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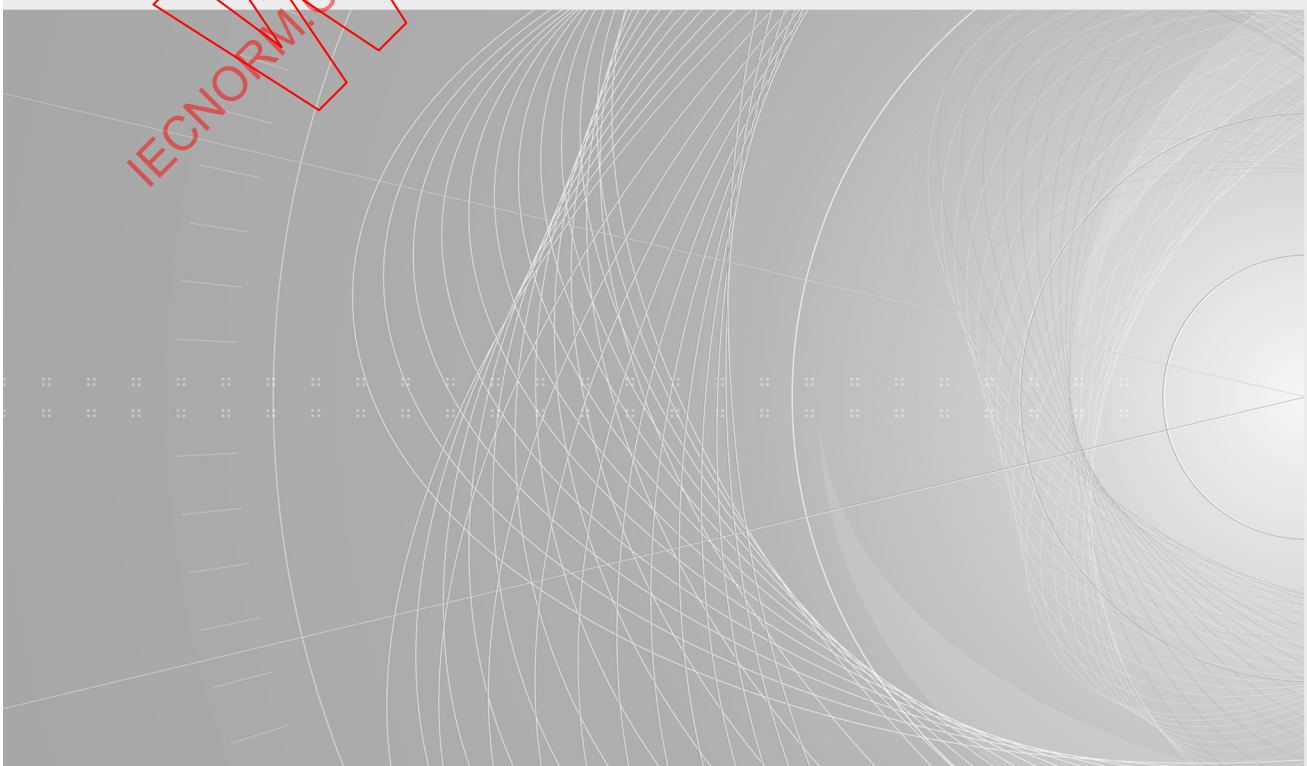
TECHNICAL REPORT

Dynamic modules –
Part 6-2: Software and hardware interfaces – Survey results



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FOREWORD

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IEC 62343-6-2, which is a technical report, has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
86C/880/DTR	86C/893/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 62343 series, published under the general title *Dynamic modules,* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

DYNAMIC MODULES –

Part 6-2: Software and hardware interfaces – Survey results

1 Scope

This part of IEC 62343 clarifies dynamic module interfaces which should be standardized based on a survey of manufacturers. The objectives of this technical report are to present the survey results and to propose software (SW) and hardware (HW) interface standards of dynamic modules.

