 Mb</td>
</tr>
<tr>
<td><strong>Communic. Medium</strong></td>
<td>non-redundant copper</td>
<td>non-redundant copper</td>
<td>non-redundant copper</td>
</tr>
<tr>
<td><strong>Hardware environ-ment</strong></td>
<td>P.C. compatible</td>
<td>P.C. compatible</td>
<td>P.C. compatible</td>
</tr>
<tr>
<td><strong>Software environ-ment</strong></td>
<td>SCO-UNIX</td>
<td>DOS</td>
<td>Windows 3.11 or Windows 95</td>
</tr>
<tr>
<td><strong>Version</strong></td>
<td>V2.0</td>
<td>V3.3</td>
<td></td>
</tr>
<tr>
<td><strong>Interface</strong></td>
<td>Graphic</td>
<td>Text</td>
<td>Graphic</td>
</tr>
</tbody>
</table>
| **Operating modes** | • Continuous acquisition with or without trigger and filtering then display/save  
|                  | • Protocol validation | • Acquisition with or without trigger (length depends on memory available) then display/save  
|                  |                   | • Acquisition and continuous filtering/display. Last 1600 frames saved.  
| **Types of triggers** | • Start and stop trigger (with filters before, during and after)  
|                  | • combinations of bytes | • Trigger  
|                  |                   | • Type of frame + identifier (first 3 bytes in a frame)  
|                  |                   | • Programmable starting of the acquisition (max depth: 3 frames)  
| **Types of filters** | • Various (see documentation for details)  
|                  |                   | • Types of frames + identifier  
|                  |                   | • Msg between 2 LSAPs  
|                  |                   | • Aperiodic traffic  
|                  |                   | • All except padding  
|                  |                   | • FIPWAY Msg  
|                  |                   | • FIPIO  
| **Statistics**   | • various frame counters  
|                  | • average, etc.  
|                  |                   | • Number of frames transmitted / received  
|                  |                   | • Number of errors  
|                   |                   |                   |


5 WorldFIP products and services

To best serve WorldFIP members, the WorldFIP product offering is made up of modules with sets of products and services. Each module is designed to meet user requirements and is made up of elements from the following list:

- Documentation and application schemas.
- Communications libraries (FIPLIB, FIPIULIB, FIP DEVICE MANAGER, Fipio Standard Device Software, MICROFIP HANDLER)
- Test software and examples
- Configurators (FIPC, OLGA, BAGEN)
- Hardware:
  - evaluation boards (FULLFIP2, FIPIU2, FIPCO1, MICROFIP)
  - components (FULLFIP2, FIPIU2, FIPCO1, MICROFIP, CREOL, FIELDRAIE, FIELDUAL, Line transformers)
  - connection devices
  - standard communications board (PC bus ISA, VME, G96, M-Module, PCMCIA)
- Test platforms including:
  - spy with board
  - test manager (PC board + access library + configurator)
  - 3- or 5-link daisy chaining cord or the elements to make one
- Training with practical application
- Technical assistance
- Development assistance: a company that wishes to do so can entrust to WorldFIP all or part of the development of a network connection for an industrial device.

WorldFIP modules are built around products from members and from WorldFIP. The modules address the needs of professionals including:

- manufacturers of agent devices
- systems manufacturers
- installers/assemblers
- users

and various types of agents:

- A decision-maker responsible for evaluating WorldFIP or choosing tools
- A hardware development engineer
- A software development engineer

A list of these modules with their descriptions can be obtained from WorldFIP.

The hardware and software products described in this document are distributed by WorldFIP.