MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

YOKOGAWA

SSB401-13 S1

ESB BUS INTERFACE MODULE

Used with the applicable ProSafe-RS safety node configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Yokogawa IM 32Q06C10-31E; SSB401 node configuration, ESB termination and maintenance.; Yokogawa IM 32Q06C10-31E, section 4.4 and Table 4.4-1.

1.2 Configuration of Safety Node Unit

The following figure shows the units that make up the safety node unit (Model: SNB10D).

The power supply modules and ESB bus interface modules are always dual-redundantly configured.

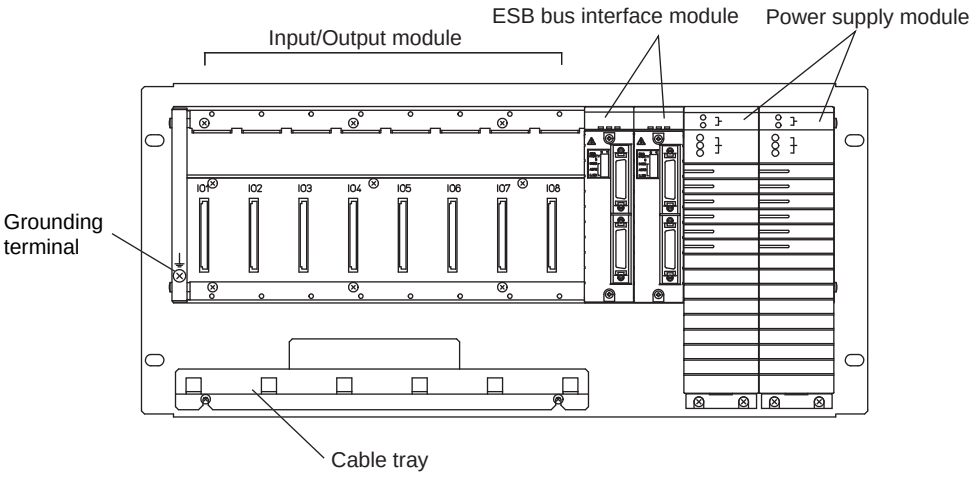


Figure 1.2-1 Configuration of Safety Node Unit

Configuration of SNB10D

Table 1.2-1 Module Name and Model of Safety Node Unit

Name	Safety node unit	
	SNB10D	
Power supply module (100-120 V AC)	SPW481	2pcs
Power supply module (220-240 V AC)	SPW482	2pcs
Power supply module (24 V DC)	SPW484	2pcs
ESB bus interface module	SSB401	2pcs
Dummy cover (for I/O module) (*1)	SDCV01	as required

*1: :To cover the empty I/O module slot.

3.4 Connecting ESB Bus Cable

This section describes the connections of ESB bus cables and fiber-optic cables.

