

# PLC

## CC-Link IE Control Network (MELSEC iQ-R Series)

This course covers the steps from configuration to programming of CC-Link IE Control Network.

This fundamentals course is aimed at first-time users of CC-Link IE Control Network.

In this course, you will learn data communication among multiple programmable controllers on a single network, process of receiving/sending data, specifications, various settings, and implementation procedure, which form the basic functionality of CC-Link IE Control Network.

As prerequisites for this course, you should have already completed the following courses or possess the equivalent knowledge.

- FA Equipment for Beginners (Industrial Network)
- MELSEC iQ-R Series Basic
- Programming Basics

The contents of this course are as follows.

### **Chapter 1 - Overview of CC-Link IE**

Necessity of FA networks and preliminary information on CC-Link IE Control Network

### **Chapter 2 - System configuration and specifications of CC-Link IE Control Network**

System configuration, specifications, and parameter settings

### **Chapter 3 – Implementing of CC-Link IE Control Network**

Procedures from implementation to operation check

### **Chapter 4 - Test operation of CC-Link IE Control Network System**

Procedures to create programs, check operation, and perform basic network diagnostics in case of problems

### **Final Test**

Pass grade: 60% or higher

**Introduction****How to use this e-Learning tool**

Go to the next page		Go to the next page.
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Move to the desired page		"Table of Contents" will be displayed, enabling you to navigate to the desired page.
Exit the learning		Exit the learning.

**Safety precautions**

When you learn based on using actual products, please carefully read the safety precautions in the corresponding manuals.

**Precautions in this course**

The displayed screens of the software version that you use may differ from those in this course.

This course uses the following software version:

- GX Works3 Version 1.038Q

## Chapter 1 Overview of CC-Link IE

This course covers the fundamentals of CC-Link IE Control Network for those who have taken the "FA Equipment for Beginners (Industrial Network)" course or have the equivalent knowledge.

CC-Link, an acronym for Control & Communication Link, realizes integration of system control and communications. CC-Link Family is an open network for use in FA environments. "IE" in CC-Link IE is an acronym for Industrial Ethernet\*.

The types of CC-Link IE networks include CC-Link IE Control Network and CC-Link IE Field Network. This chapter describes an overview of data share, data transfer, and data communication of CC-Link IE.

1.1 CC-Link IE Control Network

1.2 Necessity of FA networks

1.3 Operation of FA network

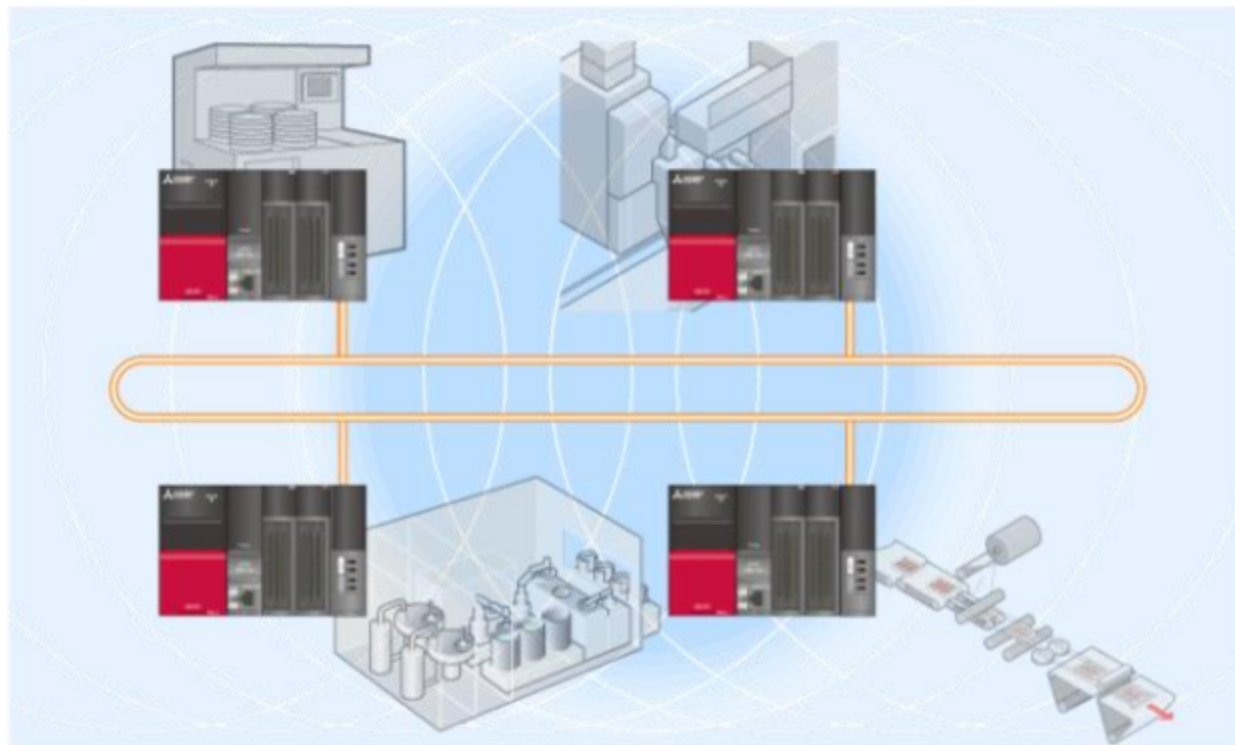
1.4 Preliminary information on CC-Link IE Control Network

\* Ethernet is a trademark of Xerox Corp.

**1.1****CC-Link IE Control Network**

The Ethernet-based open network CC-Link IE is a high-speed and large-capacity network integrating device control data and management data.

CC-Link IE Control Network connects programmable controllers distributed among production lines and equipment in the factory.

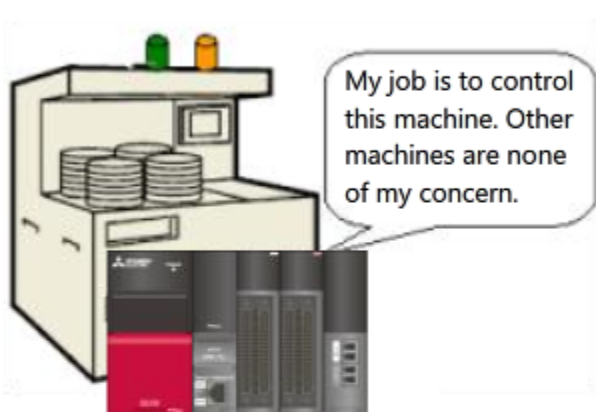


## 1.2

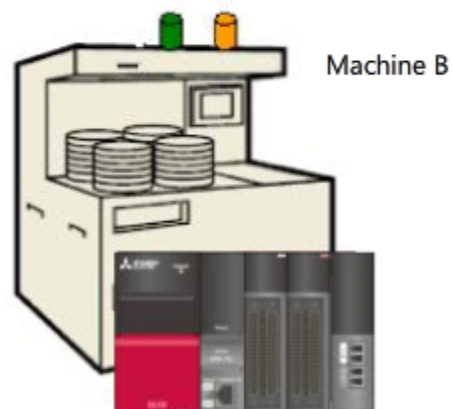
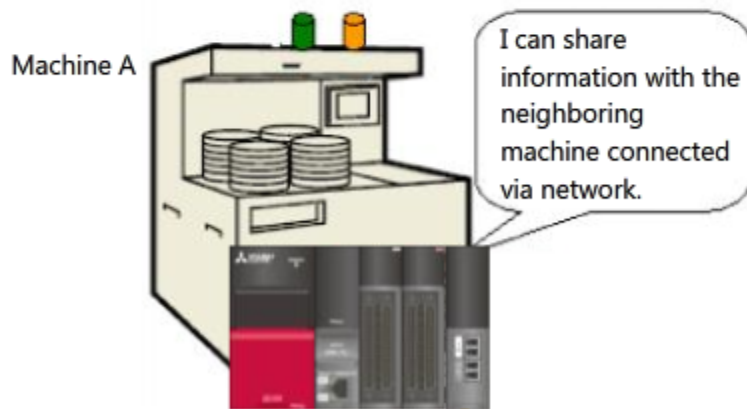
# Necessity of FA networks

### Importance of FA networks

Before the introduction of FA networks, machines were mostly operated independently, and programmable controllers concentrated on controlling each specific machine.



As the automation of production equipment progresses, data sharing among machines becomes necessary to centrally manage the production information of each machine.



Network

A yellow line representing a network connects the bottom of Machine A and Machine B.



# 1.3 Operation of FA network

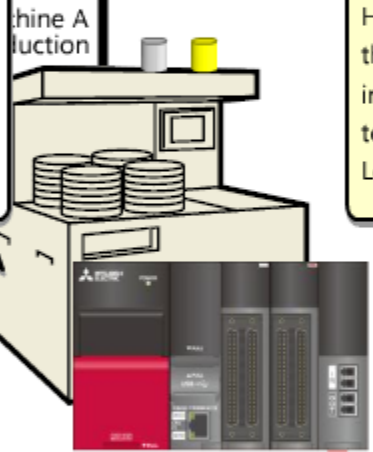
The following animation shows the operation of FA network.

Click the [START] button to start the device operation.

Production count			
Machine A production	106	<input type="radio"/>	<input checked="" type="radio"/>
Machine B production	106	<input type="radio"/>	<input checked="" type="radio"/>
Machine C production	79	<input type="radio"/>	<input checked="" type="radio"/>

**START**

Today's target achieved. Let's stop production.



Here comes the instruction to stop. Let's stop.



Here comes the instruction to stop. Let's stop.



## 1.4 Preliminary information on CC-Link IE Control Network

This section provides some preliminary information to help with selection of the FA network suitable for your environment.

### 1.4.1 Differences between CC-Link IE Control Network and CC-Link IE Field Network

The types of CC-Link IE networks include CC-Link IE Control Network and CC-Link IE Field Network. The following table summarizes the differences between these networks.

Pressing the feature buttons highlights the items that detail each feature.

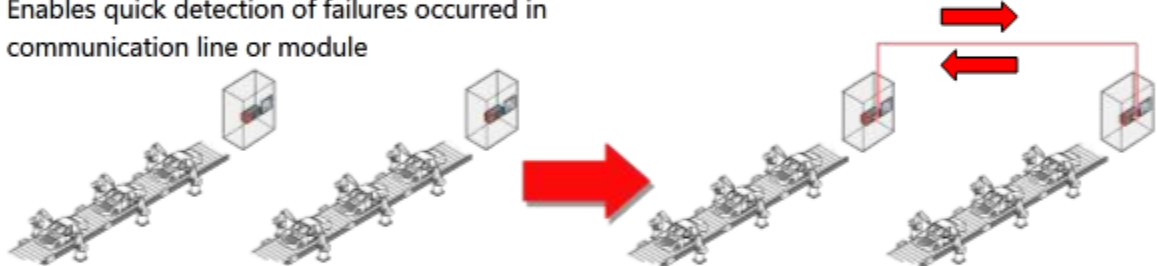
	CC-Link IE Control Network		CC-Link IE Field Network	
Features	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid blue; border-radius: 10px; padding: 2px 5px; background-color: #fff9c4;">Large Capacity</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 2px 5px; background-color: #fff9c4;">High Reliability</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 2px 5px; background-color: #fff9c4;">Long Distance</div> </div>		<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid blue; border-radius: 10px; padding: 2px 5px; background-color: #fff9c4;">Multipurpose</div> <div style="border: 1px solid blue; border-radius: 10px; padding: 2px 5px; background-color: #fff9c4;">Flexible Cabling</div> </div>	
Network Purpose	Distributed control		Distributed control, remote I/O control	
Max. number of device points	Word: 128k points; Bit: 32k points		Word: 16k points; Bit: 32k points	
Fault tolerance	Control station: Operating even when the control station fails		Submaster function: Operating even when the master station fails.	
Physical communication medium	Optical fiber cable: Expensive and requires skill for cabling High noise tolerance	Twisted paired cable: Less expensive and relatively easy cabling	Twisted paired cable: Less expensive and relatively easy cabling	
Topology	Ring: Featuring higher reliability than dual loop	Star, line, ring: Featuring a high degree of freedom for cabling	Star, line, ring: Featuring a high degree of freedom for cabling	
Max. station-to-station distance	550 m	100 m	100 m	
Max. total distance	550 m × 120 (maximum number of connected stations) = 66 km	Line topology: 100 m × 120 (maximum number of connected stations) = 12 km	Line topology: 100 m × 120 (maximum number of connected stations) = 12 km	

This course provides explanation about CC-Link IE Control Network connected with optical fiber cable.


## 1.4.2

# Characteristics of CC-Link IE Control Network

### Application

Purpose of network	Description
<p>Information sharing (Cyclic transmission by master station and local stations)</p>	<p>Information is shared among programmable controllers. Connecting distributed equipment (controllers) via a network improves flexibility, expandability, and serviceability of automation systems.</p> <p><b>Advantage of information sharing:</b></p> <ul style="list-style-type: none"> <li>Improves equipment and production line productivity</li> <li>Enables full management of factory by collecting traceability information</li> <li>Enables quick detection of failures occurred in communication line or module</li> </ul> 

### Topology

Topology	Features
<p>Ring topology (connected in a ring)</p> 	<ul style="list-style-type: none"> <li>Highly reliable</li> <li>Faulty wiring and station failures are less likely to affect the entire network</li> </ul>

## 1.4.3 Procedure of data communication

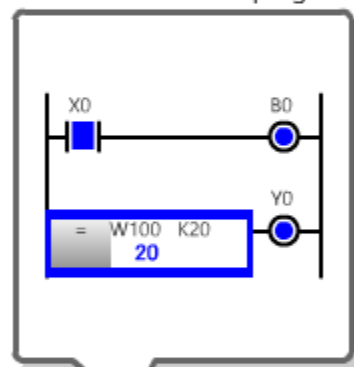
### Information sharing

This section describes how information is shared on CC-Link IE Control Network. To share information among programmable controllers, when one programmable controller turns on a signal or performs an operation, such information must be sent to other programmable controllers.

The dedicated device for link (link device) is used to share information among programmable controllers. Link device includes the link relay (B) and the link register (W).

Click the [START] button to start the explanation of the programmable controller in CC-Link IE Control Network.

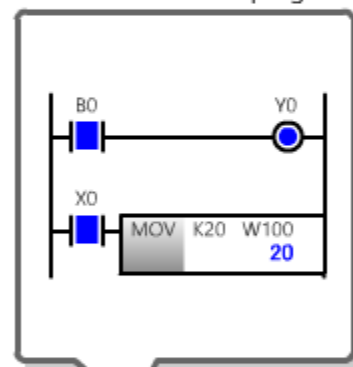
Station No.1 control program



Station No.1



Station No.2 control program



Station No.2



### START

- (1) Turn on the contact "X0" of station No.1 programmable controller.
- ↓
- (2) The coil "B0" of station No.1 programmable controller is turned on.
- ↓
- (3) The on signal is transmitted to the contact "B0" of station No.2 programmable controller.
- ↓
- (4) The coil "Y0" of station No.2 programmable controller is turned on.
- ↓
- (5) Turn on the contact "X0" of station No.2 programmable controller.
- ↓
- (6) "20" is stored in the register "W100" of station No.2 programmable controller.
- ↓
- (7) "20" is transmitted to the register "W100" of station No.1 programmable controller.
- ↓
- (8) The coil "Y0" of station No.1 programmable controller is turned on.**

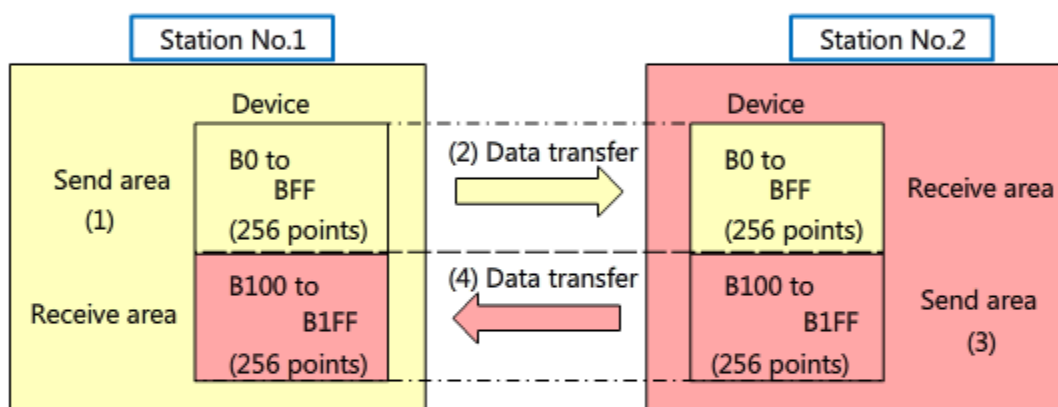
Information sharing is enabled by sharing the device among all the programmable controllers connected via CC-Link IE Control Network.