2 Survey description

2.1 Survey contents

The survey included the following items:

a) Types of dynamic modules (supplier/user)
b) Standards for the control interface that were offered in the past (from suppliers)
c) Standards for the control interface that are planned in the future (from suppliers)
d) Standards for the control interface that are requested (from users)
e) Comments about the standards of typical control interfaces (from suppliers and users)
f) Opinions about the standardization of control interfaces (from suppliers and users)

Annex A provides a summary of responses from Japan, Europe, and North America.

2.2 Survey conditions

The survey conditions are as follows:

a) Request to 55 companies
   (81 departments: users, suppliers, and representatives of suppliers)
b) Received 28 replies
   Users: 12 companies
   Suppliers: 13 companies
   Both: 3 companies
c) Survey period
   From September to October, 2004

3 Interface definitions

3.1 General

The layer structure of the interface of a dynamic module is shown in Figure 1. There are an optical component and two microprocessors for control, and there are three interfacing points, Interface A, Interface B, and Interface C.

3.2 Interface A

The interface A is the fundamental electrical interface portion of the core optical device and the optical component. It is, for example, an analogue interface, with the electric power directly impressed to a conductor or a motor. Moreover, it is thought that many proprietary specifications are changed to the TTL/CMOS level digital interfaces with this simple conversion circuit. This interface point is defined as the fundamental interface group.

3.3 Interface B

As a second interface group, there are, for example, dual port RAM, I^2C, etc. which are used at the interface B. These interfaces have spread widely and are adopted as a standard interface in the equipment by the system side.

3.4 Interface C

The interface used at the interface C is classified into a third interface group. There is a bus that is specified by the system vendor. Ethernet and PCI/Compact-PCI bus are classified into this interface C.

3.5 Other interfaces

In addition to this, traditional interfaces, such as GP-IB and RS232C, are also classified as interface C. RS485 and USB which are considered to be substitution of RS232C are also classified into this. Since these interfaces are easy to use with a PC, they are used widely.

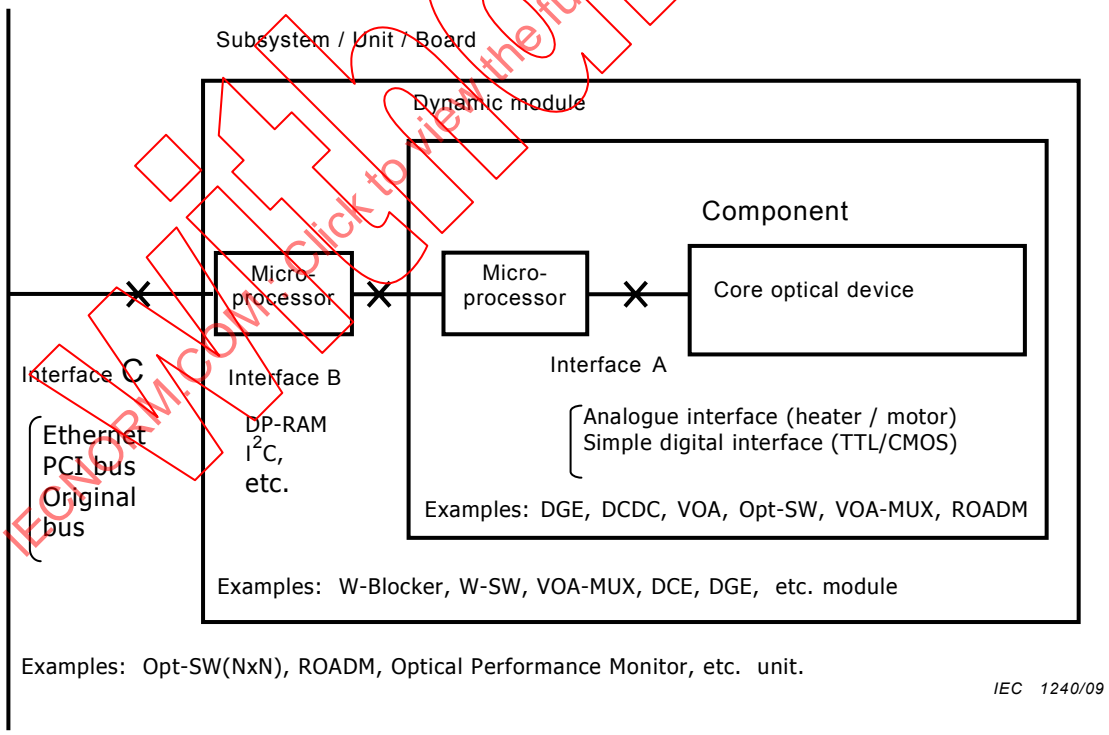

Figure 1 – Layer structure of dynamic module interface

4 Survey results

4.1 Types of dynamic modules

The survey results concerning the types of modules currently used are shown in Table 1. Types of dynamic modules include wavelength blockers, wavelength switches, and dynamic chromatic dispersion compensators.

