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 4 km by connecting the ANT421 Optical ESB Bus Repeater Master Module and ANT522 Optical ESB Bus Repeater Slave Module with an optical fiber cable.

These modules can replace existing ER bus and RIO bus to the optical ESB bus by utilizing the existing multimode fiber cables.

- **ANT421 Optical ESB Bus Repeater Master Module for 4 km**
  
  This module can be installed in the Field Control Unit (AFV30□/AFV40□, A2FV30□, A2FV50□), Unit for Optical ESB Bus Repeater Module (ANT10U), ESB Bus Node Unit (ANB10□), and Optical ESB Bus Node Unit (ANB11□).
  
  To branch the ESB bus at the ANT421, specify “Connector unit for ESB Bus” (option code “/CU1N”).
  
  To terminate the ESB bus at the ANT421, specify “Connector unit with terminator for ESB Bus” (option code “/CU1T”).

- **ANT522 Optical ESB Bus Repeater Slave Module for 4 km**
  
  ANT522 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 branch the ESB bus at the ANT522, specify “Connector unit with ESB Bus connector” (option code “/BU1A” or “/HU1A”). To not connect the ANT522 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 ANT421 and ANT522 can be installed.
  
  For the installation positions corresponding to the slot numbers, see to the GS “N-IO System Overview” (GS33J62A10-01EN) and “FIO System Overview” (GS33J60A10-01EN).

  **Table ANT421 Optical ESB Bus Repeater Master Module for 4 km**

<table>
<thead>
<tr>
<th>Installable Unit and Slot Number</th>
<th>A2FV30□, A2FV50□</th>
<th>ANB10□, ANB11□</th>
<th>ANT10U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single configuration (*1)</td>
<td>IO1, 3, 5</td>
<td>IO1, 3, 5, 7</td>
<td>IO1, 3, 5, 7, B1</td>
</tr>
<tr>
<td>Dual-redundant configuration (*2)</td>
<td>IO1 to 6</td>
<td>IO1 to 8</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

  **Table ANT522 Optical ESB Bus Repeater Slave Module for 4 km**

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

- **HKU Interface (ANT522 Option)**
  
  When ANT522’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.
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 (*3):
  N-IO system (*1): 16 hops (for chain and star connection)
  FIO system (*2): 8 hops (for chain and star connection)
Maximum transmission distance (*4): 4 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: N-IO system consists of A2FV50□ and related components
*2: FIO system consists of AFV30□ or AFV40□ and related components
*3: The number of paired connection between Master Module and Slave Module.
*4: Depending on the characteristics of the optical fiber cable, the maximum transmission distance is different. Please refer to the section "Optical fiber cable specifications".

CONNECTING OPTICAL FIBER CABLE

The figure below shows how optical fiber cables are connected. A single mode fiber side of a mode conditioning patch cord has to be connected to an output side of ANT421 and ANT522.
## Optical fiber cable specifications

<table>
<thead>
<tr>
<th>Maximum permissible optical loss</th>
<th>Quartz multimode fiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>GI 50/125 (*2)</td>
</tr>
<tr>
<td></td>
<td>GI 62.5/125 (*3)</td>
</tr>
<tr>
<td>Transmission bandwidth</td>
<td>Up to 2 km transmission distance: 200 MHz · km or over @1.3 μm (*1)</td>
</tr>
<tr>
<td></td>
<td>2 to 4 km · transmission distance: 400 MHz · km or over @1.3 μm (*1)</td>
</tr>
</tbody>
</table>

*1: In case existing optical fiber cables are used, check that these has not deviated from the specifications by aging degradation.
*2: IEC 60793-2A1a-compliant
*3: IEC 60793-2A1b-compliant

## Mode conditioning patch cord specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>GI 62.5/125</th>
<th>GI 50/125</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum insertion loss (*1)</td>
<td>0.5 dB</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>Coupled power ratio (CPR) (*1)</td>
<td>28 dB &lt; CPR &lt; 40 dB</td>
<td>12 dB &lt; CPR &lt; 20 dB</td>
</tr>
</tbody>
</table>