## 1.4.3 Procedure of data communication

### Device area to be shared and behavior of stations

To share information (such as on/off signal or numerical data) among programmable controllers connected via CC-Link IE Control Network, each programmable controller reserves a specific device area to be shared with other programmable controllers. Data is sent/received to/from this area periodically.

The following shows an example of data exchange performed in such device areas in CC-Link IE Control Network. In this example, the link relay "B" is used.



(1) The device B0 to BFF of the station No.1 is set as the send area.

(2) Data in the device B0 to BFF of the station No.1 is automatically transferred to the device B0 to BFF of the station No.2.

(3) The device B100 to B1FF of the station No.2 is set as the send area.

(4) Data in the device B100 to B1FF of the station No.2 is automatically transferred to the device B100 to B1FF of the station No.1.

#### Important point

Signals and data of a programmable controller can be sent to other programmable controllers simply by setting such signals and data in the send area of the own station (\*1).

The programmable controller on the receiving side can retrieve the information of other programmable controllers simply by referencing the receive area of its own station without regard to the network.

\*1: The programmable controllers which are connected to the network are identified by the station numbers.

"Own station" denotes an own programmable controller, and "other stations" denotes other programmable controllers.

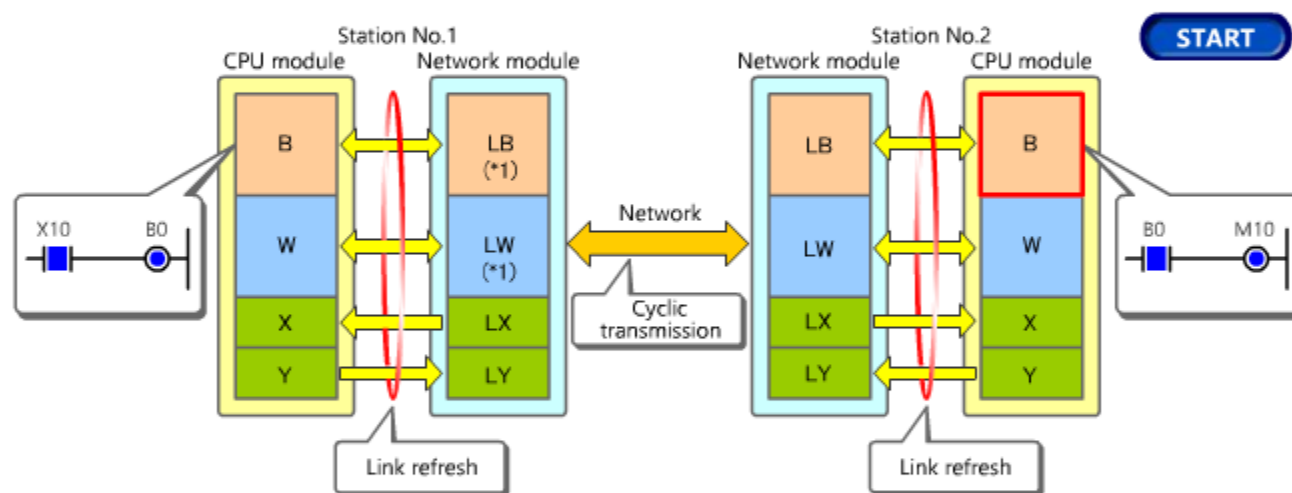
## 1.4.3 Procedure of data communication

### Exchange of device data

CC-Link IE Control Network uses the link relay "B" (on/off information) and the link register "W" (16-bit numerical value information) to share data.

The following animation shows the steps from turning on "B0" on the programmable controller of the station No.1 to turning on "B0" on the programmable controller of the station No.2.

Click the [START] button to start the explanation.



\*1

"LB" and "LW" are the link device handled internally in the network module.

\*2

Link refresh is the communication of device data performed between the device "B/W" of the CPU module and the device "LB/LW" on the network.

Link refresh is performed for each scan of the CPU module.

The "B0" is turned on by the control program of station No.1.

By link refresh (\*2), the "B0" ON information is transferred to the network module from the CPU module, and "LB0" is turned on.

By cyclic transmission (\*3), the "B0" ON information is transferred to the network module of station No 2, and "LB0" of station No 2 is turned on.

By link refresh (\*2), the "B0" ON information is transferred from the network module to the CPU module, and "B0" is turned on.

The "B0" ON status can be checked in the control program of station No.2.

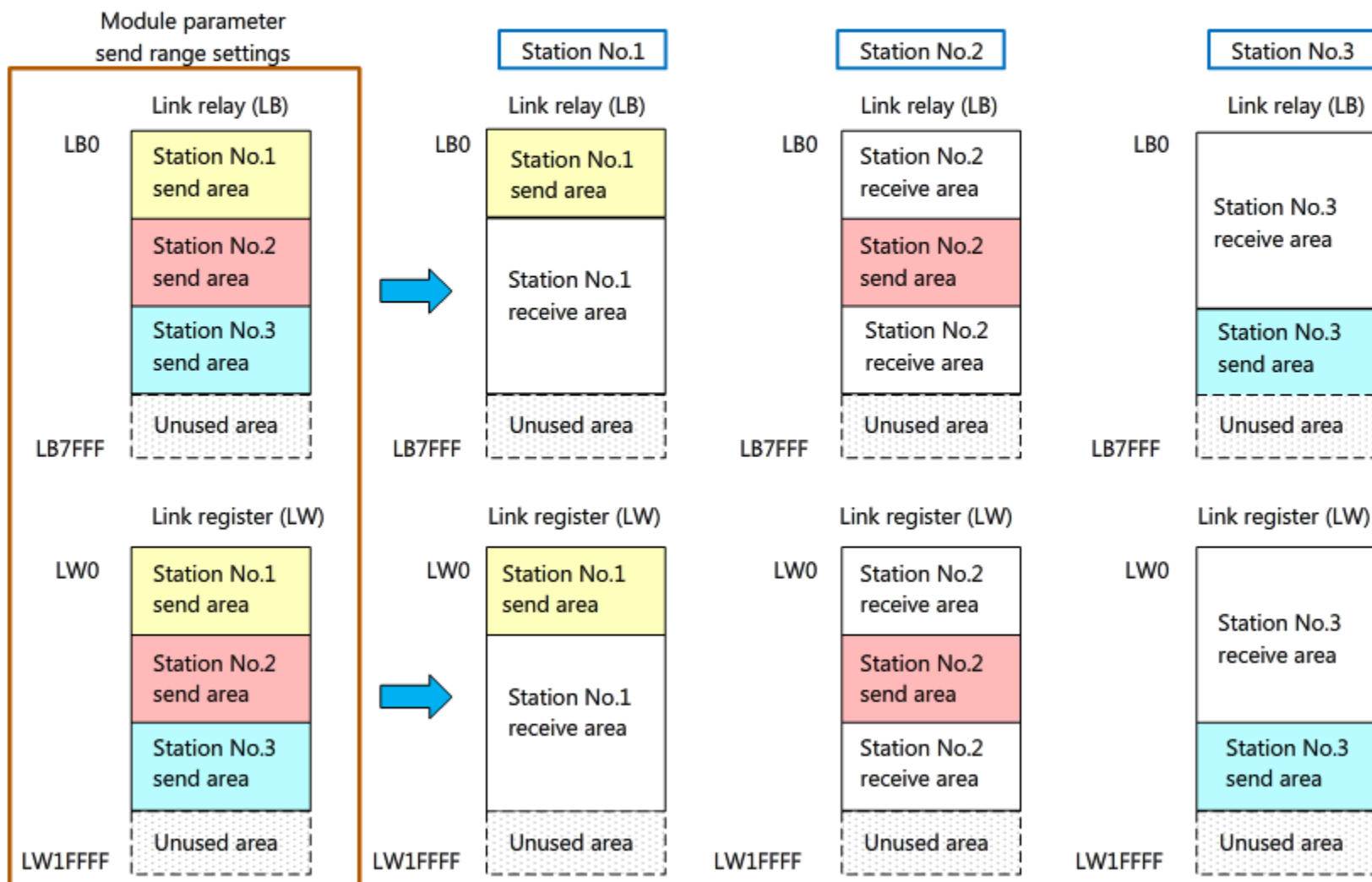
\*3

Cyclic transmission is the data communication format used in CC-Link IE Control Network. Refer to Sections 1.4.5 to 1.4.6 for more information.

## 1.4.4

## Assignment procedure of link device

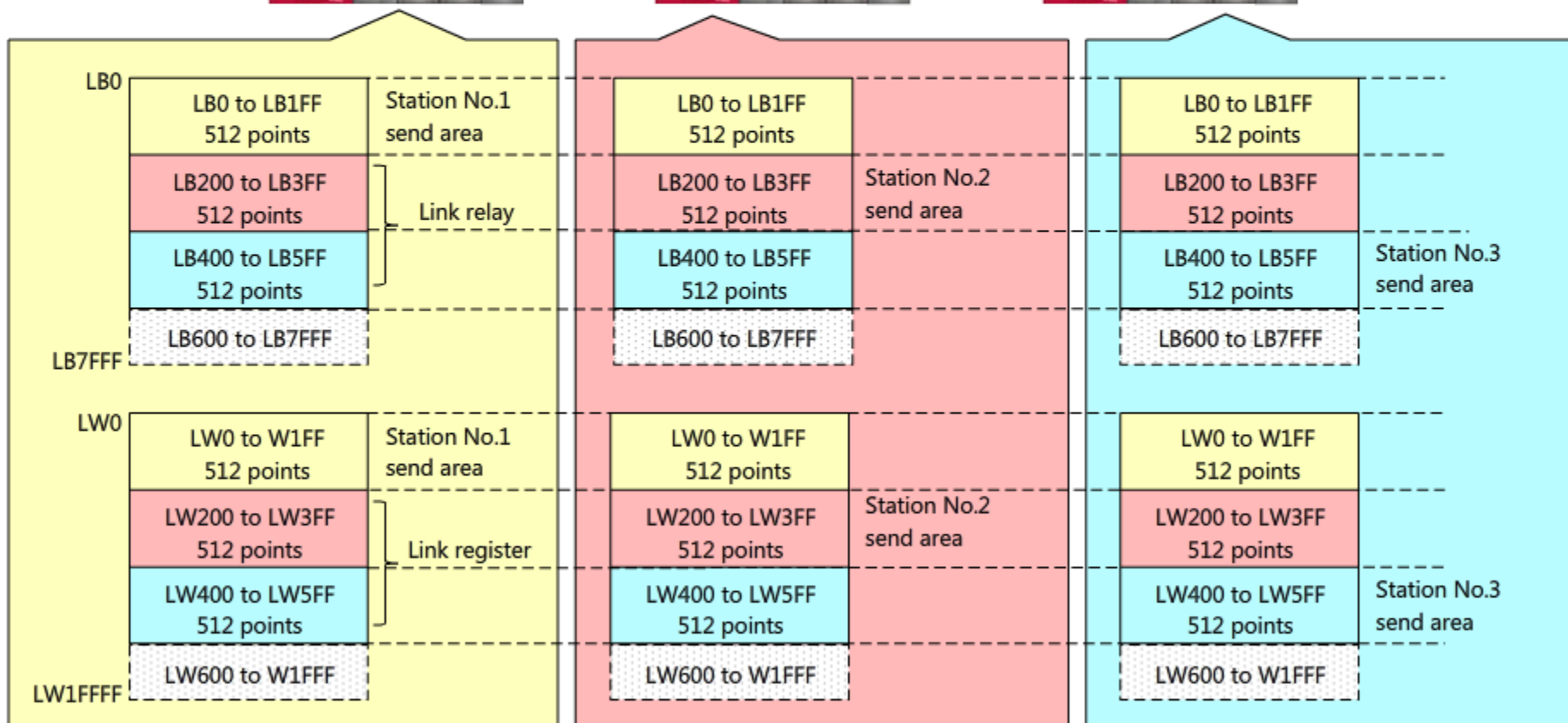
Link relay (LB) and link register (LW) can be set in the link device range available for the CPU module. The "transmission range (send area)" is assigned to each station with module parameters configured in MELSOFT GX Works3 engineering software (hereinafter referred to as GX Works3). The link device area that is assigned as the send area of a certain station is handled as the receive area of other stations.





## 1.4.4 Assignment procedure of link device

In the following example, 512 points are assigned to each of LB and LW, which are the link device area of the CPU module on the station No.1 to 3.





## 1.4.5 Data communication method

There are following two methods of data communication used in CC-Link IE Control Network.

The following table lists the overview of each method.

Method	Overview	Send/receive program
Cyclic transmission	Communication method to cyclically and automatically send/receive data in the area predetermined by module parameters (*1)	Not required (Data is sent/received based on the setting of module parameters.)
Transient transmission	Communication method to send/receive data only when a communication request is issued between programmable controllers in the network during intervals between cyclic transmissions.	Required (Data is sent/received by the program through execution of the dedicated instruction.)

\*1: This setting is used to manage the network of CC-Link IE Control Network. For more information, refer to Sections 2.3 and 3.2.

Cyclic transmission and transient transmission can be used simultaneously in CC-Link IE Control Network.

This course provides explanation using cyclic transmission, which is the primary type of communication performed in CC-Link IE Control Network.

## 1.4.6

## Data communication by cyclic transmission

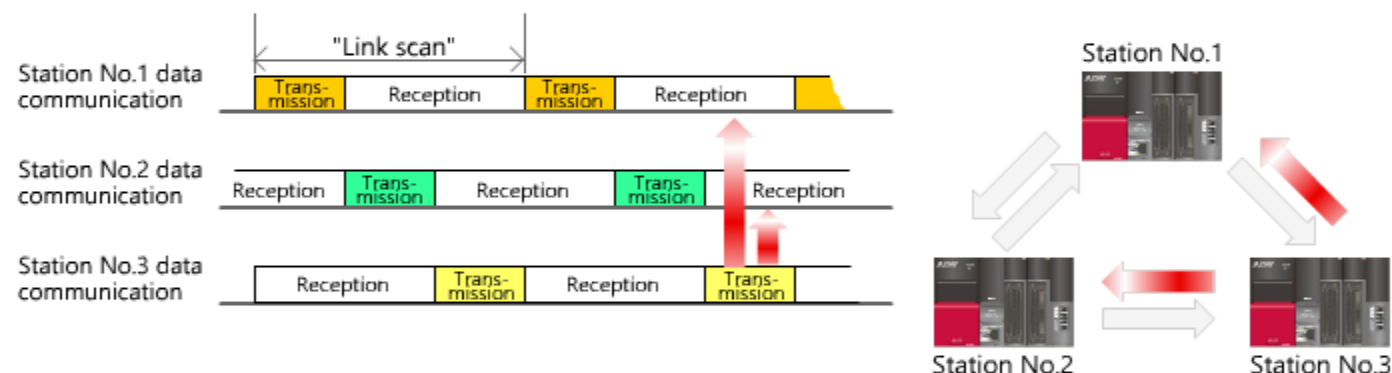


## Periodic data communication

In cyclic transmission, programmable controllers in the network send their own data sequentially and periodically at a specified interval. This data is received concurrently by stations other than the transmitting station.

Data can be sent reliably by shifting the transmission authority called token pass from one programmable controller to the next in sequence.

This format is referred to as "cyclic transmission" format because data is transmitted periodically. A single cycle of send processing of all the programmable controllers is referred to as "link scan". The send authority is granted to each programmable controller for each link scan, and such data transmission is referred to as "deterministic data transmission". The following example shows the timing of cyclic transmission of each station.



## Features of control system network mainly composed of programmable controllers

In cyclic transmission, each station sends data in a sequential manner, and therefore data can be transmitted reliably without collision even when the number of devices connected in the network or the frequency of communications increases. Therefore, cyclic transmission is suitable for the control of production equipment that requires deterministic communications.

