MITSUBISHI ELECTRIC
Changes for the Better

PLC
CC-Link IE Controller Network

This course is for participants who will configure a CC-Link IE Controller Network for the first time.

L(NA)00109ENG

Introduction Purpose of the Course

This course explains the CC-Link IE Controller Network basics, and is intended for those who configure a CC-Link IE Controller Network for the first time.

By taking this course, a participant will learn the basic CC-Link IE Controller Network functions such as data communications between multiple programmable controllers connected to a single network. A participant will also understand of the data delivery formats, the network specifications and settings, and the module start-up procedure.

This course requires the basic knowledge of FA networks, programmable controllers, sequence programs, and GX Works2.
Taking the following courses is recommended before starting this course.

1. FA Equipment for Beginners (Industrial Network)
2. MELSEC-Q Series Basics Course, or MELSEC-L Series Basics Course
3. GX Works2 Basics Course

Introduction Course Structure

The contents of this course are as follows.
We recommend that you start from Chapter 1.

Chapter 1 - CC-link IE Controller Network Overview

Explains the CC-Link IE Controller Network basics.

Chapter 2 - CC-link IE Controller Network Device Configuration and Specifications

Explains the CC-Link IE Controller Network configuration, specifications, and settings.

Chapter 3 - Starting Up the CC-link IE Controller Network

Explains the CC-Link IE Controller Network operation procedures from the start-up to the operation tests.

Chapter 4 - CC-Link IE Controller Network System Test Operation

Explains the procedures from the program creation to the operation check. Also explains the basic network diagnostics and troubleshooting procedure using an example system.

Final Test

Passing grade: 60% and higher.

Introduction How to Use This e-Learning Tool

Go to the next page		Go to the next page.
Back to the previous page		Back to the previous page.
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. Window such as "Contents" screen and the learning will be closed.

Introduction Cautions for Use

Safety precautions

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

Precautions in this course

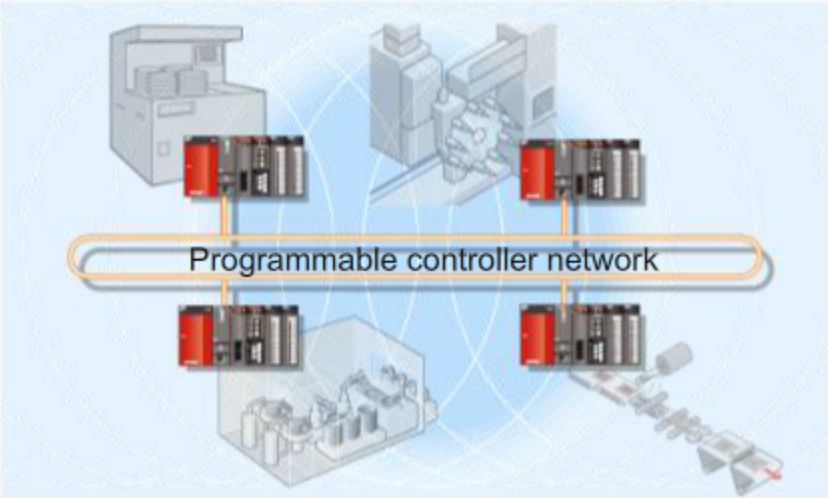
- The displayed screens of the software version that you use may differ from those in this course.

  This course uses the following software version:

  - GX Works2 Version 1.493P

Chapter 1 CC-Link IE Controller Network Overview

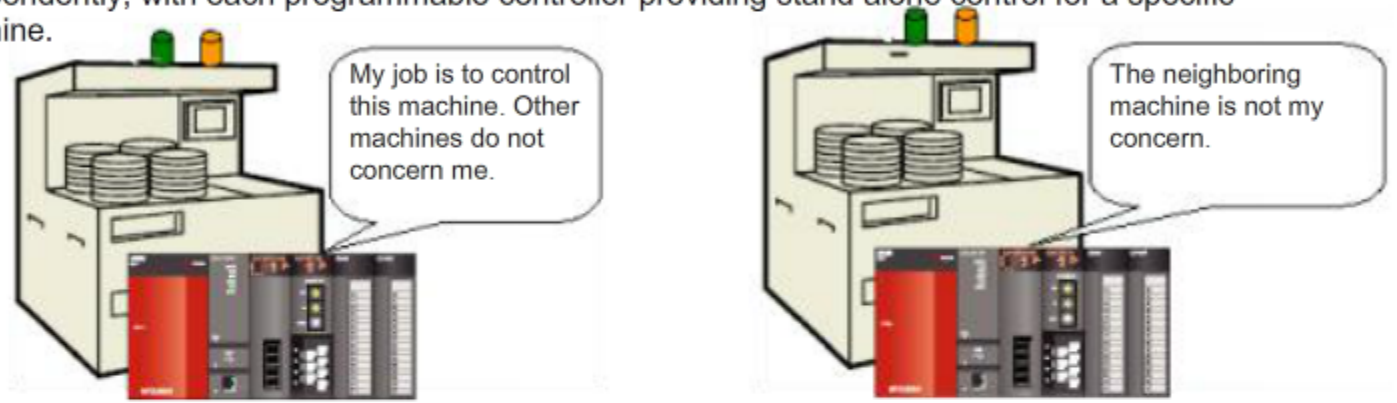
Chapter 1 explains the basics of the CC-Link IE Controller Network, which is a programmable controller network for the MELSEC-Q Series and MELSEC-L Series. This chapter also covers programmable controller network data sharing and data transmission, and data communication formats in the CC-Link IE Controller Network.



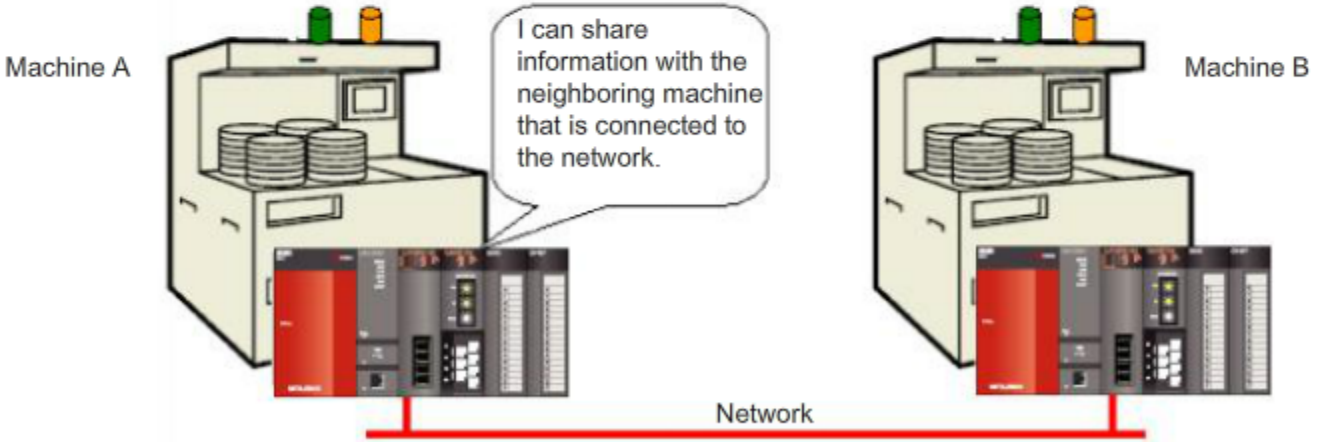
1.1 Why Have a Programmable Controller Network

Why is a programmable controller network necessary?

Before the introduction of programmable controller networks, machines were mostly operated independently, with each programmable controller providing stand alone control for a specific machine.



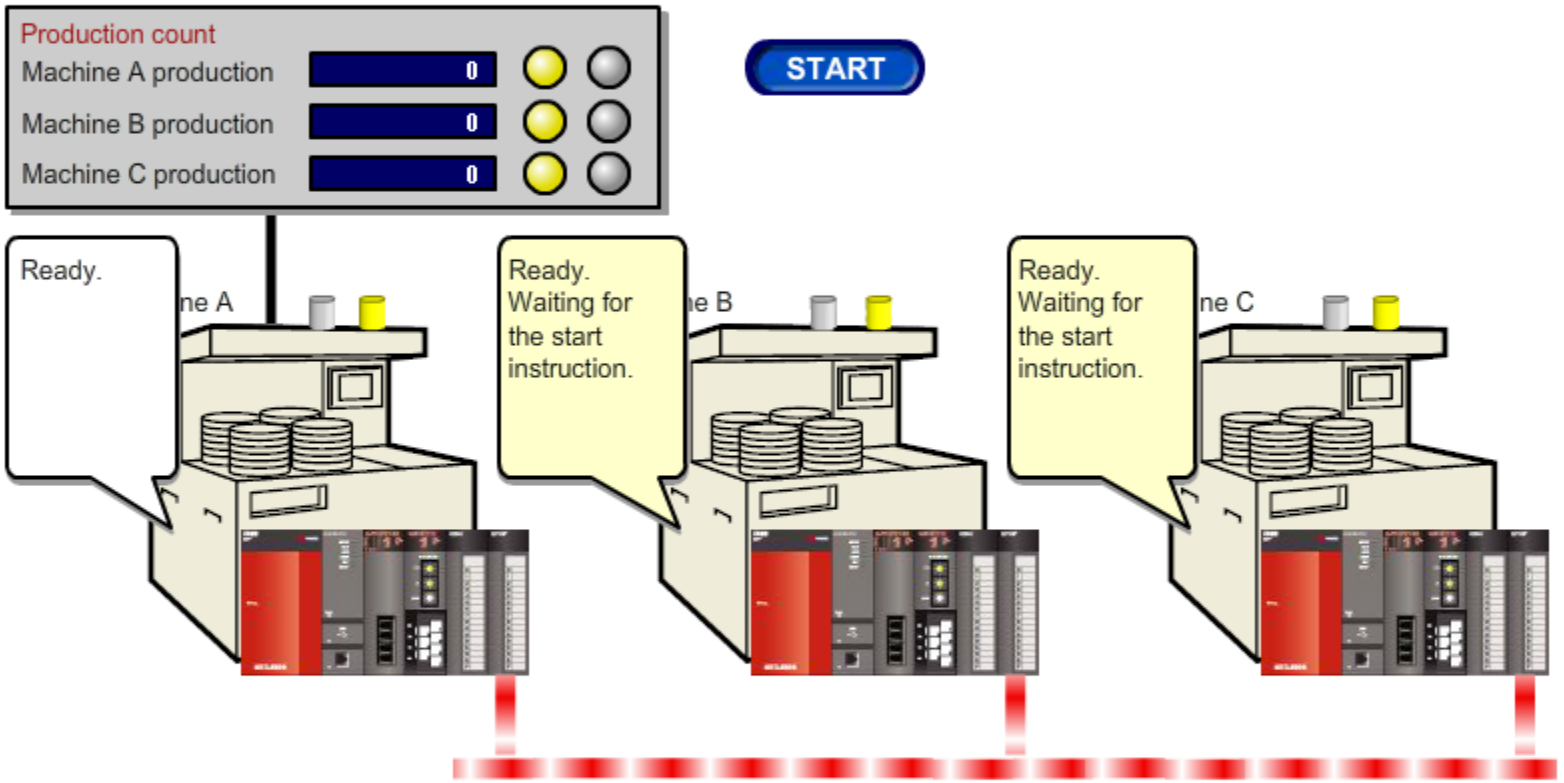
With the increasing automation of production equipment, it has become necessary to have data shared between machines in order to realize a centralized control of different machine's production.



1.2 Programmable Controller Network Operation

The programmable controller network operation is explained using an example system given below.

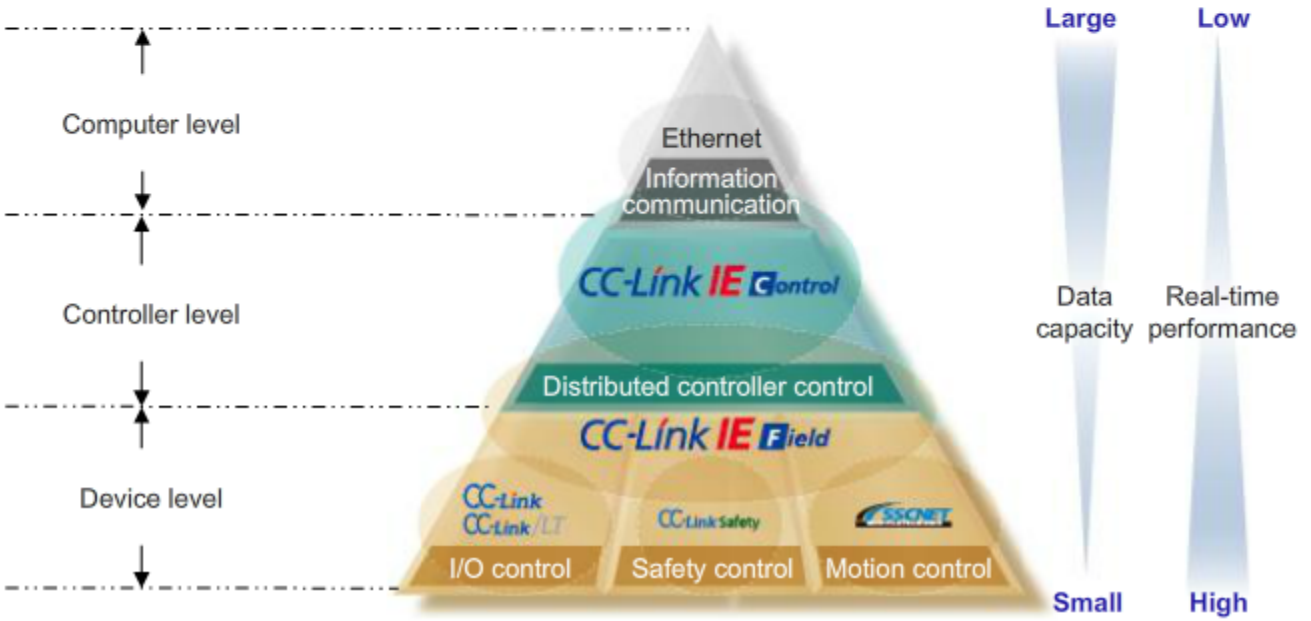
Please click the [START] button to visualize the machine operation.



1.3 CC-Link Family Structure

A production system network involving programmable controllers consists of different network layers where dedicated communication is performed. These multiple layers are collectively referred to as the CC-Link Family. The "CC-Link IE Controller Network" is an Ethernet-based integrated open network that provides a seamless communication from the IT layer to the field layer. Devices manufactured by Mitsubishi and its partners are connectable to CC-Link IE, and sharing its functionality and capabilities.

Type		Main network	Summary
Computer level	Information communication	Ethernet	Used for collecting production statuses for factory management and production control.
Controller level	Machine-to-machine control	CC-Link IE Controller Network	Connects different manufacturing equipment. Large-capacity link devices are used to provide data communication in a high speed. This real-time inter-controller communication is suitable for transmitting data directly related to machine operations.
		CC-Link IE Field Network	High-speed, large-capacity field network for handling a mixture of machine control data and management data.
Device level	I/O control Safety control Motion control	CC-Link	Provides real-time communications between machine controllers and drives. Control and information communications can be handled simultaneously.



1.4 CC-Link IE Types

There are two types of CC-Link IE: The "CC-Link IE Controller Network" and the "CC-Link IE Field Network". Their differences are summarized in the table below.

	CC-Link IE Controller Network	CC-Link IE Field network
Control application	Controller distributed control	Controller distributed control, remote I/O control
Communication medium	Fiber optic cable: high cost, requires expertise to install, superior noise resistance	Twisted-pair cable: low cost, easy to install
Topology	Ring: high reliability ensured by duplex loop	Star, line, ring: flexible wiring
Number of device points / networks	Words: 128k points Bits: 32k points	Words: 16k points Bits: 32k points
Reliability	Control station switching function: If a control station fails, the data link is maintained by substituting a normal station for the control station.	Sub master function: If the master station fails, the data link is maintained by substituting the sub master station for the master station.
Station-to-station cable distance	550m	100m
Total length	550 (m) × 120 (max. number of connectable stations) = 66 (km)	For line connection: 100 (m) × 120 (max. number of connectable stations) = 12 (km)

High reliability

All-round

Wire as desired

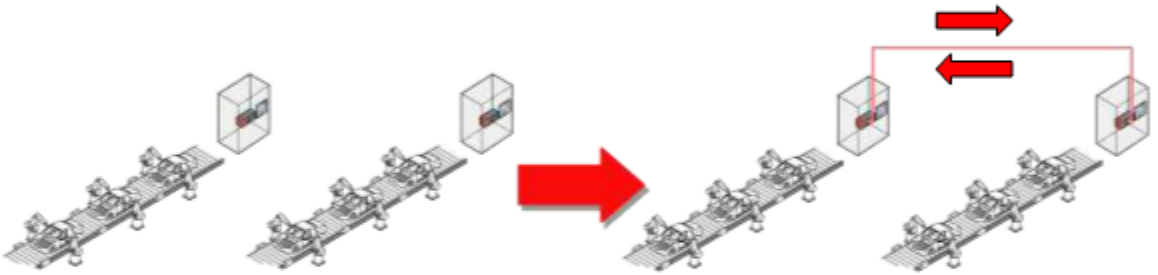
Large capacity

Long distance

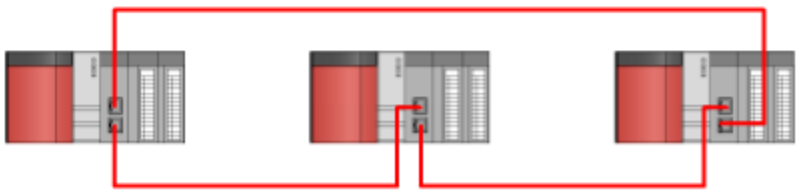
1.5 CC-Link IE Controller Network Characteristics

This section explains the CC-Link IE Controller Network applications and its wiring method.

Application

Network purpose	Explanation
Information sharing (cyclic transmissions by master station and local stations)	Information is shared between programmable controllers. CC-Link IE Controller Network is used to connect different equipment (controllers) to a network. This provides improved flexibility, expandability, and maintainability to an automated system. Benefits of information sharing: • Improves equipment and line productivity. • Enables full factory management by collecting traceability information. • Enables quick detection of communication line failures and unit faults. 

Wiring method

Wiring method	Positive features
Ring connection: stations are connected in a loop. 	• No bulky wiring. • Because stations are connected to each other, a single disconnected line does not affect the whole system.

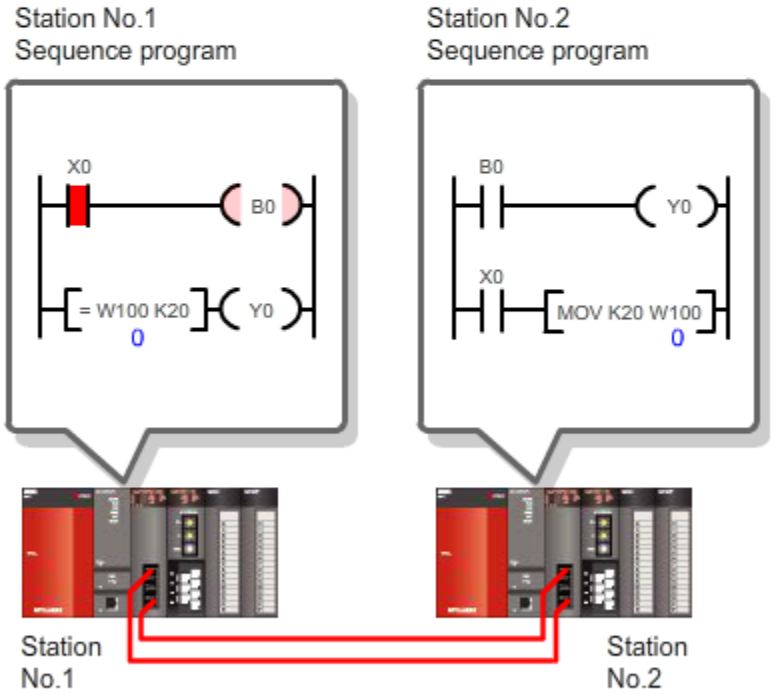
1.6 Data Communication Procedure

Sharing information

In order for programmable controllers to share information, signals and operation data of a single programmable controller must be sent to other programmable controllers.

As shown in the animation below, the programmable controllers share information by using the link dedicated devices "B" and "W".

Please click the [START] button to begin the explanation of the programmable controller CC-Link IE Controller Network.



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 saved 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.

Note) In this example, the "B" link relay and "W" link register are used.

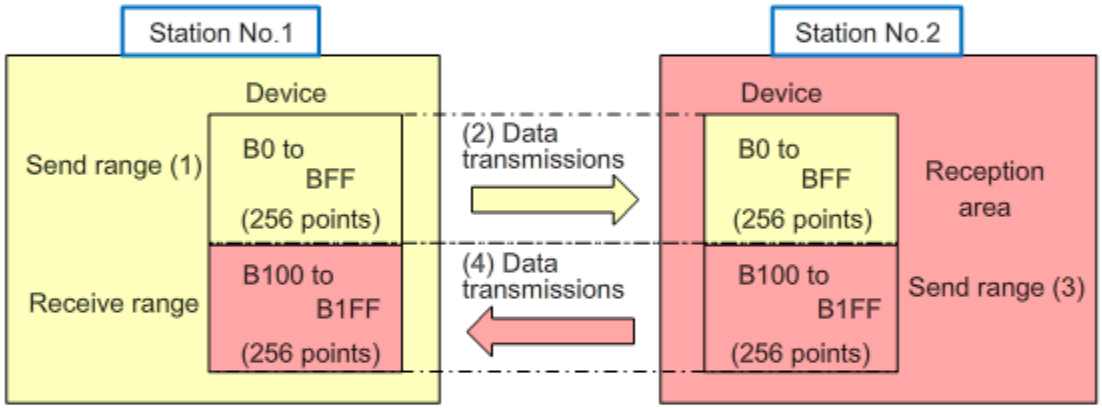
In the CC-Link IE Controller Network, each programmable controller in the network reserves link devices for information sharing.

1.6 Data Communication Procedure

Correspondence between the link device areas and stations

In order for the programmable controllers in the CC-Link IE Controller Network to share information (signal states, numerical data, etc), each programmable controller reserves a specific device area for linking with other programmable controllers. Periodic data exchanges occur between these areas.

An example of such a device area in the CC-Link IE Controller Network is shown below, together with the data exchanged. In this example, the "B" link relay is used. (Details are given on the following page.)



(1) The station No.1 devices B0 to BFF are set as the send range.
(2) The data saved in the station No.1 devices B0 to BFF are automatically sent to the station No.2's B0 to BFF.
(3) The station No.2 devices B100 to B1FF are set as the send range.
(4) The data saved in the station No.2 devices B100 to B1FF are automatically sent to station No.1's B100 to B1FF.

Important points
The signal and data of a programmable controller can be sent to other programmable controllers simply by setting such data at its own-station's (*1) send range devices. In the same manner, the receiving-side programmable controller can retrieve the other-programmable controller's information simply by referencing their own-station's receive range device, without regard to the network.

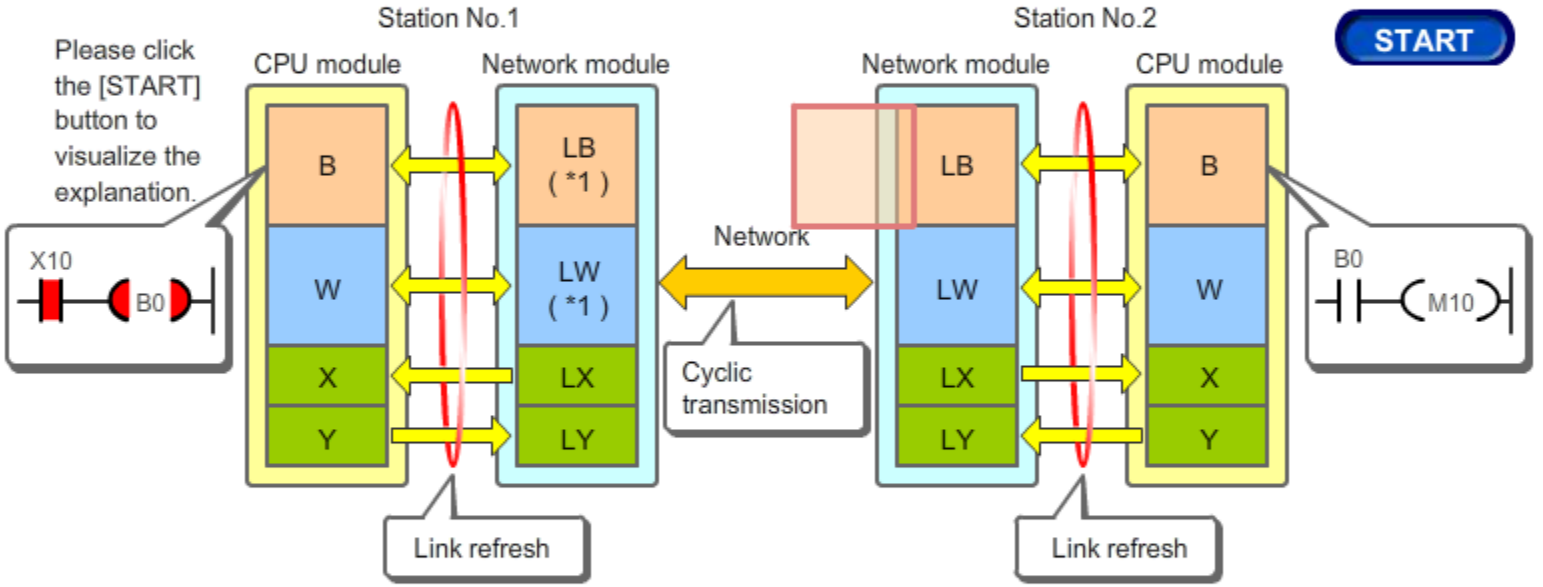
*1: The programmable controllers which are connected to the network are identified by the station Nos. "Own station" denotes a programmable controller itself, and "other station" denotes the other programmable controllers.

