CS1 Series

Controller Link

Controller Link Units: CS1W-CLK21 and CS1W-CLK11
Controller Link Support Boards: 3G8F5-CLK21 and 3G8F5-CLK11

A Basic FA Network with Data Links and Message Communications. Both Wired and Optical Networks Supported.

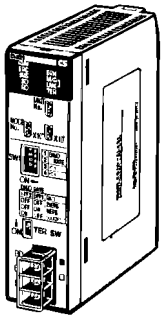
- An FA network Controller Link Network supports data links between PCs or between PCs and personal computers (data constantly shared over a given area), as well as communications messages between PCs or between PCs and personal computers (i.e., send and receive data when necessary).

What is the Controller Link?

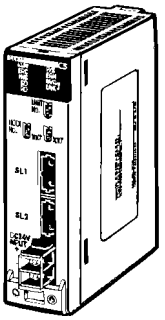
The Controller Link is an FA network that can send and receive large data packets flexibly and easily among advanced OMRON Programmable Controllers (CS1-series, C200HX/HG/HE-series, and CV-series PCs) and IBM PC/AT or compatible computers.

The Controller Link supports data links that enable data sharing and a message service that enables sending and receiving data when required. Data link areas can be freely set to create a flexible data link system and effectively use data areas.

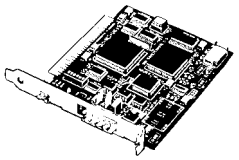
The network is connected using either shielded twisted-pair cable or optical fiber cable, and high-volume data transmissions at high speed enable construction of a wide range of networks, from low-level systems to high.



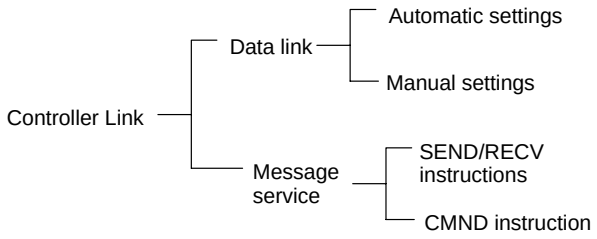
Wired Unit
CS1W-CLK21

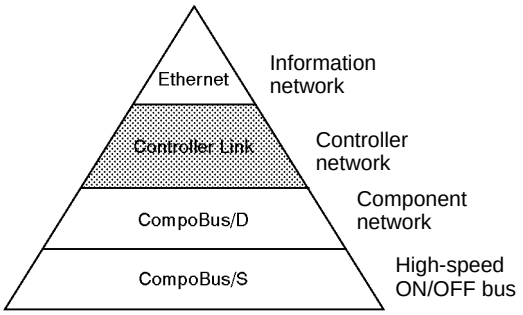


Optical Unit
CS1W-CLK11



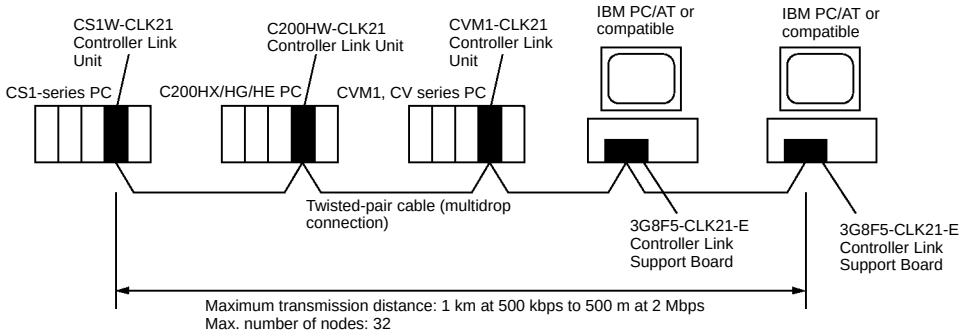
Personal Computer Board
3G8F5-CLK21-E (Wired Board)
3G8F5-CLK11-E (Optical Board)