A function-distributed system, where functions are divided among network-connected CPU modules, offers the following advantages in comparison with the individual systems where all functions are performed by one CPU module.

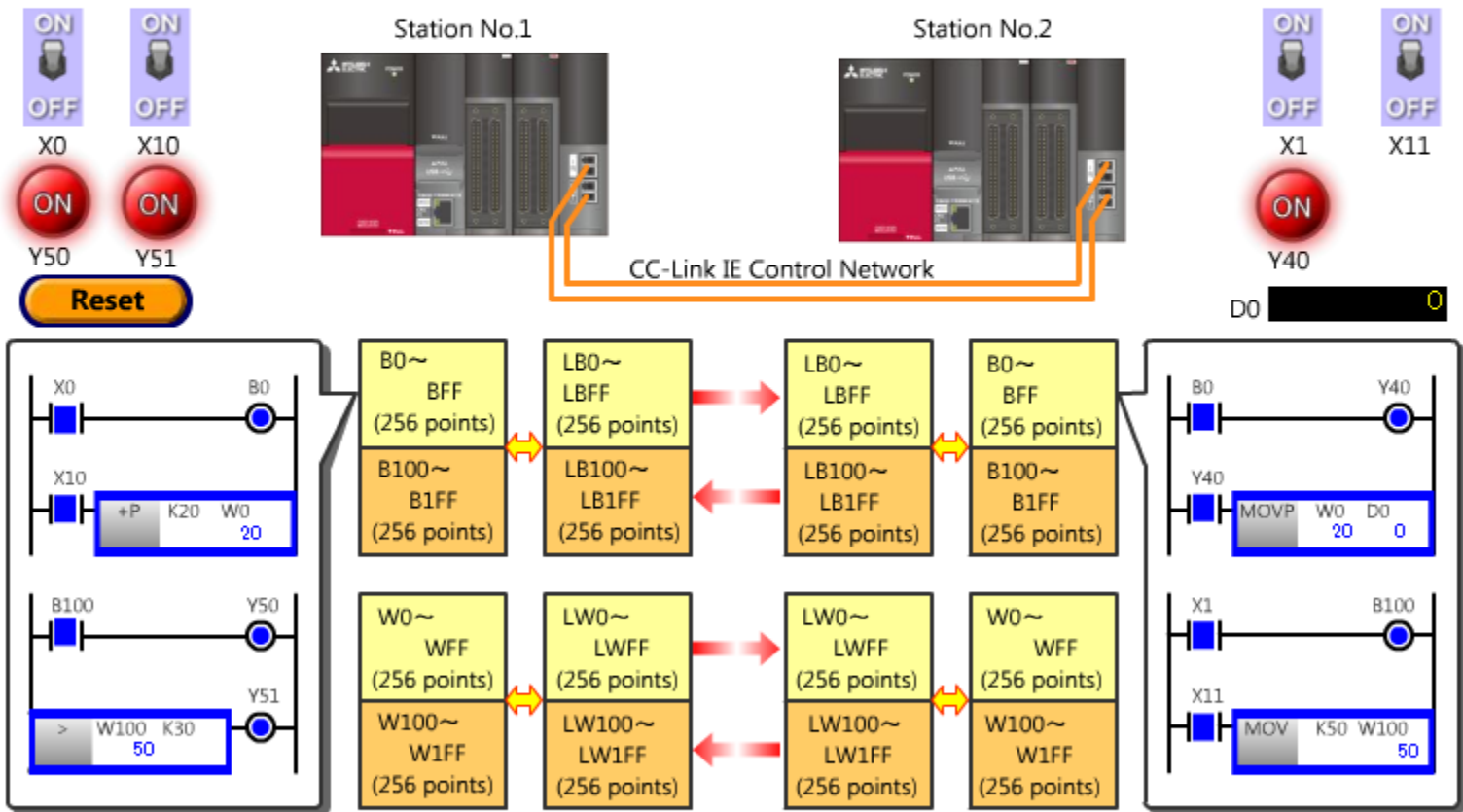
- Less processing load for each CPU module
- Less influence of failure

# 1.4.6 Data communication by cyclic transmission

CC-Link IE Control Network performs high-speed cyclic transmission, and therefore data in the link device is communicated among stations with minimum transmission delay. The link device of the send area of the other station can be handled as if it is the device of the own station.

The following animation shows the operation of cyclic transmission.

Click the [ON/OFF] switch on a programmable controller to view the transfer of corresponding data to the connected station.  
Click the [Reset] button to return to the initial status.



In this chapter, you have learned:

- Necessity of FA networks
- Operation of FA network
- Difference between CC-Link IE Control Network and CC-Link IE Field Network
- Application and wiring topology of CC-Link IE Control Network
- Procedure of data communication
- Assignment procedure of link device
- Data communication method
- Data communication by cyclic transmission

Important points

Role of FA network	<p>FA network allows to share the control information among programmable controllers in each production equipment.</p> <p>Using FA network offers the following benefits:</p> <ul style="list-style-type: none"> <li>• Load is distributed among multiple programmable controllers (load distribution)</li> <li>• Failure with a single programmable controller will have a minimal effect on the entire system (function distribution)</li> </ul>
Overview of data communication	<ul style="list-style-type: none"> <li>• FA networks primarily use cyclic transmission</li> <li>• Cyclic transmission uses the dedicated network device called "link devices"</li> <li>• Link device is shared with other stations connected to the FA network</li> <li>• The link device area that is assigned as the send area of a certain station is handled as the receive area of other stations</li> </ul>
Type of link device	<ul style="list-style-type: none"> <li>• Link device includes the link relay (B) and the link register (W)</li> <li>• "B" is a bit device, and "W" is a word device</li> <li>• Bit device and word device in the network module are called LB and LW</li> </ul>

## Chapter 2 System configuration and specifications of CC-Link IE Control Network

This chapter describes system configuration, specifications, and module parameter setting of CC-Link IE Control Network.

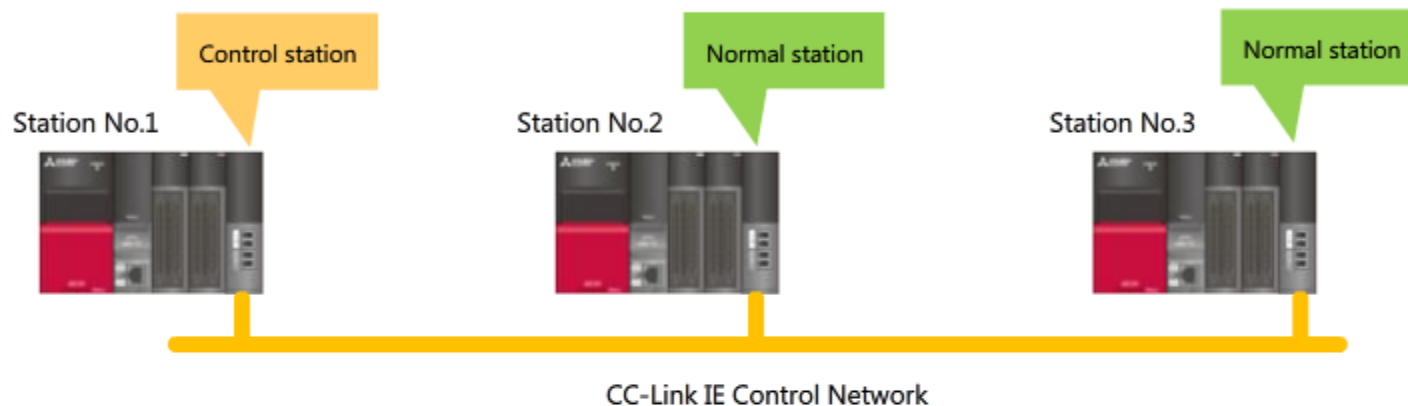
2.1 Network configuration

2.2 Network specifications

2.3 Module parameter

## 2.1 Network configuration

CC-Link IE Control Network comprises of a "control station" and multiple "normal stations". A unique station number is assigned to each station. The control station and normal stations are specified by the module parameter setting.



### (1) Role of the control station

The "control station" controls the module parameters.

Only one station in the network can be set as the control station.

Use the module parameters of the control station to assign the link device of each station.

### (2) Role of normal stations

All stations other than the "control station" are referred to as "normal stations".

These stations send data in their send range of the own station to other stations in accordance with the module parameters set in the control station.

If the control station fails, one of the normal stations takes over the role of the control station (sub-control station), allowing the data link to remain operational. This function is referred to as the "control station switching function".

### Specifications check

The following table summarizes the specifications to be checked before choosing CC-Link IE Control Network.

Check item	Relevant specifications
Network scale and number of connectable stations	<ul style="list-style-type: none"> <li>Maximum number of networks: 239</li> <li>Maximum number of connectable stations per network: 120 *1</li> </ul>
Selection of connection method	Cable specifications: Optical fiber cable (multimode fiber) or twisted pair cable
Number of link points	<ul style="list-style-type: none"> <li>Maximum number of link points per network *1</li> <li>Maximum number of link points per station *1</li> </ul>
Connection distance	<ul style="list-style-type: none"> <li>Overall cable distance: 66 km (with 120 stations connected)</li> <li>Station-to-station distance: Maximum 550 m (core/clad = 50/125 (μm))</li> </ul>
Communication speed	1 Gbps

\*1: For details, refer to the manual of the CC-Link IE Control Network module used.

### Designing a network configuration

#### (1) Function distribution

Review the entire system to identify the locations where it is beneficial to divide the system by functions.

CPU module is required for each divided station.

Use CC-Link IE Field Network, CC-Link IE Field Network Basic, or CC-Link to use the remote I/O control.

#### (2) Load distribution

If there is any overloaded module, review the entire system to consider the distribution of the load by CC-Link IE Control Network.

#### (3) Others

Verify that the station-to-station distance, overall cable distance, and cable specifications conform to the design specifications.



## 2.2.1 Explanation of specifications

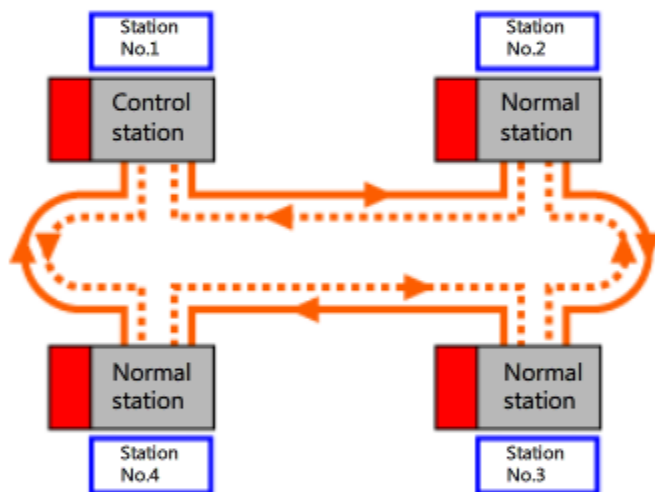
This section describes specifications that are particularly important for understanding CC-Link IE Control Network.

### Network topology

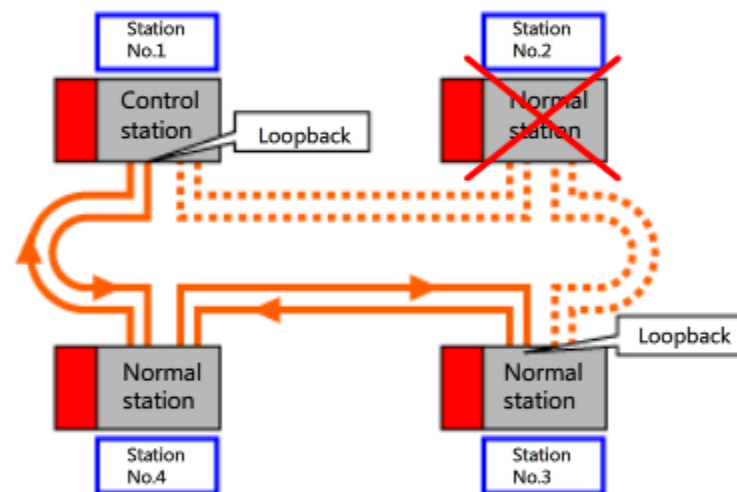
The network topology of CC-Link IE Control Network is the optical loop system.

Each optical cable has two pairs of transmission paths (including a spare). If operation at a station becomes abnormal, communication is continued by remaining normally operating stations. This process is referred to as the loopback.

#### Example of normal communication



#### Example of loopback communication



### Number of connectable stations per network

A maximum of 120 stations can be connected to an optical loop system.

(Varies depending on the CPU module used.)

For more information, refer to the user's manual of the CC-Link IE Control Network module used.

### Overall cable distance





The maximum overall cable distance is 66 km for a single network.



## 2.2.2

## Devices functioning as control station and normal station

The following types of devices are capable of functioning as control station and normal station on CC-Link IE Control Network.

Station type	Device type	Features	External appearance
Control station/ normal station	Integrated CPU module type	Network functionality including CC-Link IE Field Network, CC-Link IE Control Network, and Ethernet is integrated into the CPU module. A different type of network can be used with each connection port.	
	Multi-network type	This network module supports multiple network types including CC-Link IE Field Network, CC-Link IE Control Network, and Ethernet. A different type of network can be used with each connection port.	
	Dedicated type	This module supports only CC-Link IE Control Network. This module is connected to the network using optical fiber cable.	
	Network interface board	This board is used to connect computers to CC-Link IE Control Network. This board is a PCI Express card.	

This course covers the system of which control and normal stations are both configured using dedicated modules.

## 2.2.3 Transmission delay time

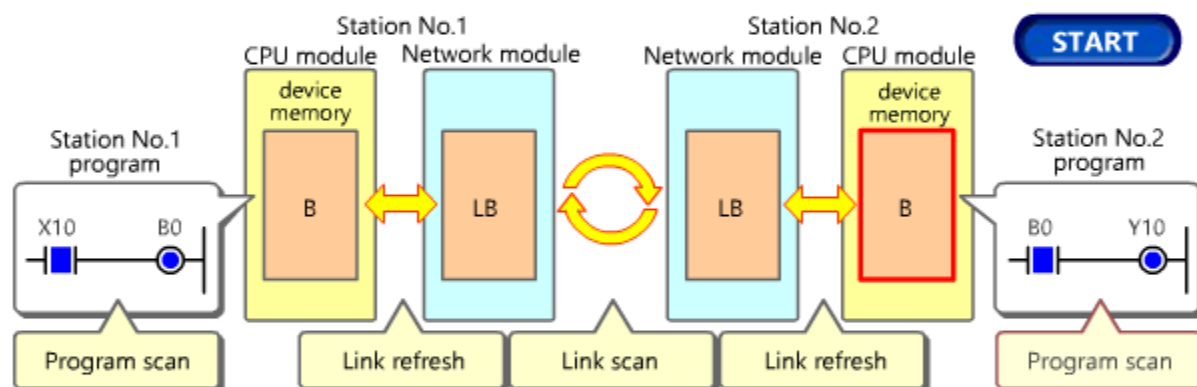
The "transmission delay time" refers to the time it takes for a status change of the device in the sending-side program to be applied to the receiving-side program.

This delay time must be considered for a system where accurate synchronization is required.

Before designing a system, understand the outline of the transmission delay time, and check that the system has allowance for the transmission delay time.

The following example shows the processing flow in which data in the link relay (B0) of the CPU module on the station No.1 is sent to the CPU module on the station No.2.

Click the [START] button to start the explanation.



The transmission delay time is composed of:

- Sending-side program scan time
- Receiving-side program scan time
- Link scan time

The "B0" is turned on by the control program of station No.1.

By link refresh, the B0 information is stored in the link device (LB) of the network module.

By link scan, the B0 information is transmitted to the link device (LB) of the network module on the receiving side.

By link refresh, the B0 information is stored in the device memory (B) of the CPU module.

The "B0" ON status is checked by the control program of station No.2.

## 2.3

## Module parameter

This section describes the module parameter settings required to use CC-Link IE Control Network.

### Minimum required parameters

The following table lists the parameters required and note for CC-Link IE Control Network.