1.6 Data Communication Procedure

Device data exchanges

Dedicated link devices are used to share information within the CC-Link IE Controller Network. These devices are the "B" link relay (bit data) and the "W" link register (16-bit integer data).

The animation below shows an example of operation which occurs from the "B0" ON at station No.1, and ends with the "B0" ON at station No.2.



The "B0" is turned ON by the sequence program of station No.1.

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

By cyclic transmission (*3), the "B0" ON information is transmitted 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 transmitted from the network module to the CPU module, and "B0" is turned ON.

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

*1 "LB" and "LW" are link devices handled internally by the network modules.

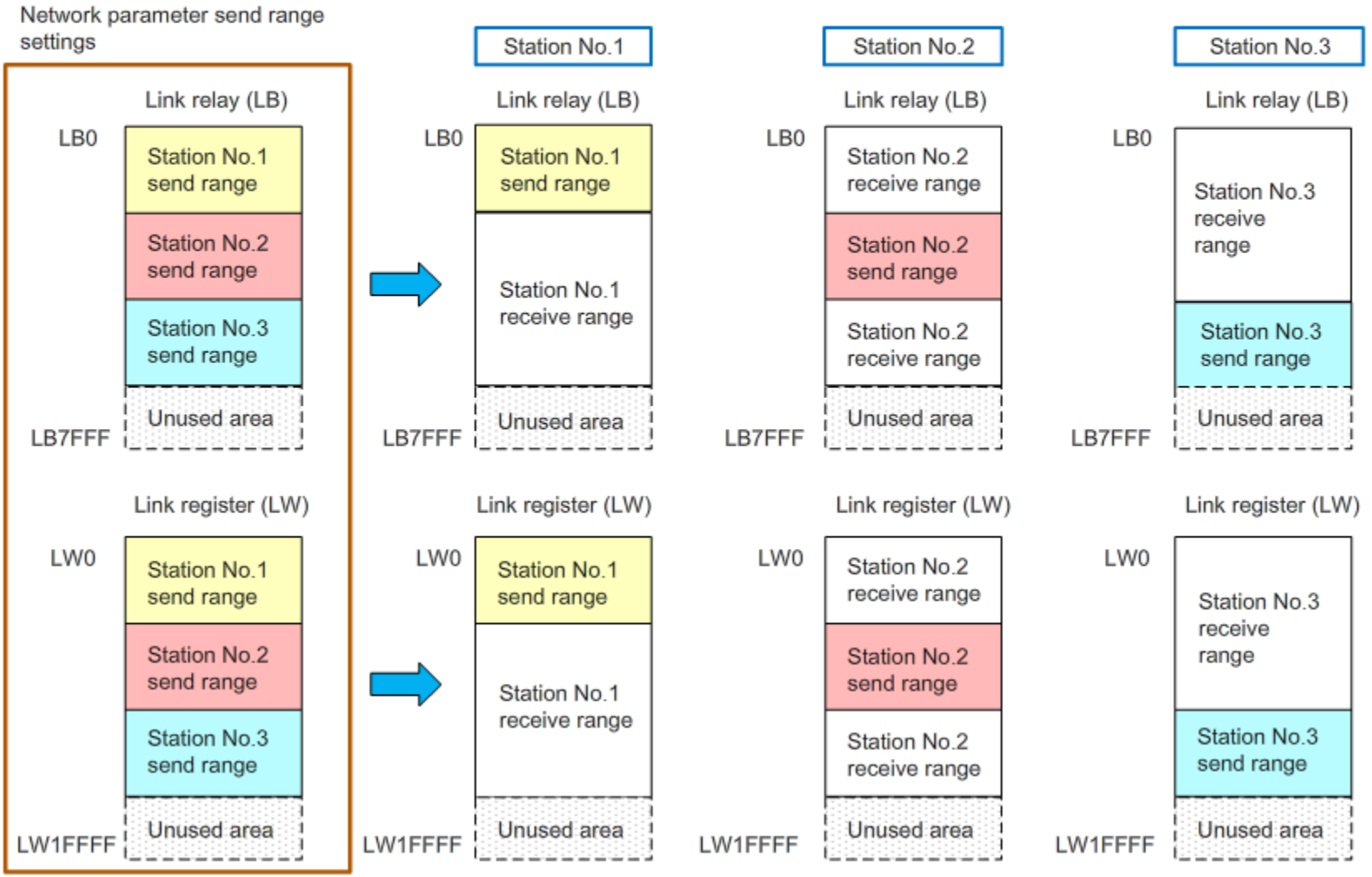
*2 A "link refresh" is the device data communication which occurs between the CPU module's "B/W" devices and the network module's "LB/LW" devices.

A link refresh occurs at each scan of the CPU module.

*3 A "cyclic transmission" is the data communication format used by the CC-Link IE Controller Network. Further details are given in Section 1.8.

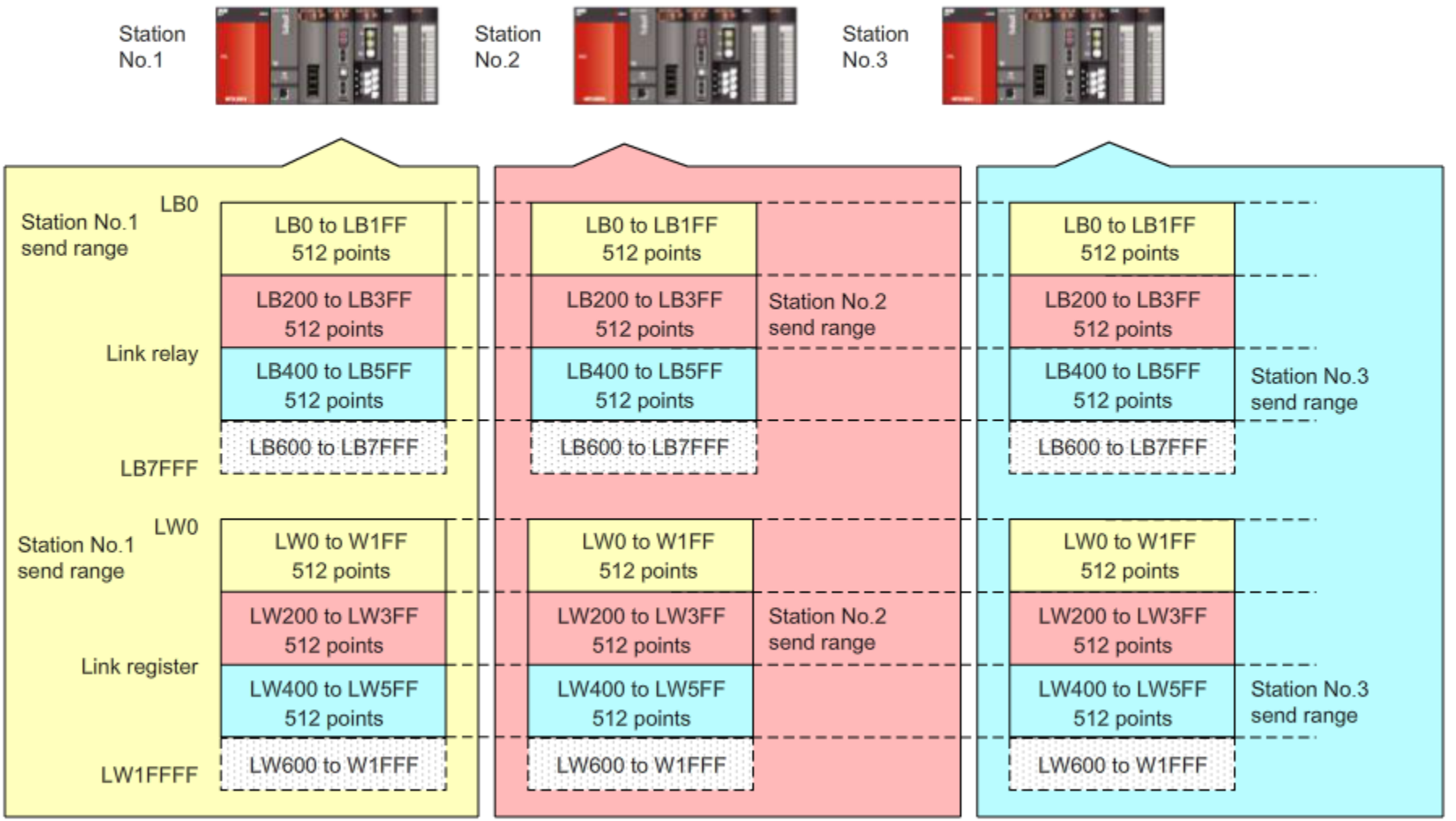
1.7 Link Device Assignment Procedure

A link relay (LB) and link register (LW) can be set in the available link device range of the CPU module.
GX Works2's network parameter setting function can be used to assign a "send range" in each station.
One station's link device area, which is set as the "send range", is handled as the "receive range" at other stations.



1.7 Link Device Assignment Procedure

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



1.8 Data Communication Format

As shown in the table below, the CC-Link IE Controller Network uses two data communication formats.

The table below summarizes differences between these formats and the benefits of each.

Format	Data communication overview	Send/receive program
Cyclic transmission	Data in the area set in advance by network parameters (*1) are periodically and automatically exchanged.	No program required. (Communication occurs in accordance with the network parameter settings.)
Transient transmission	Data are exchanged between programmable controllers only when requested. The transmission/reception are performed in between of cyclic transmissions.	Program is required. (Send/receive operation is executed by a program containing a dedicated instruction.)

*1: This setting is used for CC-Link IE Controller Network control. Further details are given in Section 2.3.

The CC-Link IE Controller Network can use the cyclic and transient transmissions simultaneously.

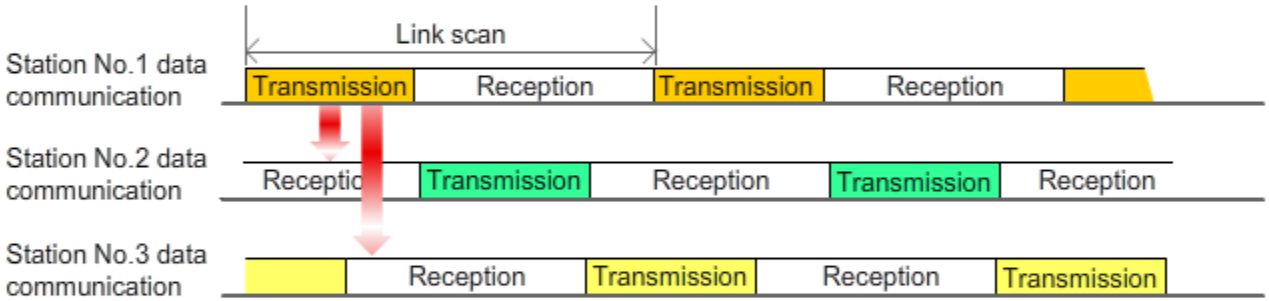
This course features the cyclic transmission, which is the main transmission method used in the CC-Link IE Controller Network.

1.9 Data Communication by Cyclic Transmission

Periodic data communication

In cyclic transmissions, programmable controllers send their own data sequentially within a given interval. This data is received by other stations which are not transmitting at that time.

To ensure complete data exchange, the transmission authority called token pass shifts from one programmable controller to the next in sequence. Because transmission occurs in a periodic manner, this format is referred to as a "cyclic transmission" format. The one cycle of send authority shifting (token passing) is referred to as a "link scan". Each programmable controller is granted the send authority once in each link scan, and this is referred to as an "on-time" condition. The following example shows the cyclic transmission timing for each station.



Features of a programmable controller based control network

In a cyclic transmission, data transmissions without collision are possible with many network-connected stations and in a high transmission frequency. This is because the stations perform their transmissions in a sequential manner, with only one transmission occurring at a time.
For this reason, cyclic transmission, which offers a reliable real-time communication, is suitable for controlling production equipment, etc.

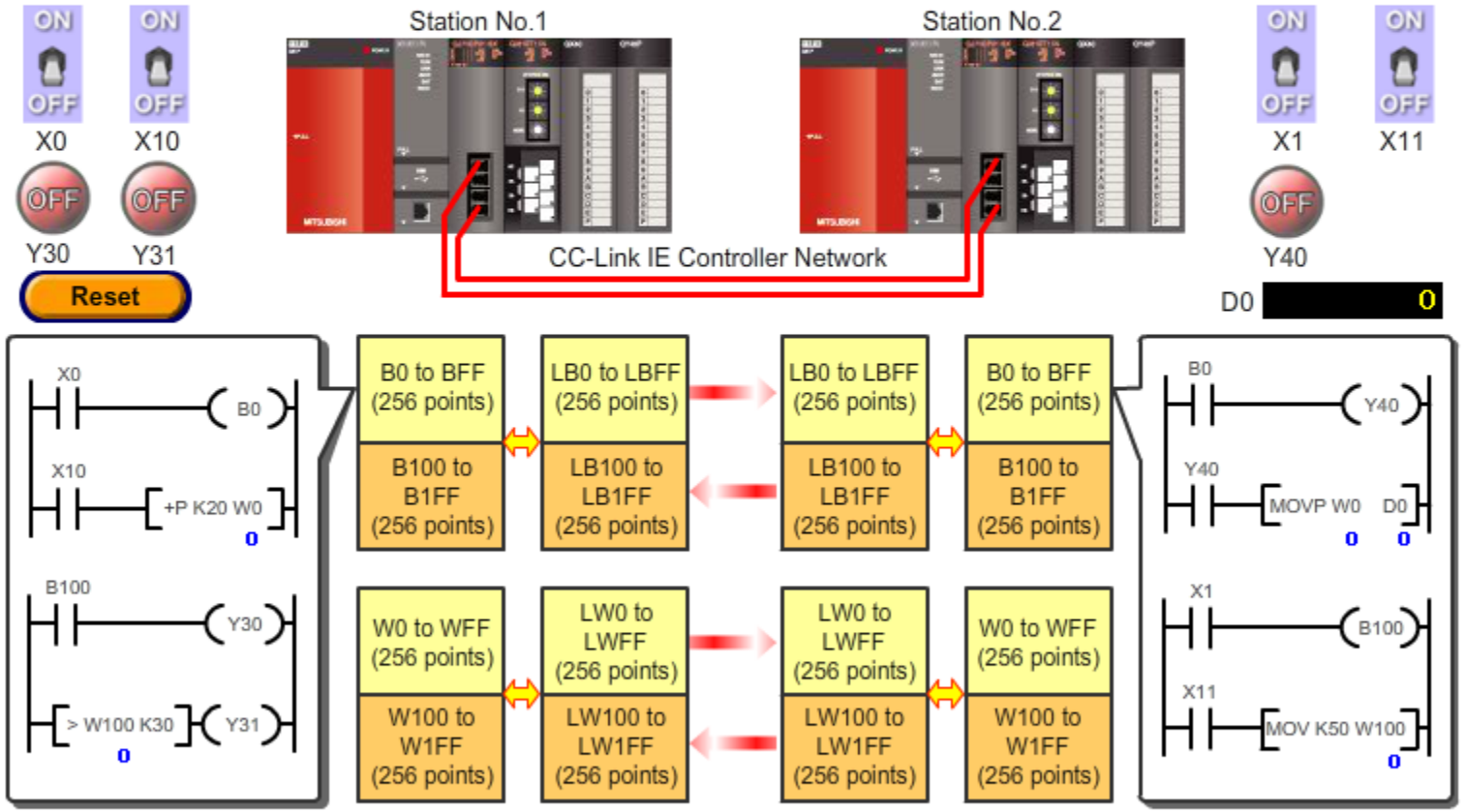
A function-distributed system, where functions are divided between network-connected CPU modules, offers the following advantages to the individual systems that are controlled by several CPU modules:

- Less processing load for each CPU module.
- A failure in a single location will have the minimal effect to the others.

1.9 Data Communication by Cyclic Transmission

To perform high-speed cyclic transmissions, link device data is communicated between stations with minimum transmission delay. The link devices of other station's send areas are handled as "own station devices". The animation below shows how cyclic transmissions occur.

Click the programmable controller's switch (ON/OFF) to view its data transmitted to another station.
The Reset button returns the set values to the default.



1.10 Summary

In this chapter, you have learned:

- Why have a programmable controller network
- Programmable controller network operation
- CC-Link family structure
- CC-Link IE types
- CC-Link IE controller network characteristics
- Data communication procedure
- Link device assignment procedure
- Data communication format
- Data communication by cyclic transmission

Important points

Why have a programmable controller network	A programmable controller network allows control information for production machine to be shared between programmable controllers, offering the following benefits: • The load is distributed among multiple programmable controllers (load distribution). • The failure of a single programmable controller will have a minimal effect on the overall system (function distribution).
Data communication procedure	• Programmable controller networks primarily use a cyclic transmission format. • The cyclic transmission format uses dedicated network devices called "link devices". • Link devices act like shared devices among programmable controllers in the network. • One station's link device area set as the send range corresponds with the receive range at the other stations.
Link device types	Link devices are a link relay (B) and a link register (W). "B" is a bit device, and "W" is a word device.

Chapter 2 CC-Link IE Controller Network Device Configuration and Specifications

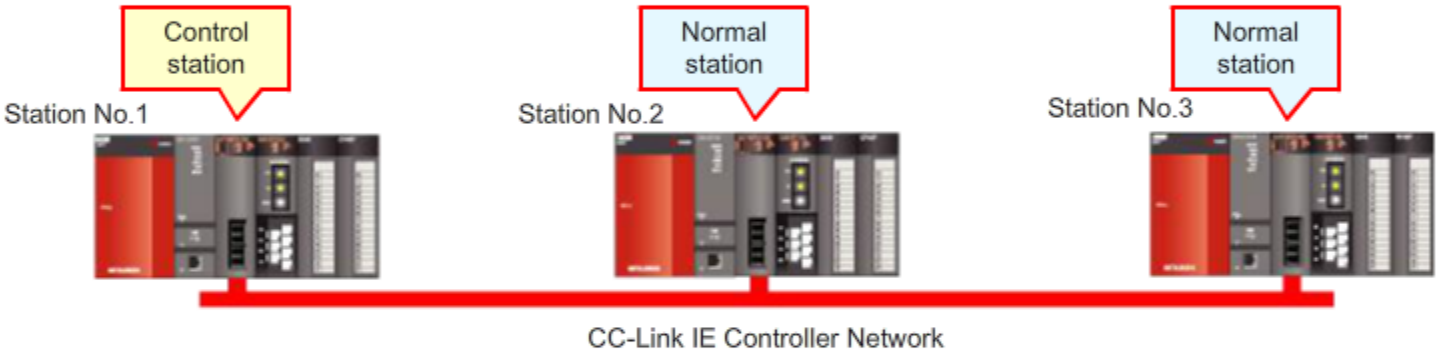
Chapter 2 explains the CC-Link IE Controller Network configuration, specifications, and settings.
This chapter will provide further understanding on the network configuration, specifications and functions, the network parameter settings, etc.

2.1 Network Configuration

This section explains the network configuration and the network modules.

2.1.1 Network station configuration

The CC-Link IE Controller Network comprises of a "control station", and multiple "normal station(s)". Each station is assigned a unique station number. The control station is distinguished from normal stations by the network parameter setting.



(1) Role of the control station

The "control station" controls the network parameters.
There can be only one control station in a network.
Use the control station's network parameters to assign link devices of other network stations.

(2) Role of a normal station

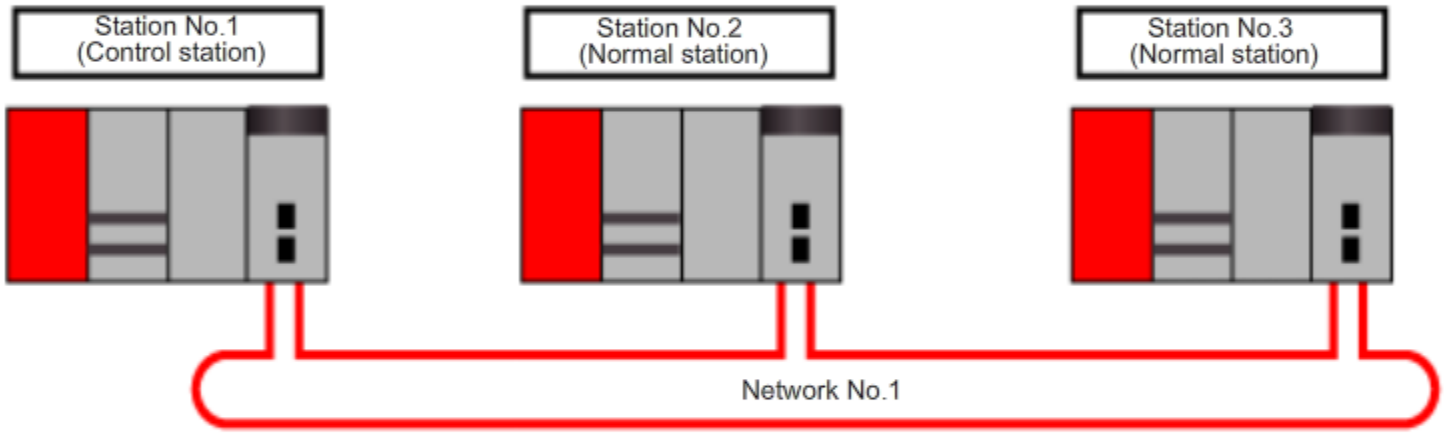
All stations other than the "control station" are referred to as "normal stations".
These stations send the data in their own stations send range to other stations in accordance with the parameter settings set by the control station.

If a control station fails, one of the normal stations takes over the role of the control station (sub control station) allowing system operations to continue. This is referred to as the "control station switching function".

2.1.2 Dividing the network by using network numbers

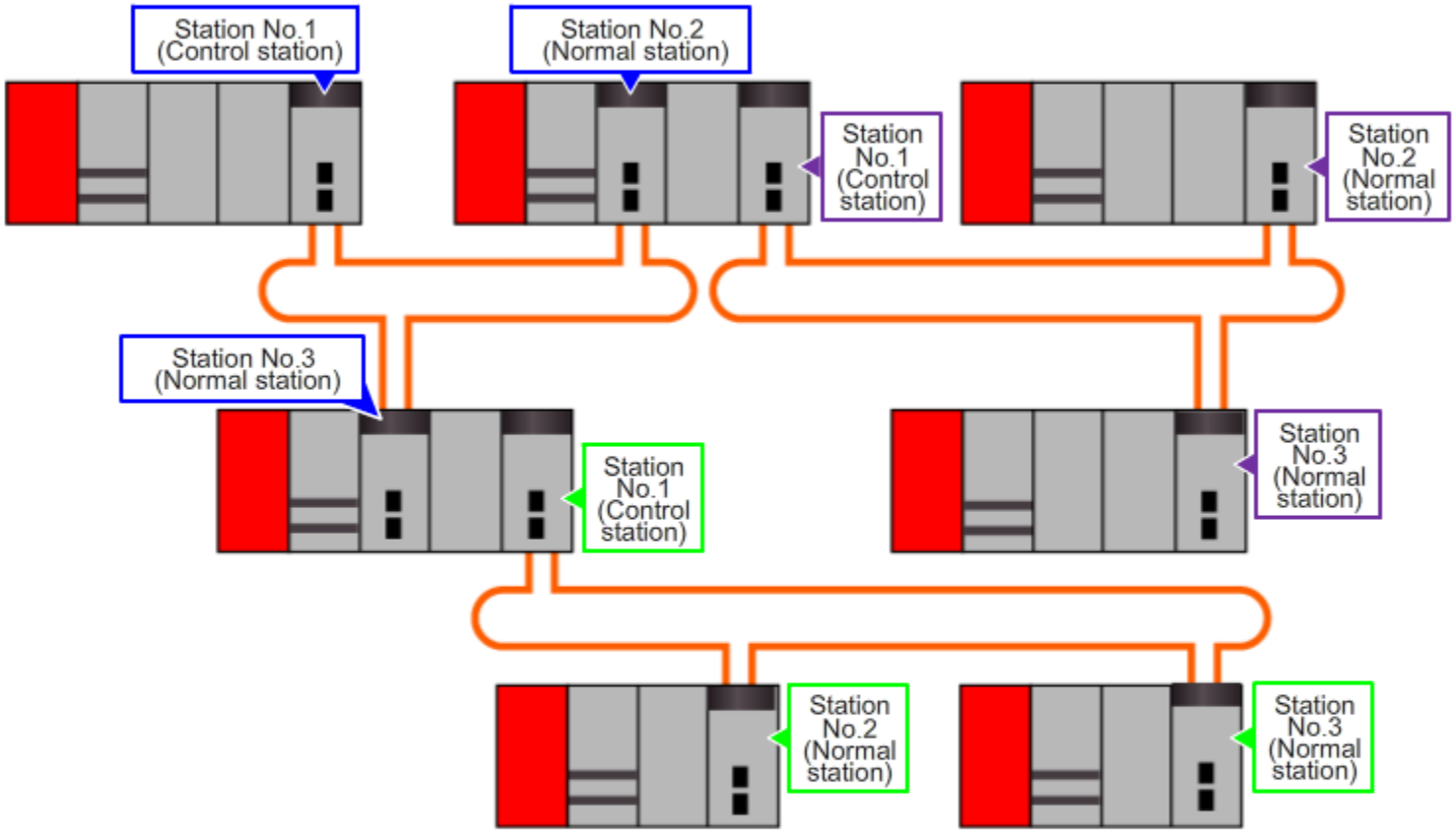
The CC-Link IE Controller Network can be configured in a variety of ways, ranging from a "single network system" to a large-scale "multiple network system". In a multiple network system, each system is assigned a unique system number by which it is controlled. Network numbers are specified by the network parameter settings.

