HISTORY OF THE DOCUMENT

Name	Date	Author	Type of change
Draft 01	06-20-1996	J.DE AZEVEDO / P.FAURE GEORS	Initial version
Draft 02	08-20-1996	J.DE AZEVEDO / P.FAURE GEORS	Corrections after re-readings
Version 1	09-16-1996	J.DE AZEVEDO	Corrections after re-readings
Version 4	21/11/1996	J.DE AZEVEDO	Definitive document
Version 5	12/08/1998	N. CRAVOISY	Update

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 :

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CONTENTS

1 INTRODUCTION

1.1 WorldFIP Specifications

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

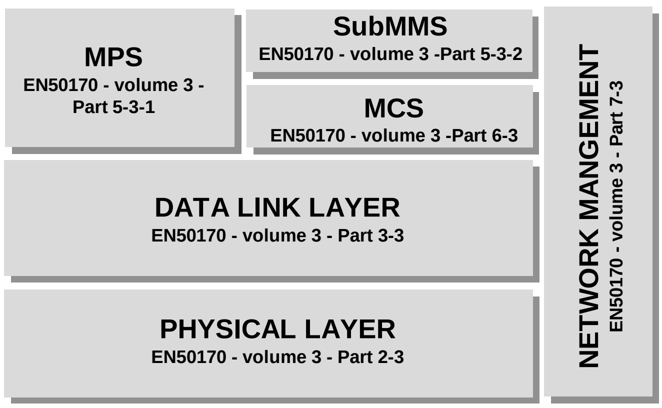
This standard can be obtained from:

- 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:



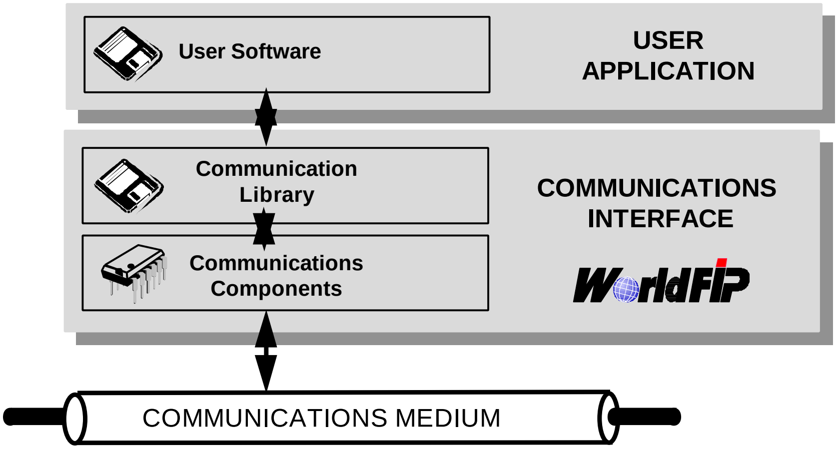
EN 50170 -volume 3- Part 1-3: System		General Purpose Field Communication
EN 50170 -volume 3- Part 2-3:		**PHYSICAL LAYER** Specification and Service Definitions
	Sub-Part 2-3-1:	IEC Twisted Pair
	Sub-Part 2-3-2:	IEC Twisted Pair Amendment
	Sub-Part 2-3-3:	IEC Fiber Optic
EN 50170 -volume 3- Part 3-3:		**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** Defintion
	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:



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- FIPOPTIC 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

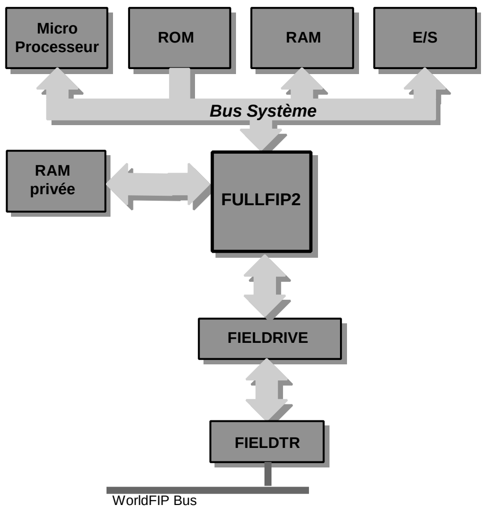
Data link layer services:
- Variable transfer services
- Variable updating requests services
- Message transfer services