3.4.1 Connecting ESB Bus Cable

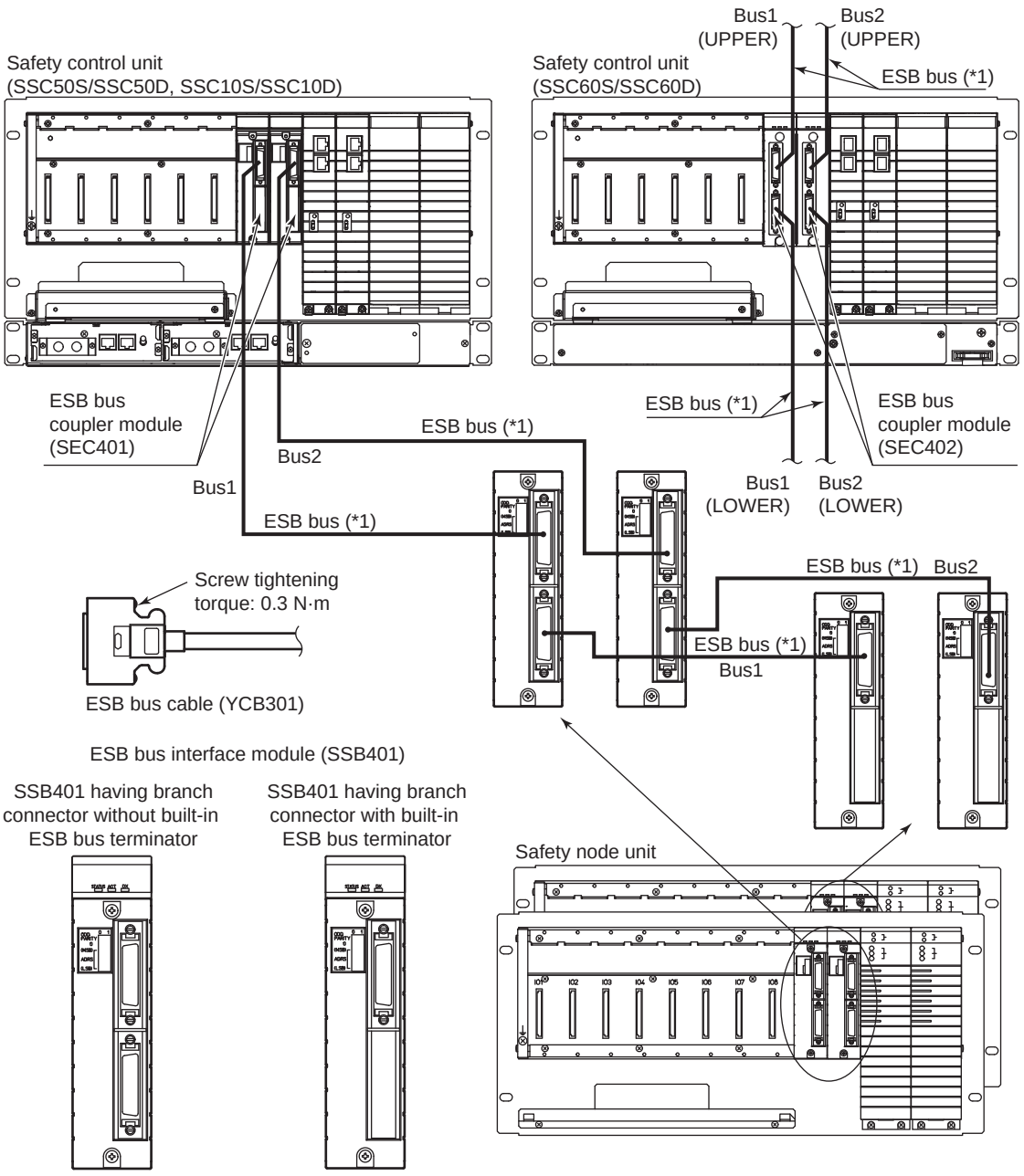
How to install ESB bus coupler module to the safety control unit, how to connect safety node unit, and how to connect the optical ESB bus repeater module are explained in this section.

ESB Bus

The communication bus to link the safety control unit and the safety node units is referred as ESB bus.

The ESB bus coupler module on the safety control unit is at one end of the ESB bus and it has a branch connector with built-in ESB bus terminator.

Connect an ESB bus interface module that has a branch connector with built-in ESB bus terminator to the safety node unit at the other end of the ESB bus. Connect an ESB bus interface module that has a branch connector without built-in ESB bus branch connector to the safety node units in between the two ends of ESB bus. The following figure shows an example of an ESB bus connection.



*1: Total transmission distance of ESB bus1 and ESB bus2 is less than 10 m each.

Figure 3.4.1-1 ESB Bus Connection

3.4.2 Connecting ESB Bus Fiber-Optic Cable

This section describes how to connect the safety control unit, the safety node unit, and the unit for optical bus repeater module with the optical ESB bus repeater module mounted onto each in order to extend the ESB bus using the fiber-optic cables.