*1: IEEE 802.3z-compliant

## EXTERNAL DIMENSION

### Optical ESB Bus Repeater Master Module for 4 km (ANT421)

Nominal Tolerances:
When the reference dimension is over 0.5 mm and equal or less than 120 mm, its nominal tolerance is ±0.8 mm, while its combination of nominal tolerance is ±1.5 mm.
When the reference dimension is over 120 mm, its nominal tolerance is in accordance with JEM 1459.
- Optical ESB Bus Repeater Slave Module for 4 km (ANT522)

![Diagram of ANT522-50/HU1A and ANT522-50/HU1B modules](image)

**Antennas:**
- ANT522-50/HU1A (Connector unit with ESB Bus connector and HKU I/F)
- ANT522-50/HU1B (Connector unit with HKU I/F)

**Dimensions:**
- 32.8 mm
- 155.9 mm
- 142.5 mm
- 13.4 mm
- 129 mm
- 130 mm

**Unit:** mm

**Nominal Tolerances:**
- When the reference dimension is over 0.5 mm and equal or less than 120 mm, its nominal tolerance is ± 0.8 mm, while its combination of nominal tolerance is ± 1.5 mm.
- When the reference dimension is over 120 mm, its nominal tolerance is in accordance with JEM 1459.

**Restrictions and Cautions for Installation**
The master side, ANT421 must be paired with the slave side, ANT522 as described below.
- ANT421 for master side and ANT522 for slave side
- ANT421 for master side and A2EN501 for slave side
- A2EN501 for master side and ANT522 for slave side

- 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.
- Refer to the GS “N-IO System Overview” (GS 33J62A10-01EN) and “FIO System Overview” (GS 33J60A10-01EN) for restrictions in mounting “ANT401” and “ANT502”.

**Remarks Before Use**
- ANT421/ANT522 can be used with ANT401/ANT502 in two hops with the maximum total distance of 9 km. ANT421/ANT522 can also be used with ANT411/ANT512 in two hops with the maximum total distance of 50 km.
- When installing ANT421/ANT522, conformance to the instructions for “ANT401” and “ANT502” of “CENTUM VP Installation Guidance (TI 33J01J10-01EN)” is required.
- As for engineering of ANT421/ANT522, conform to the instructions for “ANT401” and “ANT502” of “Electronic Instruction Manual : VP6C5495”.

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EXAMPLE OF CONNECTION STRUCTURE

Example of Chain and Star Connection (for N-IO System)

Figure  Example of Chain and star Connection (for N-IO System)
Example of Chain Type Connection (for FIO System)

Max. length of Fiber-optic cable 4 km

Total Max. length of Fiber-optic cable 8 km

Max. length of Fiber-optic cable 4 km

ANT421: option code “ICU1T”
ANT522: option code “IHU1A”

ANT522: option code “IHU1B”

: Multimode optical fiber

Figure  Example of Chain Connection Using HK Function
● Example of Star Type Connection (for FIO System)

![Diagram]

ANT401(B1, 2) : option code "/CU1T"
ANT411(IO7, 8) : option code "/CU1N"
ANT421(IO5, 6) : option code "/CU1N"
ANT512: option code "/HU1B"
ANT522: option code "/HU1A"
SB401: option code "/CU2T"

*1: 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 ANT421 modules.

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

## Optical ESB Bus Repeater Master Module (for Multimode Fiber)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT421</td>
<td>Optical ESB Bus Repeater Master Module 4 km (for Multimode Fiber)</td>
</tr>
</tbody>
</table>

### Suffix Codes

-5       Standard type with no explosion protection
-E       Standard type with explosion protection
-0       Basic type
-3       With ISA Standard G3 option and temperature (-20 °C to 70 °C) option

### Option Codes

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

## Optical ESB Bus Repeater Slave Module (for Multimode Fiber)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT522</td>
<td>Optical ESB Bus Repeater Slave Module 4 km (for Multimode Fiber)</td>
</tr>
</tbody>
</table>

### Suffix Codes

-5       Standard type with no explosion protection
-E       Standard type with explosion protection
-0       Basic type
-3       With ISA Standard G3 option and temperature (-20 °C to 70 °C) option

### 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

## Node Unit for Single ESB Bus with Optical Repeater (for Multimode Fiber)

This model is the optical ESB bus node unit equipped with ANT522.