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



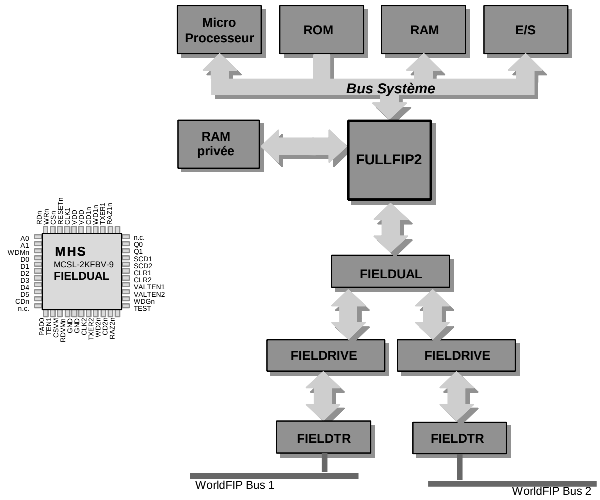
The private memory of the component (16-bit words) contains:
- the buffers of produced and consumed variables
- queues of messages waiting for reception or transmission
- bus arbitrator tables (if any)
- the FIPCODE microcode

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

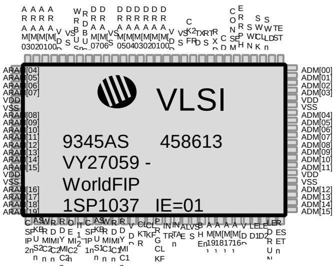
Physical layer services:
- choice between the EN50170 standard and FIP

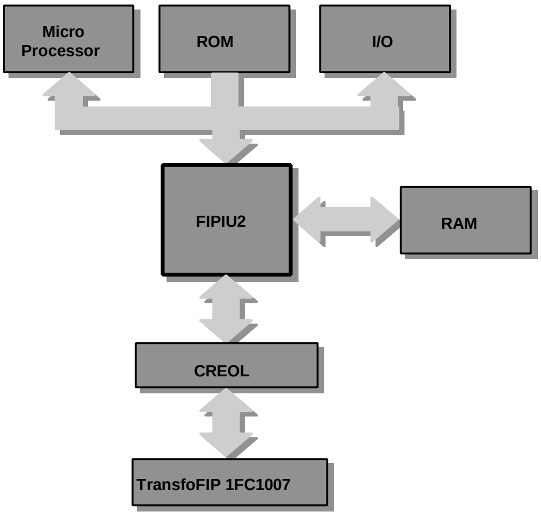
Data link layer services:
- Variable transfer services
- Variable updating requests services (free and specified)
- Message transfer services

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.

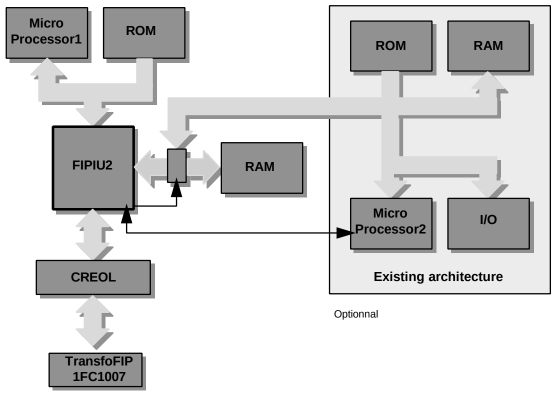
The RAM contains the communications objects: buffers, message queues, bus arbitrating tables (if any) and the application variables. This 8-bit memory is shared between the microprocessor and the FIPIU2 component.

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

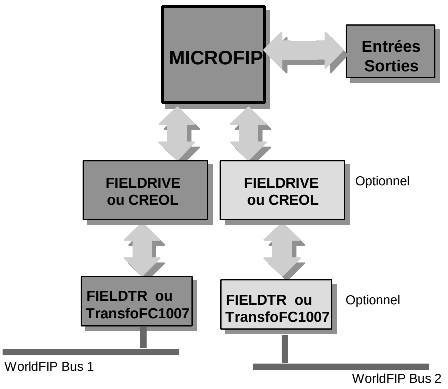
Physical layer services:
- choice between the EN50170 standard and FIP.

