**GENERAL**
The Optical ESB Bus Repeater Module converts the ESB bus to an optical signal and transmits it. The ESB bus transmission distance can be extended within the range of up to 5 km by connecting the ANT401 Optical ESB Bus Repeater Master Module and ANT502 Optical ESB Bus Repeater Slave Module with an optical fiber cable.

The ESB bus transmission distance can be extended within the range of up to 5 km by connecting the ANT401 Optical ESB Bus Repeater Master Module to A2EN501 N-ESB Bus Repeater Slave Module and A2EN501 N-ESB Bus Repeater Slave Module to ANT502 Optical ESB Bus Repeater Slave Module with an optical fiber cable.

**ANT401 Optical ESB Bus Repeater Master Module for 5 km**
This module can be installed in the Field Control Unit (AFV30□/AFV40□/A2FV50□/A2FV70□), Unit for Optical ESB Bus Repeater Module (ANT10U), ESB Bus Node Unit (ANB10□), and Optical ESB Bus Node Unit (ANB11□).
To connect the ANT401 to the ESB bus, specify "Connector unit for ESB Bus" (option code "/CU1N"). To terminate the ESB bus at the ANT401, specify "Connector unit with terminator for ESB Bus" (option code "/CU1T").

**ANT502 Optical ESB Bus Repeater Slave Module for 5 km**
ANT502 is installed as standard in the Optical ESB Bus Node Unit (ANB11□) as a slave module of the optical ESB bus. It can also be installed in the Unit for Optical ESB Bus Repeater Module (ANT10U).
To connect the ANT502 to the ESB bus, specify "Connector unit with ESB Bus connector" (option code "/BU1A" or "/HU1A"). To not connect the ANT502 to the ESB bus, specify "Connector unit" (option code "/BU1B" or "/HU1B").
To monitor the temperatures and fans in the cabinet, specify "With HKU interface" (option code "/HU1A" or "/HU1B").

### Installation Position
The following table shows the units and numbers of slots in which ANT401 and ANT502 can be installed. For the installation positions corresponding to the slot numbers, see “FIO System Overview” (GS 33J60A10-01EN), “N-IO System Overview” (GS 33J62A10-01EN), and “Field Control Unit, Cabinet Utility Kit (for RIO System Upgrade)” (GS 33J64E10-01EN).

#### Table ANT401 Optical ESB Bus Repeater Master Module for 5 km

<table>
<thead>
<tr>
<th>Installable Unit and Slot Number</th>
<th>ANB10□</th>
<th>ANT10U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single configuration (&quot;1&quot;)</strong></td>
<td>IO1, 3, 5</td>
<td>IO1, 3, 5, 7</td>
</tr>
<tr>
<td><strong>Dual-redundant configuration (&quot;2&quot;)</strong></td>
<td>IO1 to 6</td>
<td>IO1 to 8</td>
</tr>
</tbody>
</table>

*1: A dummy cover is to be attached to the even-numbered slot of a pair of slots in which the module is installed.
*2: Install the module in the slots with the following numbers: IO1-2, IO3-4, IO5-6, IO7-8, and B1-2

#### Table ANT502 Optical ESB Bus Repeater Slave Module for 5 km

<table>
<thead>
<tr>
<th>Installable Unit and Slot Number</th>
<th>ANB11□</th>
<th>ANT10U</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single configuration (&quot;1&quot;)</strong></td>
<td>B1</td>
<td>IO1, 3, 5, 7, B1</td>
</tr>
<tr>
<td><strong>Dual-redundant configuration (&quot;2&quot;)</strong></td>
<td>B1, 2</td>
<td>IO1 to 8, B1, 2</td>
</tr>
</tbody>
</table>

*1: A dummy cover is to be attached to the even-numbered slot of a pair of slots in which the module is installed.
*2: Install the module in the slots with the following numbers: IO1-2, IO3-4, IO5-6, IO7-8, and B1-2
STANDARD SPECIFICATIONS