(1) Example of a single network system



2.1.2 Dividing the network by using network numbers

(2) Example of a multiple network system



As shown in the figure above, the CC-Link IE Controller Network can be divided into multiple networks which are identified by network numbers. Stations which relay across different networks must have two network modules installed.

Benefits of dividing the network

- Minimizes the amount of data transferred per loop, making link scans faster.
- Prevents a faulty network from affecting other networks.

Notes

- The station numbers should not overlap within the same network.
- The station numbers can overlap with the numbers in a different network.

2.2 Network Specifications

Specification confirmation

Before selecting the CC-Link IE Controller Network, the system environment should be checked if it meets the network specifications.

Items to check	CC-Link IE Controller Network specifications
Network scale, and number of connectable stations	• Max. number of networks: 239 • Max. number of connectable stations per network: 120 *1
Connection format	Cable specs.: Fiber optic cable (multi-mode fiber)
Number of link points	• Max. number of link points per network *1 • Max. number of link points per station *1
Connection distance	• Total distance: 66km (with 120 stations connected) • Distance between stations: Max. 550m (core/clad = 50/125 (μm)) *2)
Baud rate	1Gbps

*1: For details, please refer to the corresponding manual of the CC-Link IE Controller Network module.
*2: The distance between stations can be extended to 15km by using a media converter.

Designing a network configuration

(1) Function distribution

Examine the overall system, and identify locations where it is beneficial to divide the system by functions. Each station requires a CPU module.
To simply place an I/O device at a remote location, CC-Link or CC-Link/LT can be used.

(2) Load distribution

Examine the overall system to determine if an excessive load is concentrated at a single CPU module. If so, consider distributing the load by using the CC-Link IE Controller Network.

(3) External power supply

Use this to keep the power of stations if the power supplied through programmable controllers is shut off.

(4) Other

Verify that the distance between stations, the total distance, and the cable specifications conform to the designed specifications.

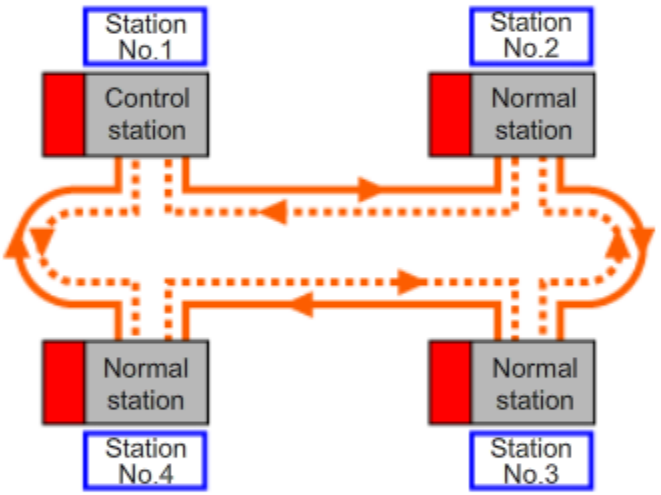
2.2.1 Explanation of specifications

This section explains specifications that are particularly important for understanding the CC-Link IE Controller Network.

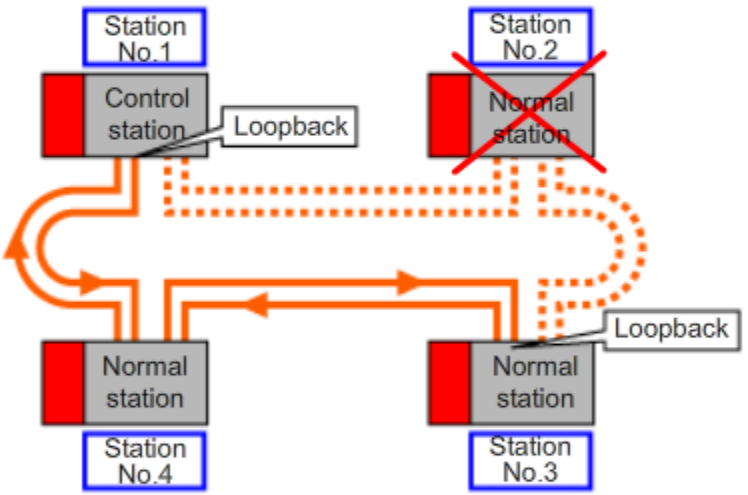
Network topology

The network topology of the CC-Link IE Controller Network is the optical loop topology. Each optical cable has two pairs of transmission paths (including a spare). If operation at a given station becomes abnormal, communication is continued among remaining normal stations. This process is referred to as a loopback.

Example of normal communication



Example of loopback communication



Number of connected stations per network

A maximum of 120 stations can be connected to an optical loop system. For details, please refer to the corresponding manual of the CC-Link IE Controller Network module.

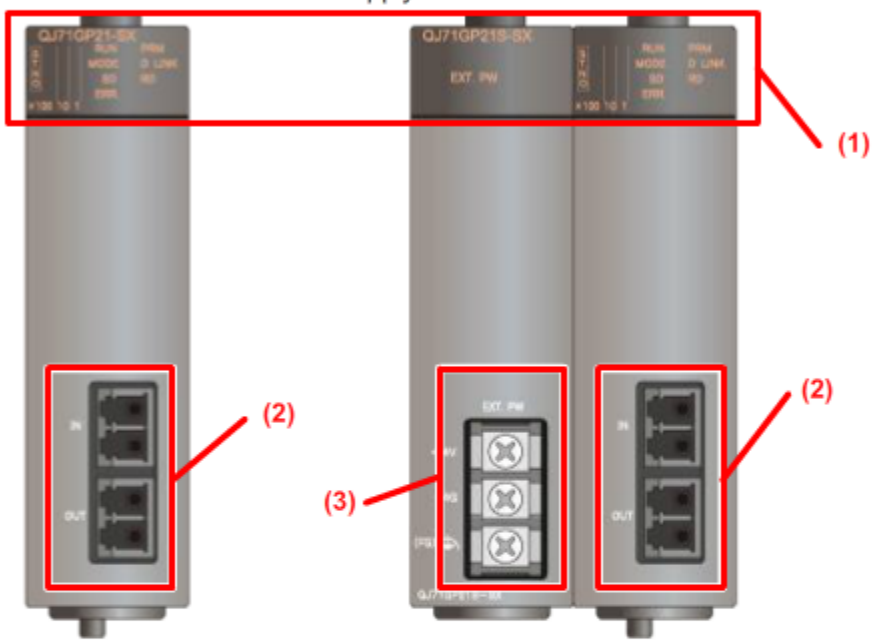
Overall distance

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

2.2.2 CC-Link IE Controller Network module types and component names

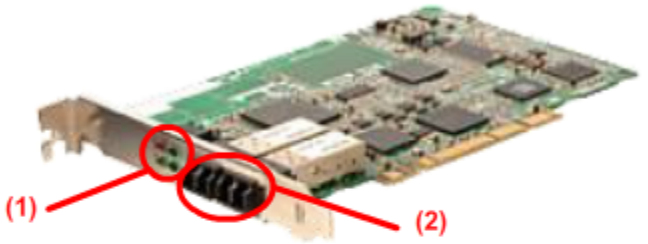
QJ71GP21-SX

QJ71GP21S-SX with external power supply terminal

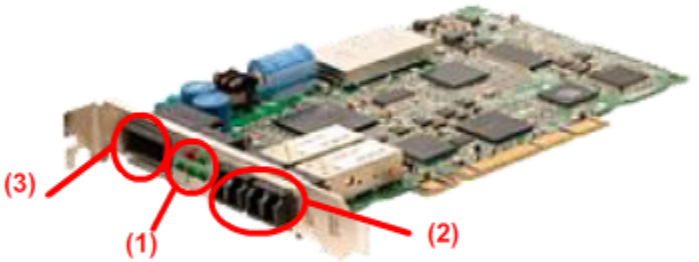


Boards which are installable in a personal computer or a server computer are also available.

Q80BD-J71GP21-SX



Q80BD-J71GP21S-SX with external power supply terminal



	Name	Function
(1)	LED indicator	Indicates the module status.
(2)	Fiber optic cable connector	For connection of an fiber optic cable which connects the OUT connector of another station to this station's IN connector. The fiber optic cable connected to this station's OUT connector connects to another station's IN connector.
(3)	External power supply terminal block	For supplying power to the network module separately from the power supplied from the power supply module. An external power supply (UPS, battery, etc.) prevents the module from being disconnected from the network even if the power from the power supply module is shut off.

2.2.3 Transmission cable specifications

Fiber optic cable specifications

	Specifications
Name	1000BASE-SX (MMF) compatible fiber optic cable
Standard	IEC60793-2-10 Types A1a.1 (50/125μm multimode)
Connector	2-fiber LC connector
Distance between stations	550m *1

*1: The distance between stations can be extended to 15km by using the media converter of Mitsubishi Electric System & Service Co., Ltd.

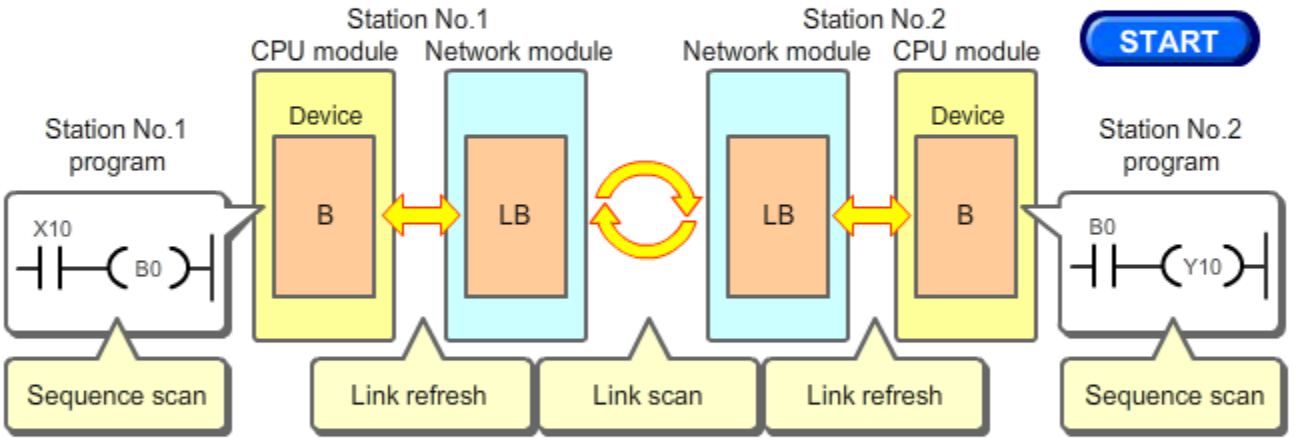
2.2.4 Transmission delay time

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

This delay time must be considered in a system where accurate synchronization is required. Before designing a system, the transmission delay time approximate value must be calculated as to design an appropriate system.

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

Please click the [START] button to visualize the explanation.



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

↓

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

↓

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

↓

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

↓

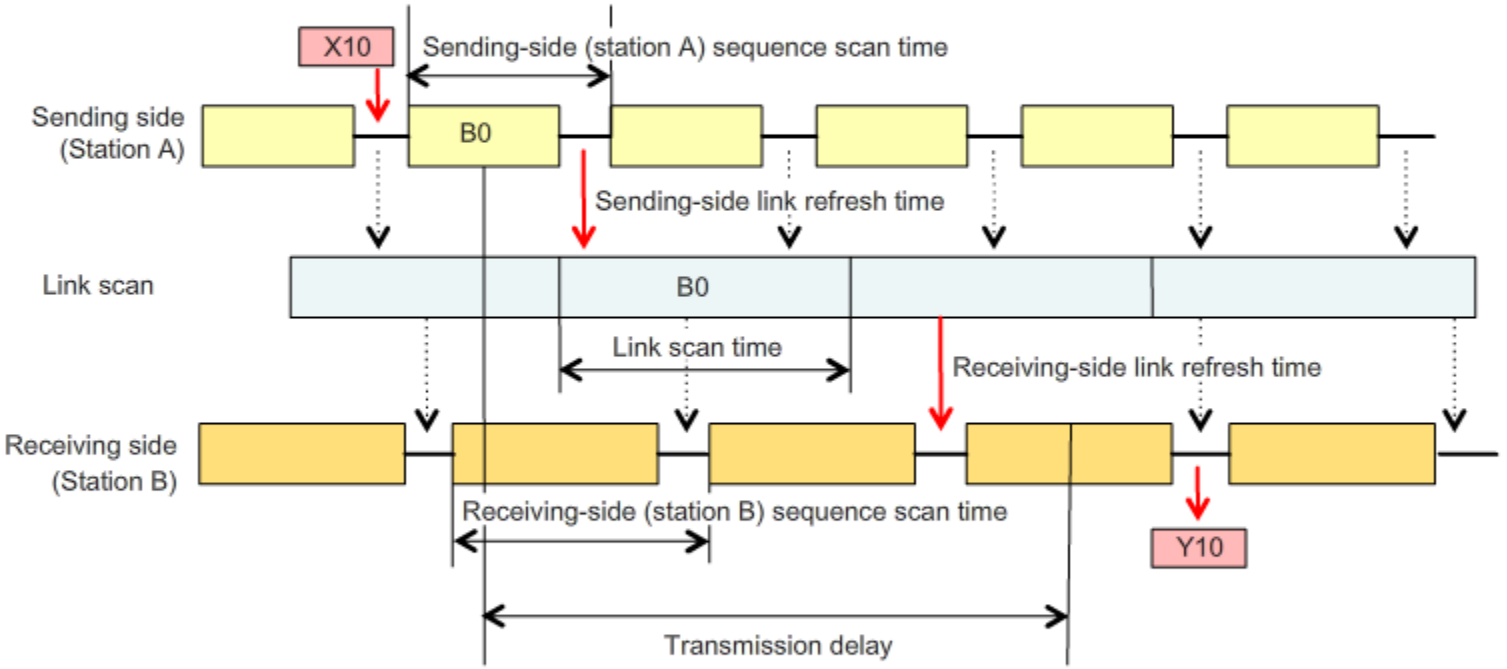
The "B0" ON status is checked in the sequence program of station No.2.

2.2.4 Transmission delay time

"Transmission delay time" elements

The following elements comprise the transmission delay time.

- Scan time for the sending-side and receiving-side sequence programs
- Link refresh time at the sending-side and receiving-side
- Time required to process through all stations in the network (link scan time)



"Transmission delay time" countermeasures

If the transmission delay time calculation indicates that the data will not be obtained within the required time, the following measures are available.

- Separate the network into segments
- Replace the CPU module with a high-speed type
- Adjust the number of link refresh points

2.2.4 Transmission delay time

Transmission delay time at cyclic transmissions (worst case values)

Under the following conditions, the data transmission time (Taxa) can be calculated as below.

- Single network system
- Non-redundant CPU is receiving
- ST>LS
- Station-based block data

Taxa (ms) = (ST + αT) + (SR + αR + LS) x 2

The scan time (ST, SR) can be checked at the GX Works2's "scan time measurement".

Other variables are represented by the following formulas:

αT, αR = KM1 + KM2 x { (LB + LX + LY + SB) / 16 + LW + SW } + αE + αL

αE = KM3 x { (LB + LX + LY) / 16 + LW }
αL = KM4 + KM5 x (LB / 16 + LW)

LS = [KB + (n x 116) + { LB + LY + (LW x 16) } / 8 x 0.016] / 1000 + 100

ST: Sending side sequence scan time (excluding the link refresh time)
SR: Receiving side sequence scan time (excluding the link refresh time)
αT: Sending side link refresh time
αR: Receiving side link refresh time
LS: Link scan time
N: Total number of stations

LB, LW, LY, SB: Number of points assigned by the network parameter settings

KB, KM1, 2, 3, 4, 5: Constants which are dependent on the CPU module.

The above calculation formulas represent the worst-case scenario.
For formula details, please refer to the corresponding manual of the CC-Link IE Controller Network module.

2.3 Network Parameters

This section explains the network parameter settings required to use the CC-Link IE Controller Network.

Minimum required settings

The following table shows the items and points which must be set and checked in order to use the CC-Link IE Controller Network.

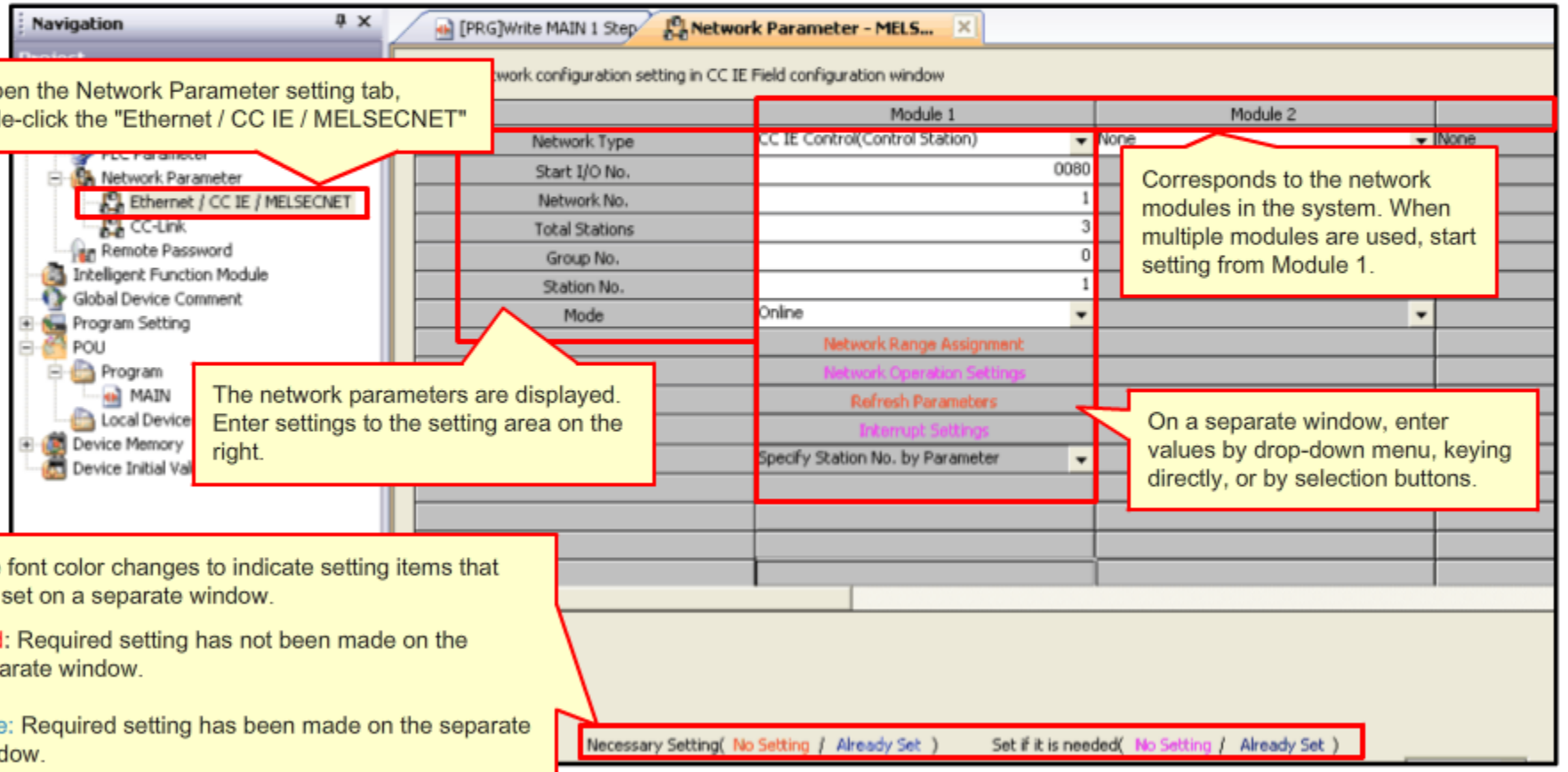
Setting item	Setting purpose and function	Point
Network Type	Set the network type and station type for each network module.	Setting is required for each network module.
Start I/O No. Network No. Total Stations Group No. Mode	Set the network settings for each network module. The "Total Stations" is set only at the control station.	Settings are required for each network module.
Network Range Assignment	Set the cyclic transmission ranges for the link devices LB, LW, LX, LY in which data will be exchanged among the stations in the same network.	Setting is required for the control station (not required for normal stations).
Refresh Parameters	Set the send range in the CPU module's link devices (B/W) and in the network module's link devices (LB/LW). This setting is required in systems where multiple network modules are installed with a single CPU module.	In a single network system, the default setting can be used as it is.

2.3.1 GX Works2 setting window

GX Works2 can be used to set the network module parameter settings.

GX Works2 Network Parameter setting tab

The Network Parameter setting tab for CC-Link IE Controller Network is shown below. Please check the setting items.

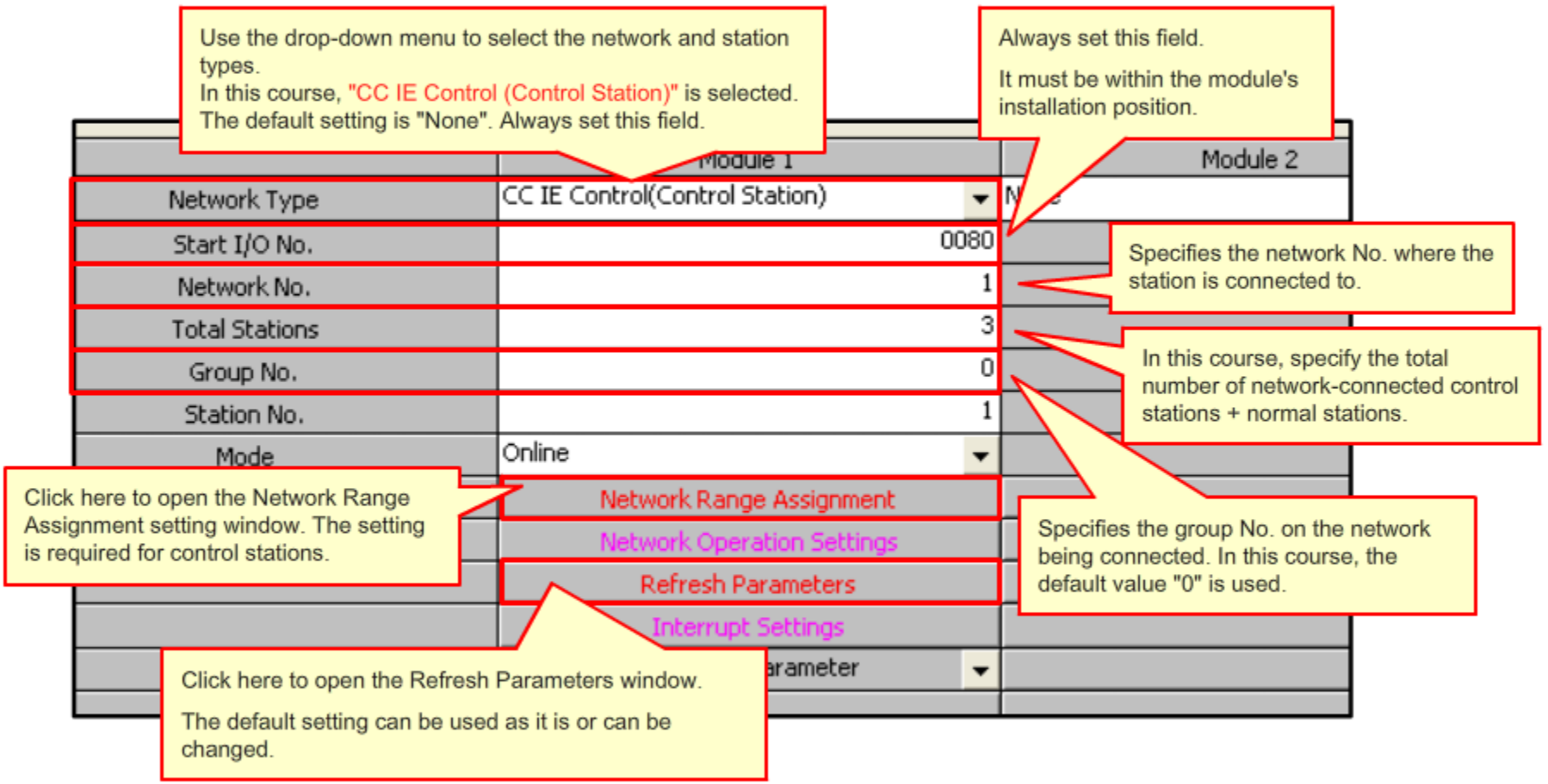


Network Parameters setting window

2.3.2 Network types and network settings

Network setting for control station

The figure below shows the network type and other network settings.