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

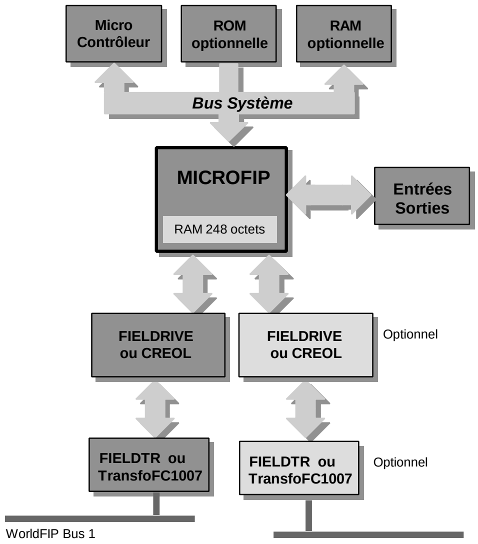
Network management services
- MICROFIP includes management of medium redundancy

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

2.1.2.2 Architecture



Stand-Alone Mode



Micro-Controlled Mode

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

	FULLFIP2	FIELDUAL	FIPIU2	MICROFIP
Communica-tions speeds supported	31.25 kbps 1 Mbps 2.5 Mbps	31.25 kbps 1 Mbps 2.5 Mbps	(31.25 kbps) consult us 1 Mbps (2.5 Mbps) consult us	31.25 kbps 1 Mbps 2.5 Mbps
Packaging	84 PLCC 100MQFP	PLCC44	100PQFP	100MQFP
Operating temperature	-40°C / +85°C	-40°C / +85°C	-40°C / +93°C	-40°C / +85°C
Technology	0.8 µCMOS	0.8 µCMOS	0.6 µCMOS	0.6 µCMOS
Input / output	TTL Compatible	C-MOS level	TTL Compatible	C-MOS level

Power supply voltage	5V +/- 10%	5V +/- 10%	5V +/- 10%	5 V +/- 10% 3,3V +/- 10% (Intrinsic security)
Clock	31.25 Kbps: 40MHz 1 Mbps: 64MHz 2.5 Mbps: 80MHz	31.25 Kbps: 20MHz 1 Mbps: 32MHz 2.5 Mbps: 40MHz	31.25 Kbps: 48 MHz 1 Mbps: 48 MHz 2.5 Mbps: 60 MHz	31.25 Kbps: 20 MHz or 40MHz 1 Mbps: 20 MHz or 40MHz 2.5 Mbps: 20 MHz or 40MHz
Consumption	31.25 kbps: 25 mA 1 Mbps: 30 mA 2.5 Mbps: 35 mA *LowPower Version FULLFIP2LP (with* 3.3V +/- 10%) *31.25 kbps: 1.4 mA*	typical: 12 mA	typical: 40 mA	31.25 kbps: 2 mA 1 Mbps: 10 mA 2.5 Mbps: 20 mA

2.1.3.2 Functional Characteristics

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

Manager of dual media	FIELDUAL component	-	integrated	integrated
Bus Arbitrator	supported	supported	not supported	not supported

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.

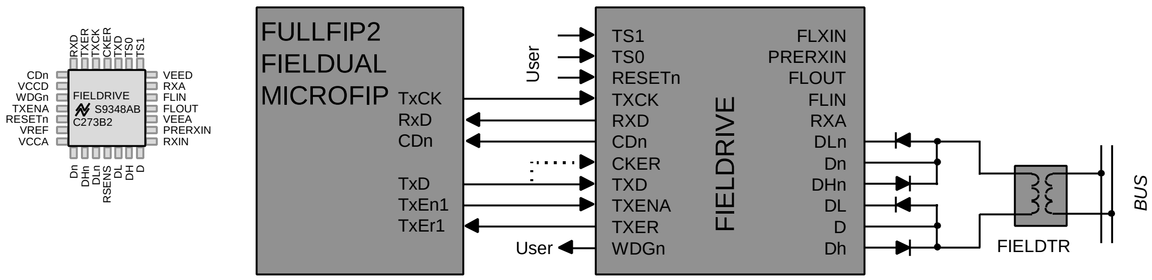
With the copper line tools FIELDRIVE and CREOL a transformer must be used to provide galvanic insulation.