■ System Configuration

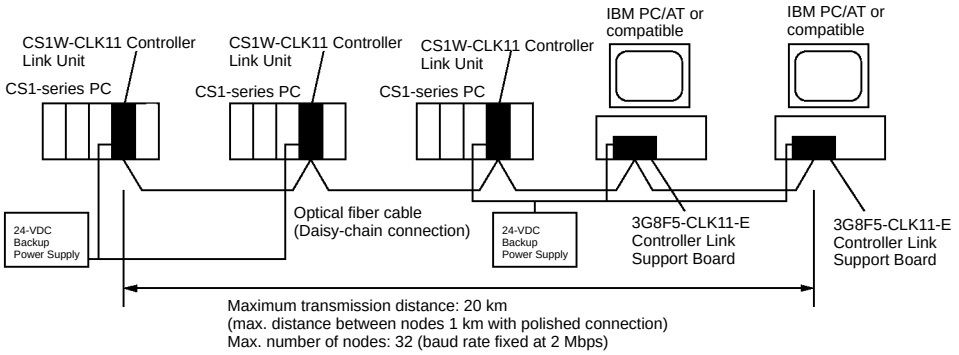
Wired System (Twisted-pair Cable)



"Programmable Controller" is abbreviated as "PC" in these *Specification Sheets.*

Optical System (Optical Fiber Cable)

An optical system can be used to connect CS1-series PCs and personal computers.



Note: C200HX/HG/HE, CVM1, and CV-series PCs cannot be connected via optical fiber cable.

■ Features

Data Links

Data links allow the constant sharing of data in predetermined data areas between nodes, between PCs, or between a PC and an IBM PC/AT or compatible computer on the network. Data links do not require the use of communications programs on the PC (CPU Unit) or IBM PC/AT or compatible computer. Data written in the send area of the local node will be automatically sent to the receive area of other nodes.

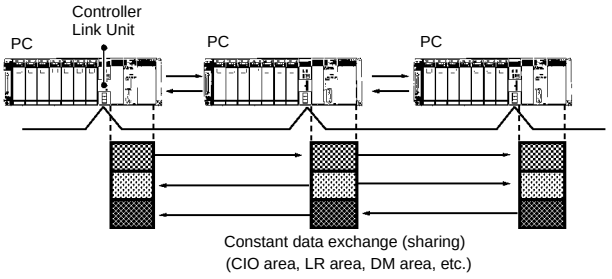
The I/O area (CIO area), link area (LR area), data memory area (DM area), and extended data memory area (EM area) can be freely set in the send or receive area. (The area used for sending or receiving data using the data link function is called “data link area.”)

- Number of send words per node: 1,000 words max.
- Number of send and receive words per node: 12,000 words max. for CS1-series PCs, 8,000 words max. for C200HX/HG/HE and CVM1, CV-series, and 32,000 words max. for personal computers.

The data link area can be set automatically or manually.

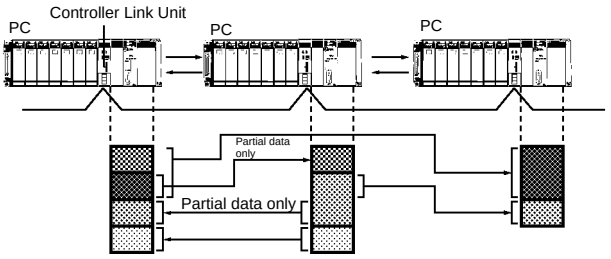
Automatic Setting

Used for simple data link processing. Data link can be performed by simply setting parameters in the DM area of the PC.Send data size per node is the same for all nodes. All nodes participating in the data link share the same data.



Manual Setting

Used for flexible data link processing depending on each system.Using the Controller Link Support Software, individual data link tables can be set for each node and the data link area can be freely allocated for each node. Send data size per node can be freely set. It is also possible to set nodes for only send or receive data. With the Controller Link Unit, the data link can be set to receive only a part of the data link area of other nodes.



Message Service

This function controls data transmission with particular nodes, reading or writing of status data, changing of operation modes, etc., by executing communications instructions on a program. The communications instructions include SEND/RECV instructions for data transmission and CMND instructions for issuing various commands.

SEND/RECV

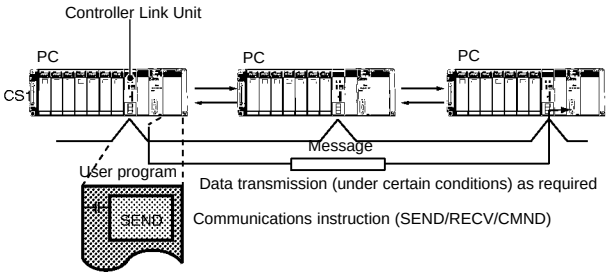
The SEND or RECV instruction sends or receives data in an area of a particular node.