Item	Purpose/Function	Note
Station Type	Sets whether the network module is used as the control station or a normal station.	Setting is <b>required for each module</b> .
Network Number	Sets the network number. (Network is managed by the network number.)	
Station Number	Sets the station number used to identify modules.	
Network Range Assignment	Sets the cyclic transmission range for the link devices LB, LW, LX, and LY in which data will be exchanged among stations in the same network.	Setting is <b>required for the control station</b> (not required for normal stations).
Refresh Setting	Set the range for the transmission between the link device (B/W) of the CPU module and the link device (LB/LW) of the network module.	Setting is <b>required for each module</b> .

In this chapter, you have learned:

- Station configuration of network and role/purpose of control station and normal station
- Network specifications
- Device used in CC-Link IE Control Network
- Transmission delay time
- Module parameter setting for using network

Important points

Station configuration of CC-Link IE Control Network	A single network consists of one control station and multiple normal stations. The control station and normal stations are set by the module parameters.
Transmission delay time of CC-Link IE Control Network	The transmission delay time is composed of the sending-side and receiving-side program scan time, and the link scan time.
Module parameter settings	Station type, network number, station number, and refresh settings must be set to all the network modules in the network. Additionally, the network range must be assigned to the control station.

## Chapter 3 Implementing of CC-Link IE Control Network

This chapter describes the procedures from implementation to operation check of CC-Link IE Control Network.

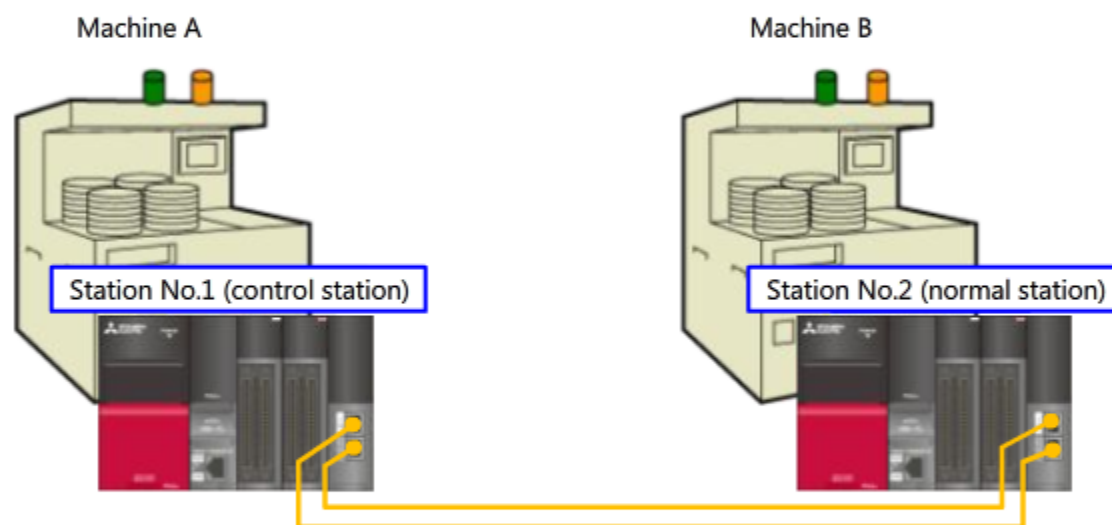
- 3.1 Starting the system hardware
- 3.2 Setting module parameters
- 3.3 Establishing link between control station and normal stations
- 3.4 Checking the operation by control program

## 3.1 Starting the system hardware

This section describes the configuration procedure of a simple two-station CC-Link IE Control Network system.

### 3.1.1 System configuration and specifications

The following figure shows the system configuration.  
Machine A is the control station and Machine B is the normal station.



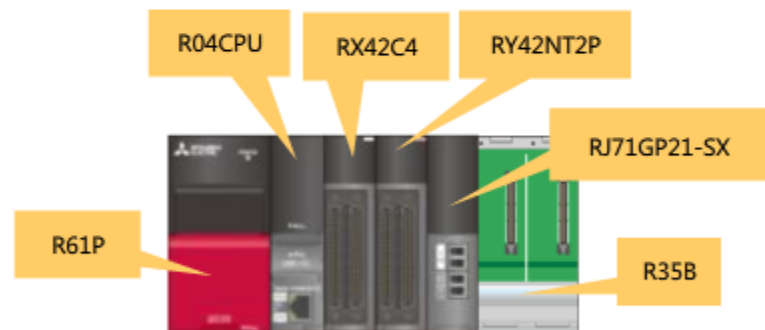
### 3.1.1 System configuration and specifications

The system will be configured according to the following network specifications.

Network topology	Duplex loop
Network module	RJ71GP21-SX
Total number of stations	2 stations (Station No.1: Control station; Station No.2: Normal station)
Network number	1
Link device	Link relay (B/LB): 256 points/station Link register (W/LW): 256 points/station

The following figure shows the module configuration and the I/O assignment.

Station No.1 (control station) and station No.2 (normal station) have the same module configuration.



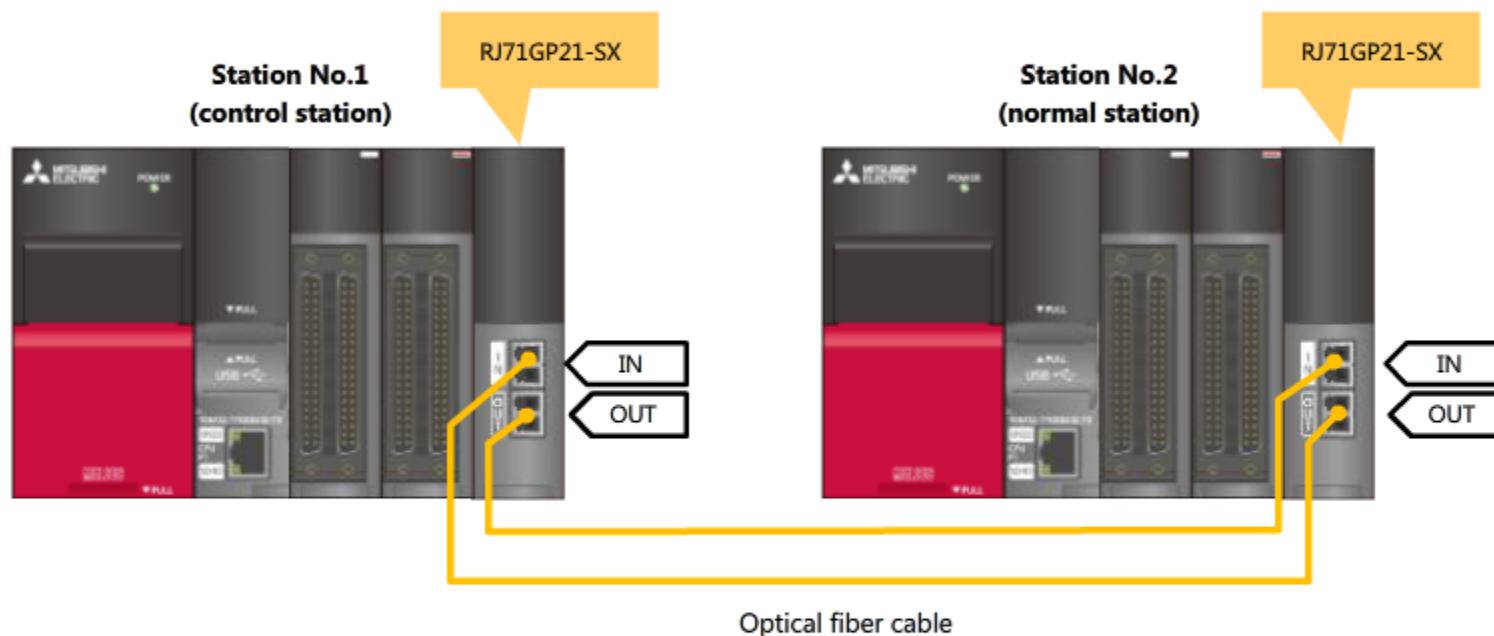
Input	Output	Intelligent
64 points	64 points	32 points
X00 to 3F	Y40 to 7F	X/Y80 to 9F

The following figure shows the link device range used by each station.

	Link relay	Link register
Station No.1	LB0 to LBFF (256 points)	LW0 to LWFF (256 points)
Station No.2	LB100 to LB1FF (256 points)	LW100 to LW1FF (256 points)

## 3.1.2 Optical fiber cable connection

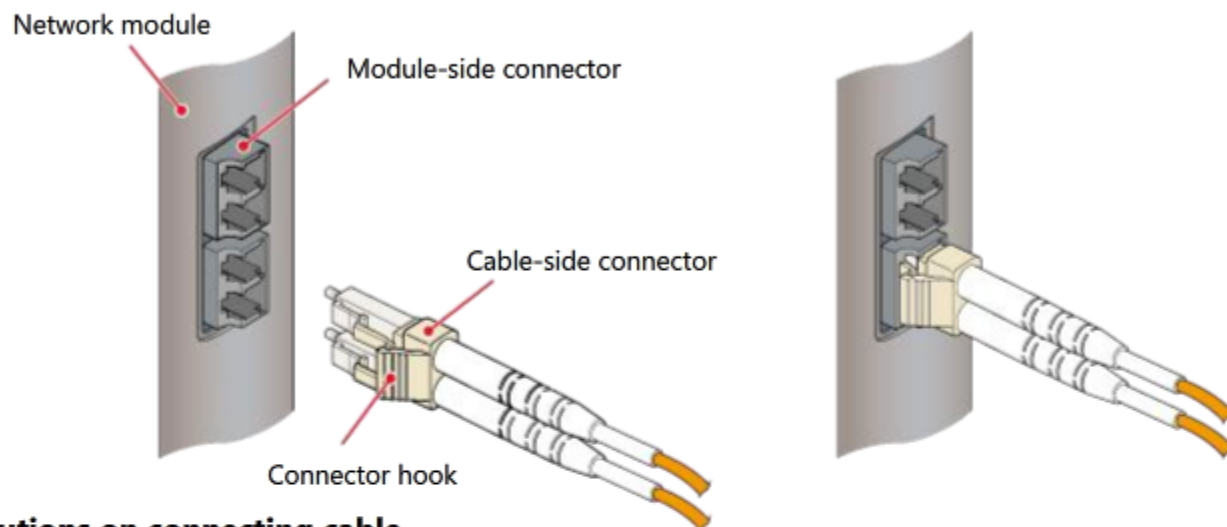
The network module RJ71GP21-SX is equipped with the "IN" and "OUT" ports for optical link. Connect the "OUT" port on the module and the "IN" port on the next station using the optical fiber cable. A loop is configured by connecting the modules in the order of "Station No.1: OUT" -> "Station No.2: IN", "Station No.2: OUT" -> "Station No.1: IN".





## 3.1.2 Optical fiber cable connection

The following describes the connecting method of the optical fiber cable.



### Precautions on connecting cable

- Always remove the cable by holding the cable-side connector.
- To connect the cable, align the projection of the connector with the groove of the plug, and then insert the cable.
- Insert the cable-side connector into the module-side connector until the cable clicks into place.

### Handling of optical fiber cable

- A single optical fiber cable has two lines of optical transmission path
- Because the optical fiber cable has a glass fiber core, its bend radius is limited. The cable must therefore be handled with care, and should be protected using a duct or similar tool
- During wiring of an optical fiber cable, do not touch the optical fiber core of the cable-side connector and module-side connector, and pay attention to prevent dirt or dust from adhering to the cable. If oil on hands, dirt, or dust adheres to the optical fiber, the transmission loss increases, possibly resulting in faults.

## 3.2 Setting module parameters

Set module parameters for both control station and normal stations using GX Works3.

### 3.2.1 Setting station type and station number

Set the station type of the CC-Link IE Control Network module.  
This setting must be configured for both the control station and normal station.

From the Navigation window, select [Parameter], then [Module Information], and then [RJ71GP21-SX] module parameters to open the setting window. Configure [Required Settings] as follows.

**Control station**

Item	Setting
<b>Station Type</b>	Control Station
Station Type	Control Station
<b>Network No.</b>	1
Network No.	1
<b>Station No.</b>	1
Station No.	1
<b>Network Range Assignment</b>	<Detailed Setting>
Network Range Assignment Setting	<Detailed Setting>

Complex system should be divided into multiple smaller networks. The system configured in this course is a simple network, so leave this setting to 1 (default).

Station number of each device on the same network must be unique. Leave the setting to "1" (default) for the control station.

**Normal station**

Item	Setting
<b>Station Type</b>	Normal Station
Station Type	Normal Station
<b>Network No.</b>	1
Network No.	1
<b>Station No.</b>	2
Setting Method	Parameter Editor
Station No.	2

Leave this setting to "Normal Station" (default).

Same as the control station.

Set "2" for the normal station.

Select "Control Station".

## 3.2.2 Setting network configuration

Set the configuration of stations connected to the network and the range of the link device used by each station. These settings are configured on the control station only.

From the module parameter setting window, select [Required Settings] and then [Network Range Assignment Setting].

Select the device to be set.  
LB and LW are used for network communication, so select [LB/LW Setting (1)] (initial value).

Specify the total number of stations (control station and normal stations) connected to the network.

### Control station

Total No. of Stations

Switch Windows

LB/LW Setting (1)

Displays the station numbers. The number of stations displayed automatically corresponds to the number entered in [Total No. of Stations].

Station No.	Station Type	LB/LW Setting (1)					
		LB			LW		
		Points	Start	End	Points	Start	End
1	Control Station	256	0000	00FF	256	00000	000FF
2	Normal Station	256	0100	01FF	256	00100	001FF

Set the range of the link device LB/LW used by each station as follows.

	Link relay	Link register
Station No.1	LB0 to LBFF (256 points)	LW0 to LWFF (256 points)
Station No.2	LB100 to LB1FF (256 points)	LW100 to LW1FF (256 points)

## 3.2.3 Assigning link device

Link devices of CPU module and network module must be assigned to determine the device range used for data transfer by link refresh. This setting must be configured for both the control station and normal station.

From the module parameter setting window, select [Basic Settings] and then [Refresh Setting].

### Common settings for control station and normal station

Link special relay (SB) and link special register (SW) are used to receive the information such as operating status of the network module. Refer to Section 4.2.2 for more information.

Select the link devices of the network module to be used.

Set the link device range of the network module.

Select the link devices of the CPU module to be used.

These devices are the transfer destination of the data from the network module.

Link Side					CPU Side				
Device Name	Points	Start	End		Target	Device Name	Points	Start	End
SB	512	00000	001FF	↔	Specify Device	SB	512	00000	001FF
SW	512	00000	001FF	↔	Specify Device	SW	512	00000	001FF
LB	512	00000	001FF	↔	Specify Device	B	512	00000	001FF
LW	512	00000	001FF	↔	Specify Device	W	512	00000	001FF

Configure a total of 512 points for link devices to be used by station No.1 and station No.2.

Set the range of the link device of the CPU module.

Now that the module parameter settings have been configured, next perform the parameter error check, apply the parameters, convert all, write the settings to the CPU module, and reset the CPU module.