There are star type and chain type connections.

Types of Optical ESB Bus Repeater Module

The following models of optical ESB bus repeater modules are available:

- SNT401 optical ESB bus repeater master module
- SNT411 optical ESB bus repeater master module 5 km to 50 km (for SCSP2/SCSP1)
- SNT501 optical ESB bus repeater slave module
- SNT511 optical ESB bus repeater slave module 5 km to 50 km (for SCSP2/SCSP1)

Transmission Distance

Combination of optical ESB bus repeater modules determines the transmission distance.

Table 3.4.2-1 Transmission Distance

Combinations	Each Stage	2 Stage Total
SNT401 and SNT501	Maximum 5 km	Maximum 10 km (SCSP2/SCSP1) Maximum 5 km (SCSV1)
SNT411 and SNT511	Minimum 5 km Maximum 50 km	5 km to 50 km
Mix of combination of SNT401 and SNT501 and that of SNT411 and SNT511	Stage with a combination of SNT401 and SNT501: maximum 5 km Stage with a combination of SNT411 and SNT511: maximum 50 km	5 km to 50 km

IMPORTANT

With the SCSP2/SCSP1, the maximum extension length of the combinations “SNT401 + SNT501” and “SNT411 + SNT511” must be less than 50 km.

ESB Bus Connection

Both ends of the modules connected with the ESB bus must be terminated. Use the following modules for a terminator.

- ESB Bus Coupler Module (SEC402/SEC401)
  Both SEC401 and SEC402 have built-in terminators. The SEC401 and SEC402 can be directly used at the end of the bus.
- ESB Bus Interface Module (SSB401)
  Two types exist: Branch connector with built-in ESB bus terminator and branch connector without built-in ESB bus terminator. For a terminator, use the branch connector with built-in ESB bus terminator.
- Optical ESB Bus Repeater Master Module (SNT401/SNT411)
  Two types exist: Branch connector with built-in ESB bus terminator and branch connector without built-in ESB bus terminator. For a terminator, use the branch connector with the built-in ESB bus terminator.

7.2.7 Exchange ESB Bus Cables

Replace the ESB bus cable according to the following procedure.

Procedure of Exchanging ESB Bus Cables

1. When exchanging a bus cable, the corresponding bus becomes the abnormal status. For an instance, before changing the Bus 1 cable, make sure that the communication to all the nodes and I/O modules by Bus 2 is working properly.
2. Disconnect the ESB bus cable from the ESB bus coupler module (SEC402/SEC401) or ESB bus interface module (SSB401) of Bus 1.
3. Exchange the ESB bus cables.
4. Connect the ESB bus cable to the ESB bus coupler module or ESB bus interface module. The torque to fasten the screws on ESB bus connector is about 0.3 N·m.
5. Make sure that the replaced hardware is working properly.

7.4 Replacing Safety Node Unit

For replacing a safety node unit, satisfy the following requirements:

- Switch off the power supply of the node
- The safety node unit can be replaced while the Safety Control Unit is running

When the SCS is running (online), it is necessary to be very careful to proceed according to the following procedures.

Procedure of Replacing Safety Node Unit

1. Check the Bus1 and Bus2 status on the SCS state management window beforehand.
2. Switch off the power supply of the safety node unit to be replaced.
3. While the ESB bus cable is connected, remove the branch connector unit for ESB bus from the SSB401 for ESB bus 1.
4. Make sure on the SCS state management window that there is no abnormality occurred other than in the node to be replaced.
5. While the ESB bus cable is connected, remove the branch connector unit for ESB bus from the SSB401 for ESB bus 2.
6. Replace the node. And make sure that the SSB401 address is correct.
7. Connect branch connector unit for ESB bus to the new SSB401.
8. Switch on the node power supply.
9. Make sure that the replaced node is running properly on the SCS state management window.