The SEND instruction sends data from an area of the local node and writes to an area in the designated node.

The RECV instruction requests the designated node to send area data and writes the data to the local node.

CMND

The CMND instruction issues a command to read or write data of other nodes, control, or read error logs. With the Controller Link Unit, OMRON’s command protocol called “FINS commands” is used.



Twisted-pair Cable or Optical Fiber Cable Connection

The Controller Link Units can be connected to the network using either shielded twisted-pair cables or optical fiber cables. Select the system that suits your application.

Features of Twisted-pair Cable

- Twisted-pair cable is easy to connect and maintain. The cable can be processed much more easily than coaxial or optical cable, thereby reducing the cost of tools and assembly time.
- Connections are made to a terminal block on the Controller Link Unit and to a special connector on the Controller Link Support Board for easy system assembly and modification.
- The network is equipped with the required terminating resistance built into the Units allowing the terminating resistance to be easily set at both ends of the network using a simple switch.

Features of Optical Fiber Cable (CS1 Series Only)

- Optical Fiber Cable has superior noise resistance, so this system can provide highly reliable communications even in very noisy conditions.
- The communications distance can be up to 20 km in total (1 km max. between nodes), which allows long-distance or large-scale networks.

Compatible with Different Node Configurations

- The following Controller Link Units are available for communications between different models. It must be noted, however, that the wired system and optical system cannot exist in one Controller Link Network.
- **Wired system**
- Controller Link Unit for CS1-series Programmable Controllers
- Controller Link Unit for C200HX/HG/HE Programmable Controllers
- Controller Link Unit for CVM1 and CV-series Programmable Controllers
- Controller Link Unit for CQM1H-series Programmable Controllers
- Controller Link Support Board for IBM PC/ATs or compatibles
- **Optical System**
- Controller Link Unit for CS1-series Programmable Controllers
- Controller Link Support Board for IBM PC/ATs or compatibles

Flexible Inter-network Connections

- The Controller Link Network can connect to other networks (Ethernet, SYSMAC NET, SYSMAC LINK, and another Controller Link network) via CVM1, CV-series, or CS1-series PCs. By installing a Communications Unit for the Ethernet, SYSMAC NET or SYSMAC LINK on the same CS1-series or CV series-PC as a Controller Link Unit, a message service can be created with nodes in interconnected networks through the CVM1 or CV-series PC. Up to three network levels are possible.

Note: CS1-series PC cannot be installed on SYSMAC NET and SYSMAC LINK networks.

- The programming and monitoring of other PCs on the network can be conducted from Programming Devices connected to the PC's CPU Unit. Inter-network connections are possible in this case also and can cover up to three network levels.

Node Bypass (Optical System Only)

With the Optical Controller Link network, data communications can be continued by bypassing the node, even when a node in the communications line malfunctions or the PC or IBM PC/AT or compatible computer power supply is turned OFF. This prevents the whole network system from being affected by a node malfunction or power interruption.

To use the bypass node function, backup power must be supplied to the Controller Link Unit/Support Board.

RAS

RAS performs real-time monitoring of the network status. If an error occurs in the network, RAS records and displays the time and contents of the error.

- **Status Area**
- Data Link Status Area
  When the data link function is used, the data link status is reflected in the data link status area of the PC.
- Network Status Area Other than the Data Link:
  The network status such as the state of node participation is reflected in the status area of the PC.

Error Log

The error log function records contents (codes) and times of errors that occur in the network into the RAM or EEPROM, up to the maximum of 39 errors.

The recorded errors can be read using the Controller Link Support Software or the message service function.

Data Link Settings Using CX-Programmer

You can make user data link table settings, monitor the status of data links, and perform similar operations for the CS1-series Controller Link Unit using the CX-Programmer programming software. (You cannot directly connect the Controller Link Support Software to a CS1-series CPU Unit using RS-232C.)