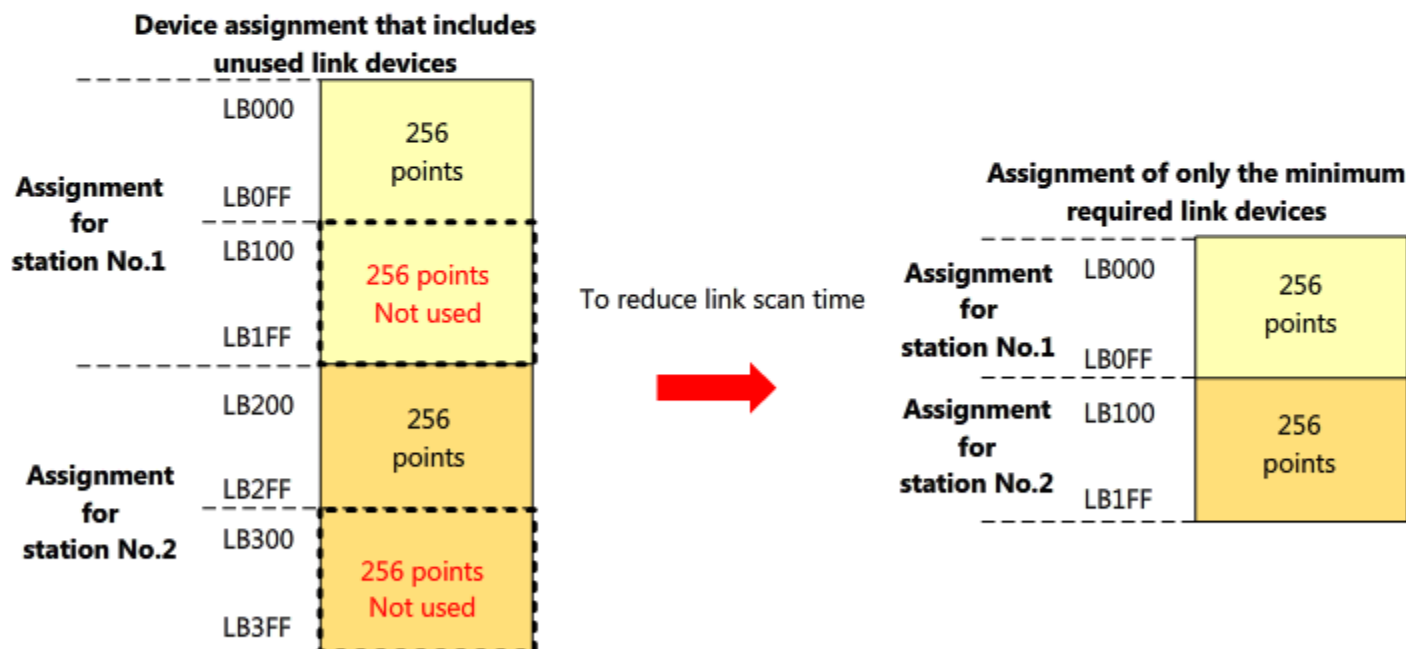
## 3.2.4

### Reducing the transmission delay time by limiting the number of points for link devices

The previous sections described the general procedure to configure module parameter settings. The **transmission delay time** (refer to Section 2.2.3) can be reduced by limiting the number of points for link devices using the network range assignment setting described in Section 3.2.2. Refer to the following for more information.

The figure shows an example that 512 points are assigned to the link device LB for each of station No.1 and 2. If the number of points actually used is 256 each, the **link scan time** can be reduced by reducing the number of points to be assigned to the minimum required number (256 points).

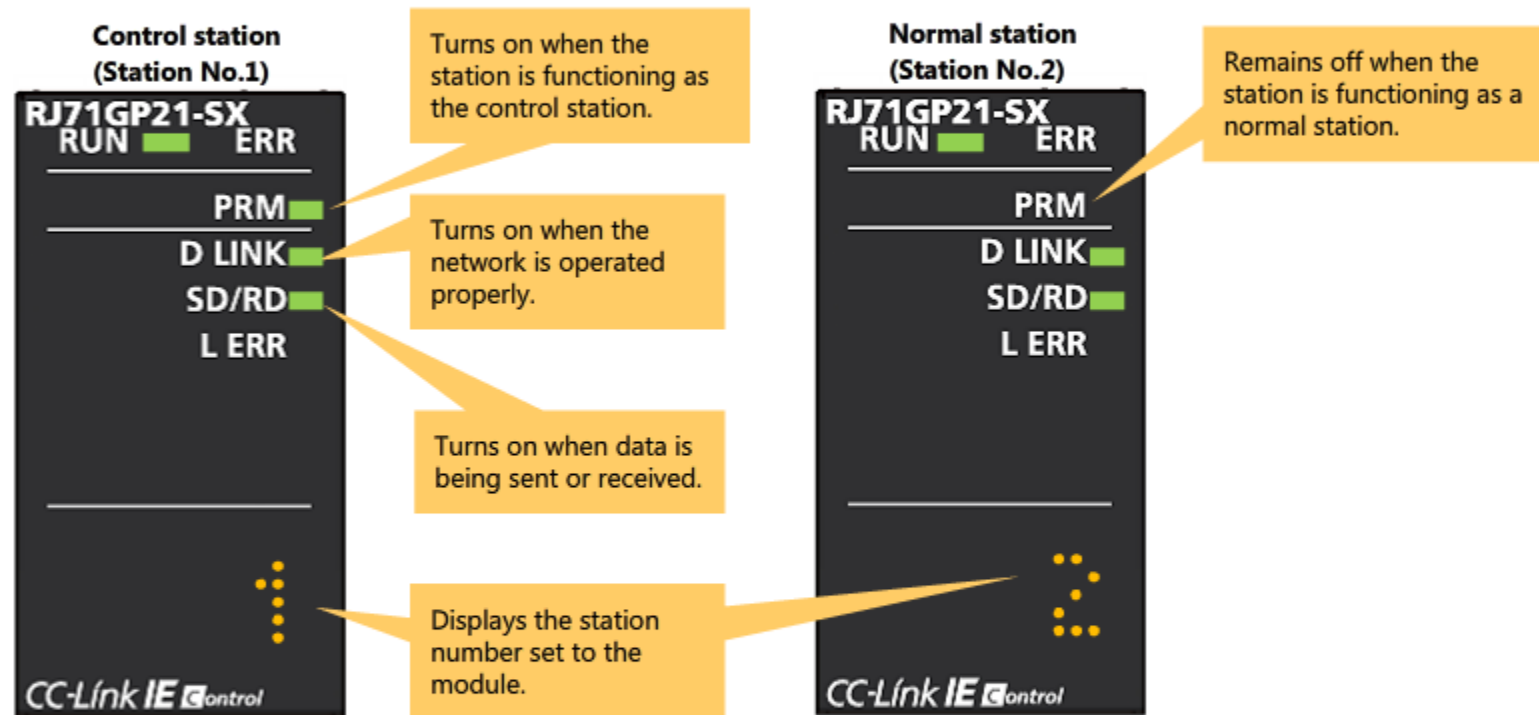
Reducing the link scan time results in reduced transmission delay time.



### 3.3 Establishing link between control station and normal stations

Network communication will start if there are no errors with the module parameters written to the CPU module of each station.

Check that the network communication is performed properly using the LED indication on the network module.



For the troubleshooting procedures when communication is not performed properly, refer to Section 4.4.

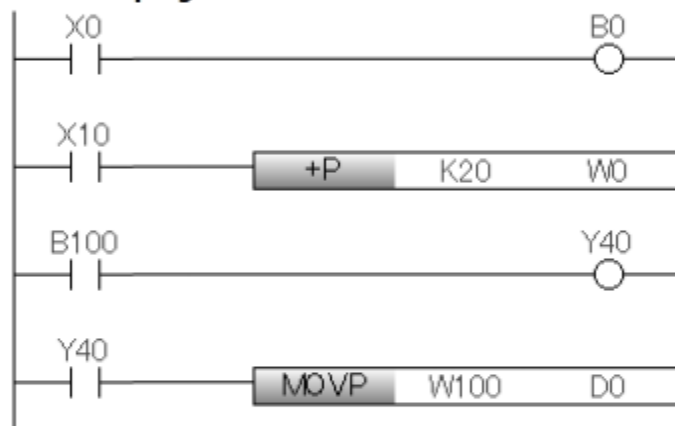
## 3.4 Checking the operation by control program

To check the data communication on the network, create control programs for checking the operation of station No.1 and 2. Check the actual data communication status by operating the program.

### 3.4.1 Control program

The following shows the control program of each station.

#### Station No.1 program



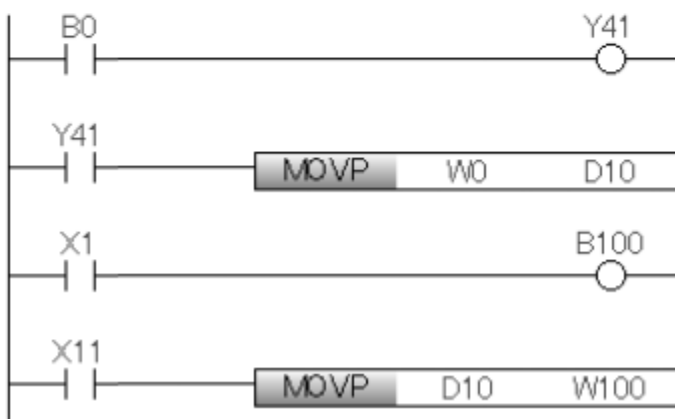
When the "X0" input signal is turned on, "B0" is turned on.

When the "X10" signal is turned on (rising edge), 20 is added to the value stored at "W0".

When "B100" is turned on, the "Y40" output signal is turned on.

When "Y40" is turned on (rising edge), the value stored at "W100" is transferred to "D0".

#### Station No.2 program



When "B0" is turned on, the "Y41" output signal is turned on.

When "Y41" is turned on (rising edge), the value stored at "W0" is transferred to "D10".

When the "X1" input signal is turned on, "B100" is turned on.

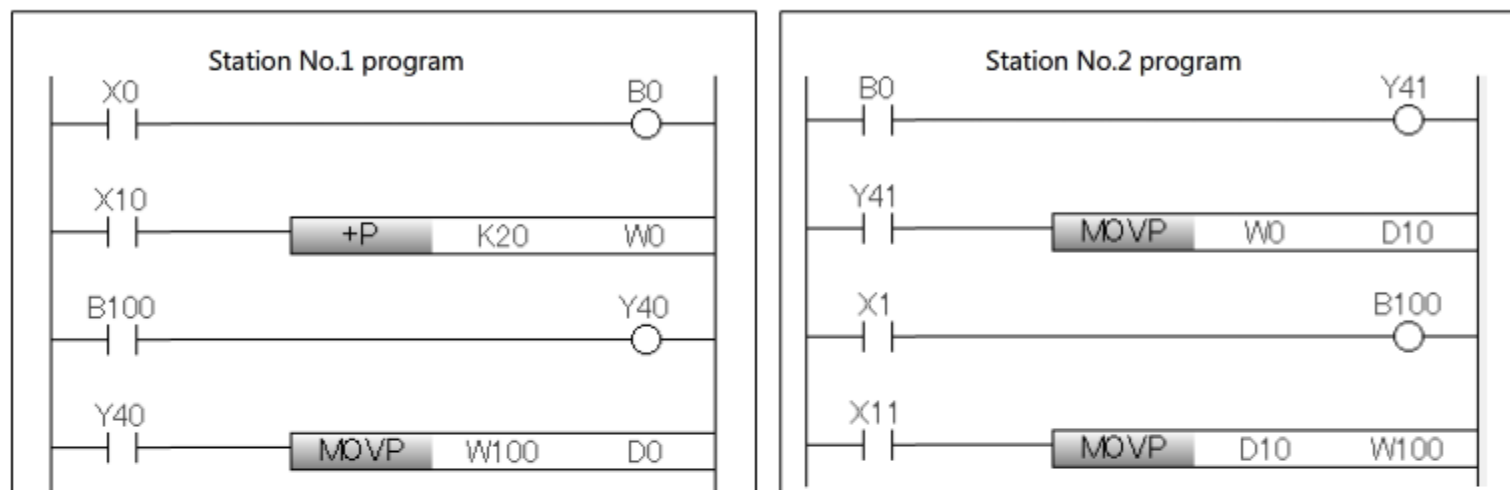
When the "X11" signal is turned on (rising edge), the value stored at "D10" is transferred to "W100".



## 3.4.2

## Operation check

Check that the network communication is performed properly by executing the control program written in the CPU module. In this course, the following operations are checked.



- (1) Each time the "X10" switch on the station No.1 is turned on, 20 is added to "W0". Accordingly, the value of "W0" on the station No.2 changes to the same value.
- (2) When the "X0" switch on the station No.1 is turned on/off, the "B0" coil is also turned on/off. At the same time, the "B0" contact on the station No.2 is turned on/off.
- (3) When "B0" on the station No.2 is turned on/off, the "Y41" coil is also turned on/off. When "Y41" is turned on, the "W0" value is transferred to "D10".
- (4) When the "X1" switch on the station No.2 is turned on/off, the "B100" coil is also turned on/off. At the same time, the "B100" contact on the station No.1 is turned on/off. When the "B100" contact on the station No.1 is turned on/off, the "Y40" coil is also turned on/off.
- (5) When the "X11" switch on the station No.2 is turned on/off, the "D10" value described above is transferred to "W100".
- (6) When "Y40" on the station No.1 is turned on, the "W100" value is transferred to "D0".

Using the operation simulation of the control program described on the next page, the data communication can be checked by performing the operation described above.



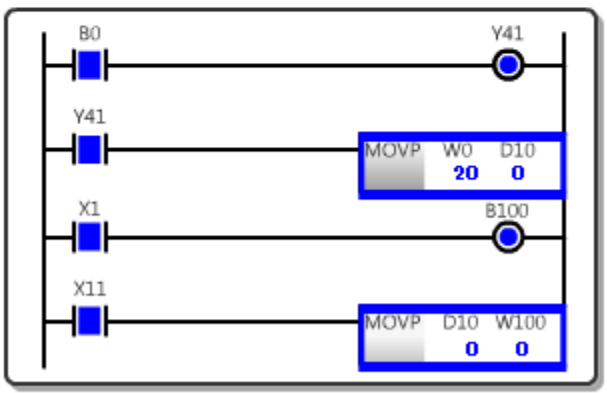
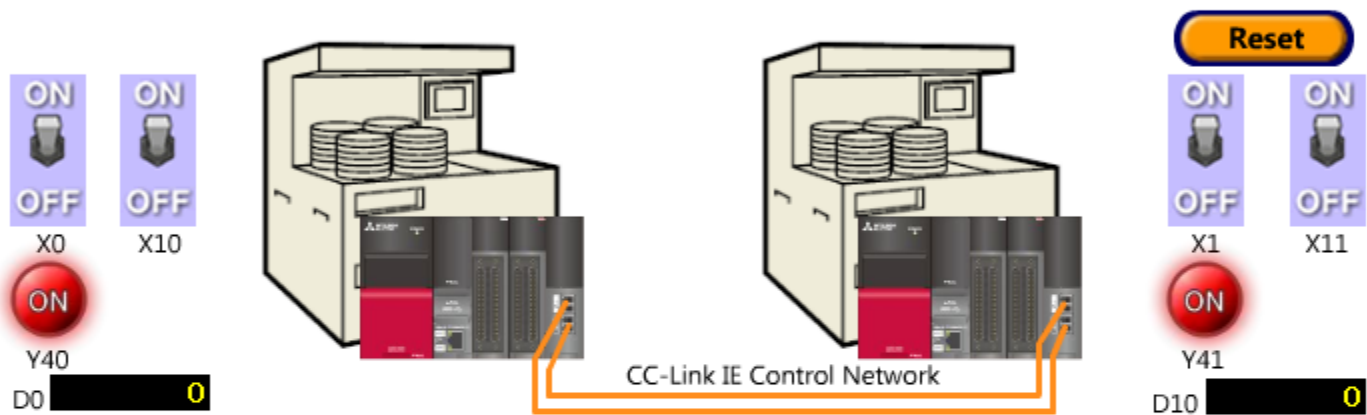
# 3.4.2 Operation check

## Operation simulation of the control programs

The operation simulation of the programs shows the data communication process.

Click the "X0" and "X10" ON/OFF switches on the station No.1 and the "X1" and "X11" ON/OFF switches on the station No.2 to check the data communication process, which is indicated by LED indication, data display, and ladder monitor.

Click the [Reset] button to return to the initial status.



In this chapter, you have learned:

- Specifications of the system
- Connecting method of optical fiber cable
- Module parameter settings
- Reducing the transmission delay time by limiting the number of points for link devices
- Check of the network operation

Important points

Module parameter settings	GX Works3 is used to set the module parameters. Settings should be made for all the programmable controllers connected to the network.
Operation check of network system	Operation of the CC-Link IE Control Network module can be verified by checking the LED indication on the network module.
Check by control program	Signals and data to be transferred to other stations should be set to the link device in the send area of the own station. Signals and data from other stations are stored in the link device in the receive area of the own station (send area of the other station).

## Chapter 4 Test operation of CC-Link IE Control Network System

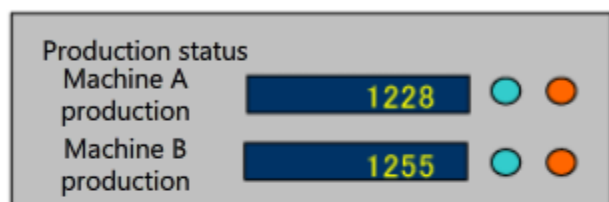
This chapter describes the procedures to create programs, check operation, and perform basic network diagnostics in case of problems using the system started up in Chapter 3.