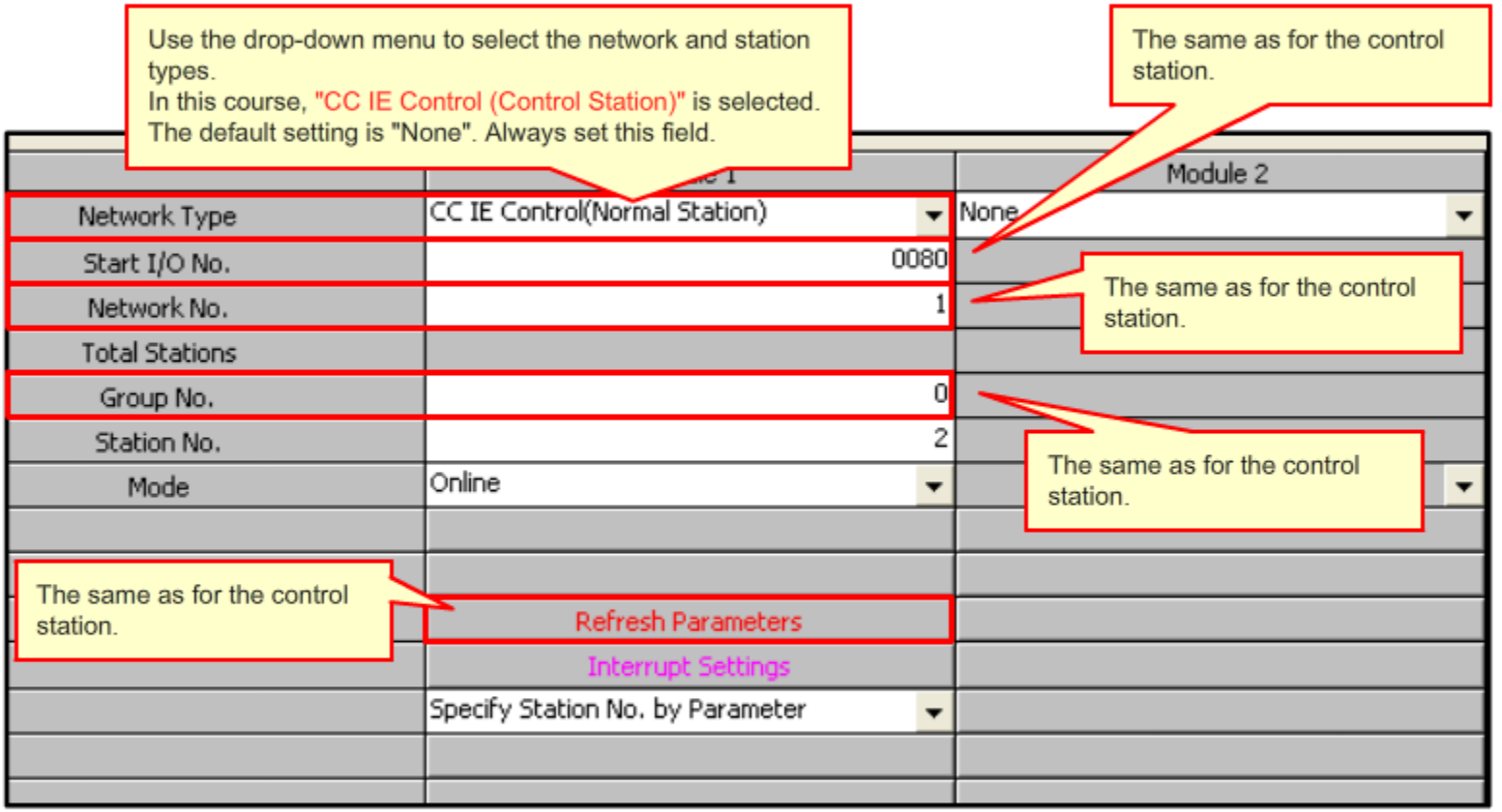


Network Parameters setting window

2.3.2 Network types and network settings

Network setting for normal station

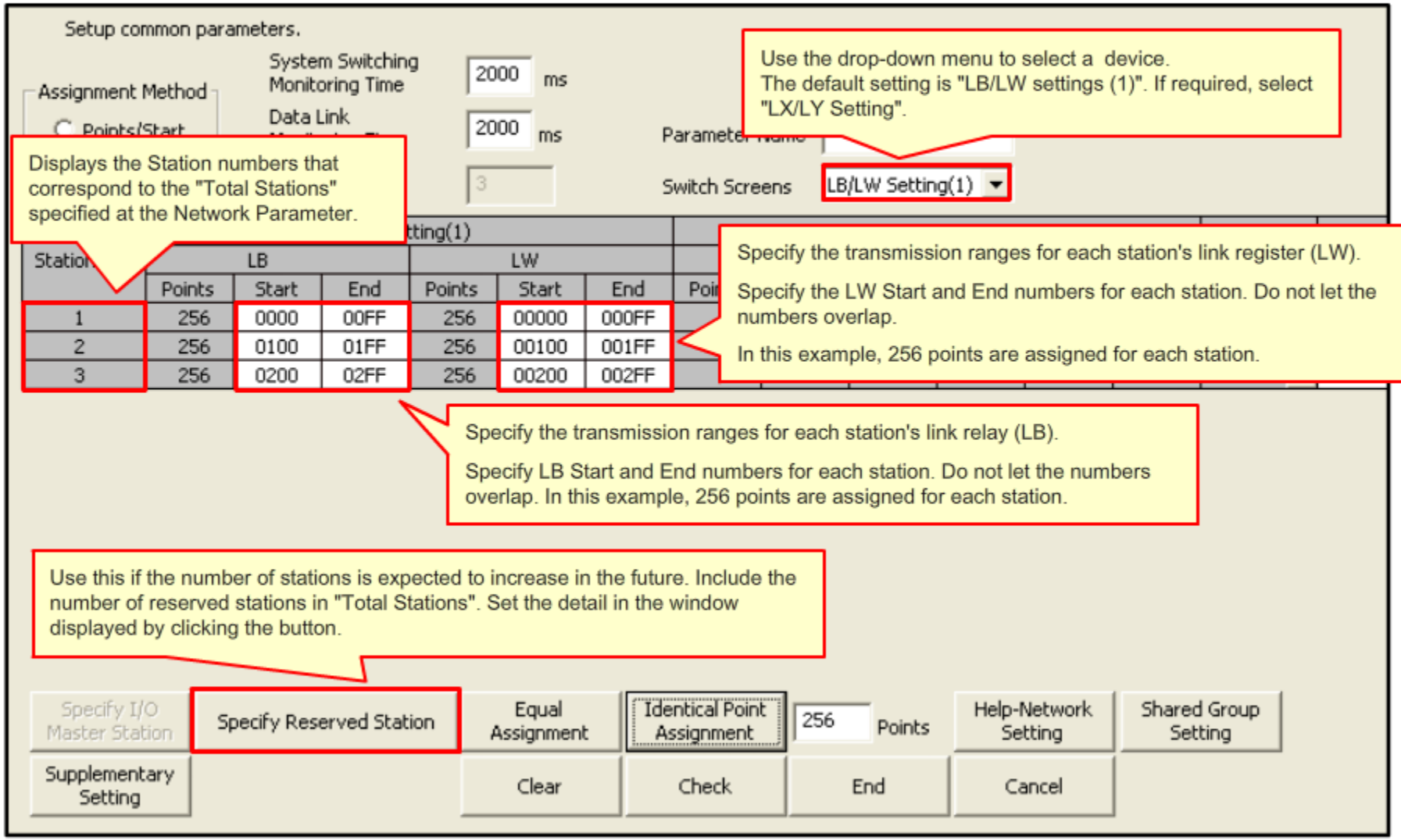
The figure below shows the network type and other network settings.



Network Parameters setting window

2.3.3 Common parameter setting

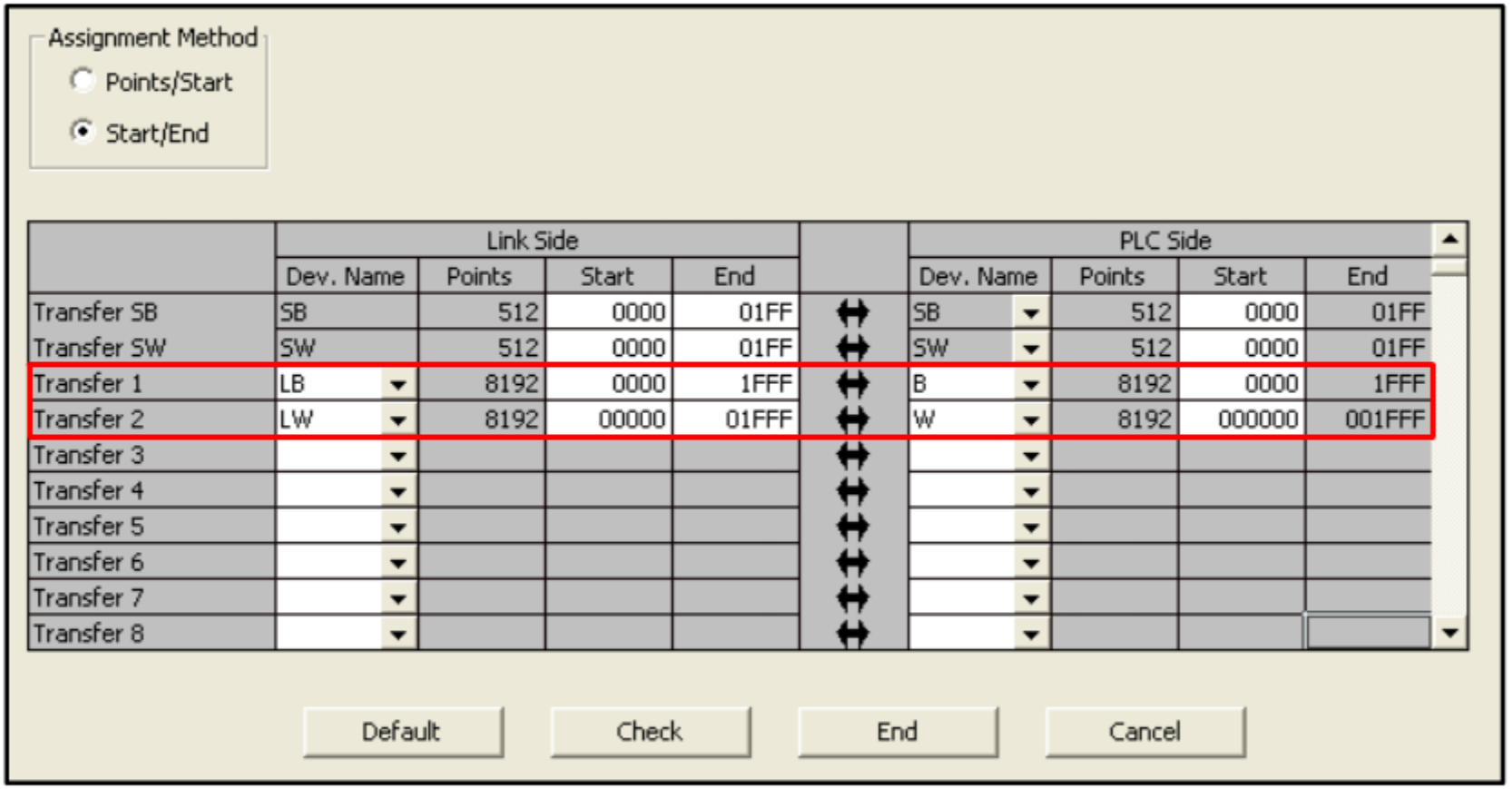
The Network Parameter Assignment (LB/LW assignment) tab can be opened by clicking the "Network Range Assignment" button.



Network Parameter Assignment window

2.3.4 Network refresh parameters setting

Network refresh parameters are used to set the send ranges of the network module link devices (LB, LW, LX, LY). Data in these devices are sent to the CPU module devices (X, Y, M, L, T, B, C, ST, D, W, R, ZR) to be used in sequence programs.
The figure below shows the default network refresh parameter setting.



Network Parameter setting tab

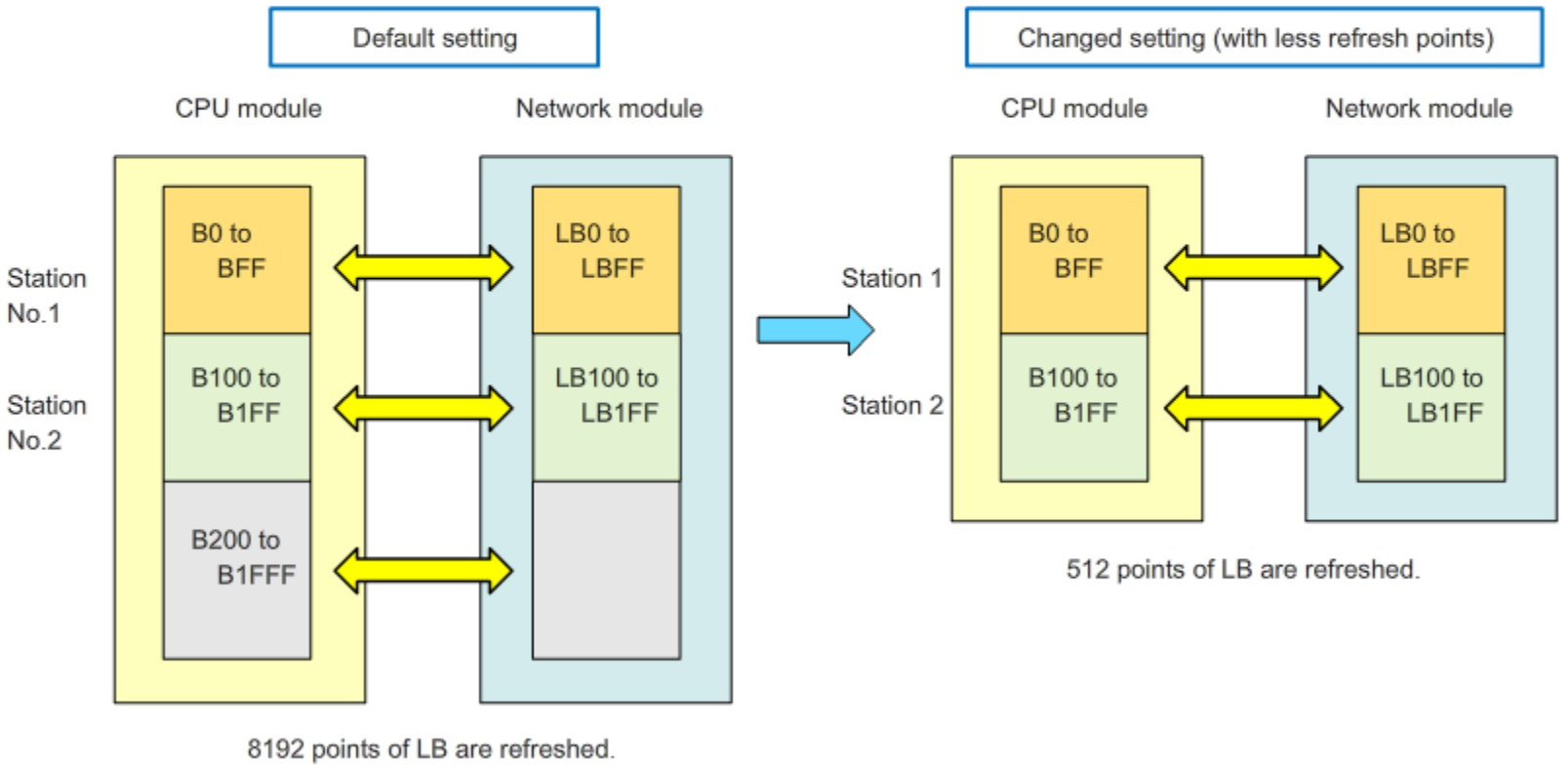
(1) In the default setting, the data in "LB/LW0 to 1FFF" (8192 points) are set to be transferred to the CPU module devices "B/W0 to 1FFF". Unless another setting is required, this default setting can be used.
(2) If the actual number of used devices is less than 8192 points, the refresh time can be shortened by reducing the number of points.

2.3.4 Network refresh parameters setting

Reducing the number of refresh points by the network refresh parameter setting

With the default setting, a refresh occurs between the LB and B of all ranges. However, the network refresh parameters can be set to specify a minimum required refresh range in order to shorten the refresh time. Such a setting shortens the link scan time, resulting in a shorter transmission delay time.

The following examples show the refresh operations with the default range setting, and with the decreased range setting.



2.4 Summary

In this chapter, you have learned:

- Network configuration
- Network specifications
- Network parameters

Important points

CC-Link IE Controller Network station configuration	A single network consists of one control station and multiple normal stations. The control station and normal station settings are set in the network parameters.
CC-Link IE Controller Network transmission delay time	The transmission delay time is determined by the sequence scan time, link refresh time, and the link scan time at the sending/receiving-side programmable controllers.
Network parameter settings	Network type, start I/O No., and network No. settings are required for all the network modules in the network. In addition to those settings, the control station requires a "Station Number" setting, "Network Parameter", and "Network Parameter Assignment" (LB/LW) settings.

Chapter 3 Starting Up the CC-Link IE Controller Network

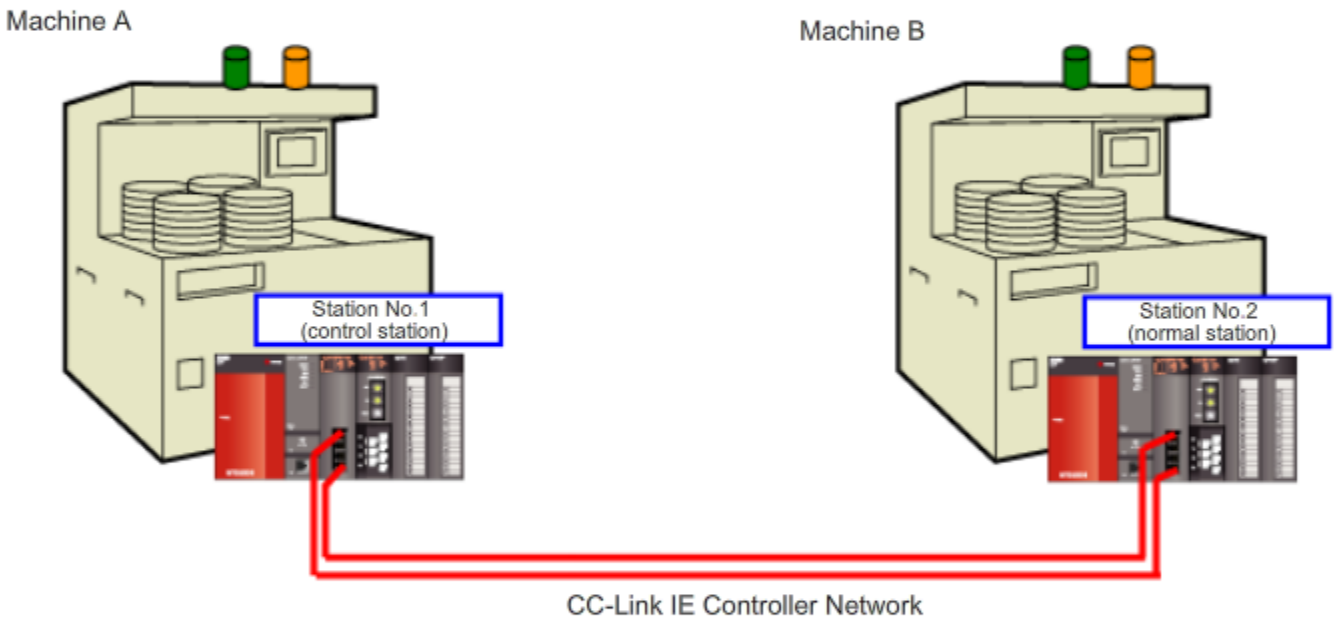
Chapter 3 explains the procedures from the CC-Link IE Controller Network start-up, to its operation check. This chapter provides explanation on the system configuration, the network connection method, the various setting operations, and the sequence programs.

3.1 Configuring a Network System

In this section, you will learn the configuration procedure of a simple two-station network system.

3.1.1 Configuring a network system

The description in this section will be based on the following two-station network system.



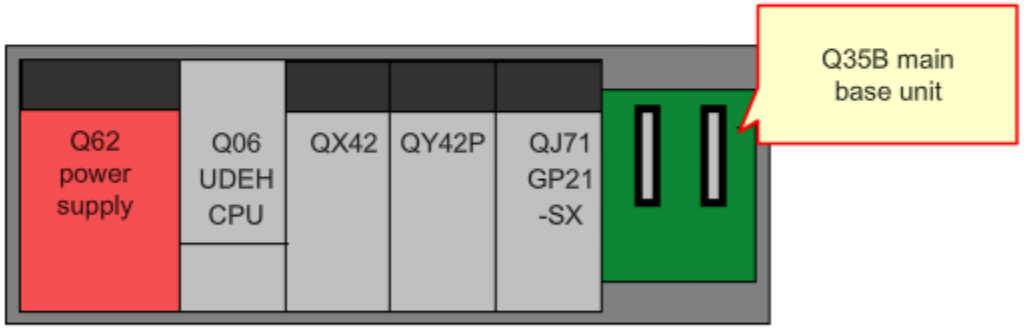
3.1.1 Configuring a network system

The specification of the example system is shown below.

Network topology	Optical loop system
Network module	QJ71GP21-SX
Total number of stations	2 stations (Station No.1: control station; Station No.2: normal station)
Network No.	1
Group No.	0
Link device	Link relay (B/LB): 256 points/station; link register (W/LW): 256 points/station

Programmable controller module configuration

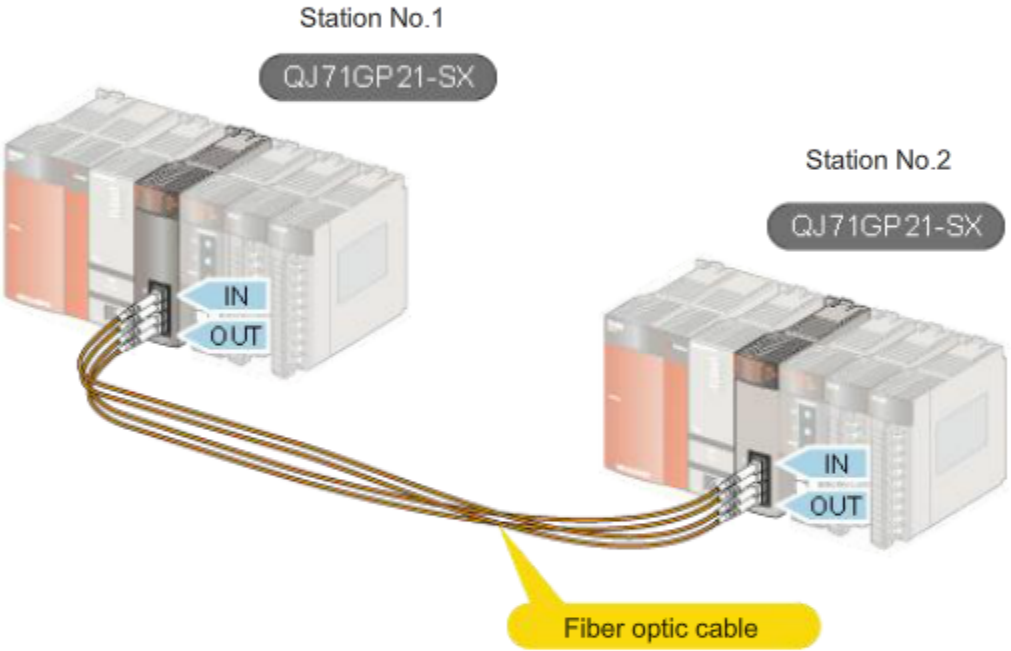
In this example system, the station No.1 (control station) and No.2 (normal station) have the same module configuration as shown below.



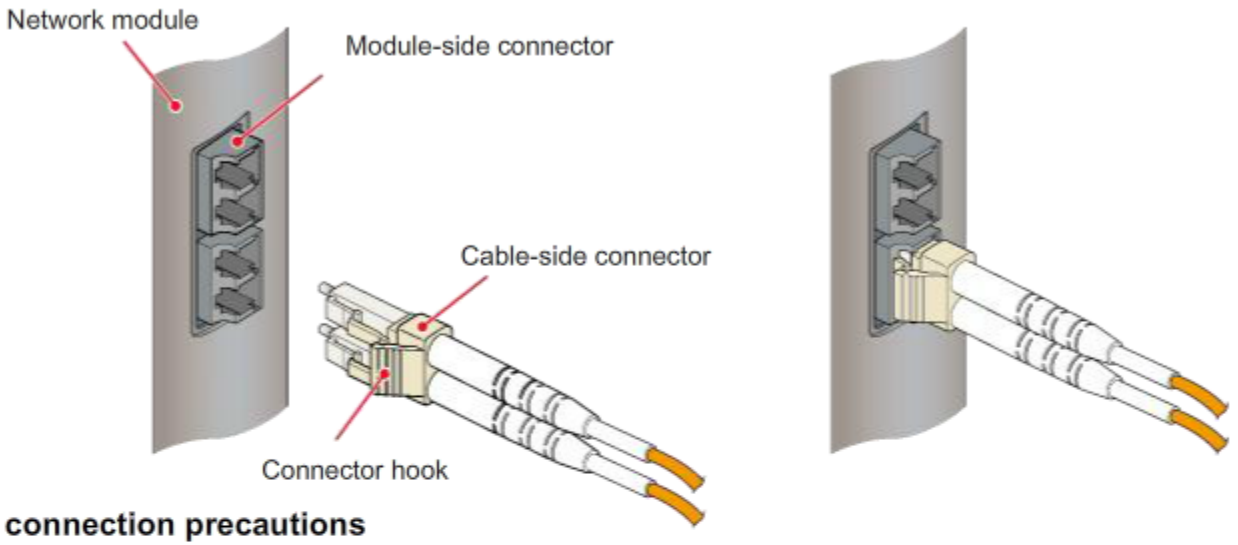
I/O assignments	Input	Output	Intelligent
	64 points X00 to X3F	64 points Y40 to X7F	32 points X/Y80 to 9F

3.1.2 Fiber optic cable connection

Network modules are equipped with "IN" and "OUT" optical link connectors.
The fiber optic cable connects a module's "OUT" connector to the next station's "IN" connector.
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 Connecting the fiber optic cable



Cable connection precautions

- Always hold the cable's connector area when disconnecting the cable.
- When connecting the cable, align the connector's protruded area with the groove of the plug, then insert the cable.
- Connect the cable connector with the module-side connector securely until a latching sound (click) is heard.