■ Controller Link Communications Specifications

Item	Specifications	
	Wired system	Optical system
Communications functions	Data links, message communications	
Communications method	N:N token bus	
Code	Manchester code	
Modulation	Baseband code	
Synchronization	Flag synchronization (conforms to HDLC frames)	
Transmission path form	Multi-drop bus	Daisy-chain
Baud rate and maximum transmission distance	The maximum transmission distance varies with the baud rate as follows: 2 Mbps: 500 m 1 Mbps: 800 m 500 Kbps:1 km	Baud rate: 2 Mbps Maximum transmission distance: 20 km Maximum distance between nodes: Crimp cut: 800 m Adhesive: 1 km (see note)
Media	Specified shielded twisted-pair cable Number of signal lines: 2, shield line: 1	H-PCF cable (optical two-core cable)
Node connection method	PC: Connected to a terminal block IBM PC/AT or compatible: Connected via a special connector (included)	Connected via a special (full-lock connector) connector. (A half-lock connector can also be used.)
Maximum number of nodes	32 nodes	
Number of data link words	Transmission area per node: 1,000 words (2,000 bytes) max. Data link area in one CS1-series PC (send/receive): 12,000 words (24,000 bytes) max. Data link area in one C200HX/HG/HE, or CVM1, CV-series (send/receive): 8,000 words (16,000 bytes) max. Data link area in one IBM PC/AT or compatible (transmission/reception): 32,000 words (64,000 bytes) max. Number of data link words in one network (total transmission): 32,000 words (64,000 bytes) max.	Transmission area per node: 1,000 words (2,000 bytes) max. Data link area in one PC (CS1-series PC) (send/receive): 12,000 words (24,000 bytes) max. Data link area in one IBM PC/AT or compatible (transmission/reception): 32,000 words (64,000 bytes) max. Number of data link words in one network (total transmission): 32,000 words (64,000 bytes) max.
Data link areas	Bit areas (IR, AR, LR, CIO), data memory (DM), and extended data memory (EM)	
Message length	2,012 bytes max. (including the header)	
RAS functions	Polling node backup function Self-diagnosis function (hardware checking at startup) Echoback test and broadcast test (using the FINS command) Watchdog timerError log function	Polling node backup function Self-diagnosis function (hardware checking at startup) Echoback test and broadcast test (using the FINS command) Watchdog timerError log function Node bias function
Error control	Manchester code check CRC check (CCITT $X^{16} + X^{12} + X^5 + 1$)	

Note: The maximum distance between nodes depends on the connector and cable processing methods.

Data Link Specifications

Type of Data Link		Automatic settings		Manual settings	
No. of data link nodes		32 nodes max. (2 nodes min.)			
No. of data link words	Number of send/receive words per node (total of area 1 and area 2)	CS1: Up to 12,000 C200HX/HG/HE, CVM1, CV: Up to 8,000 IBM of compatible: Up to 32,000			
Data link areas	Area 1	CIO Area (including I/O bits and work bits)		CIO Area (including I/O bits and work bits), data memory (DM) Area, and extended memory (EM) Area	
	Area 2	Data memory (DM) Area, and extended memory (EM) Area			
Number of words sent per node	Area 1	0 to 1,000 words (same for all nodes)	Max. number of words total for area 1 and area 2: 1,000	0 to 1,000 words (same for all nodes)	Max. number of words total for area 1 and area 2: 1,000
	Area 2	0 to 1,000 words (same for all nodes)		0 to 1,000 words (same for all nodes)	
Receiving data	Area 1	All nodes receive data sent from all other nodes participating in the data link (cannot receive from only specified nodes)		You can set each node individually to receive either all or only part of the data sent from any specified node. You can also set a node to receive no data at all from any specified node.	
	Area 2				
Offset specification	Area 1	Not possible		Possible (can receive from the word specified from the start of the send data)	
	Area 2				
Send node order	Area 1	Node address order		Can be set by user.	Area 1 and area 2 have the same send node order.
	Area 2			Can be set by user.	

Message Specifications

Instruction		SEND/RECV	CMND
Application		Sending and receiving data	Reading and writing data (file memory, etc.) from other nodes, changing the operating mode, other control operations, reading error log, etc.
Message contents		Execute command to send or receive data	Sends any FINS command
Local node to destination node	PC to PC	Possible	Possible
	PC to computer	Possible (requires a program to return responses from computer)	Possible (requires a program to return responses from computer)
	Computer to PC	Possible (requires a program to receive responses at the computer)	Possible (requires a program to receive responses at the computer)
Local node: destination node		SEND instruction: 1:1 or 1:N (broadcasting data) RECV instruction: 1:1	SEND instruction: 1:1 or 1:N (broadcasting data)
Data length		1,980 bytes (990 words) max.	1,990 bytes max.