- 4.1 Overview of control
- 4.2 Control program
- 4.3 Operation check
- 4.4 Troubleshooting
- 4.5 Remote monitoring of programs on other stations

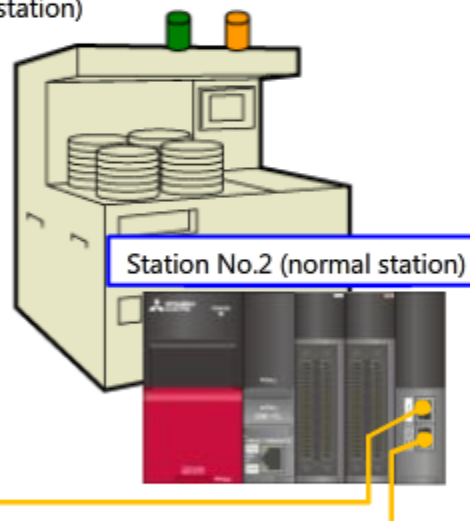
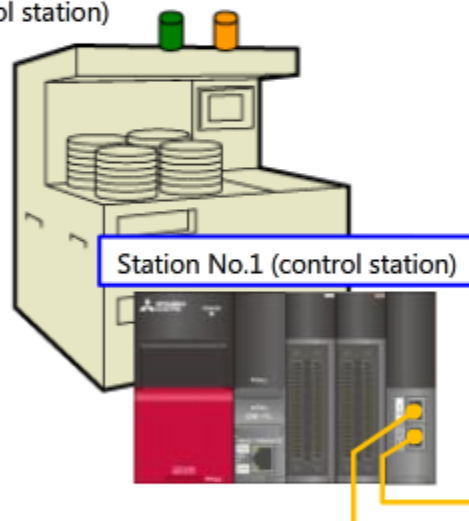
## 4.1

## Overview of control

The following shows the overview of the system control explained in this chapter. Information such as production target and production volume is exchanged between Machine A and Machine B, and status is displayed on the display panel.



- Displays the production volume of each machine
- Indicates the operation/stop status
- Indicates an error

Machine A  
(control station)Machine B  
(normal station)

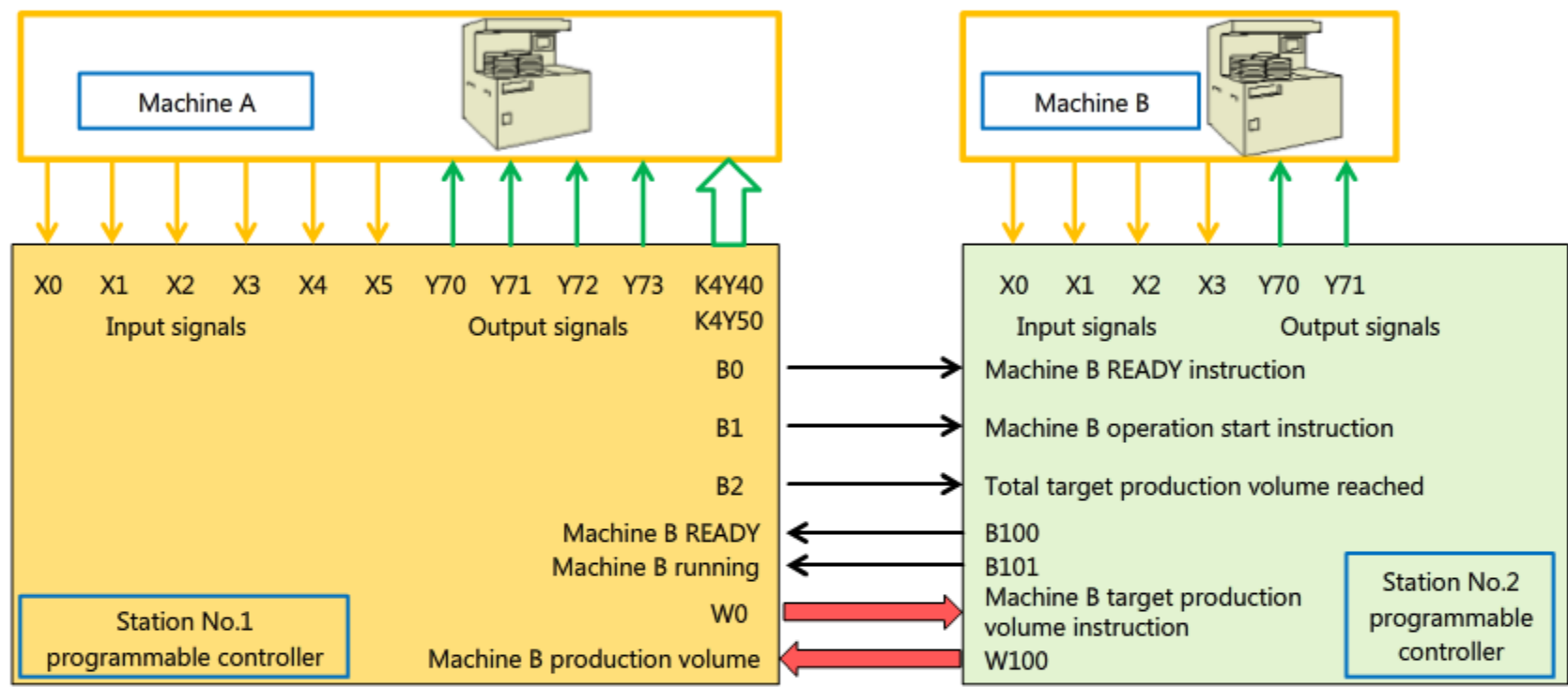
CC-Link IE Control Network

- Starts or stops operation (Machines A and B)
- Sends the target production volume to Machine B
- Counts the actual production volume of the own station
- Manages the total production volume of Machines A and B
- Indicates the production status (Machines A and B)

- Starts or stops operation
- Sends the operating status to Machine A
- Counts the actual production volume of the own station
- Sends the actual production volume to Machine A

# 4.1.1 Signal to be exchanged

The following figure shows the signals exchanged between machines. The control programs will be created based on this information.



Machine A I/O signals

X0	READY ON	Y70	Machine A READY
X1	Machine A error	Y71	Machine B READY
X2	Machine A operation start	Y72	Machine A operation started (running)
X3	Machine A READY	Y73	Machine B running
X4	Machine B operation start	K4Y40	Machine A production volume output
X5	Machine A production count	K4Y50	Machine B production volume output

Machine B I/O signals

X0	Machine B error
X1	Machine B READY
X2	Machine B independent operation start
X3	Machine B production count
Y70	Machine B READY
Y71	Machine B operation started (running)

## 4.2

## Control program

Create the programs to control Machine A (station No.1) and Machine B (station No.2) in accordance with the overview of control described in Section 4.1.

### 4.2.1

### Details of the control programs

#### Machine A (station No.1) program

- (1) Machine A starts operation when READY ON (X0) and Machine A operation start (X2) are turned on. Machine A sends Machine B READY instruction (B0) and Machine B operation start instruction (B1) to Machine B.
- (2) The program counts up the production volume when Machine A production count (X5) is received from Machine A during operation.
- (3) The program monitors Total production volume (D10), which is based on Machine A production volume (D0) and Machine B production volume (W100), and the operation stops once the target has been reached.
- (4) The program outputs Machine A production volume (D0) and Machine B production volume (W100) to the production volume display panel.

#### Machine B (station No.2) program

- (1) Machine B starts operation when Machine B READY instruction (B0) and Machine B operation start instruction (B1) received from Machine A are turned on.
- (2) The program counts up the production volume when Machine B production count (X3) is received from Machine B during operation.
- (3) Machine B successively sends Machine B running (B101) and Machine B production volume (W100) to Machine A.
- (4) Machine B stops operation when Total target production volume reached (B2) is received from Machine A.

**4.2.2****Tips on creating control programs****(1) Interlock program having the input condition added with the network status**

In order to ensure proper operation, the control program is generally created in combination with the interlock program depending on the status of the CPU module or equipment.

When creating the control program of the programmable controller that configures the network system, create the interlock program with the network status added to the interlock condition.

**(2) Link special relay (SB) and link special register (SW)**

Bit device and word device that indicate the network status have the link special relay (SB) that is stored by the bit signal (on/off) and the link special register (SW) that is stored by data information (16-bit) respectively.

Data stored in the relay and the register is refreshed between the network module and the CPU module, and such data can be used for the interlock signal to check the network module status or for the error processing in the control program.

## 4.2.2 Tips on creating control programs

### (3) Consideration of transmission delay time and link refresh timing

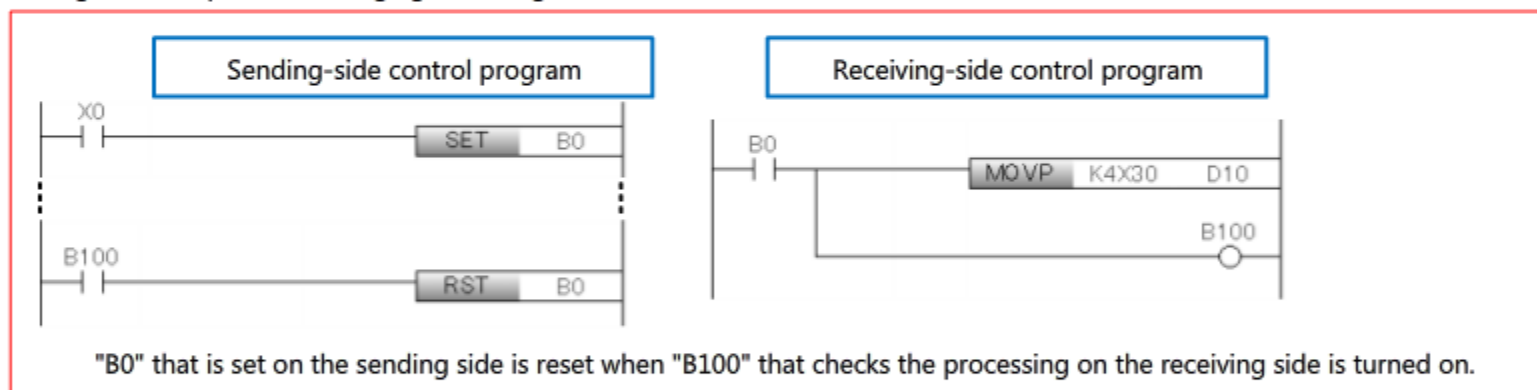
Programmable controllers in the network share on/off signals and data via the link device. However, the on/off signals and data may not be transferred reliably to other stations depending on the transmission delay or the link refresh timing.

Therefore, the following points should be observed.

#### (a) Exchange of on/off signal

If the on/off time period of the link relay or other function is too short, data may not be received by other stations due to transmission delay. It is necessary to ensure an appropriate on/off time period using the "SET" and "RST" instructions.

Program example for exchanging on/off signal



#### (b) Transfer of 32-bit data

When 32-bit data (2 words) is transferred, the "32-bit data assurance" function can be used to ensure the data integrity. For details on the conditions where this assurance is enabled, refer to the manual of the CC-Link IE Control Network module used.

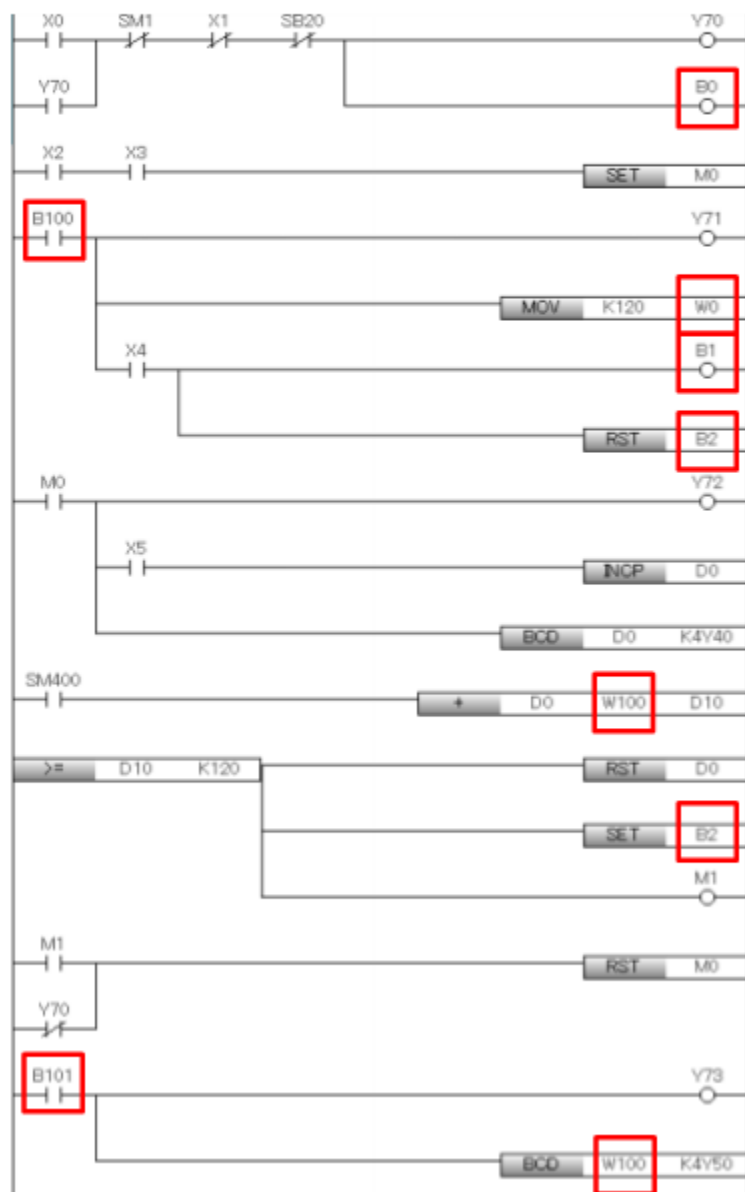
#### (c) Transfer of multiple word data

When multiple word data that exceeds 32 bits is transferred at a time, the "station-based block data assurance" can be used to avoid separation of multiple word data. For details, refer to the manual of the CC-Link IE Control Network module used.



## 4.2.3 Machine A (station No.1) program

Devices enclosed in red are those used for communication.



When "X0" is turned on, "Machine A READY (Y70)" is also turned on (self hold).

When "B0" is turned on, the READY instruction is sent to Machine B.

Machine A starts operation when "Machine A READY (X3)" and "Machine A operation start (X2)" are turned on.

When "B100" is turned on, "Machine B READY (Y71)" is also turned on.

The Machine B target production is transferred to "W0".

When "X4" is turned on, "B1" is also turned on, and the operation start instruction is sent to Machine B.

At the start of operation, the previous "Total target production volume reached (B2)" is reset.

While "M0" is on, "Machine A operation started (running) (Y72)" is turned on, and the machine starts operation.

When "X5" is turned on/off, Machine A production volume is counted by "D0".

During operation of Machine A, "Machine A production volume (D0)" is displayed on the production control panel.

The sum of "Machine A production volume (D0)" and "Machine B production volume (W100)" is calculated to obtain the total production volume.

When the target total production volume is reached, "Machine A production volume (D0)" is cleared.

"Total target production volume reached (B2)" is set so that Machine B will be notified.

When the target total production volume is reached, "M1" is turned on.

When "M1" is turned on or "Y70" is turned off, the Machine A running status is cleared and operation is stopped.

While "B101" is turned on, "Machine B running (Y73)" is output.

While Machine B is operating, the "Machine B production volume (W100)" is displayed on the production volume display panel.

## 4.2.3 Machine A (station No.1) program

The following table lists the external signals.

X0	READY ON	Y70	Machine A READY
X1	Machine A error	Y71	Machine B READY
X2	Machine A operation start	Y72	Machine A operation started (running)
X3	Machine A READY	Y73	Machine B running
X4	Machine B operation start	Y40 to Y4F	Machine A production volume
X5	Machine A production count	Y50 to Y5F	Machine B production volume
B100	Machine B READY		
B101	Machine B running		
SM1 (*1)	Machine A programmable controller error	SM400 (*3)	Always ON signal
SB20 (*2)	Machine A network module status		

\*1: SM1 is special relay which is turned on when an error is detected on the programmable controller.