Function: ESB bus optical transport
Topology: chain and star connection
Maximum number of hops:
  2 hops (for chain connection)
Maximum number of hops for each FCU (*1):
  AFV30[] or AFV40[]: 8 hops (for chain and star connection)
  A2FV50[]: 16 hops (for chain and star connection) (*2)
  A2FV70[]: 8 hops (for chain and star connection)
Maximum transmission distance: 5 km (one hop)
Optical connector type:
  LC (IEC61754-20-compliant)
Number of optical fiber cores: 2
Current consumption: 0.5 A
Weight: Approx. 0.25 kg (main body only)

*1: The number of paired connection between Master Module and Slave Module.
*2: Up to 24 hops are possible only when A2FV50[] is used for FCU and star connection is configured with ANT4[] via EC402. (Supported by CENTUM VP R6.06 or later.)

**Optical Fiber Cable Specifications**

<table>
<thead>
<tr>
<th>Optical fiber specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optical connector type</strong></td>
</tr>
<tr>
<td><strong>Max. Permissible Optical Loss</strong></td>
</tr>
<tr>
<td><strong>Optical fiber</strong></td>
</tr>
<tr>
<td><strong>Required number of cores</strong></td>
</tr>
<tr>
<td><strong>Max. Length</strong></td>
</tr>
</tbody>
</table>

*1: JIS C 6835 SSMA -9.3/125 or IEC 60793-2-50 B1.1 type

**HKU Interface (ANT502 Option) (*1)**

When ANT502’s option code /HU1A or /HU1B is specified, the environmental information of the cabinet where the modules are installed can be transmitted to FCU via optical ESB bus.

The FCU monitors the connected cabinet’s environmental conditions and displays HKU’s operating status as well as system alarm on HIS.

*1: HKU Interface is only available in case of configured with AFV40[] or AFV30[] is installed in the Rittal cabinet by using ACUKT1 Cabinet Utility Kit.
**EXTERNAL DIMENSION**

- Optical ESB Bus Repeater Master Module for 5 km (ANT401)

![Diagram showing dimension and connections of ANT401-5E/CU1N and ANT401-5E/CU1T]

**Nominal Tolerances:**
- Nominal tolerance is ± 0.8 mm for the dimensions of 0.5 mm or more and 120 mm or less, and the combined nominal tolerance is ± 1.5 mm.
- The nominal tolerance is in accordance with JEM 1459 for the dimensions over 120 mm.
Optical ESB Bus Repeater Slave Module for 5 km (ANT502)

Ant502-5E/HU1A
(Connector unit with ESB Bus connector and HKU I/F)

Ant502-5E/HU1B
(Connector unit with HKU I/F)

Ant502-5E/BU1A
(Connector unit with ESB Bus connector)

Ant502-5E/BU1B
(Connector unit)

*The side view is of Ant502-50/HU1B
(Connector unit with HKU interface).

Nominal Tolerances:
Nominal tolerance is ± 0.8 mm for the dimensions of 0.5 mm or more and 120 mm or less, and the combined nominal tolerance is ± 1.5 mm.
The nominal tolerance is in accordance with JEM 1459 for the dimensions over 120 mm.

Restrictions and Cautions for Installation
- Dual-redundant modules should be installed in a pair of continuous slots.
- The module for ESB bus 1 should be installed in an odd-numbered slot, and the module for ESB bus 2 in an even-numbered slot.
**EXAMPLE OF CONNECTION STRUCTURE**

- **Example of Chain and Star Connection (In the case of A2FV50□/A2FV70□ for FCU)**

```
**Total max. length of optical cable; 50 km or less**

**Max. length of optical cable 5 km or less**
```

![Diagram](image_url)

*1: Connectable Node Interface Unit
A2NN30D for A2FV50D
A2NN10D or A2NN20D for A2FV70D

Figure  Example of Chain and Star Connection (In the case of A2FV50□/A2FV70□ for FCU)
Example of Chain Connection (In the case of AFV30□/AFV40□ for FCU)

![Diagram](F04E.ai)