FIELDRIVE 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.**

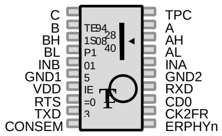
1500v galvanic insulation transformers available:

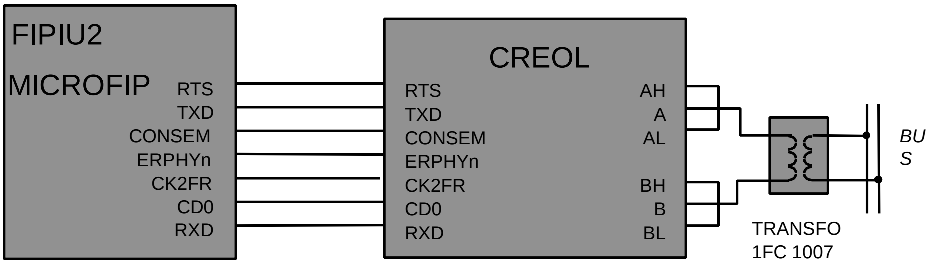
- **FIELDTR1 (1 Mbps)**

- **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).





detection signal that informs FIPIU2 of the **presence** of a signal on the network.

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:
- **TRANSFOFIP 1FC1007 (1 Mbps).**

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

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

2.2.4.2 Compatibility Table

	FULLFIP2	FIPIU2	MICROFIP
FIELDRIVE **FIELDTR**	Compatible		Compatible
FIELDUAL **FIELDRIVE** **FIELDTR**	Compatible		
CREOL **TransfoFIP 1FC 1007**		Compatible	Compatible
OPERA **FIPOFTIC** **2/TS**	Compatible	Compatible	Compatible

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

	FIP DEVICE MANAGER	FIPIULIB	MICROFIP HANDLER
Version studied	4	2	1
Communica. controller	FULLFIP2	FIPIU2	MICROFIP
Source code	yes	yes	yes
Object code	yes	yes	no
Code size	42 to 110 Kb	15 to 35 Kb	-
Equipment profiles possible	1,2,3,4 (c.f.Interop. Guide)	1,2,3,4 (c.f. Interop. Guide)	1,2,3 (c.f.Interop. Guide)
Possible w/manager device	yes	yes	no
Configur.	By program and OLGA (option)	OLGA	By program and OLGA (option)
Manage-ment of medium redundancy	yes	no	integrated in the component
SM-MPS agent variables managed by the library	presence, report, identification, presence check	presence, report, identif.,pres. check, segment parameters, remote control, load, check, read	presence, identification
SM-MPS manager Variables managed by the library	presence check	presence check	none
Manage-ment of SM-MPS variables not handled by library	By application software	By application software	no
AESEI or AE/LE mgmt	yes	yes	no
Configura-tion of the BA	dynamic by program (without BA shut-down)	dynamic by OLGA or BAGEN (with BA shut-down)	no bus arbitrator
Micro MMS Option	yes	yes	being developed
Application mgmt	By appli. software	By appli. software	By appli. software

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

	FIPSPY	FIPAnalyser	FIP WATCHER
Board	CC-120, CC-121 1Mb, 31.25kb	TSX FPC10 1Mb	FIP WATCHER 31.25 kb,1Mb,2.5 Mb
Communic. Medium	non-redundant copper	non-redundant copper	non-redundant copper
Hardware environ-ment	P.C. compatible	P.C. compatible	P.C. compatible
Software environ-ment	SCO-UNIX	DOS	Windows 3.11 or Windows 95
Version		V2.0	V3.3
Interface	Graphic	Text	Graphic
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.	• Acquisition with or without trigger (length depends on selected memory : max 32 Ko) then display/save • Acquisition and filtering/display.
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	• Various (see documentation for details)
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, FIELDRIVE, 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.