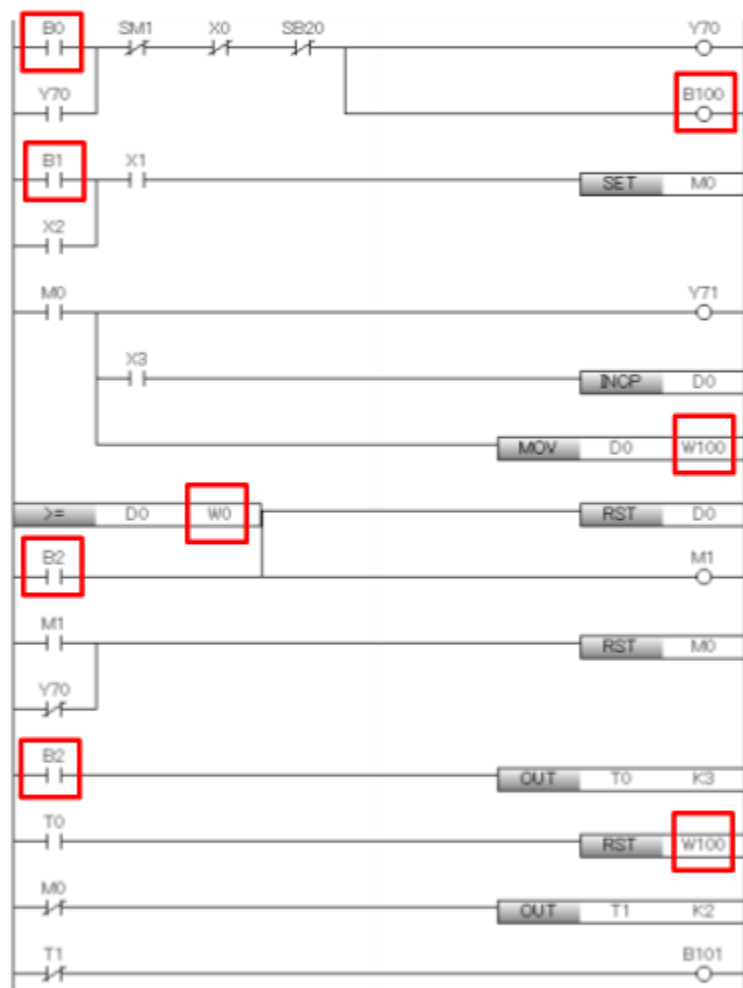
\*2: SB20 is link special relay which is turned on when an error occurs during communication between the network module and the CPU module.

\*3: SM400 is special relay which represents a normally open contact.

## 4.2.4

## Machine B (station No.2) control program

Devices enclosed in red are those used for communication.



When "B0" is turned on, "Machine B READY (Y70)" is also turned on (self hold).

When "B100" is turned on, Machine A is notified of the Machine B READY status.

The "Machine B operation start instruction (M0)" is turned on when "Machine B READY (X1)" and the "Machine B operation start instruction (B1)" are turned on.

When "M0" is turned on, the "Machine B operation start (running) (Y71)" is also turned on, and the machine starts operation.

When "X3" is turned on/off, the Machine B production volume is counted by "D0".

"Machine B production volume (D0)" is transferred to "W100", and Machine A is notified of the production volume.

"Production volume (D0)" is cleared and "M1" is turned on when "Total target production volume reached (B2)" is turned on either by reaching the target of Machine B or reaching the total production volume of Machine A.

When "M1" is turned on or "Y70" is turned off, the Machine B running status is cleared and operation is stopped.

"Machine B production volume (W100)" is cleared when "Total target production volume reached (B2)" is turned on and the setting time of the "Timer (T0)" elapses.

The "Machine B running (B101)" is turned on, and Machine A is notified that Machine B is running.  
("B101" is turned off when the operation stops and the setting time of the "Timer (T1)" elapses.)

**4.2.4****Machine B (station No.2) control program**

The following table lists the external signals.

X0	Machine B error
X1	Machine B READY
X2	Machine B independent operation start
X3	Machine B production count
B0	Machine B READY instruction (signal from Machine A)
B1	Machine B operation start instruction (signal from Machine A)
B2	Total target production volume reached (signal from Machine A)
SM1	Machine B programmable controller error
SB20	Machine B network module status
Y70	Machine B READY
Y71	Machine B operation start

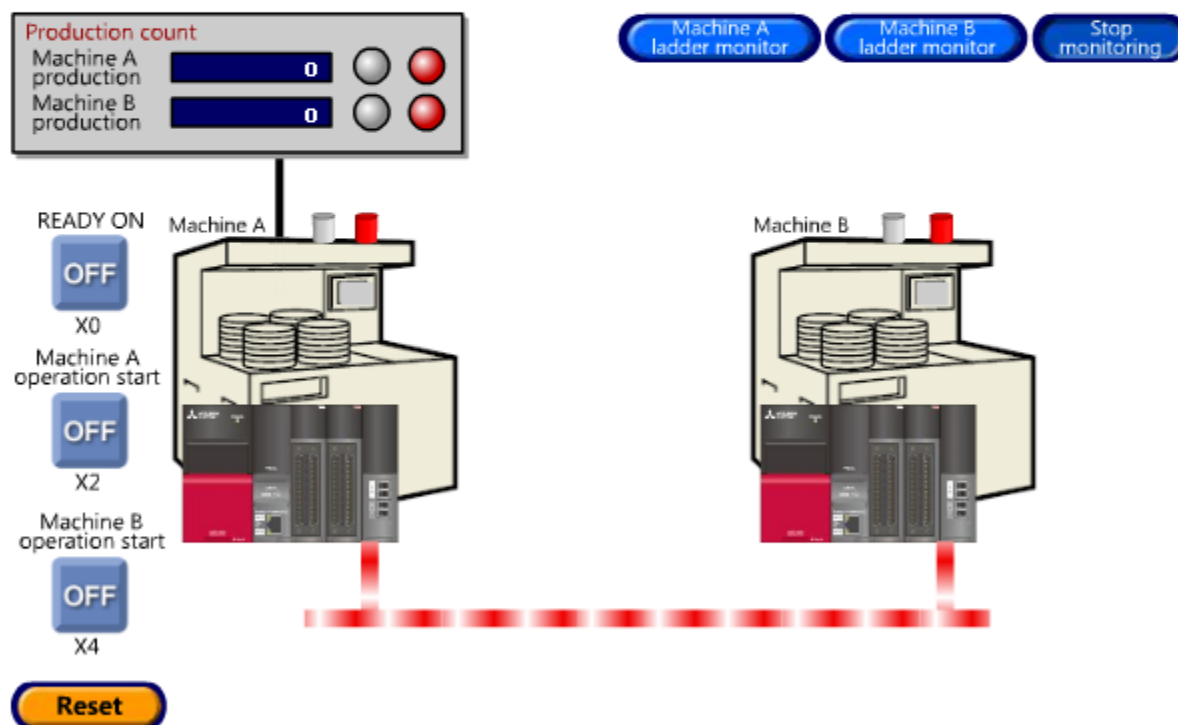
## 4.3

## Operation check



The following simulation shows the operation of the example system.

1. Click [X0] to make both Machine A and Machine B ready for operation.
2. Click [X2] to start Machine A operation and display the count value of the production volume in the production count area.
3. Click [X4] to start Machine B operation in the same manner as in step 2.
4. Click the [Machine A ladder monitor] or [Machine B ladder monitor] button to check the program operation. (Click [Monitor stop] to close the monitor.)
5. Operation ends when the total production volume of Machines A and B reaches 120.
6. Click the [Reset] button to return to the initial status.



## 4.4 Troubleshooting

This section describes the basic diagnostics procedure for a network failure that occurs at startup.

### 4.4.1 Troubleshooting procedure

Try the following procedure to resolve issues.

Check the LED indication on the module.

- Power supply module
- CPU module
- Network module



Check the module status using the engineering software.

- Module diagnostics



Check the network status using the engineering software.

- CC-Link IE Control Network diagnostics

If the "PROGRAM RUN" LED on the CPU module has turned off, the CPU module may not be operating.

Check the status of LEDs on the front of the network module.

(Refer to Section 4.4.2.)

If the LED indication shows that an error has occurred, check the detailed error information using the module diagnostics function in the engineering software, and eliminate the error cause.

(Refer to Section 4.4.3.)

Use the CC-Link IE Control Network diagnostics function in the engineering software to check the network status.

(Refer to Section 4.4.4.)


## 4.4.2

## Checking for errors by the LED indication

If the network does not seem to be operating normally, check the network status using the LEDs on the front of modules without having to access the engineering software.



RUN	On	Normal operation
	Off	Hardware failure
ERR	On/Flashes	Error
	Off	Normal operation
PRM	On	Operating as the control station
	Off	Operating as a normal station
D LINK	On	Data link in progress (cyclic transmission in progress)
	Flashes	Data link in progress (cyclic transmission stopped)
	Off	Data link not in operation (disconnected)
SD/RD	On in green	Data being sent or received
	Off	Data not sent or received
L ERR	On	Line error (cable disconnection or similar error)
	Off	Line is normal

 : LED indication status when communication is not performed normally

## 4.4.3

## Checking errors using module diagnostics

If you have access to the engineering software, open the system monitor from the [Diagnostics] menu and select [Module Diagnostics].

Error codes of module, descriptions of errors, and troubleshooting procedures appear.

The screenshot shows the 'Module Diagnostics(Start I/O No. 0080)' window. At the top, the 'Module Name' is 'RJ71GP21-SX' and 'Production information' is '1812461760211211'. The 'Supplementary Function' is set to 'CC IE Control Diagnostics'. A 'Monitoring' button is highlighted in green. Below this, a table lists error information:

No.	Occurrence Date	Status	Error Code	Overview
1	2017/12/21 14:07:07.099	Major	3001	Station number duplication detection

Below the table is a legend for error status: Major (red triangle), Moderate (orange triangle), and Minor (yellow triangle). A 'Cause and corrective action' section provides detailed information:

Parameter information	Duplication type information
Parameter type :Module parameter I/O No. :0080 ParameterNo. :7100	Duplication type information:Station number duplication
<b>Cause</b>	* A module with the same station number was found in the same network. * Multiple control stations were detected in the same network.
<b>Corrective Action</b>	* Correct the station number or station type of the station where the error was detected. * After taking the above actions, power off and on or reset all stations where the error was detected.

Module Diagnostics window



## 4.4.4

# Checking network status using CC-Link IE Control Network diagnostics

CC-Link IE Control diagnostics graphically shows the actual network wiring. This helps you to quickly identify the error location and troubleshoot the issue.

On the GX Works3 menu, select "Diagnostics" - "CC-Link IE Control Diagnostics (Optical Cable)" to open the window shown below.

The screenshot displays the 'CC-Link IE Control Diagnostics (Optical Cable)' window. At the top, it shows 'Module1 Network No.1 Total Number of Stations: 2I/O Master Station [Block1: 0,Block2: 0] Network Type:CC-Link IE Control'. A network diagram shows two stations, with Station 1 highlighted as the 'Selected station'. Below this, the 'Display Selected Station Network Equipment Status' window is open for Station No. 1, showing a 'Cable Disconnected on IN Side' error. A status panel for the station shows 'RUN' as green and 'ERR' as black. A detailed diagram of the station's network ports shows a starburst icon at the input side, indicating the disconnection point.

Configuration of the network and status of each station

Selected station

Occurs of a cable disconnection error

The location of the disconnection can be easily identified.

Displays the detailed status of the selected station (during normal operation).

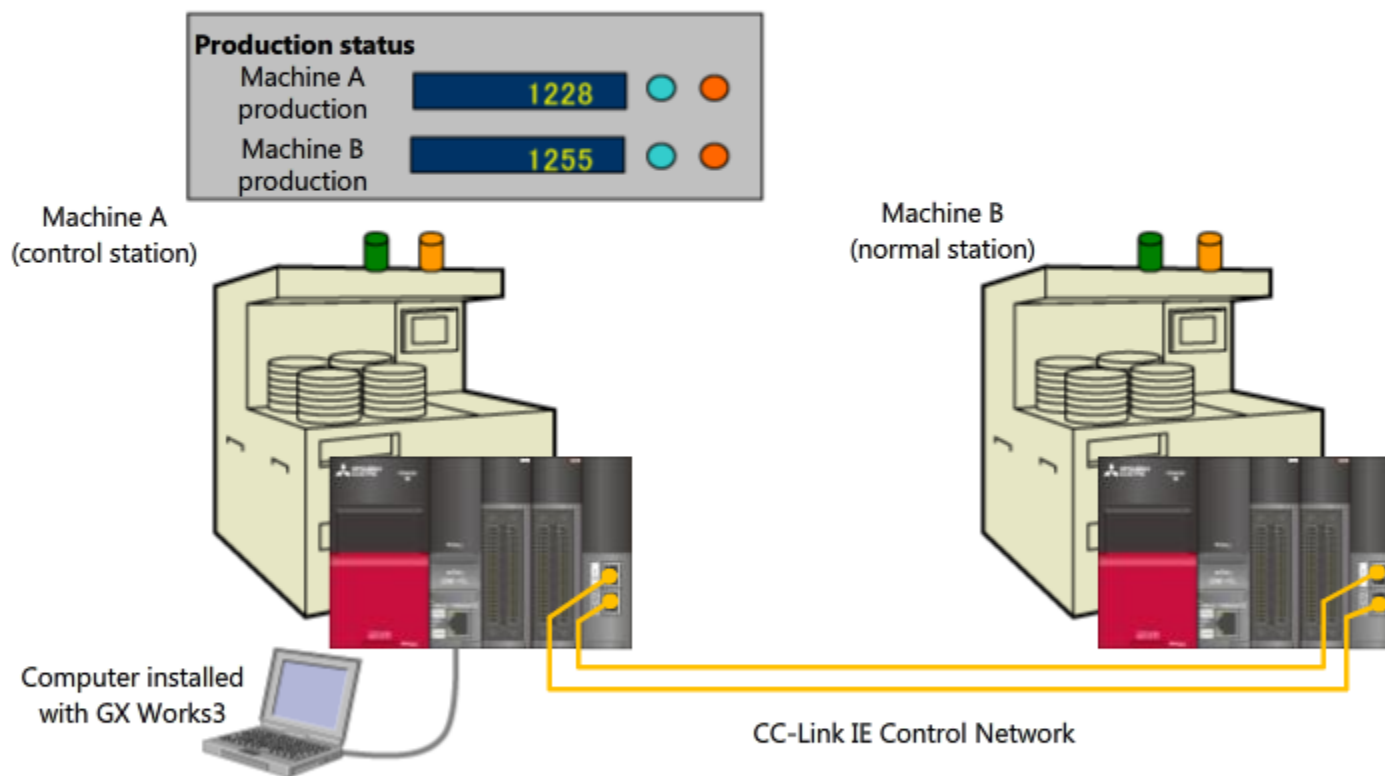
CC-Link IE Control Diagnostics (Optical Cable) window

## 4.5

## Remote monitoring of programs on other stations

This section describes the procedure to access other stations over the CC-Link IE Control Network to transfer and monitor programs.

Machine B (programmable controller) can be accessed remotely from the computer connected to Machine A (programmable controller). An operator can view the status of CPU module in a remote control panel from a nearby control panel without having to walk to the remote control panel.