Table 1 – Types of dynamic modules

Types of dynamic modules	Supplier	User
Wavelength blocker (W-blocker)	2	4
Wavelength switch (W-SW)	4	4
Variable optical attenuator-multiplexer (VOA-MUX)	4	4
Dynamic channel equalizer (DCE)	2	3
Dynamic gain equalizer (DGE) (including dynamic gain flattening filter)	4	5
Dynamic slope equalizer (DSE) (including dynamic gain tilt equalizer, variable slope attenuator)	2	3
Dynamic chromatic dispersion compensator (DCDC)	4	4
Dynamic polarization-mode dispersion compensator (DPMDC)	3	3
Tunable filter (TF) (including dynamic bandpass filter)	4	5
Variable optical attenuator, single channel type (VOA-s)	8	11
Variable optical attenuator, array type (VOA-a)	7	5
Optical spatial switch, 1x2/2x2 (OSW-12)	7	12
Optical spatial switch, MxN, 2<M, 2<N (OSW-MN)	7	5
Reconfigurable optical add/drop multiplexers (ROADM)	5	3
Optical performance monitor (OPMON)	4	6
Arrayed waveguide grating with automatic temperature control (AWG)	3	6

NOTE This survey was carried out in 2004. In early 2007, the latest information of dynamic modules was investigated. Since 2004, WSS (wavelength selective switch) has been one of the most attractive dynamic modules. It is found out the software and hardware interface of WSS is only DP-RAM. Moreover, the other dynamic modules have continued to use almost the same interfaces as those in 2004.

4.2 Standards of the control interface dealt in the past (from suppliers)

The survey results about standards of the control interface, which were dealt with in the past, are shown in Table 2. Various interfaces are used resulting from a demand from users, a proposal from suppliers, repair, support, or management because no standardization exists. RS232C is commonly adopted.

Table 2 – Standards of the control interface dealt in the past

Interface	Number of companies	User demand	Supplier proposal	For management
Ethernet	2	3	0	0
I^2C	4	3	3	0
SCSI	0	0	0	0
GP-IB	6	3	5	2
RS232C	10	5	16	4
RS485	2	1	1	1
USB	2	1	1	0
Dual port RAM	4	2	5	0
Shift register	0	0	0	0
VME bus	0	0	0	0
PCI/compact-PCI bus	1	0	1	0
TTL/CMOS proprietary spec	4	2	2	0
Analogue control	3	0	7	0
Motor controlled	4	3	3	0

4.3 Potential future control interface standards (from suppliers)

The survey result about standards of the control interface which is planned to offer from now on is shown in Table 3. Various interfaces are planned because there is currently no standardization.

Table 3 – Standards of the control interface planned to be offered in the future

Interface	Number of companies	User demand	Supplier proposal	Maintain same as before
Ethernet	3	3	1	0
I^2C	3	2	0	1
SCSI	0	0	0	0
GP-IB	4	2	1	2
RS232C	9	3	4	13
RS485	2	1	0	1
USB	4	1	3	0
Dual port RAM	3	1	1	4
Shift register	0	0	0	0
VME bus	0	0	0	0
PCI/compact-PCI bus	0	0	0	0
TTL/CMOS proprietary spec	3	2	0	1
Analog control	2	1	4	0
Motor controlled	2	0	0	4

4.4 Standards of the control interface requested (from users)

The survey results about standards of the control interface that are requested are shown in Table 4. There are some interfaces which do not currently exist although there is a strong request, for example, Ethernet and I^2C.