Fiber optic cable handling

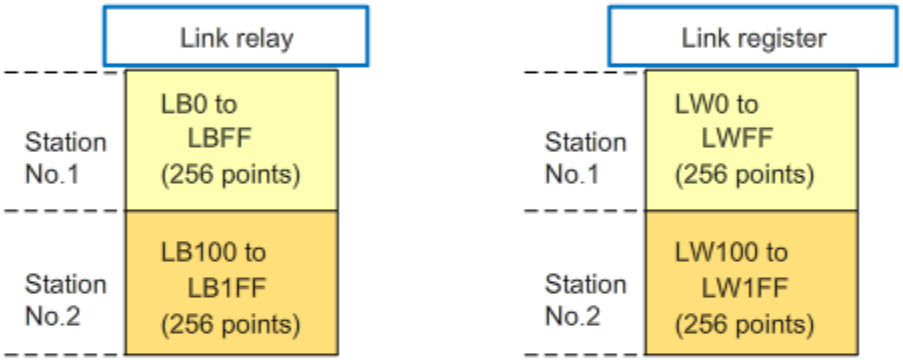
- A single fiber optic cable has two lines of optical transmission paths.
- Because the fiber optic cable has a glass fiber core, its bend radius is limited. The cable must therefore be handled with care, and should be installed in duct, etc., to protect it.
- Oil from hands and foreign matter such as dust, etc., can adhere to the fiber optic, reducing its transmission capability, and possibly resulting in faults. When an fiber optic cable is being installed, its fiber cores and the module connector areas should not be touched with bare hands. These areas should also be protected against dust, etc.

3.2 Setting the Network Parameters

This section explains the network parameters setting procedures.

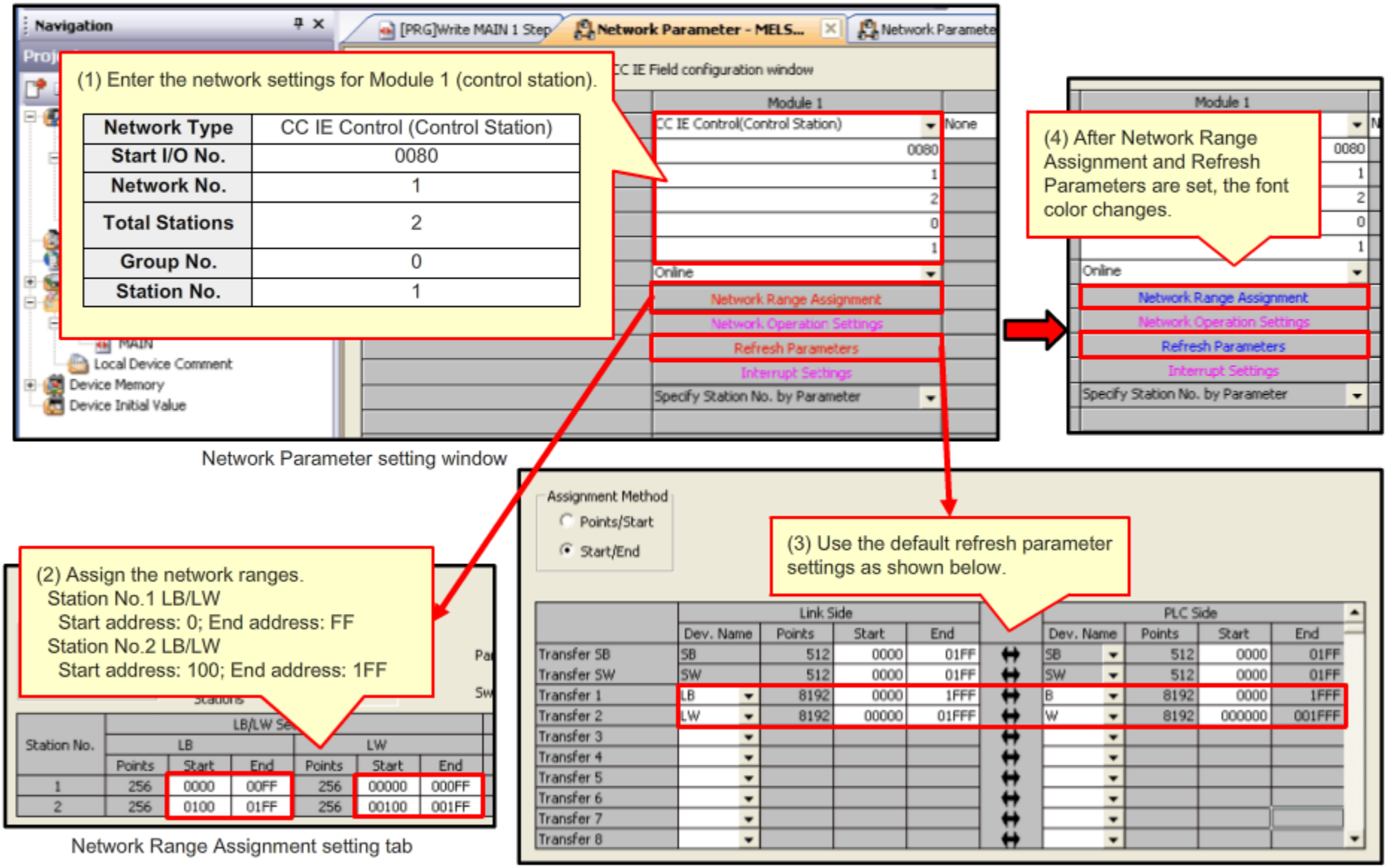
3.2.1 Setting the control station parameters

The diagrams below show the device assignment, which will be set by the control station parameters.



3.2.1 Setting the control station parameters

The control station's network parameters are set in the following procedure.



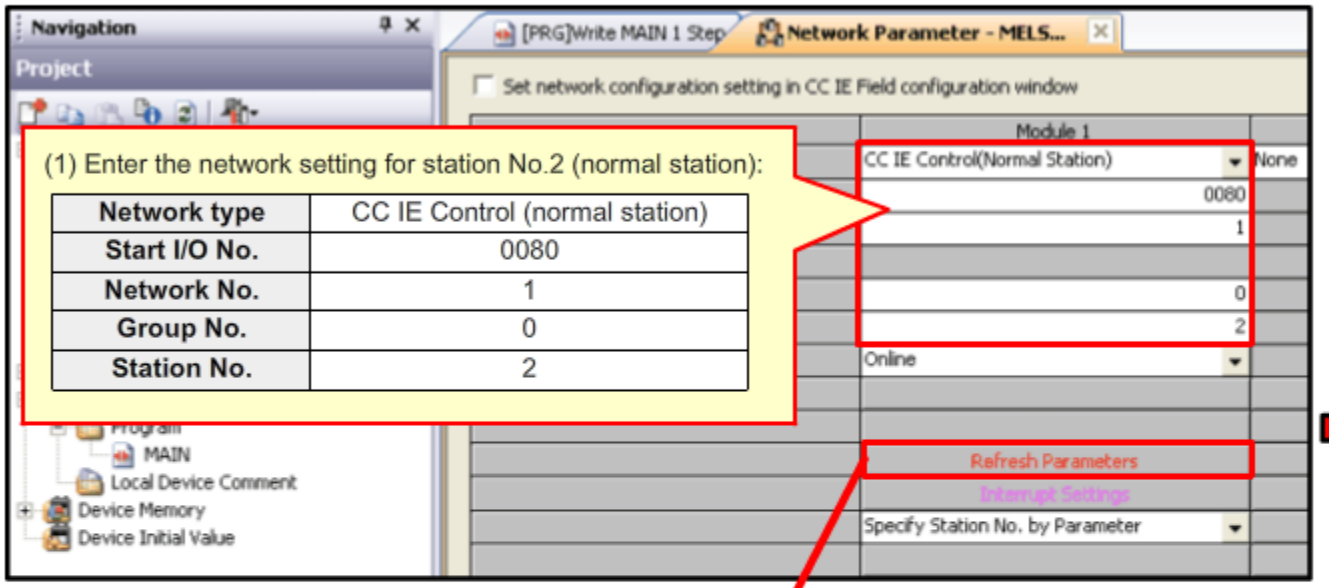
Network Parameter setting window

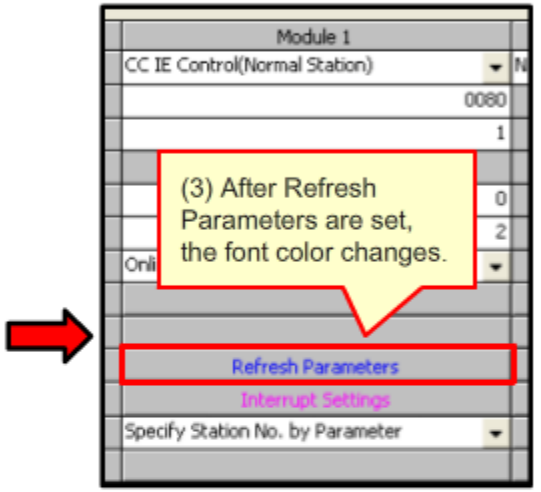
Network Range Assignment setting tab

Refresh Parameter setting tab

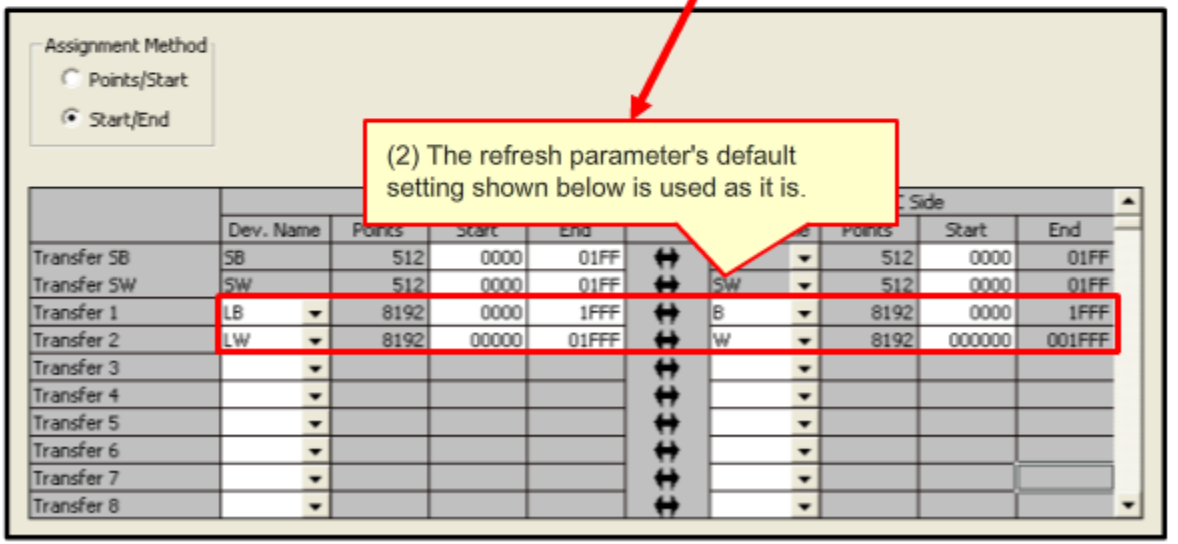
3.2.2 Setting the normal station parameters

The normal station's network parameters are set in the following procedure.





Network parameter setting tab



Network refresh parameter setting tab

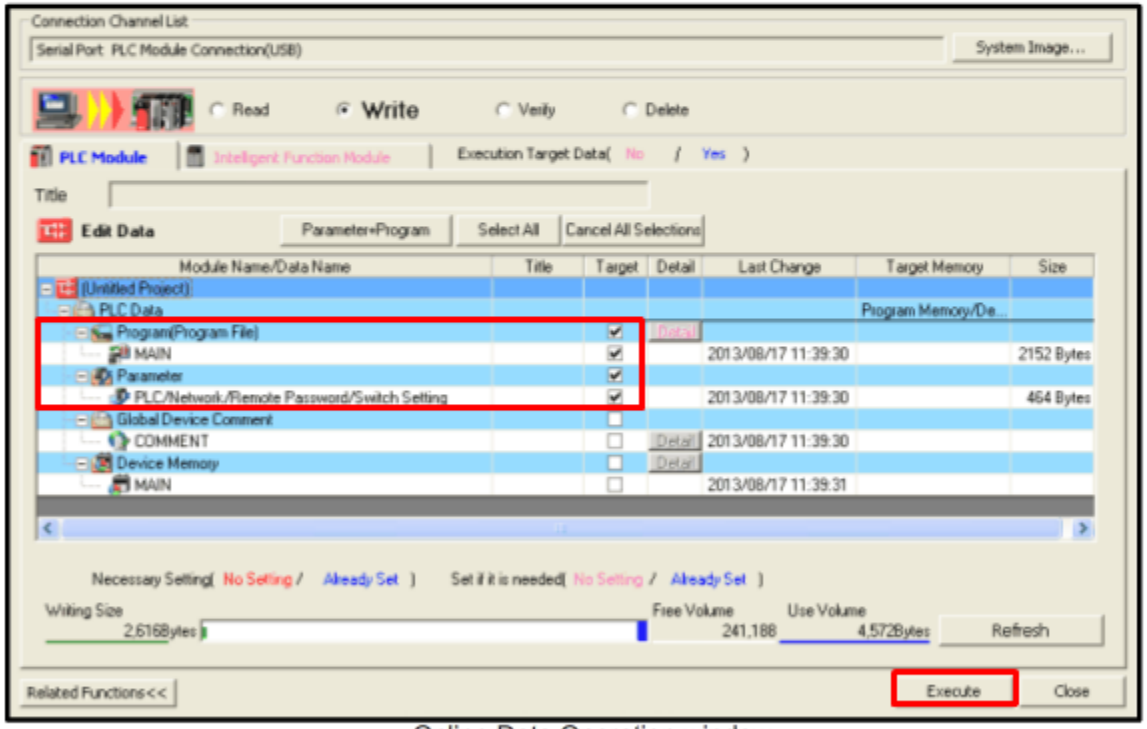
3.3 Checking the Network Operation

After the specified network parameters have been written to the CPU module, the network operation should be checked.

3.3.1 Parameters registration procedure

Each station's CPU module should be connected to a personal computer (GX Works2) so that the network parameters, which have been specified for each station, can be registered. The following section explains parameter registration procedure. (The explanation is based on the default PLC parameter setting.)

(1) On the "Online Data Operation" window, select the "Parameters + Programs", then click the [Execute] button to begin registering parameters and programs to the CPU module.



Online Data Operation window

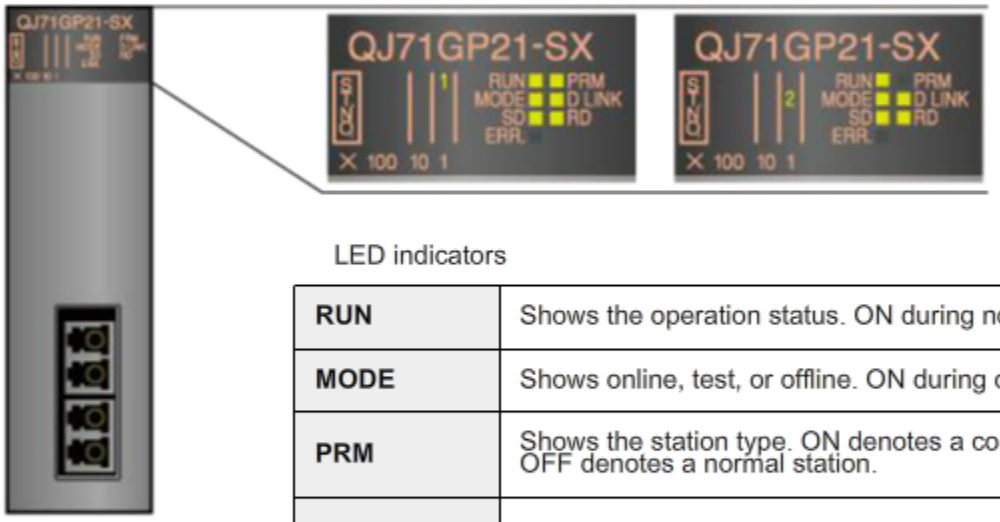
(2) After completing the parameter registration, reset the CPU module to apply the changes.

3.3.2 Checking the network module's LED indicators

If parameters and other settings are correctly configured and registered to each CPU module, network communication begins. The network module's LED indicators can be used to verify normal network communication.

LED indicators during normal communication:

- Station No.1 (control station): "1", which is the first digit of the station number, is ON; and PRM, which indicates a control station, is ON.
- Station No.2 (normal station): "2", which is the first digit of the station number, is ON; and PRM, which indicates a control station, is OFF.



LED indicators

RUN	Shows the operation status. ON during normal communication.
MODE	Shows online, test, or offline. ON during online.
PRM	Shows the station type. ON denotes a control station, and OFF denotes a normal station.
D.LINK	Shows the data link status. ON during cyclic transmission.
SD	Shows that data is being sent.
RD	Shows that data is being received.
ERR.	Shows that error is occurring. OFF while no error is occurring.

The check procedure for abnormal communication is given in Chapter 4.

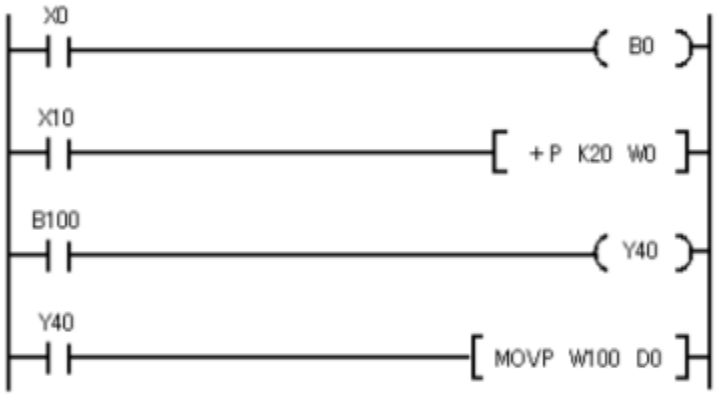
3.4 Checking the Operation by Sequence Program

A sequence program can be created to check the communication status between the station Nos.1 and 2.

3.4.1 Sequence program

The sequence programs for the stations are shown below.

Station No.1 sequence program



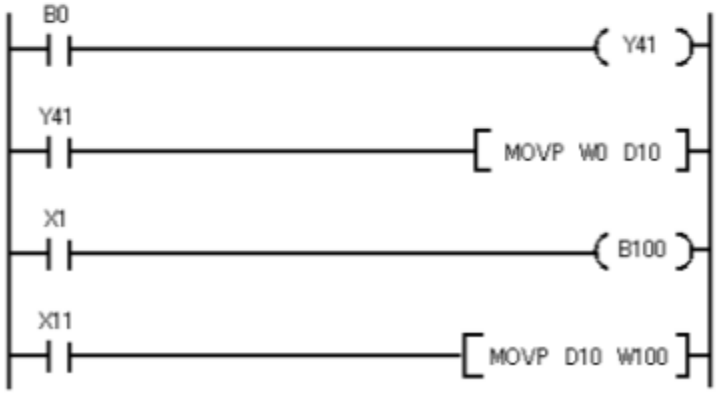
When the "X0" input signal is ON, "B0" is turned ON.

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

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

When "Y40" is ON (rising edge), the "W100" saved value is sent to "D0".

Station No.2 sequence program



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

When "Y41" is ON (rising edge), the "W0" saved value is sent to "D10".

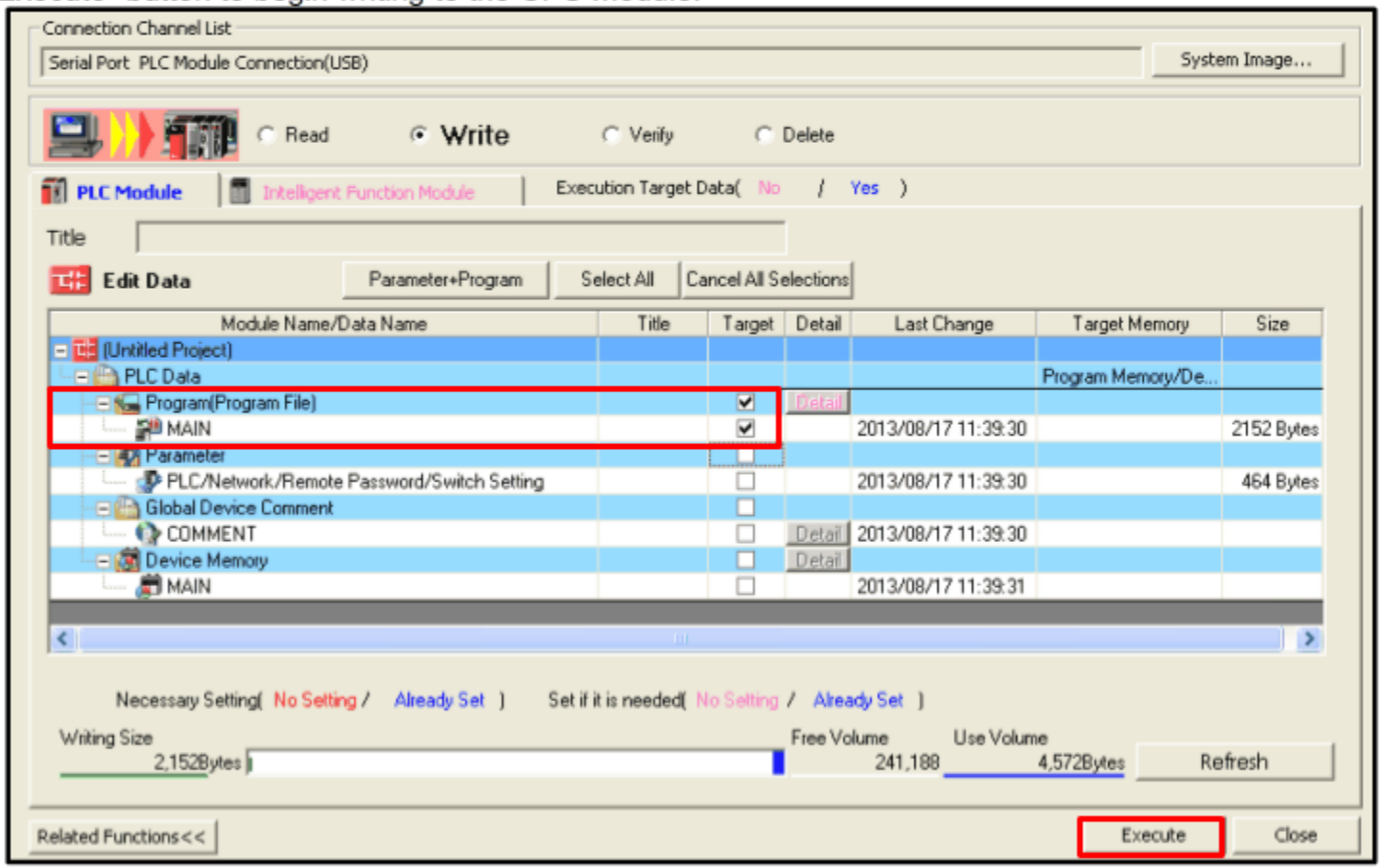
When "X1" is ON, the "B100" output signal is turned ON.

When "X11" is ON (rising edge), the "W100" saved value is sent to "D10".

3.4.2 Sequence program writing procedure

Each station's sequence program must be written to the corresponding CPU module. Please check the procedure using the example given below.

(1) At the "Online Data Operation" window, select the "Program(Program File)", then click the "Execute" button to begin writing to the CPU module.



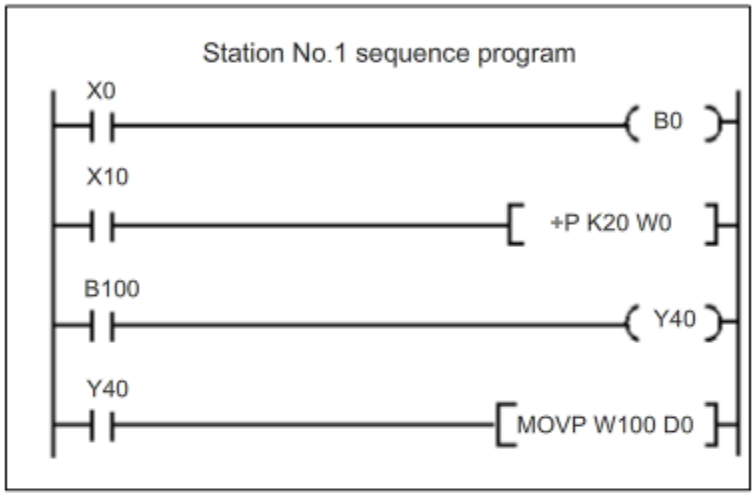
Online Data Operation window

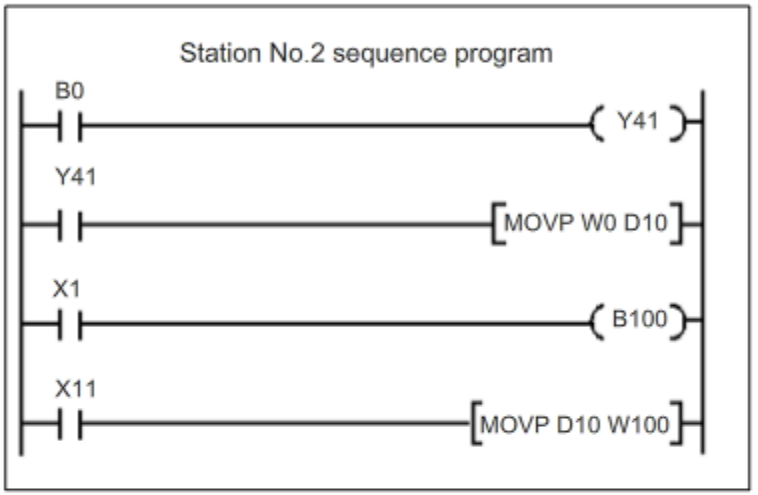
(2) When writing is completed, reset each station's CPU module to apply the changes.