7.5 Adding Safety Node Unit

This chapter explains how to add a safety node unit at the end of the ESB bus.

IMPORTANT

After adding a new safety node unit, offline download is necessary if the version of SCS system programs is earlier than R2.03.

When adding a safety node unit, satisfy the following requirements:

- Work on one side of the ESB bus first, work on the other side only when the first side is completed.
- Adding safety node unit can be done while the Safety Control Unit is running.

When the SCS is running (online), it is necessary to be very careful to proceed according to the following procedures.

Adding a Safety Node Unit at the End of ESB Bus

1. Check the Bus1 and Bus2 status on the SCS state management window beforehand.
2. Work on Bus 1 of the safety control unit; pull the ESB bus coupler module (SEC402/ SEC401) forward and remove it from the base unit. ESB Bus1 will then be indicated as FAIL. At this moment, make sure that Bus 2 is normal.
3. Find the last node of Bus 1, and then separate the ESB bus branch connector (with built-in terminator) from the ESB bus interface module (SSB401) without disconnecting the cable. How to separate is illustrated in the figure of "Procedure of Separating ESB bus branch connector from ESB bus interface module."

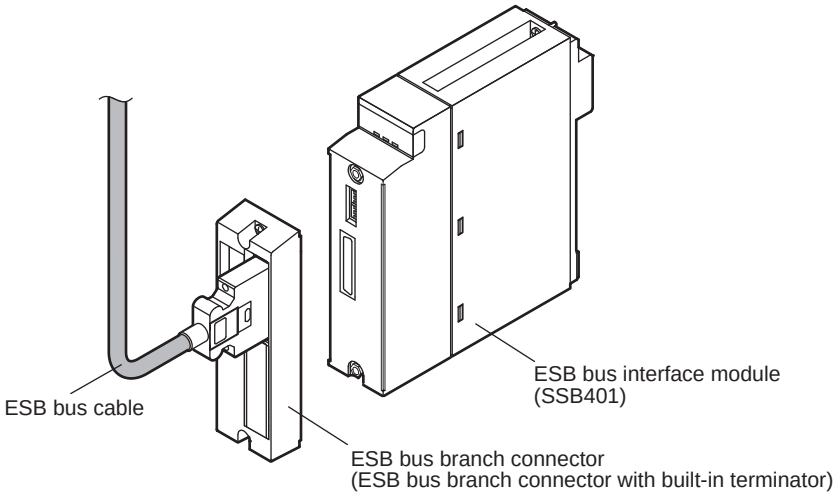


Figure 7.5-1 Separating ESB Bus Branch Connector from ESB Bus Interface Module

4. Disconnect cable from the ESB bus branch connector (with built-in terminator) that was separated from the ESB bus interface module (SSB401) on step 3.
5. Connect the cable disconnected on step 4 to an ESB bus branch connector (without built-in terminator), and then fasten the connector screws for about 0.3 N•m torque.
6. Use an ESB bus cable to connect the ESB bus branch connector (with built-in terminator) you worked on step 4 and the ESB bus branch connector (without built-in terminator) you worked on step 5.

7. Make sure that the new node unit to be added has already defined with a proper node address.
8. Connect the ESB bus branch connector (without built-in terminator) you worked on step 5 to the existing node.
9. Connect the ESB bus branch connector (with built-in terminator) you worked on step 4 to the newly added node.
10. Put back the ESB bus coupler module (SEC402/SEC401) to the base unit where you removed it from on step 2.
11. On the SCS State Management window, make sure that both ESB buses are working properly.
12. Repeat step 3 to 9 to work on Bus 2 of the ESB bus.
13. On the SCS State Management window, make sure that both ESB buses are working properly.
14. Install the I/O modules to the added node and then turn on the power supply for the added node unit.
15. Run online downloading to the I/O modules installed in the added node unit.
16. Connect the cables or terminal blocks to the I/O modules installed in the added node unit.
17. On SCS State Management window, make sure that all added hardware components are working properly.