■ Controller Link Units

Models

Applicable PC	Unit classification	Type	Media	Type of communications	Model number
CS1	CPU Bus Unit	Wired	Twisted-pair cable	Data links (manual settings, automatic settings), message communications (using SEND, RECV, and CMND instructions)	CS1W-CLK21
		Optical fiber	Optical fiber cable		CS1W-CLK11

Controller Link Unit Programming Software

Type	Name	Specifications	Model number
Controller Link programming software	CX-Net in CX-Programmer	Manual data link settings, data link start/stop, read network status, read error log, routing table settings, network testing, changing network parameter settings (see note)	WS02-CX□□-E

Note: You cannot use Controller Link support software in the CS1 Controller Link Unit.

Controller Link Unit Specifications

Item		Specifications	
		CS1W-CLK21	CS1W-CLK11
		Wired Unit	Optical Unit
Unit classification		CS1 CPU BusUnit	
Applicable PCs		CS1-series PC	
Maximum number of Units		4 Units max. (total of Wired and Optical Units)	
Mounting position		Mount in any 4 slots on the CPU Rack or CS1 Expansion Rack	
Unit number settings		0 to F	
Data exchange with CPU Units	CPU Bus Unit I/O Area	25 words per Unit	
		Controller Link Unit to CPU Unit: Data link status, network participation status, error information, etc.	
	CPU Bus Unit words in DM Area	CPU Unit to Controller Link Unit: Polling node/polled note mode setting, data link start, data link mode (automatic/manual) setting, data link automatic setting parameters, etc.	
Settings switches		Rotary switches: Unit number, node address	
		DIP switch: Baud rate Selector switch: Terminating resistance	---
Indicators		There are nine LED indicators on the front of the Unit: RUN (operating), communications error, ERH (error in the CPU Unit), participating in network, sending, receiving, data link mode (manual settings/automatic settings), participating in data link, terminating resistance (Wired Units only), and power ON (Optical Units only).	
Front-panel connections		Communications cable terminal block (BD H, BD L, SHLD)	Optical connector x 2 24-VDC power terminal block
Effect on CPU Unit cycle time		0.2 ms If data links are operating, add 1.5 ms + (number of words transferred x 0.001 ms) If message service is operating, also add event execution time	
Power consumption		330 mA at 5 VDC	470 mA at 5 VDC
Dimensions (mm)		35 x 130 x 101 (W x H x D)	
Weight		250 g	330 g (excluding cable mounting)
Standard accessories		None	Cable Bracket
Catalog number		W309	

■ Accessories (Sold Separately)

Classification	Name	Specifications			Model number
Specified parts for Wired Unit/Board	Shielded twisted-pair cable	Kromberg & Schubert, Komtec Department			Li2Y-FCY2 x 0.56 qmm
		Draka Cables Industrial			1 x 2 x AWG-20PE+Tr.CUSN +PVC
		Belden			#9207
		Bando Densen Co.			ESVC 0.5 x 2C
Specified parts for Optical Unit/Board	---	---	**Cable color**	**Cable length**	---
	Optical fiber cable	Hard plastic-clad fiber (H-PCF)	Black	10 m	S3200-HCCB101
				50 m	S3200-HCCB501
				100 m	S3200-HCCB102
				500 m	S3200-HCCB502
				1,000 m	S3200-HCCB103
			Orange	10 m	S3200-HCCO101
				50 m	S3200-HCCO501
				100 m	S3200-HCCO102
				500 m	S3200-HCCO502
				1,000 m	S3200-HCCO103
		Optical connector	For node connections, full lock type, crimp cut		S3200-COCF2011
		Inline adapter	Used in cable relays (extension)		S3200-COIAT2000
		Optical fiber cable with connector	Optical connector: Both ends on S3200-COCF2011	2 m	S3200-CN201-20-20
				5 m	S3200-CN501-20-20
				10 m	S3200-CN102-20-20
				15 m	S3200-CN152-20-20
				20 m	S3200-CN202-20-20
				Over 20 m	S3200-CN-20-20 (Specify length when ordering)
			Optical connector assembly tool	Applicable optical connector: S3200-COCF2011	S3200-CAK1062
			Optical power tester	Applicable optical connector: S3200-COCF2011 (applicable head unit: S3200-CAT2702	S3200-CAT2700
			Master fiber	Applicable head unit: S3200-CAT2702	S3200-CAT2001H