(3) Set the CPU modules status to "RUN", and execute the program.

3.4.3 Checking communications by sequence program

The sequence programs, which have been written to the CPU module, are executed to verify the normal network communication. In this course, the following operations are checked.





(1) Each time the station No.1 "X10" switch is turned ON, 20 is added to "W0".
At the same time, the station No.2 "W0" value changes to the same value.

(2) When the station No.1 "X0" switch is turned ON/OFF, the "B0" coil is also turned ON/OFF.
At the same time, the station No.2 "B0" contact is turned ON/OFF.

(3) When the station No.2 "B0" is turned ON/OFF, the "Y41" coil is also turned ON/OFF.
When "Y41" is turned ON, the "W0" value is sent to "D10".

(4) When the station No.2 "X1" switch is turned ON/OFF, the "B100" coil is also turned ON/OFF.
At the same time, the station No.1 "B100" contact is turned ON/OFF. When the station No.1 "B100" contact is turned ON/OFF, the "Y40" coil is also turned ON/OFF.

(5) When the station No.2 "X11" switch is turned ON/OFF, the above "D10" value is sent to "W100".

(6) When the station No.1 "Y40" is turned ON, the "W100" value is sent to "D0".

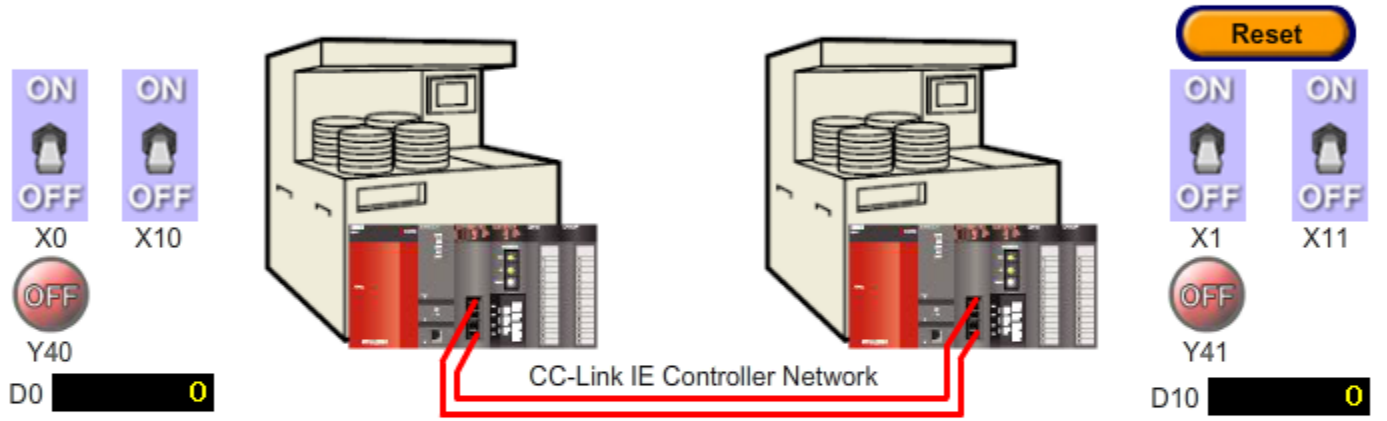
Please proceed to the next page, and check the data communication status by running the example sequence programs.

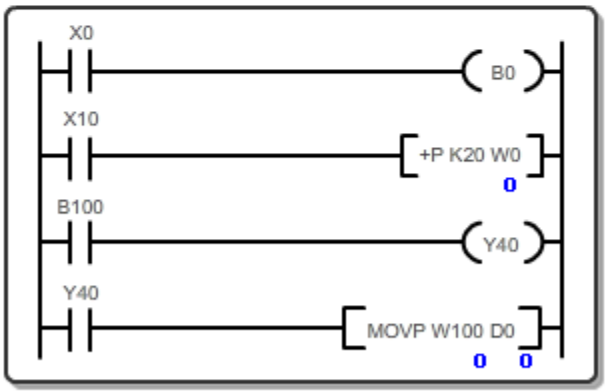
3.4.3 Checking communications by sequence program

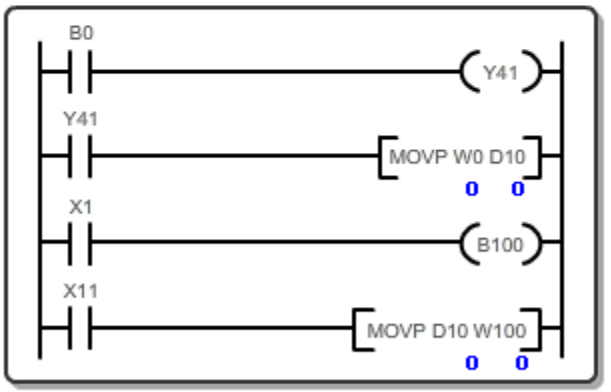
Sequence program operation simulation

Please execute the example sequence programs shown below to check the data communication status.

Click the station No.1 "X0" and "X10" switches and the station No.2 "X1"and "X11" switches to check the data communication operation status, which is indicated by LED indicators, data displays, and the ladder monitor. The Reset button returns the set values to the default.







3.5 Summary

In this chapter, you have learned:

- Network module setting procedures
- Fiber optic cable connection procedure
- Setting network parameters from GX Works2
- Parameters and sequence program writing procedures, and network operation check procedure

Important points

Network parameters setting	GX Works2 is used to set the network parameters. Settings are required for each programmable controller which is connected to the network.
Network system operation check	The operation of CC-Link IE Controller Network modules can be verified by checking the LED indicators of the network module.
Check by sequence program	Signals and data to be sent to other station are set at the own-station's send range link device. Signals and data from the other station are stored at the own-station receive range's (other station's send range) link device.

Chapter 4 CC-Link IE Controller Network System Test Operation

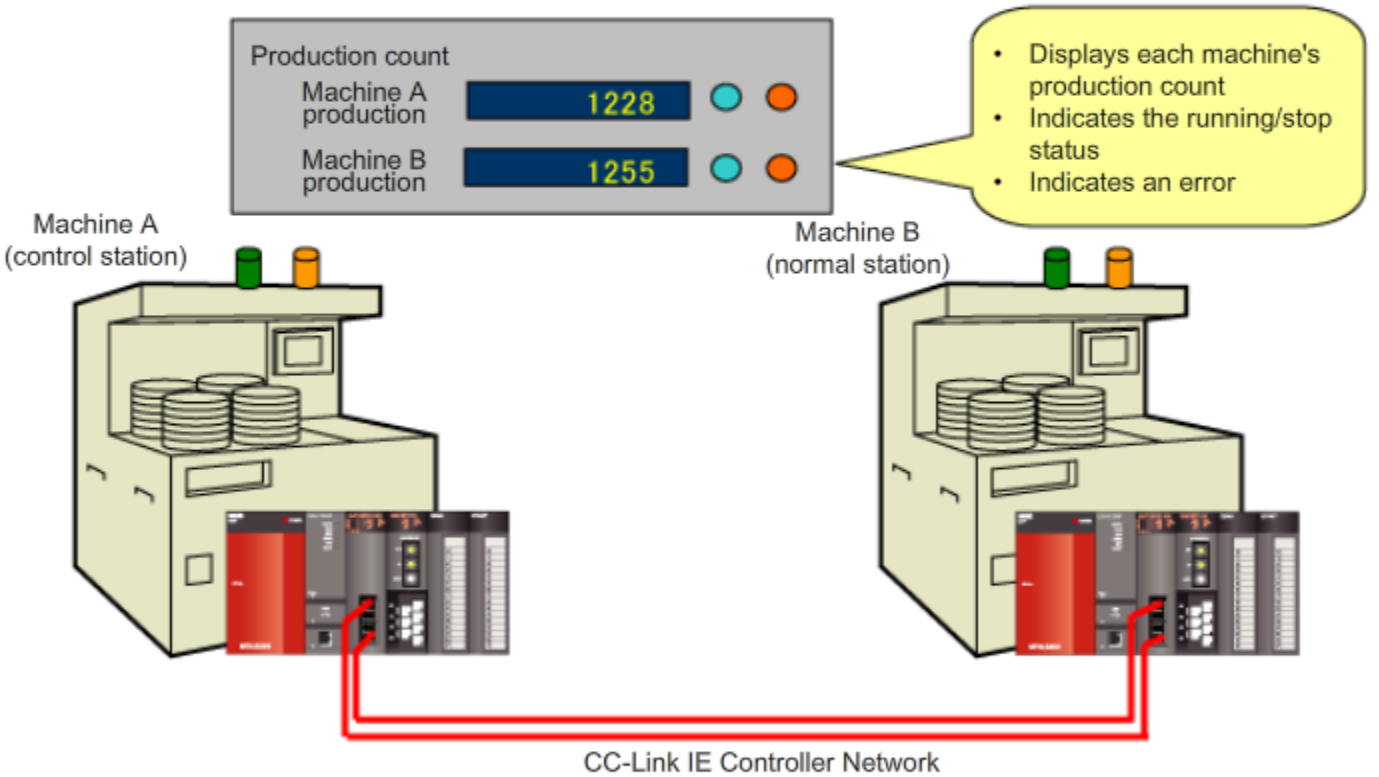
Chapter 4 explains the program creation to operation check procedures, as well as the basic network diagnostics procedures for a failure, using the example system.

4.1 Example System Configuration and Specifications

In this section, the example system's network configuration, machine control specifications, and signal exchanges will be explained. Before proceeding, please understand the example system specifications.

4.1.1 Example system's machine control details

In the example system's network configuration, two machines are being controlled.

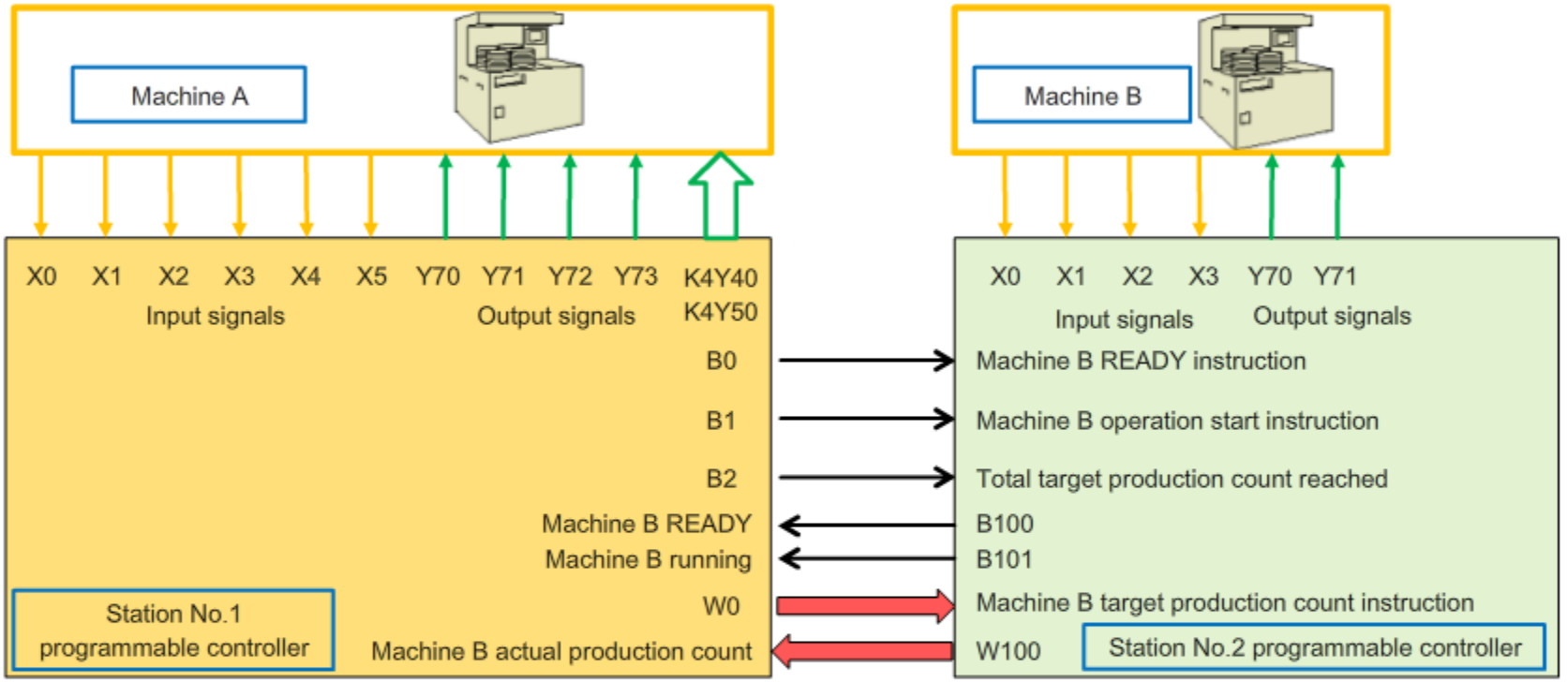


- Operation start and stop (Machines A and B)
- Target production count sent to Machine B
- Own-station actual production count
- Machines A and B total production count
- Production count indication (Machines A and B)

- Operation start and stop
- Operation status sent to Machine A
- Own-station actual production count
- Actual production count sent to Machine A

4.1.2 Example system's signal exchanges

The figure below shows signals exchanged between the example system machines and the programmable controllers. The sequence 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 count
X5	Machine A production count	K4Y50	Machine B production count

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 start

4.2 Example System's Sequence Program

Based on the control details given in Section 4.1, sequence programs are created to control Machine A (station No.1) and Machine B (station No.2).

4.2.1 Sequence programs' control details

Machine A (station No.1) sequence program

(1) Machine A operation is started by the READY ON and Machine A operation start signals. Machine B READY signal and Machine B operation start signals are also sent to Machine B.

(2) During operation, production amount is counted by the Machine A production count signal.

(3) The station No.1 determines if the total production count of Machines A and B has reached the production target. If it is reached, the operation is stopped.

(4) The Machine A and Machine B production counts are output to the production count panel.

Machine B (station No.2) sequence program

(1) Machine B operation is started by the Machine B READY and Machine B operation start signals sent from Machine A.

(2) During operation, the production is counted by the Machine B production count signal.

(3) While Machine B operates, it continuously transmits the production count to Machine A.

(4) Machine B stops its operation after being notified that the production count has reached its target.

4.2.2 Sequence program creation points

(1) Interlock with the network status

In order to ensure correct operation, sequence programs are generally created by interlocking the CPU module status, equipment monitoring results, etc.

In the same manner, when creating network sequence programs, network statuses should be interlocked.

(2) Link special relays (SB) and link special registers (SW)

Link special relay (SB) and link special registers (SW) both store network statuses.

A link special relay (SB) stores bit signals (ON/OFF), and a link special register (SW) stores data information (16-bit).

The data stored in these relays and registers are refreshed between the network modules and the CPU modules, and such data can be used in sequence programs to verify network module statuses, and for error detection.

4.2.2 Sequence program creation points

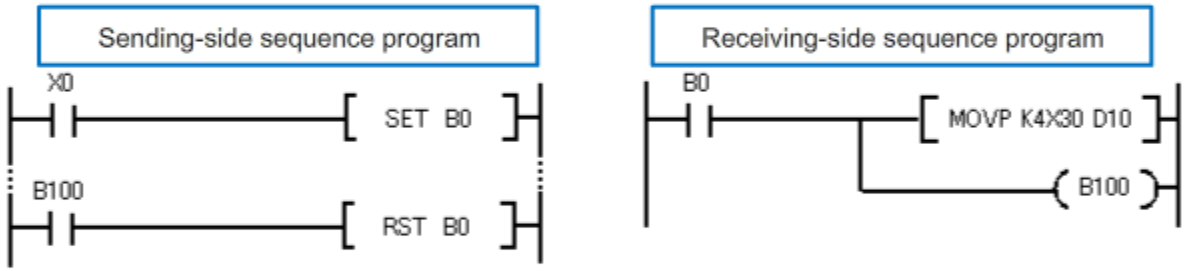
(3) The transmission delay time and the link refresh timing

Programmable controllers share the actual I/O state and numerical data values via the network link devices. However, sometimes there are instances where I/O status and data value refresh across the network can be delayed due to transmission delays, link refresh timing, etc. In order to counteract these possibilities, the following points should be observed.

(a) "SET" and RST" instructions for securing ON/OFF time period

If the on/off time period of the link relay, etc., is too short, the data may not be received by another station due to a transmission delay. To avoid this, "SET" and "RST" instructions can be used to ensure an appropriate on/off time period.

Example of an on/off signal exchange program



The "B0", which is set at the sending side, is kept ON until it is reset by the "B100" ON, which checks the receiving-side processing.

(b) 32-bit data assurance function

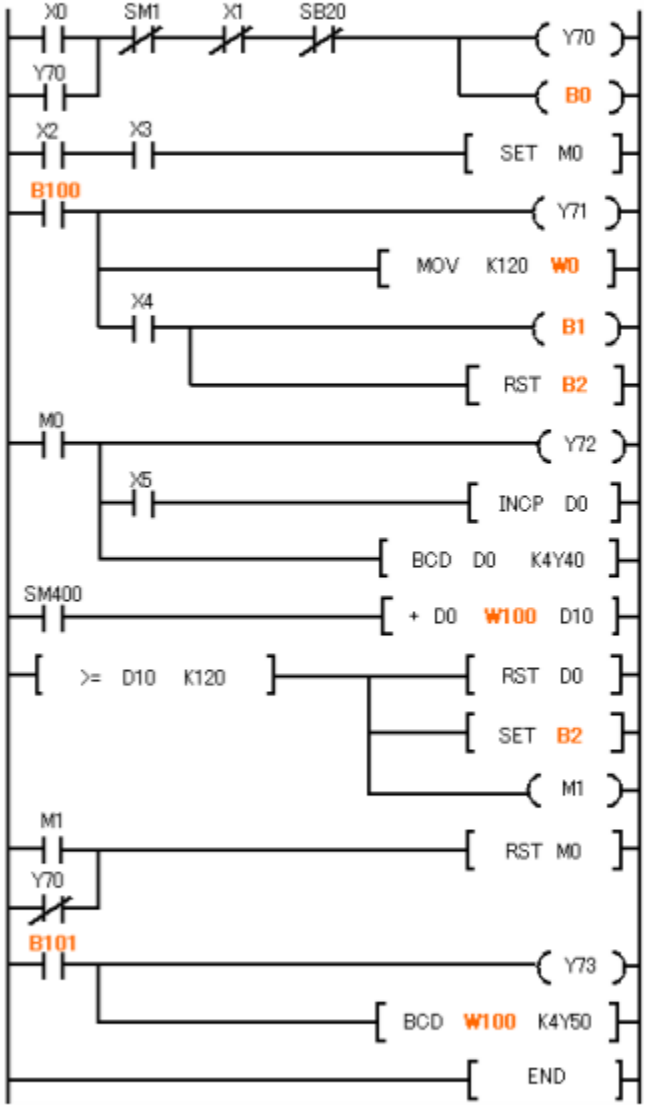
When sending 32-bit data (2 words), the "32-bit data assurance" function can be used to ensure the data integrity. For details regarding the conditions which enables this assurance, please refer to the corresponding manual of the CC-Link IE Controller Network module.

(c) Station-based block data function

When sending multiple-word data that exceeds 32 bits, the "station-based block data" can be used to provide the multiple-word data assurance.
For details, please refer to the corresponding manual of the CC-Link IE Controller Network module.

4.2.3 Machine A (station No.1) sequence program

Devices used for communications are shown in orange.



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 operation starts when "READY (X3)" and "Operation start (X2)" are turned ON.

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

The Machine B target production count is sent to "W0".

When "X4" is turned ON, "B1" is also turned ON, and "Operation start" instruction is sent to Machine B.

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

While "M0" is ON, the Machine A's "Operation started (Y72)" is turned ON, and a machine operation starts.

At an "X5" OFF to ON, Machine A production count is saved in "D0".

During Machine A operation, the Machine A production count "D0" is displayed at the production count panel.

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

When a total target production count is reached, the production count "D0" is cleared.

"Total target production count reached" is saved in "B2" so that Machine B will be notified.

When the total target production count is reached, "M1" is turned ON.

At "M1" ON or "Y70" OFF, the Machine A running status is cleared, and its operation is stopped.

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

During "Machine B running", the "Machine B production count (W100)" is displayed at the production count panel.

4.2.3 Machine A (station No.1) sequence program

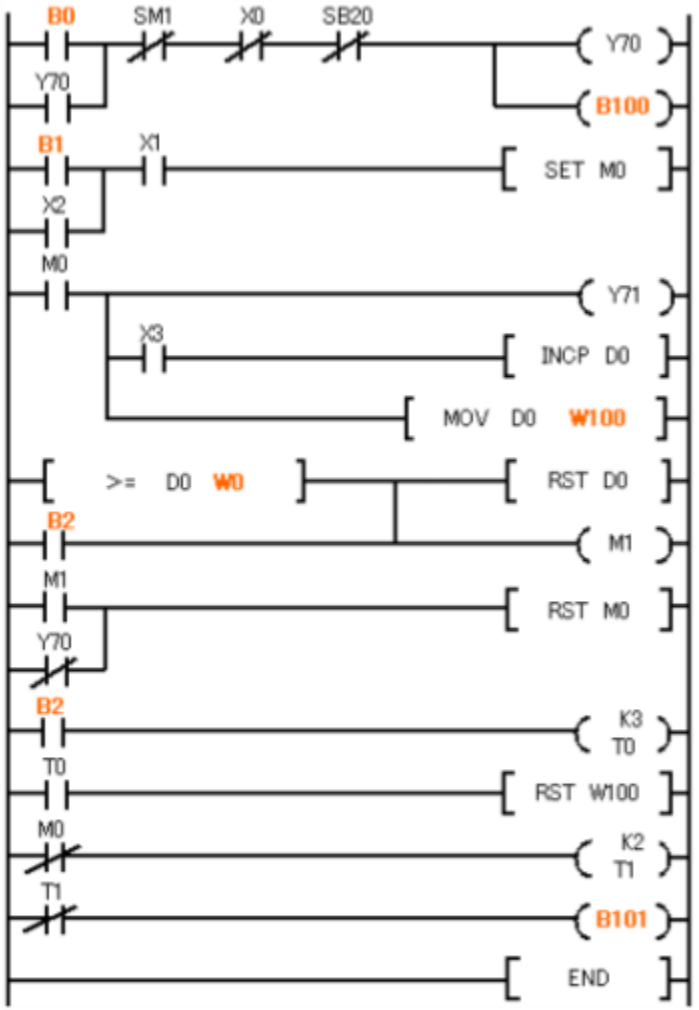
The external signal details are shown below.

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 count
X5	Machine A production count	Y50 to Y5F	Machine B production count
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 a special relay which is turned ON when a programmable controller error is detected.
*2: SB20 is a link special relay which is turned ON when an error occurs at a network module.
*3: SM400 is a special relay which represents a normally open contact.

4.2.4 Machine B (station No.2) sequence program

Devices used for communications are shown in orange.



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's READY status.

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

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

At an "X3" OFF to ON, "Machine B production count" is saved in "D0".

The "Machine B production count (D0)" is sent to "W100", and Machine A is notified of the production count.

The "production count (D0)" is cleared when the "Machine B target production count" is reached, or when the Machine A's "Total target production count reached (B2)" is turned ON.

"M1" is turned ON when the "Machine B target production count" is reached, or when the Machine A's "Total target production count reached (B2)" is turned ON.

The Machine B running status is cleared and operation is stopped when "M1" is turned ON, or when "Y70" is turned OFF.

The "production count (W100)" is cleared after the "timer (T0)" setting period elapses following a Machine A's "Target production count reached (B2)" ON.

The "Machine B running (B101)" is turned ON, and Machine A is notified that Machine B is running.

4.2.4 Machine B (station No.2) sequence program

The external signal details are shown below.

X0	Machine B error
X1	Machine B READY
X2	Machine B independent start
X3	Machine B production count
B0	Machine B READY (instruction from Machine A)
B1	Machine B operation start (instruction from Machine A)
B2	Total target production count 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

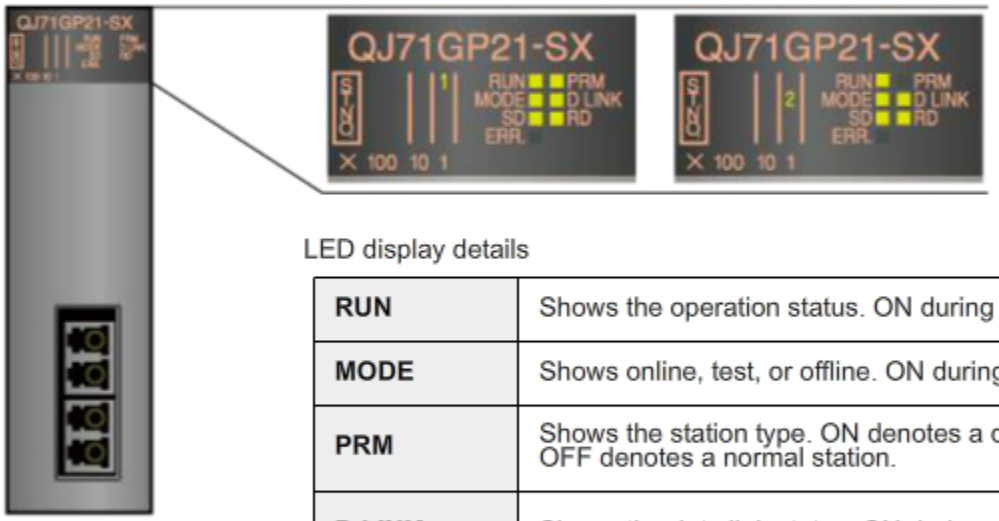
4.3 Example System's Operation Check

This section explains the check procedure for normal network communication.