SEE ALSO For more information about installing I/O modules and mounting the terminal blocks, refer to:

7.3.2, “How to Replace Input/Output Modules” on page 7-23

7.6 Removing Safety Node Unit

This chapter explains how to remove a safety node unit from the end of the ESB bus.

When removing a safety node unit, satisfy the following requirements:

- Work on one side of the ESB bus first, work on the other side only when the first side is completed.
- The safety node unit can be replaced while the Safety Control Unit is running

When the SCS is running (online), it is necessary to be very careful to proceed according to the following procedures.

Removing a Safety Node Unit from the End of ESB Bus

1. Check the Bus1 and Bus2 status on the SCS state management window beforehand.
2. Delete (online) all the definitions related to the I/O modules installed in the node to be removed. This will also delete the definition of the node.
3. Disconnect the cables of the I/O modules installed in the node, or remove the terminal blocks.
4. Loosen the two mounting screws in the upper and lower parts of the I/O module.
5. Pull the I/O module forward and remove it from the base unit.
6. Repeat step 3 to step 5 to remove all the I/O modules from the node.
7. Turn off the power supply to the node to be removed.
8. Work on Bus 1 of the safety control unit; pull the ESB bus coupler module (SEC402/SEC401) forward and remove it from the base unit. ESB Bus1 will then be indicated as FAIL. At this moment, make sure that Bus 2 is normal.
9. Find the last node of Bus 1, and then separate the ESB bus branch connector (with built-in terminator) from the ESB bus interface module (SSB401) without disconnecting the cable.
10. Find the new last node of Bus 1, and then separate the ESB bus branch connector (without built-in terminator) from the ESB bus interface module (SSB401) without disconnecting the cable.
11. Disconnect cable from the ESB bus branch connector (with built-in terminator) that was separated from the ESB bus interface module (SSB401) on step 9.
12. Disconnect the cable that is attached to the other end of the ESB bus branch connector (without built-in terminator) that was separated from the ESB bus interface module (SSB401) on step 10.
13. Connect the cable that was disconnected on step 12 to an ESB bus branch connector (with built-in terminator), and then fasten the connector screws for about 0.3 N•m torque.
14. Connect the ESB bus branch connector (the same one mentioned in step 13) to the ESB bus interface module (SSB401) on the new last node and this node becomes the end of the bus.
15. Put back the ESB bus coupler module (SEC402/SEC401) to the base unit where you removed it from on step 8.
16. On the SCS State Management window, make sure that no abnormality occurs on the ESB bus.
17. Repeat step 9 to 14 to work on Bus 2 of the ESB bus.
18. On the SCS State Management window, make sure that no abnormality occurs on either Bus 1 or Bus 2.

4.4 ESB Bus Interface Module

ESB bus interface module (Model: SSB401) is installed in the safety node unit for communicating with the ESB bus coupler module (Model: SEC402/SEC401) installed in the safety control unit. The ESB bus interface module is always dual-redundantly configured.

Configuration

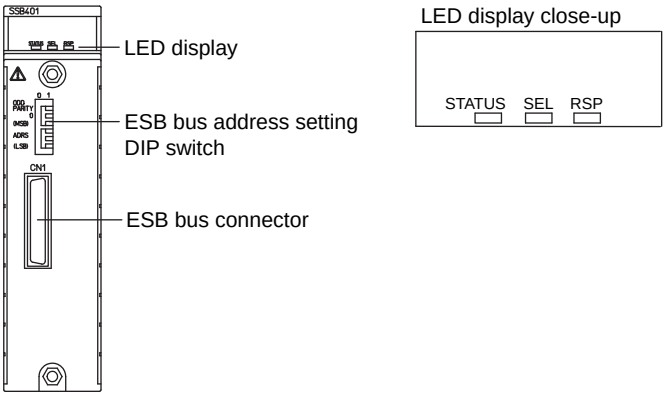


Figure 4.4-1 SSB401

LED Display

- STATUS: This LED turns on when the self-diagnosis has been completed normally and the ESB interface is operating normally, otherwise it is turned off.
- SEL: This LED flashes during data transmission to an I/O module, otherwise it is off.
- RSP: This LED flashes during data reception from an I/O module, otherwise it is off.