■ Applicable CPU Units

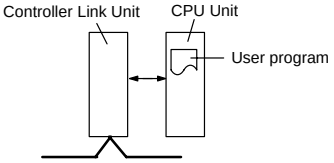
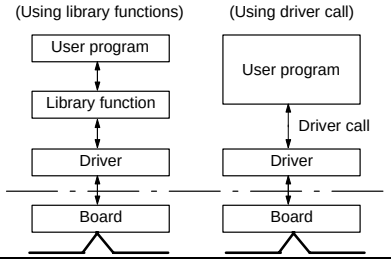
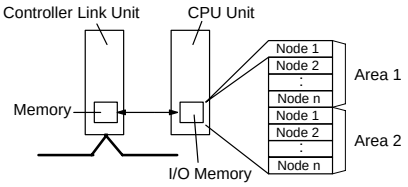
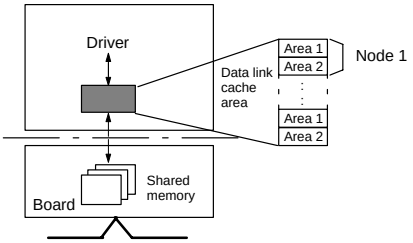
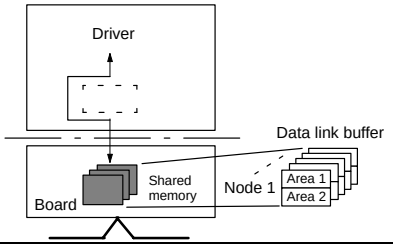
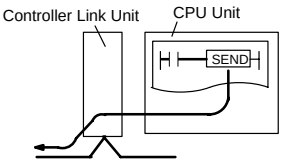
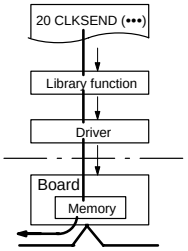
PC	CPU Unit model number	Maximum number of Units that can be mounted on CPU Racks and CS1 Expansion Racks	Mounting position limitations
CS1-series PC	CS1H-CPU□□ CS1G-CPU□□	4 Units max. (total for Wired and Optical Units)	None