Max. length of Fiber-optic cable 5 km

Total Max. length of Fiber-optic cable 50 km

Max. length of Fiber-optic cable 50 km

<table>
<thead>
<tr>
<th>Option Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT401:</td>
<td>Option code “/CU1T”</td>
</tr>
<tr>
<td>ANT411:</td>
<td>Option code “/CU1T”</td>
</tr>
<tr>
<td>ANT502:</td>
<td>Option code “/HU1A”</td>
</tr>
<tr>
<td>ANT512:</td>
<td>Option code “/HU1B”</td>
</tr>
</tbody>
</table>

*: A dual-redundant configuration is enabled by using 2 identical modules with same model code (CP461 or CP471).

Figure Example of Chain Connection Using HK Function
Example of Star Connection (In the case of AFV30□/AFV40□ for FCU)

- A dual-redundant configuration is enabled by using 2 identical modules with same model code (CP461 or CP471).
- The above diagram shows an example of ESB Bus wiring and its termination.
  The wiring can be done from left to right or vice versa in between EC401 and ANT401 and among ANT401 modules.

Figure  Example of Star Connection Using HK Function
# MODEL AND SUFFIX CODES

## Optical ESB Bus Repeater Master Module

<table>
<thead>
<tr>
<th>Description</th>
<th>Model</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical ESB Bus Repeater Master Module 5 km (for N-IO/FIO)</td>
<td>ANT401</td>
<td>-5, -E</td>
</tr>
<tr>
<td>Standard type with no explosion protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard type with explosion protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic type (only for maintenance purpose)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>With ISA Standard G3 option and temperature (-20 °C to 70 °C) option (only for maintenance purpose)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Basic type (for ANT502-□E, □F, and A2EN501-□1)</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>With ISA Standard G3 option and temperature (-20 to 70 °C) option (for ANT502-□E, □F, and A2EN501-□1)</td>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

### Option Codes

- /CU1N Connector unit for ESB Bus
- /CU1T Connector unit with terminator for ESB Bus

## Optical ESB Bus Repeater Slave Module

<table>
<thead>
<tr>
<th>Description</th>
<th>Model</th>
<th>Suffix Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical ESB Bus Repeater Slave Module 5 km (for N-IO/FIO)</td>
<td>ANT502</td>
<td>-5, -E</td>
</tr>
<tr>
<td>Standard type with no explosion protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard type with explosion protection</td>
<td></td>
<td></td>
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<td></td>
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<td>With ISA Standard G3 option and temperature (-20 °C to 70 °C) option (only for maintenance purpose)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Basic type (for ANT401-□E, □F, and A2EN501-□1)</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>With ISA Standard G3 option and temperature (-20 to 70 °C) option (for ANT401-□E, □F, and A2EN501-□1)</td>
<td>F</td>
<td></td>
</tr>
</tbody>
</table>

### Option Codes

- /BU1A Connector unit with ESB Bus connector
- /BU1B Connector unit
- /HU1A Connector unit with ESB Bus connector and HKU I/F
- /HU1B Connector unit with HKU I/F

Note: When Optical ESB bus repeater modules are connected via Optical ESB bus, the master side must be paired with one of the slave sides as described below.
- ANT401-□0 or □3 for master side and ANT502-□0, □3, ANB11S-□□, -□□, or ANB11D-□□ for slave side
- ANT401-□□ or □□ for master side and ANT502-□□, □□, A2EN501-□□, ANB11S-□□□, □□□□, or ANB11D-□□□□ for slave side
- A2EN501-□□□ for master side and ANT502-□E or □F for slave side

When using by dual-redundant configuration, the module for ESB bus1 should be the same as the module for ESB bus2.

## APPLICABLE STANDARDS

Refer to the GS “Integrated Production Control System CENTUM VP System Overview” (GS 33J01A10-01EN).

## ORDERING INFORMATION

Specify the model and suffix codes when ordering.
For selecting the right products for explosion protection, please refer to TI 33Q01J30-01E without fail.

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