4.3.1 Checking the network module's LED indicators

To find out the communication status, the network module LED indicators should be checked while the CPU module is running.

When the network is operating normally, the network module LED indicators should appear as shown below.



LED display details

RUN	Shows the operation status. ON during normal communication.
MODE	Shows online, test, or offline. ON during online.
PRM	Shows the station type. ON denotes a control station, and OFF denotes a normal station.
D.LINK	Shows the data link status. ON during cyclic transmission.
SD	Shows that data is being sent.
RD	Shows that data is being received.
ERR.	Shows that error is occurring. OFF while no error is occurring.

The check procedure for an error (ERR. is ON) is given in Section 4.4.

4.3.2 Network system operation check

Forward

The operation of the example system is simulated on the next page.
Please understand the following operation procedure before proceeding to the next page.

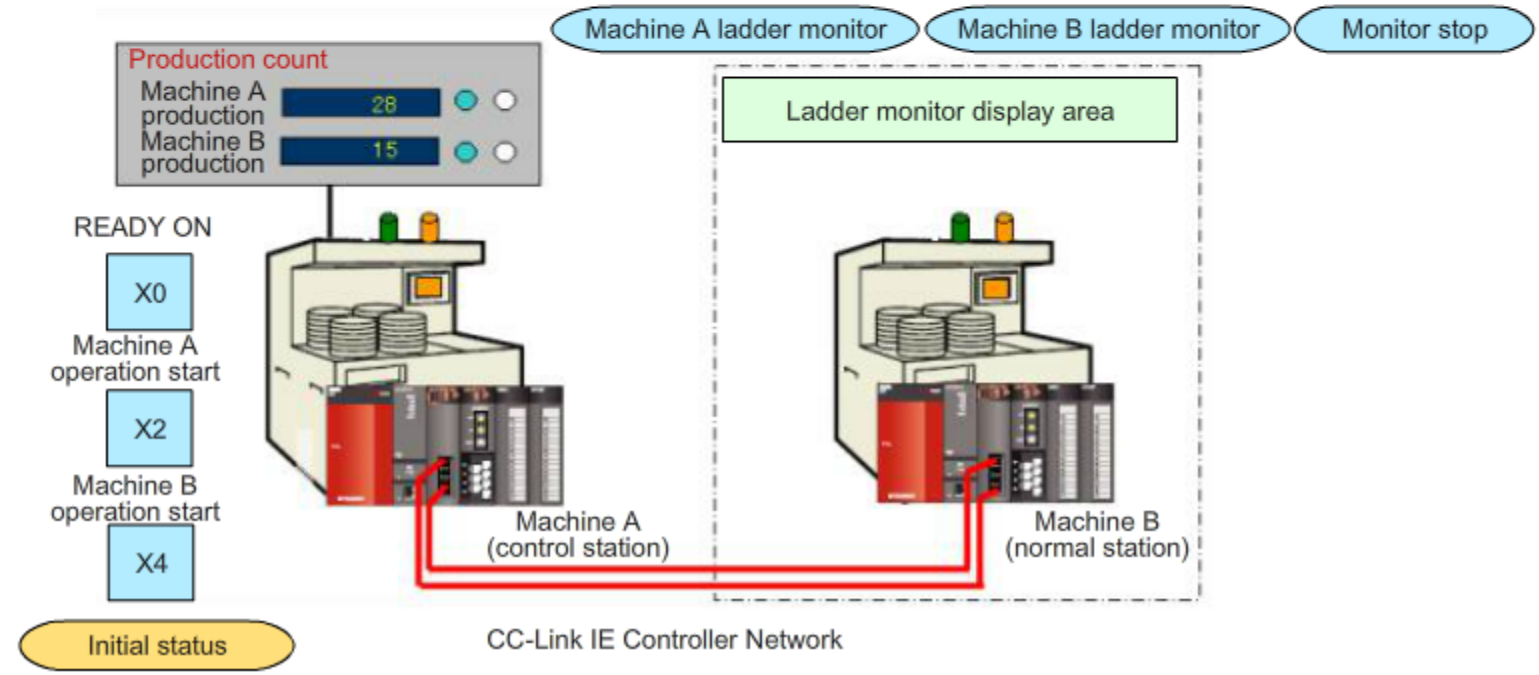
(1) Click "READY ON(X0)" to make Machines A and B ready.

(2) Click "Machine A operation start (X2)" to begin Machine A operation. The current production count value will be displayed at the production count panel.
Click "Machine B operation start (X4)" to begin Machine B operation. The current production count value will be displayed at the production count panel.

(3) The program operation can be checked by clicking each machine's "Ladder monitor" button. Click the button and check how data are exchanged between programmable controllers.
To close the ladder monitor, click the "Monitor stop" button.

(4) Operation is ended when the total production count of machines A and B reaches 120 pieces.

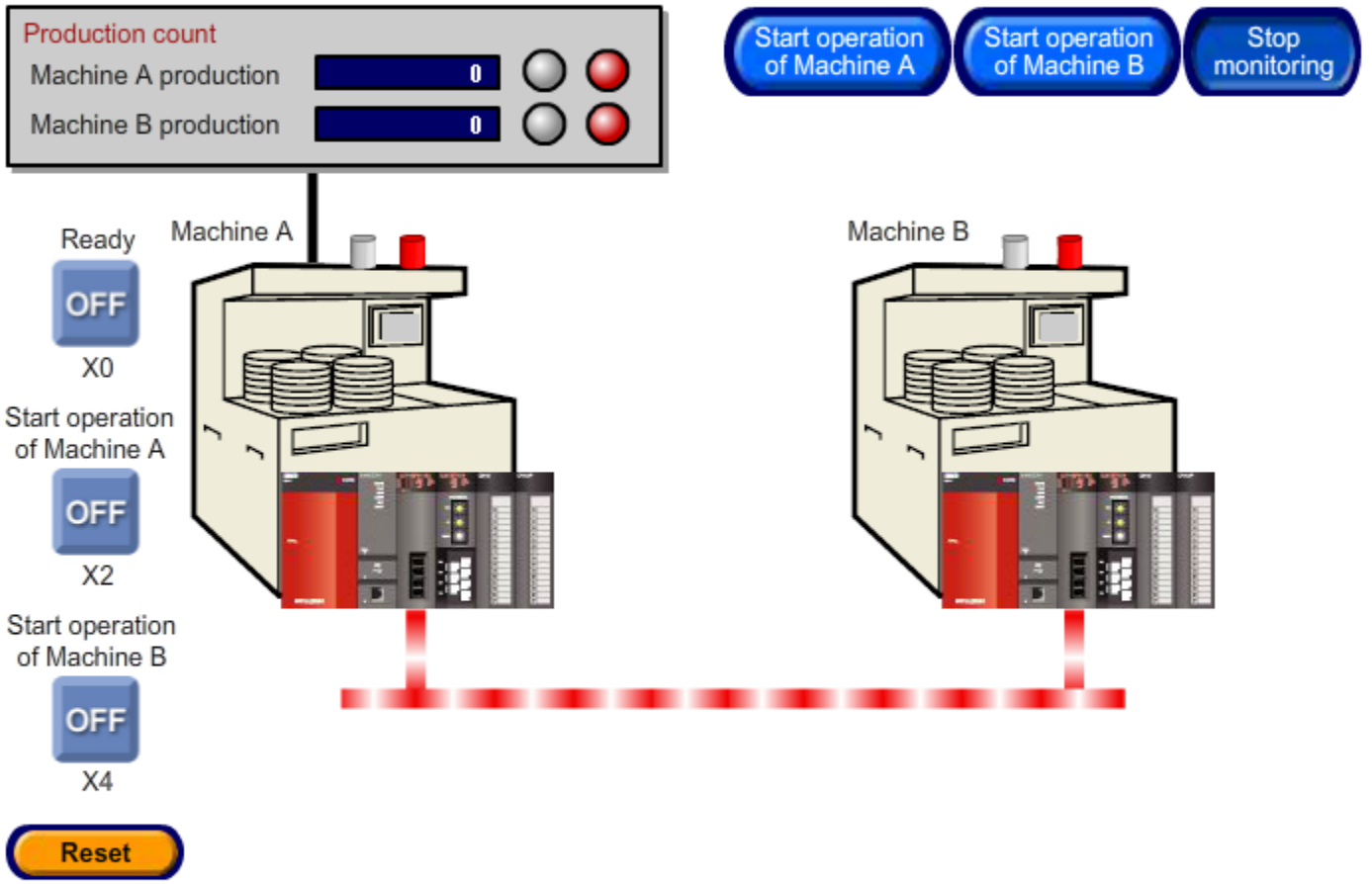
(5) Click the "Initial status" button to return to the initial status (prior to operation start).



4.3.2 Network system operation check

Forward

Please run the simulation to visualize the example system's operation.

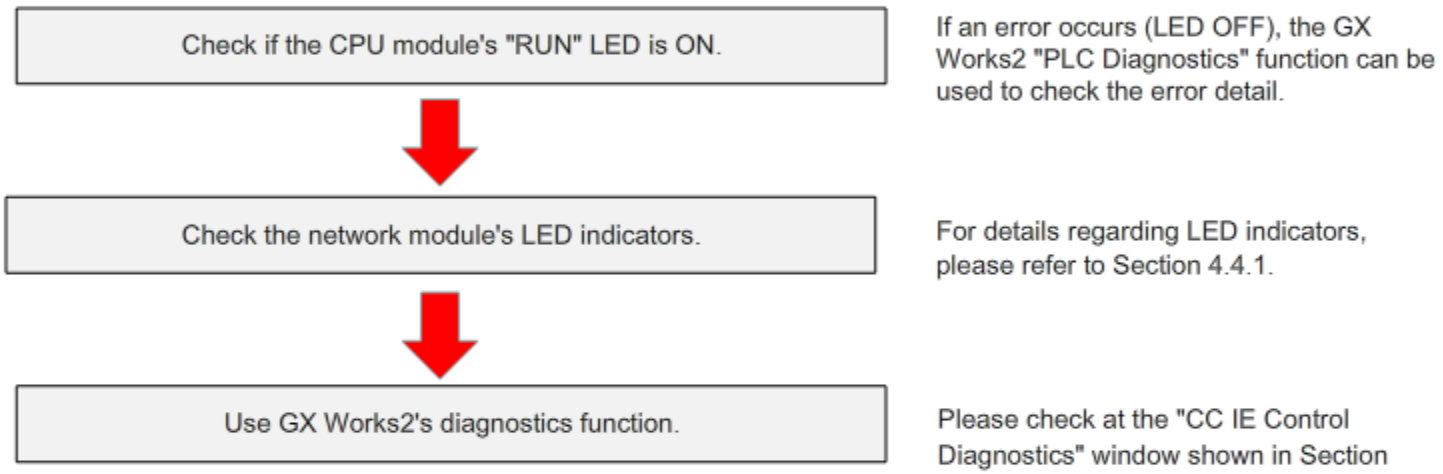


4.4 Check Procedure When Network Fails To Operate

This section explains the basic Diagnostics procedure for a network failure at startup.

Network check procedure

Check in the following order.



4.4.1 Checking the network module's LED status

If the network operates abnormally, the network module's LED indicators should be checked.

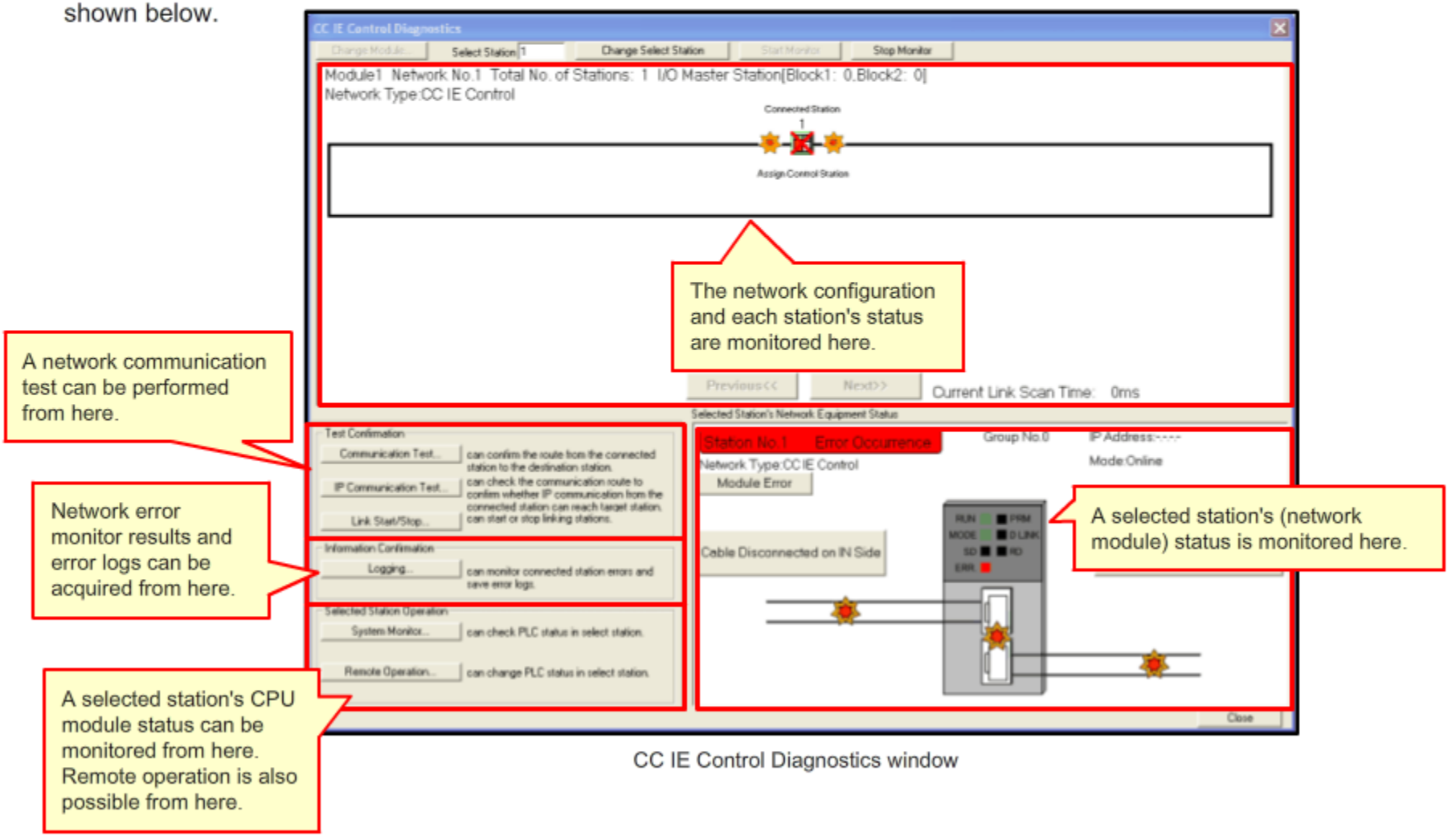
RUN	Green lamp ON	Normal operation
	Lamp OFF	Hardware error or watchdog timer error
MODE	Green lamp ON	Online mode
	Green lamp blinking	Test mode
	Lamp OFF	Offline mode
PRM	Green lamp ON	Running as control station
	Lamp OFF	Running as a normal station
D LINK	Green lamp ON	Data link in progress (cyclic transmission in progress)
	Green lamp blinking	Data link in progress (cyclic transmission stopped)
	Lamp OFF	No data link (disconnected)
ERR.	Red lamp ON	• Erroneous reception data (reception frame error) • Station-to-station frame errors exceed the specified level. • Control station duplication, or station No. duplication • Cable disconnection, or incorrect OUT/IN connection • Corrupted network parameters, or a control station and normal station setting mismatch (reserved station, total number of stations, network No., etc.).
	Lamp OFF	Normal status
SD	Green lamp ON	Data transmission in progress
	Lamp OFF	No data transmission
RD	Green lamp ON	Data transmission in progress
	Lamp OFF	No data transmission

: Indicates abnormal status.

4.4.2 Network diagnostics

This section explains the diagnostics procedure for an abnormal network operation.
The GX Works2's network diagnostics function can be used to check the communication status.

The figure below shows available functions of the network diagnostics.
At the GX Works2 menu, select "diagnostics" -> "CC IE Control diagnostics" to open the window shown below.

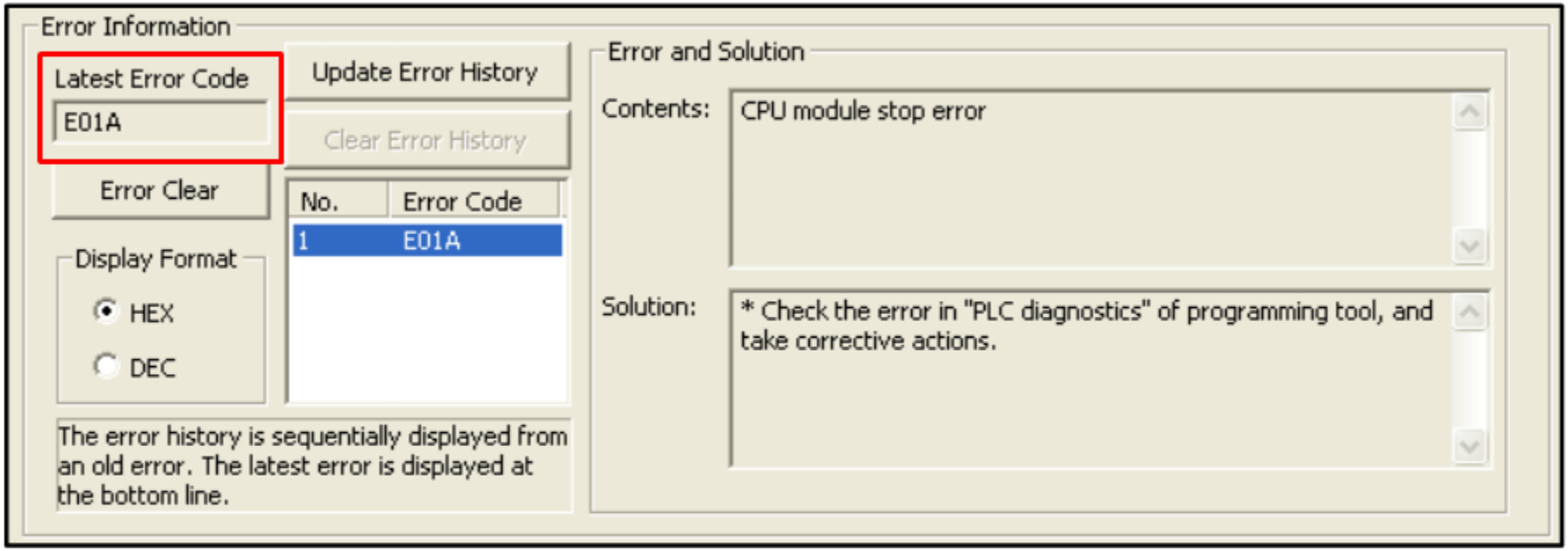


CC IE Control Diagnostics window

4.4.3 Checking error codes used for system monitoring

When an error is detected at a network module, the error code is saved in the link special register.

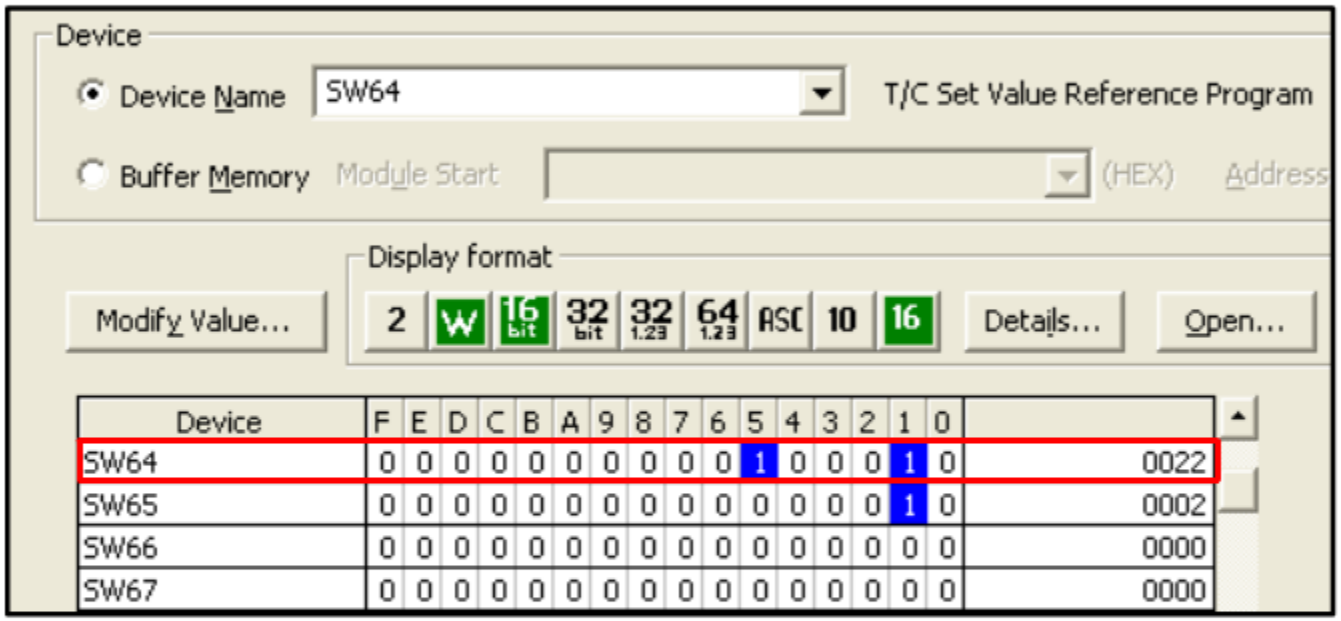
To check the error code occurring at the target module on GX Works2, open the "System Monitor" window, then "Module's Detailed Information" window.



Module's Detailed Information window

4.4.4 Checking error codes used for device batch monitor

Error codes saved in link special registers can also be checked on a batch monitor. On GX Works2, select "Device/Buffer Memory Batch Monitor -1".
In the example shown below, error code "22H" has been saved in the "SW64" link special register. This error code indicates that own station's transmission path is disconnected.



Device/Buffer Memory Batch Monitor -1 (Monitoring) window

4.4.5 Checking error codes used for loop tests

The following example shows an error condition in which the same station No. has been specified for both stations in a 2-station network. Because the status varies according to the specific settings, please refer to the corresponding manual of the CC-Link IE Controller Network module for details.

Please click the ▶ button to visualize how LED indicators appear with the correct station setting, and with the incorrect station setting.

Control station LED display (with no station number duplication)

Sucessfully completed!

All the ST.NO. LEDs are OFF.

Control station LED display (with station number duplication)

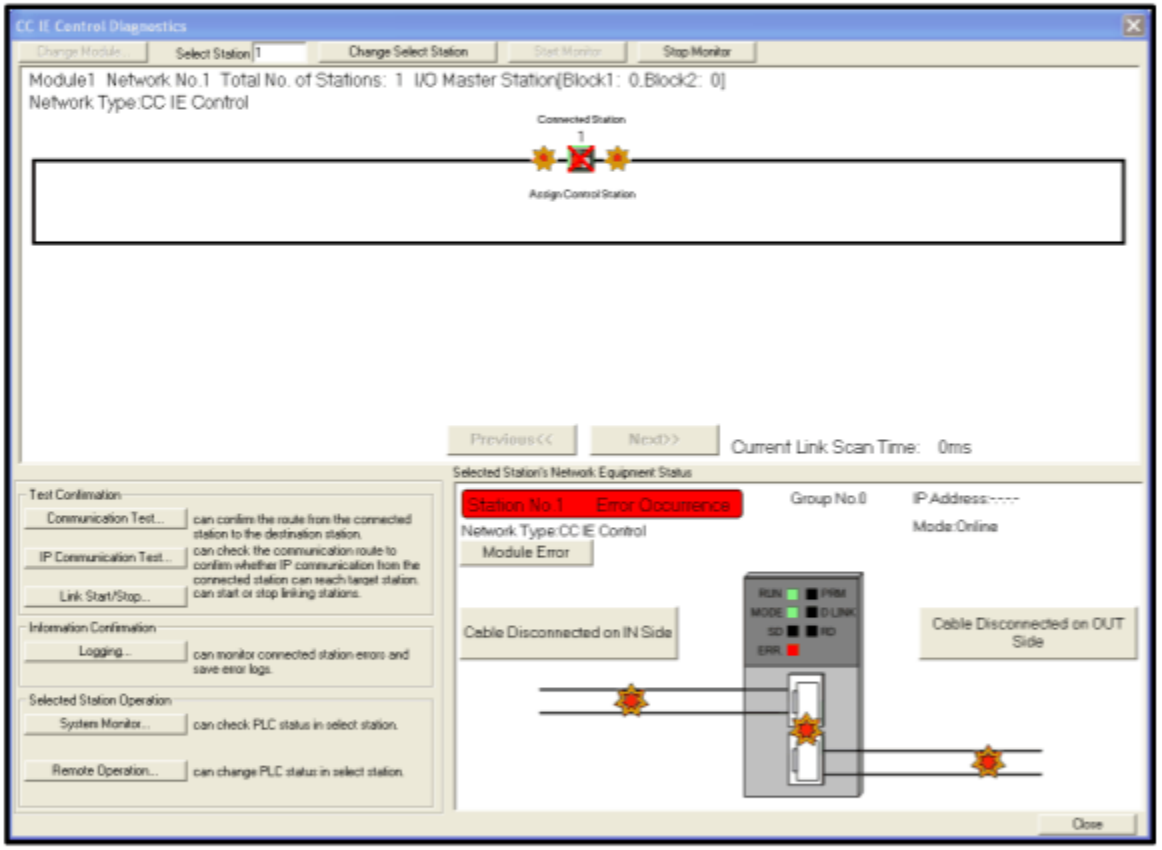
Failure detected!