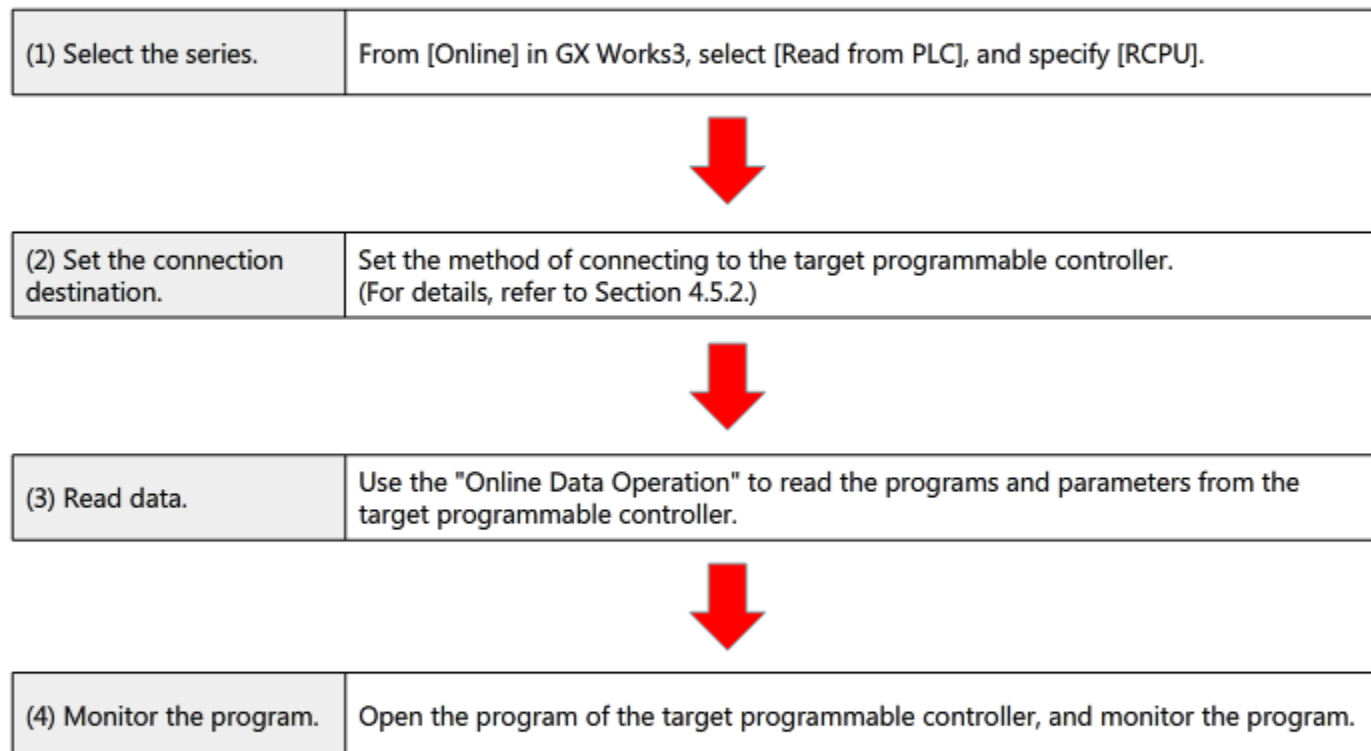


## 4.5.1

# Operating procedure for monitoring other stations

To access other stations, the connection destination settings in GX Works3 must be configured to use CC-Link IE Control Network.

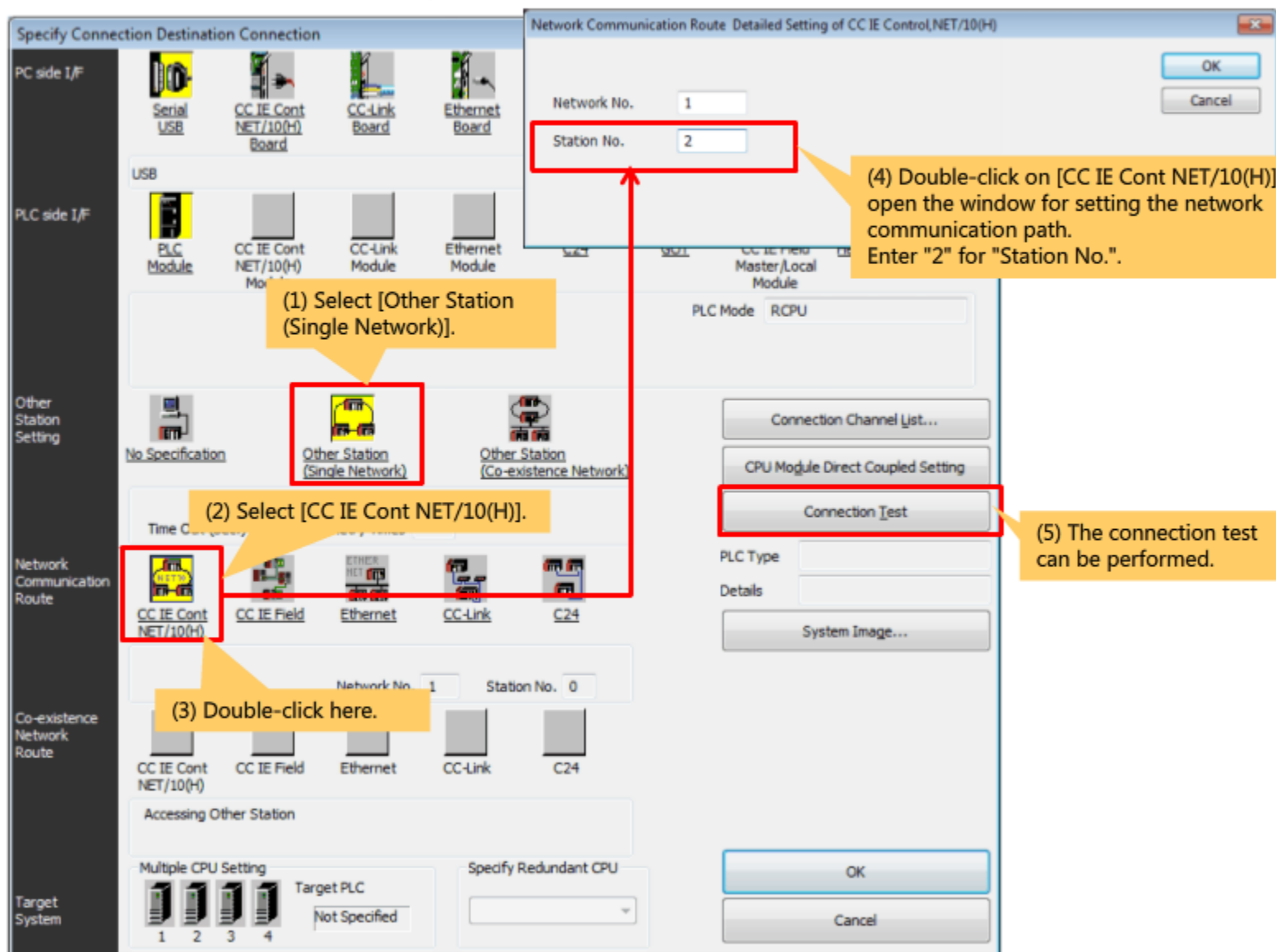
The following figure shows the procedure to monitor programs of other stations when a GX Works3 project is not specified.



## 4.5.2

## Settings for connecting to Machine B

The following figure shows the connection destination settings required to connect to Machine B (station No.2) from the computer with GX Works3 that is physically connected to Machine A (station No.1) over the network.



Connection destination setting window

In this chapter, you have learned:

- Example control program that uses the link device
- Diagnostics procedure when network fails to operate
- Method of monitoring programs of other stations using the engineering software

#### Important points

Control program	Information in link special relays and link special registers can be used for interlock signals. To transfer on/off signals, the transmission delay time must be factored into the setting of the on/off time. To send multiple word data at a time, the "32-bit data assurance" or the "station-based block data assurance" function can be used.
Measures to take when network fails to operate	If the network is not operating normally, check the LED indication on the CPU module and the network module to diagnose the problem. Errors can also be checked using the module diagnostics and network diagnostics functions in the engineering software.
Monitoring other stations	To monitor other stations, the network number and the station number of the target programmable controller must be configured in the connection destination settings.

Now that you have completed all of the lessons of the **CC-Link IE Control Network (MELSEC iQ-R Series)** course, you are ready to take the final test. If you are unclear on any of the topics covered, please take this opportunity to review those topics.

There are a total of 10 questions (36 items) in this Final Test.

You can take the final test as many times as you like.

### How to score the test

After selecting the answer, make sure to click the **Answer** button. Your answer will be lost if you proceed without clicking the Answer button. (Regarded as unanswered question.)

### Score results

The number of correct answers, the number of questions, the percentage of correct answers, and the pass/fail result will appear on the score page.

Correct answers : 6

Total questions : 6

Percentage : 100%

To pass the test, you have to answer **60%** of the questions correct.

Proceed

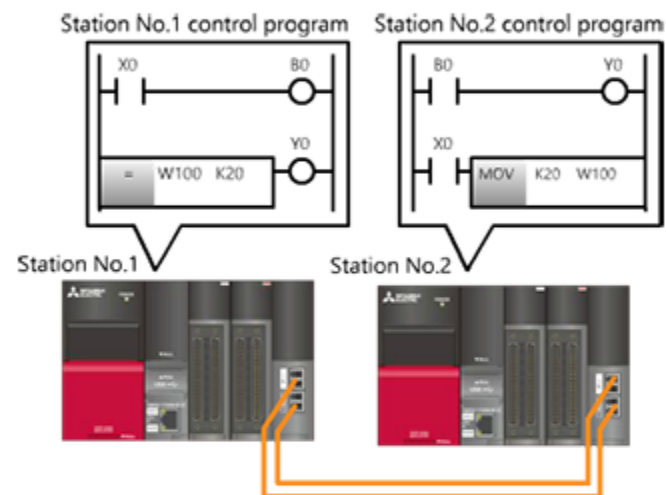
Review

- Click the **Proceed** button to exit the test.
- Click the **Review** button to review the test. (Correct answer check)
- Click the **Retry** button to retake the test again.

# Test Final Test 1

- ✓ The following sentences explain the basic operation of programmable controller network.  
Please select the correct terms to complete the sentences.

- (1) The contact "X0" of station No.1 programmable controller is turned on.
- (2) The coil "B0" of  programmable controller is turned on. ✓
- (3) The ON signal is transmitted to the contact "B0" of  programmable controller. ✓
- (4) The coil "Y0" of station No.2 programmable controller is turned on.
- (5) The contact "X0" of station No.2 programmable controller is turned on.
- (6) "20" is saved in the register "W100" of  programmable controller. ✓
- (7) "20" is transmitted to the register "W100" of  programmable controller. ✓
- (8) The coil "Y0" of station No.1 programmable controller is turned on.



## Test

## Final Test 2



- ✓ The following sentences explain how the link device name and network information of CC-Link IE Control Network are transferred to the local device. Please select the correct terms to complete each sentence.

Among CPU module link devices used in the control program, a bit device is called  ✓

and represented by the symbol  ✓.

Among CPU module link devices used in the control program, a word device for 16-bit data is called

✓ and represented by the symbol  ✓.

By  ✓, data in the link device of the CPU module (B/W) is exchanged with the bit device

✓ and the word device  ✓ of the link device of the network module.

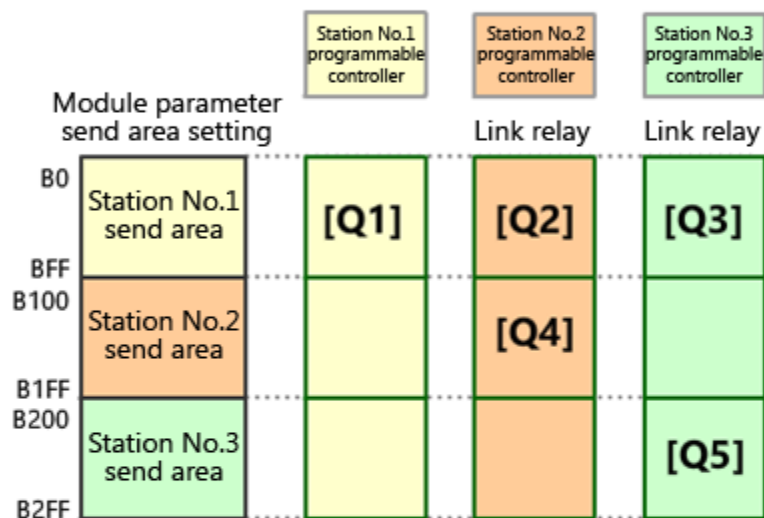




**Test**

**Final Test 3**

✓ The following shows the relationship between the send area and the receive area.  
 Please select the correct device areas for each station when the send area is set as follows by the module parameters.



Q1  ✓   
 Q2  ✓   
 Q3  ✓   
 Q4  ✓   
 Q5  ✓

- ✓ The following sentences explain cyclic transmission and transient transmission.  
Please select the correct transmission method for each sentence.

[Q1] No program is required for data communication.

[Q2] Data is exchanged periodically and automatically in an area specified by the module parameter.

[Q3] Data is exchanged between programmable controllers connected in the same network, only when requested.

[Q4] Data communication requires programs containing dedicated instructions.

[Q5] Communication is performed automatically just by setting the module parameters.

Q1 Cyclic transmission ▼



Q2 Cyclic transmission ▼



Q3 Transient transmission ▼



Q4 Transient transmission ▼



Q5 Cyclic transmission ▼



## Test

## Final Test 5



- The following sentences explain the configuration of CC-Link IE Control Network. Please select the correct terms to complete each sentence.

A  is assigned to each network in CC-Link IE Control Network.



All the network modules connected in the same network are identified by assigning a .



One of the network modules must be used as the , and other programmable controllers



are set as .



## Test

## Final Test 6



- The following sentences explain module parameter refresh settings.  
Please select the correct terms to complete each sentence.

Refresh settings are parameters to specify the send range within the link device of the network module  .

Data in this device is sent to the link device of the CPU module  so that they can be used in the control program.

&lt;&lt;

&gt;&gt;

## Test

## Final Test 7



✓ The figure below shows the connection example of an optical cable.

Station No.1 to No.3 are sequentially connected to create a duplex loop system.

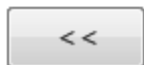
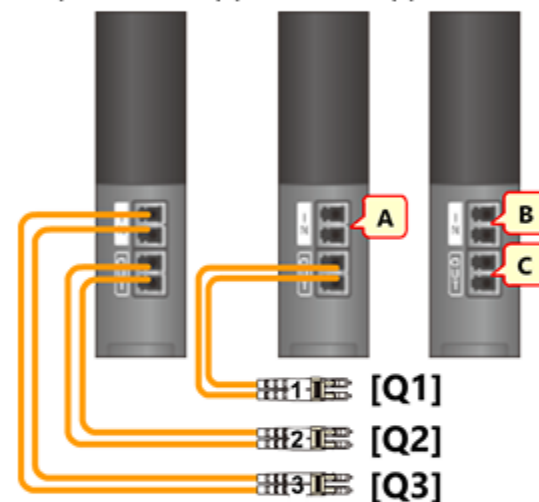
Please refer to the following figure and select the most appropriate module-side connector (A, B, or C) for each cable-side connector (1, 2, or 3).

Q1 B ✓

Q2 A ✓

Q3 C ✓

Station No.1 (control station) Station No.2 (control station) Station No.3 (control station)



## Test

## Final Test 8



The following shows LED indication on the network module.

For the stations No.1 and No.2, please select the LED indication that shows normal communication.

Station No.1 (control station): [Q1]

Station No.2 (normal station): [Q2]

Q1

Q2



## Test

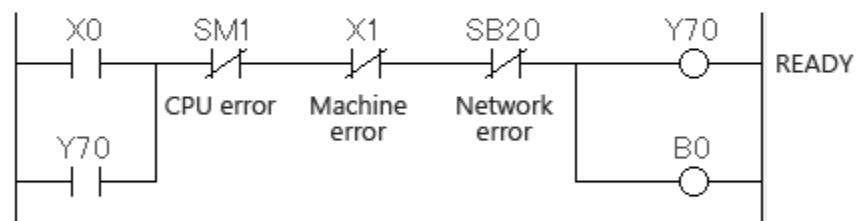
## Final Test 9



- ✓ The following description is about the control program creation method that is unique to the network operation. The diagram shown below is part of the control program for CC-Link IE Control Network. Please select the correct terms to complete the description about interlocks.

Interlocks are used in control programs in combination of CPU module status signals, machine status signals, and  status signals.

CPU module status signals correspond to  special relays. Network status signals correspond to CC-Link IE Control Network  link special relays.



Select the correct description about the diagnostic function of CC-Link IE Control Network.

- Locations of network errors and error information appear on the engineering software window in an easily understood format.
- Engineering software is required to check network status.



**Test****Test Score**

You have completed the Final Test. Your results are as follows.  
To end the Final Test, proceed to the next page.

Correct answers : **10**

Total questions : **10**

Percentage : **100%**

**Congratulations. You passed the test.**

You have completed the **CC-Link IE Control Network (MELSEC iQ-R Series)** course.

Thank you for taking this course.

We hope you enjoyed the lessons and the information you acquired in this course will be useful in the future.

You can review the course as many times as you want.

**Review**

**Close**