ESB Bus Connector

The ESB bus connector is connected to a connector unit for ESB bus, (shown in the following figure), via an ESB bus cable (YCB301).

Connect the ESB bus cable connector to a connector unit with terminator for ESB bus to terminate the ESB bus.

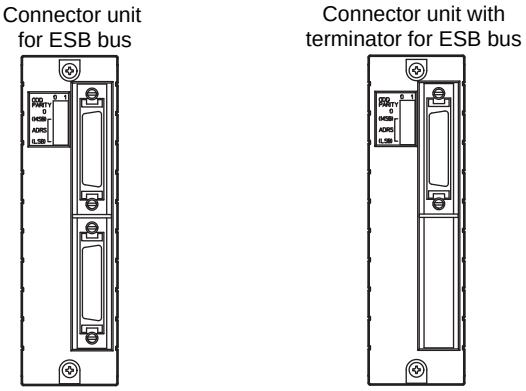


Figure 4.4-2 Connector Unit for ESB Bus and Connector Unit with Terminator for ESB Bus

WARNING

The ESB bus are always dual-redundantly configured. When connecting or disconnecting the connector unit for ESB bus, make sure the bus 1 and bus 2 are correctly identified and connected.

ESB Bus Address Setting DIP Switches

When multiple node units are connected to an ESB bus, it is possible to select a node unit to be accessed by setting the node address using these switches.

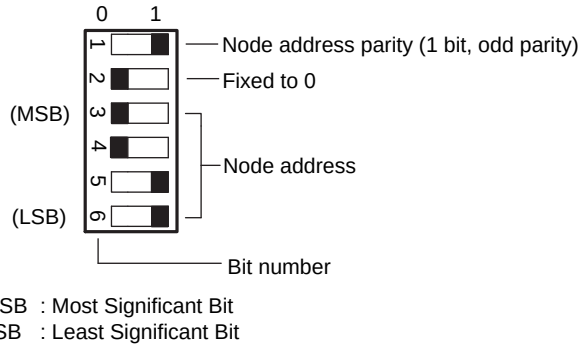
Setting Node Addresses

ESB bus node number can be defined by setting the Dip switches.

The node number can be designated in the range of 2 to 10 for a safety node unit that is connected to SCSP1/SCSV1, or in the range of 2 to 14 for a safety node unit that is connected to SCSP2. It is possible to match the required node numbers by setting the DIP switches as follows:

- Setting DIP switches
  0: In the state shown in the following figure, the switch is tilted toward the left.
  1: In the state shown in the following figure, the switch is tilted toward the right.

Node number 1 is reserved for the safety control unit.



MSB : Most Significant Bit
LSB : Least Significant Bit

Figure 4.4-3 Node Number Setting DIP Switches

Table 4.4-1 Node Number and Switch Positions

Node number	2	3	4	5	6	7	8	9	10	11	12	13	14
Bit 1	0	1	0	1	1	0	0	1	1	0	1	0	0
Bit 2	0	0	0	0	0	0	0	0	0	0	0	0	0
Bit 3	0	0	0	0	0	0	1	1	1	1	1	1	1
Bit 4	0	0	1	1	1	1	0	0	0	0	1	1	1
Bit 5	1	1	0	0	1	1	0	0	1	1	0	0	1
Bit 6	0	1	0	1	0	1	0	1	0	1	0	1	0

IMPORTANT

Make sure that the node number setting DIP switches are correctly set.