During loop test, the ST. NO. LED indicates the station where the error is occurring. In this example, the station number "2" is duplicated.
For details, please refer to the manual.

4.4.5 Checking error codes used for loop tests

If a loop test ends in an error, a CC IE Control diagnostics should be performed to determine the error cause, then the appropriate corrective action indicated in the troubleshooting section should be taken. After taking the corrective action, another loop test should be performed.

The CC IE Control Diagnostics window is shown below.



CC IE Control diagnostics window

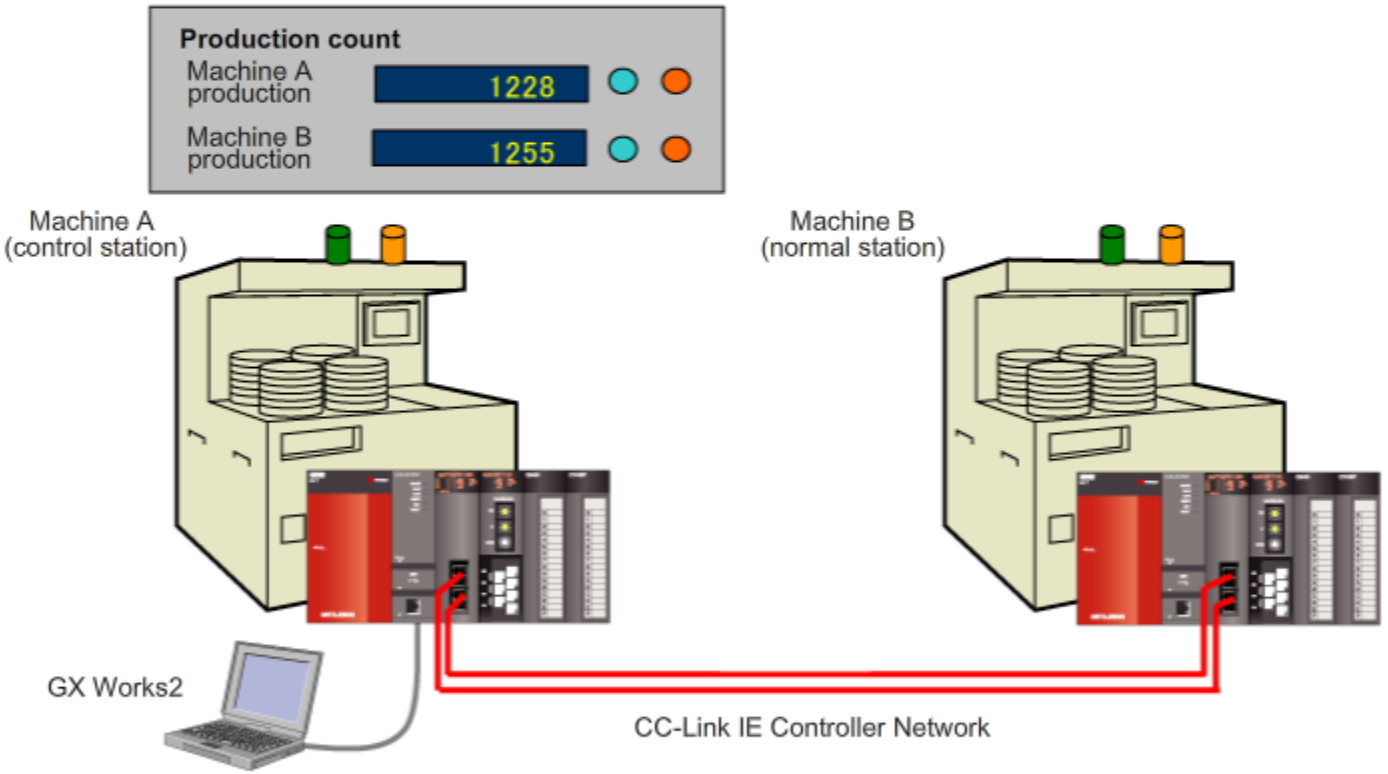
(1) Select the faulty station.

(2) Click the error details button (Module Error , etc.) to open the "Error Details" dialog box, then take the appropriate corrective action indicated in the troubleshooting section.

4.5 Using GX Works2 To Monitor Other Station Programs

This section explains how to access another station via network.
GX Works2 enables the user to access other stations in network to transfer programs and perform monitoring, etc.

The procedure for accessing the Machine B programmable controller in the example system is given below. This procedure allows the CPU module status at a distant control panel to be viewed at a nearby control panel, etc., making it unnecessary to go to that distant control panel.



4.5.1 Operation procedure for monitoring other stations

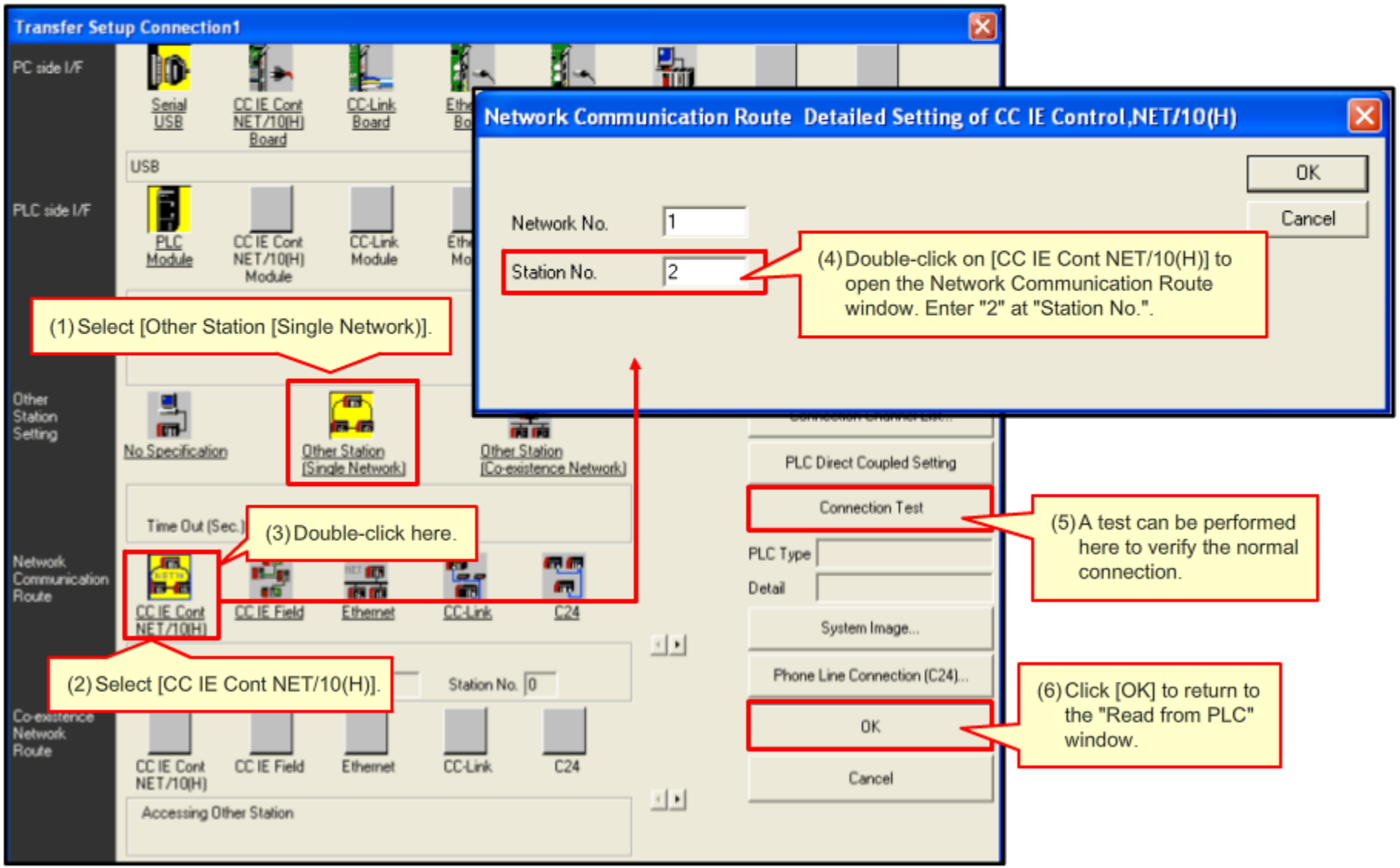
In order to access another station, "CC IE Cont NET/10(H)" must be selected as the Network Communication Route in the GX Works2's Transfer Setup Connection window.

The following procedure should be followed. (The procedure below assumes that no project has been made in GX Works2.)

(1) PLC read menu selection	At the GX Works2 "Online" menu, select "Read from PLC".
↓	
(2) Transfer setup connection	At the "Transfer Setup Connection" window, specify the target programmable controller.
↓	
(3) PLC read	At the "Read from PLC" window, read the program and parameters from the target programmable controller.
↓	
(4) Monitor	Click the "Monitor" icon, and monitor the program of the target programmable controller.

4.5.2 Settings for connecting to Machine B

The window below shows the settings required for a personal computer (GX Works2) that is physically connected with Machine A (station No.1) to be connected with Machine B (station No.2) via network.



Transfer Setup Connection1 window

4.6 Summary

In this chapter, you have learned:

- Examples of sequence programs which use link devices
- Network system operation check procedure
- Diagnostics procedure when network fails to operate
- Using GX Works2 to monitor other station programs

Important points

Sequence program for control	• Data in link special relays and link special registers can be used as interlock signals. • If on/off signals are used, the "SET" and "RST" instructions should be used to ensure an appropriate on/off time period. • To send multiple word data in a single operation, the "32-bit data assurance" or the "station-based block data" function can be used.
Network system operation check	• The communication status can be checked with the network module LED indicators. • The ladder monitor of GX Works2 can be used to verify that the data are normally exchanged via the network.
Measures to take when network fails to operate	• If the network is not operating normally, check the CPU module's LED indicators and the network module's LED indicator details to diagnose the problem. • GX Works2's PLC diagnostics, communication test, and test functions are available to check the error details.
Using GX Works2 to monitor other stations	• To monitor other stations, "Other Station" should be selected on the "Transfer Setup Connection" window, and on the "Network Communication Route" window, "Network No." and "Station No." of the monitoring target station should be set.

Test Final Test

Now that you have completed all of the lessons of the PLC CC-Link IE Controller Network 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 12 questions (58 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 : 2

Total Questions : 9

Percentage : 22%

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

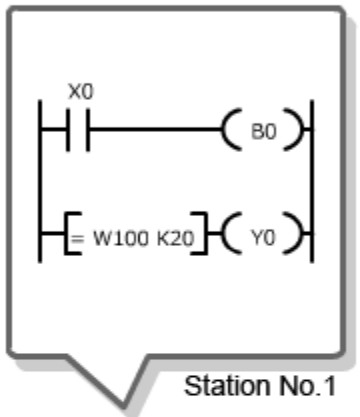
Proceed | Review | Retry

- 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.

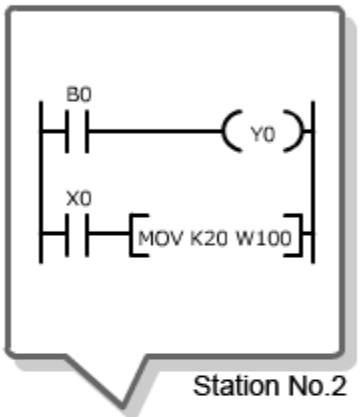
Test Final Test 1

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

Station No.1
sequence program



Station No.2
sequence program



(1) The contact "X0" of station No.1 programmable controller is turned on.

(2) The coil "B0" of (**Q1**) programmable controller is turned on.

(3) The ON signal status is transmitted to the contact "B0" of (**Q2**) 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 (**Q3**) programmable controller.

(7) "20" is transmitted to the register "W100" of (**Q4**) programmable controller.

(8) The coil "Y0" of station No.1 programmable controller is turned on.

Q1 --Select-- Q2 --Select-- Q3 --Select-- Q4 --Select--

Answer Back

Test Final Test 2

The following section explains how the link device data are exchanged between a CC-Link IE Controller Network module and a CPU module.
Please select the correct terms to complete each sentence.

Among CPU module link devices used in sequence programs, a bit device is called a --Select-- and represented by the symbol --Select--.

Among CPU module link devices used in sequence programs, a word device for 16-bit data is called a --Select-- and represented by the symbol --Select--.

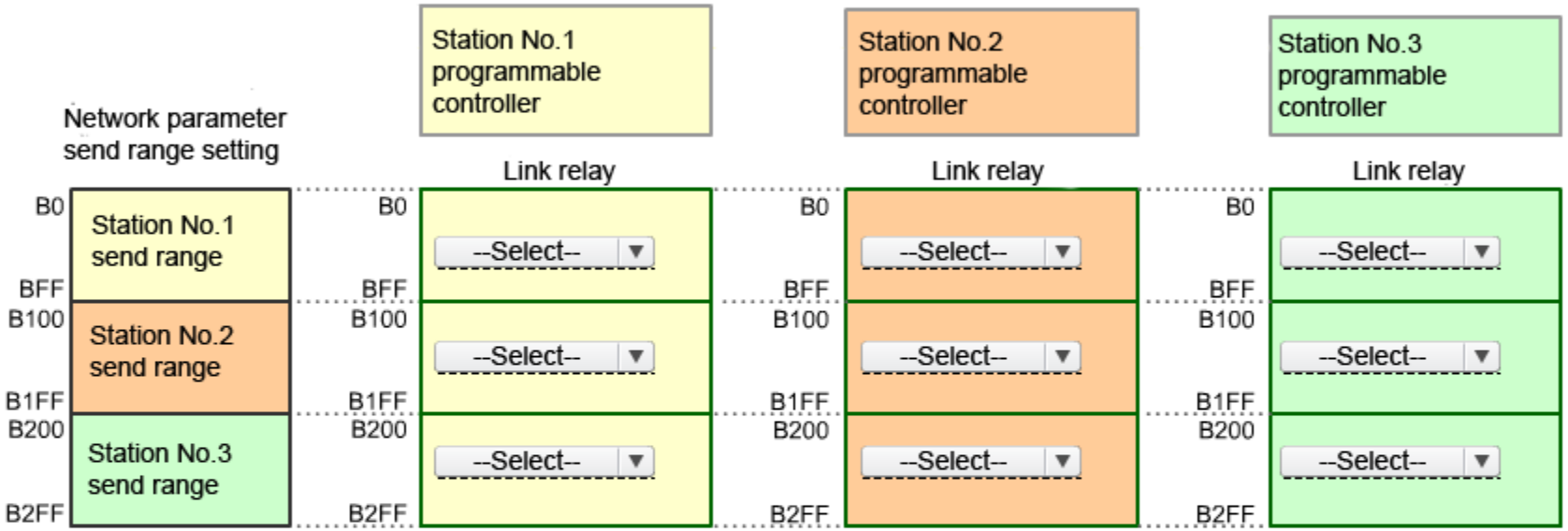
By --Select--, the data in the CPU module's link devices (B/W) are exchanged with the bit devices (--Select--) and word devices (--Select--) of the network module's link devices.

Answer Back

Test Final Test 3

Forward

The relationship between the send range and receive range is shown below.
The send range is assumed to be set as follows by the network parameters. Please select the correct device areas for each station.



Answer Back

Test Final Test 4

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

No program is required for data communication.	--Select--
Periodically and automatically exchanges data in an area specified by the network parameter.	--Select--
Data are exchanged between programmable controllers connected in the same network, only when requested.	--Select--
Data communication requires programs containing dedicated instructions.	--Select--
Communication occurs automatically by just setting the network parameters.	--Select--

Answer Back

Test Final Test 5

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

Each CC-Link IE Controller network is assigned a --Select-- .

Each of all the network modules connected in the same network is assigned a --Select--

for identification.

One of the network modules must always be used as a --Select-- , and other

programmable controllers are set as --Select-- .

Answer Back

Test Final Test 6

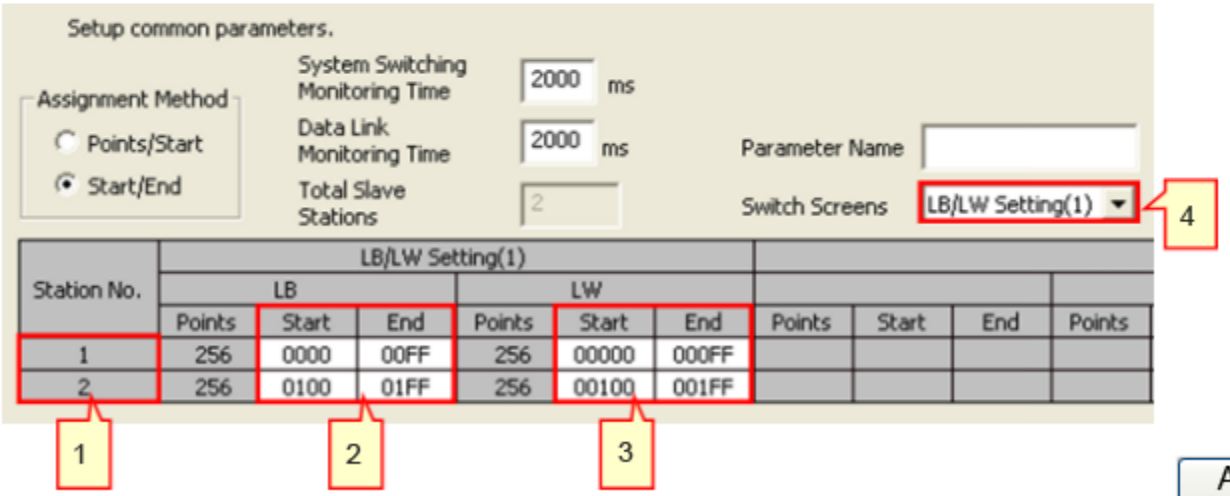
The Network Parameter setting window is shown below.
Please select the correct item for each description.

Q1 [▼]
Displays the station numbers.
The displayed numbers correspond with the "Total Stations" set in the Network Parameter setting window for the control station.

Q2 [▼]
The send range of the link registers (LW) at each station.
The start No. and last No. of LW are set for each station.
The settings should not overlap between stations.

Q3 [▼]
The control target devices are displayed in a drop down list.
When using LX/LY, select it here.

Q4 [▼]
The send range of the link relays (LB) at each station.
The start No. and last No. of LB are set for each station.
The settings should not overlap between stations.



Answer Back

Test Final Test 7

The following description is about the network refresh parameters.
Please select the correct term for each sentence.

Network refresh parameters specify the send range within the network module link devices

(▼) . Data in these devices are sent to the CPU module link devices

(▼) so that they can be used in sequence programs.

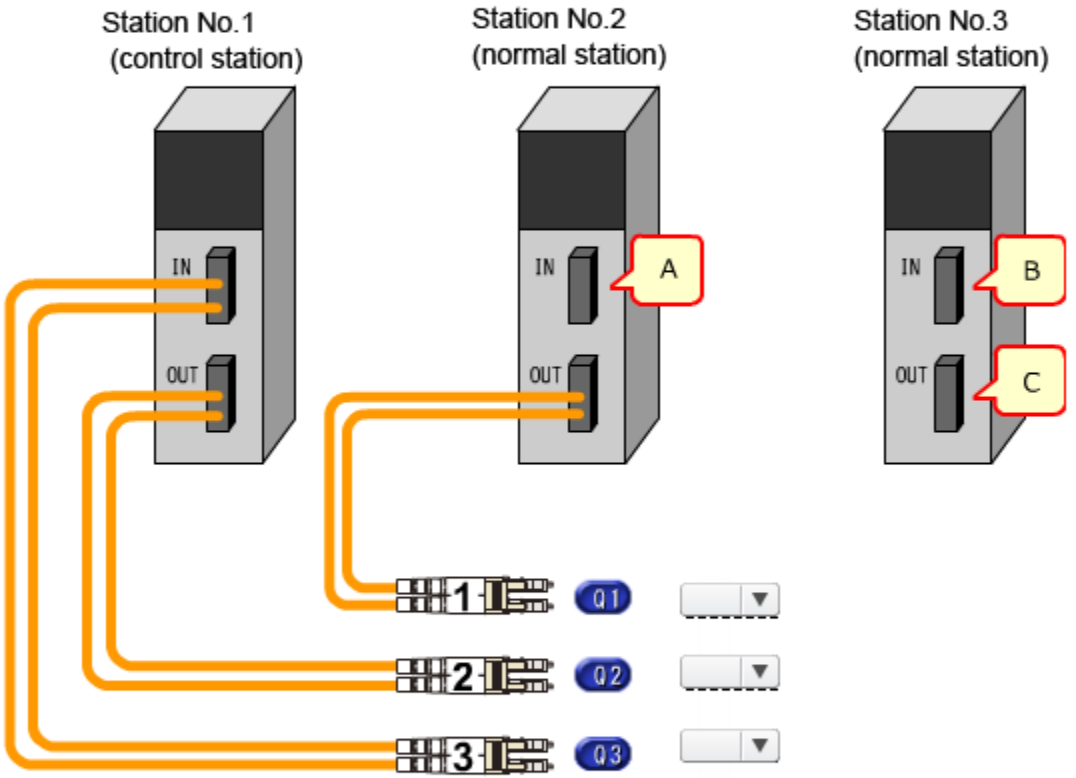
In the default setting, 8192 points each are assigned to a link device.

The default setting can be used as it is if no change is required.

Answer Back

Test Final Test 8

The figure below shows an optical cable connection example.
Station No.1 to No.3 are to be sequentially connected to create an optical 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).



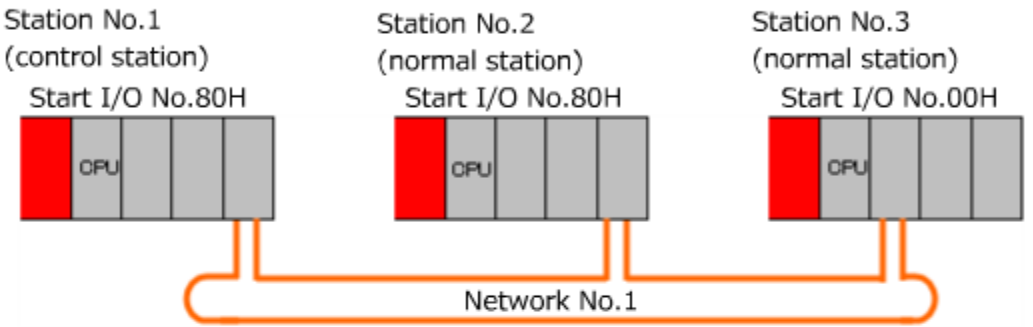
Answer Back

PLC_CC-Link_IE_Controller_Network_ENG

Test Final Test 9

Forward

Network parameter settings are required for the following CC-Link IE Controller Network modules. Please refer to the system configuration shown below and select the correct setting value for each parameter.



	Station No.1 (control station)	Station No.2 (normal station)	Station No.3 (normal station)
Network type	--Select--	--Select--	--Select--
Start I/O No.			
Network number			
Total Stations	--Select--	--Select--	--Select--
Group number	0	0	0
Station number	1	2	3

Answer Back

Test Final Test 10

The following section explains LED indicators on the network module.
For the stations No.1 and No.2, please select the LED indicator display that shows normal communication.

Station No.1 (control station) : Q1

Station No.2 (normal station) : Q2

1

2

3

4

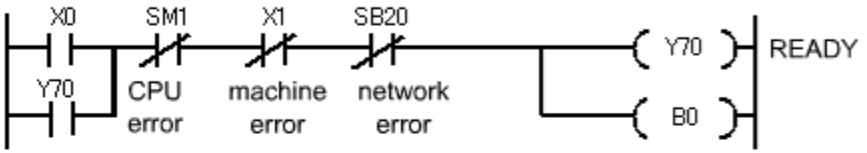
5

6

Answer Back

Test Final Test 11

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



The sequence program uses different combinations of the status signals of programmable controller CPU module, machine, [▼], etc. for interlocking operation.

Some of the examples include a programmable controller CPU status signal saved in a special relay ([▼]) and a network status signal saved in a link special relay ([--Select-- ▼]) used in the CC-Link IE Controller Network.

Answer Back

Test Final Test 12

The following sentences explain about error codes.
Please select the correct term to complete each sentence.

When an error is detected at a CC-Link IE Controller Network module, the error contents are saved as --Select-- in the relevant link special register.

The error code can be checked by specifying the link special register number in the “Module’s Detailed Information” window which is opened from --Select-- window, or in the --Select-- window of GX Works2.

Answer Back

Test Test Score

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

Correct answers : 0

Total questions : 12

Percentage : 0%

Proceed Review Retry

You failed the test.

You have completed the PLC CC-Link IE Controller Network 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