Table 4 – Requested standards of the control interface (from users)

Interface	Number of companies (requested)	Number of modules (requested)	Number of companies (existing)	Number of modules (existing)
Ethernet	1	3	0	0
I^2C	1	16	0	0
SCSI	0	0	0	0
GP-IB	1	16	3	11
RS232C	3	18	4	5
RS485	0	0	0	0
USB	0	0	0	0
Dual port RAM	3	20	2	4
Shift register	1	1	1	1
VME bus	0	0	0	0
PCI/compact-PCI bus	1	2	1	1
TTL/CMOS proprietary spec	7	12	7	11
Analogue control	4	7	5	9
Motor controlled	1	1	3	4

4.5 Comments about the standards of a typical control interface (from suppliers and users)

Comments were provided about the following control interfaces:

– Dual port RAM: high-speed, flexible, intelligent, FPGA design is required.
– Analogue interface is necessary for very high-speed control signal.
– I^2C: easy to treat, flexible, low-speed.
– RS232C: standard interface for PC, appropriate for management or maintenance, low-speed.

4.6 Opinions about standardization of control interfaces (from suppliers and users)

Almost all opinions agree to standardize the control interface and appreciate the standardization activities, there are some opinions indicating that it is very difficult to standardize the control interface.

5 Priority for standardization

The usage level of each dynamic module is classified into production and research levels. We can conclude that the priority to standardize is high when there is much usage at the production level. From the result shown in Table 5, it can be stated that the priority for standardization of VOA and OSW is high at the time of this survey.

Table 5 – Priority to standardize

Kind of dynamic modules	Total	Production level	Research level	Unclear	Points
W-blocker	4	1	1	2	2,0
W-SW	4	2	1	1	2,5
VOA-MUX	4	1	1	2	2,0
DCE	3	1	1	1	1,5
DGE	5	2	1	2	3,0
DSE	3	1	1	1	1,5
DCDC	4	2	1	1	2,5
DPMDC	3	1	1	1	1,5
TF	5	2	2	1	2,5
VOA-s	11	9	1	1	9,5
VOA-a	5	4	1	0	4,0
OSW-12	12	8	2	2	9,0
OSW-MN	5	3	1	1	3,5
ROADM	3	2	0	1	2,5
OPMON	6	3	0	3	4,5
AWG	6	3	1	2	4,0
NOTE Production level = 1 point, Research level = 0 point, Unclear = 0,5 point.					

6 Conclusion

There are three interface groups defined in Figure 1. The second interface group, interface B, is considered to be the most suitable interface for standardization today. But a suitable interface is dependent on the performance and the function of the dynamic module (Figure 2). DP-RAM is basically suitable for the intelligent dynamic module including high-speed control. But in some cases, there are some exceptions depending on the modules. For example, I^2C is suitable for the simple dynamic module with low speed control. An analogue interface is also required for very high-speed control signal.

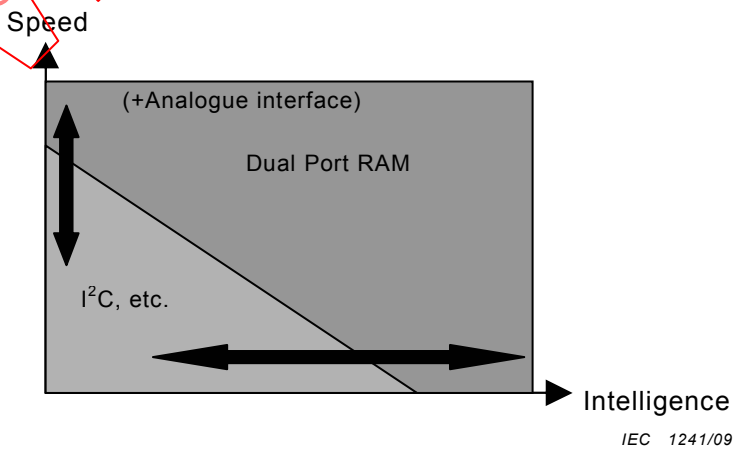

Figure 2 – Features of the interfaces

There are a variety of demands, commands, and parameters about software and hardware interfaces depending on the type of module. In some cases, there are some possibilities to use interface A or interface C.