For standard specifications, limitations of installation and notices for installation, external dimensions, and standard accessories, conform to ANB11 optical ESB bus node unit (GS 33J60F30-01EN).

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANB11S</td>
<td>Node Unit for Single ESB Bus with Optical Repeater</td>
</tr>
</tbody>
</table>

### Suffix Codes

-5       Single power supply, for 4 km multimode optical repeater (*1)
-6       Dual-redundant power supply, for 4 km multimode optical repeater (*1)
-1       100 - 120 V AC power supply (*2)
-2       220 - 240 V AC power supply (*2)
-4       24 V DC power supply (*2)
-5       Basic type with no explosion protection
-6       With ISA standard G3 option, temperature (-20 °C to 70 °C) option, and no explosion protection
-E       Basic type with explosion protection
-F       With ISA standard G3 option, temperature (-20 °C to 70 °C) option, and explosion protection

### Option Codes

- /BU1A  Connector unit for ESB Bus
- /BU1B  Connector unit with terminator for ESB Bus
- /HU1A  Connector unit for ESB Bus with HKU I/F (*3)
- /HU1B  Connector unit with terminator for ESB Bus with HKU I/F (*3)
- /ATDOC Explosion Protection Manual (*4)

---

*1: Model of Optical ESB Bus Repeater Slave Modules is ANT522.
*2: To meet the safety standards and EMC standards, the unit must be installed in a keyed metallic cabinet.
*3: Monitoring of temperatures and fans in the cabinet to be installed needs to be specified.
*4: Select the option code "/ATDOC" to follow the ATEX Directive for use in potentially explosive atmospheres.
## Node Unit for Dual-Redundant ESB Bus with Optical Repeater (for Multimode Fiber)

This model is the optical ESB bus node unit equipped with ANT522. For standard specifications, limitations of installation and notices for installation, external dimensions, and standard accessories, conform to ANB11 optical ESB bus node unit (GS 33J60F30-01EN).

### Description

<table>
<thead>
<tr>
<th>Suffix Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model ANB11D</td>
<td>Node Unit for Dual-Redundant ESB Bus with Optical Repeater</td>
</tr>
<tr>
<td>-6</td>
<td>Dual-redundant power supply, for 4 km multimode optical repeater (*1)</td>
</tr>
<tr>
<td>1</td>
<td>100 - 120 V AC power supply (*2)</td>
</tr>
<tr>
<td>2</td>
<td>220 - 240 V AC power supply (*2)</td>
</tr>
<tr>
<td>4</td>
<td>24 V DC power supply (*2)</td>
</tr>
<tr>
<td>5</td>
<td>Basic type with no explosion protection</td>
</tr>
<tr>
<td>6</td>
<td>With ISA standard G3 option, temperature (-20 °C to 70 °C) option, and no explosion protection</td>
</tr>
<tr>
<td>E</td>
<td>Basic type with explosion protection</td>
</tr>
<tr>
<td>F</td>
<td>With ISA standard G3 option, temperature (-20 °C to 70 °C) option, and explosion protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/BU2A</td>
<td>Connector unit for ESB Bus</td>
</tr>
<tr>
<td>/BU2B</td>
<td>Connector unit with terminator for ESB Bus</td>
</tr>
<tr>
<td>/HU2A</td>
<td>Connector unit for ESB Bus with HKU I/F (*3)</td>
</tr>
<tr>
<td>/HU2B</td>
<td>Connector unit with terminator for ESB Bus with HKU I/F (*3)</td>
</tr>
<tr>
<td>/ATDOC</td>
<td>Explosion Protection Manual (*4)</td>
</tr>
</tbody>
</table>

*1: Model of Optical ESB Bus Repeater Slave Modules is ANT522.

*2: To meet the safety standards and EMC standards, the unit must be installed in a keyed metallic cabinet.

*3: Monitoring of temperatures and fans in the cabinet to be installed needs to be specified.

*4: Select the option code “/ATDOC” to follow the ATEX Directive for use in potentially explosive atmospheres.

### 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 and option codes when ordering. For selecting the right products for explosion protection, please refer to TI 33J01J30-01EN without fail.

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