■ Controller Link Support Boards

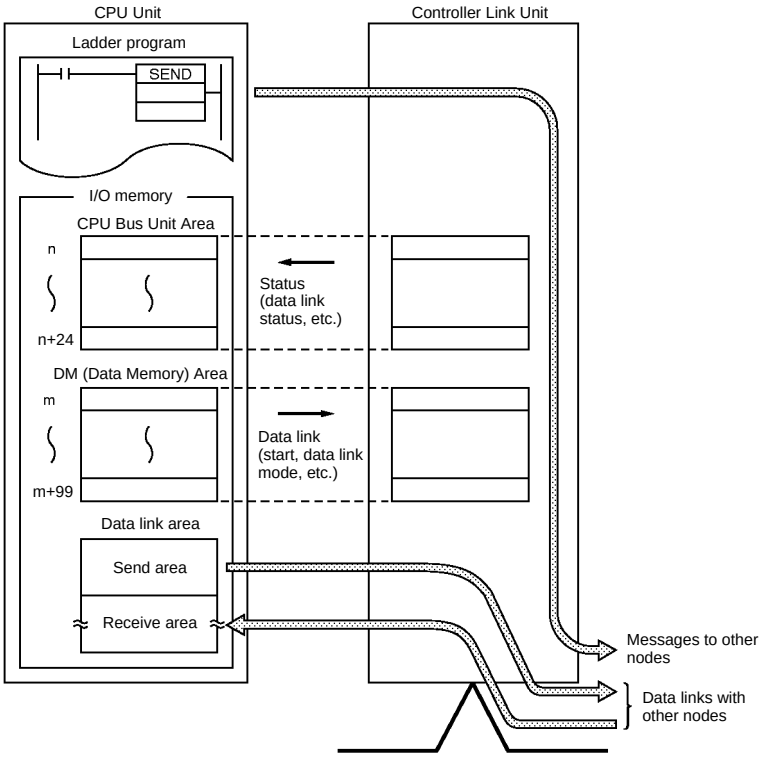
Models and Specifications

Item	Specification	
	3G8F5-CLK21-E	3G8F5-CLK11-E
	Wired Board	Optical Board
Computer	IBM PC/AT or compatible (CPUi386 or later/ISA bus)	CPU i386 or higher ISA bus
Compatible OS	IBM PC DOS Ver. 7.0	MS-DOS Ver. 6.2
Compatible language	Microsoft C Ver. 7.0A (large module)	
Library name	CLKMSC.LIB	
Setting switches	DIP switch: Memory allocations Short pin: Interrupt level Selector switch: Terminating resistance	DIP switch: Memory allocations Short pin: Interrupt level
Indicators	There are seven LED indicators on the front of the Unit: RUN (operating), communications error, EEPROM error, participating in network, sending, receiving, and participating in data link.	There are five LED indicators on the front of the Unit: RUN (operating), error (communications error, EEPROM error, etc.), participating in network, sending, participating in data link, and power ON.
Connectors	Communications connector (connect the communications cable using the communications connector supplied), card edge connector	Communications connector (connect an optical connector), backup power supply connector, card edge connector
Power consumption	0.4 A max. at 5 VDC	0.5 A max. at 5 VDC
Dimensions (mm)	106.7 x 163 (W x H)	106.7 x 163 (W x H)
Weight of board	160 g	170 g (excluding mounting)
Product configuration	1 board + 3.5-inch floppy disk (1.44 MB)	1 board + 3.5-inch floppy disk (1.44 MB)
Standard accessories	1 communications connector	1 optical fiber cable mounting 1 backup power supply connector
Specified parts	Shielded cable and optical fiber cable are the same as for the Controller Link Unit.	
Catalog No.	W307	

■ Differences between Controller Link Units and Support Boards

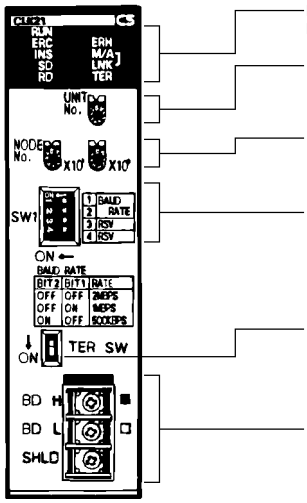
Item	Controller Link Unit	Controller Link Support Board
Communications cable connection	Terminal block	Special connector
Access method		
Network participation	Turn ON/OFF Unit power	Library functions or driver call
Data link		
Data link cache		
No data link cache (direct access to data link buffer in shared memory)		
Max. send/receive volume per node	12,000 words (CS1 series) 8,000 words (SYSMAC C200HX/HG/HE-series and CVM1/CV-series PCs)	32,000 words
Data link start position	Variable	Fixed
Data link status start position	Variable	Fixed
Automatic settings data links	Participation, start, and settings	Participation possible, but start and settings not possible
Messages	Using communications instructions (SEND, RECV, and CMND) in the ladder program  The Controller Link Unit automatically processes a response to a command received if necessary.	Using message send and receive functions or driver call in the ladder program.  Response processing by the user program is necessary if a response is required to a command received.

■ Outline of Data Exchange



■ Nomenclature

Wired Unit



LED indicators
Display Unit status and network status

Uni number setting switch (0 to F)
A single rotary switch. Use to set the unit number on the PC as a single hexadecimal digit.

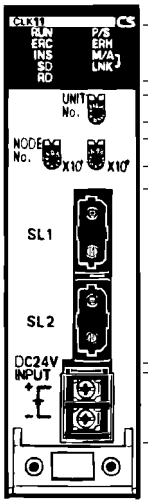
Node address setting switch
Two rotary switches. Use to set the node address on the Controller Link network as a 2-digit decimal number.

Baud rate setting switch
A 4-pin DIP switch. Set the pins as follows:
Pin 1 and 2: Baud rate
Pins 3 and 4: Reserved (set to OFF)

Terminating resistance setting switch
A slider switch. Be sure to turn ON the terminating resistance for the nodes at both ends of the Controller Link Network.

Communications cable terminal block
Connect the specified communications cable (twisted-pair cable) to the Controller Link Network.

Optical Unit



LED indicators
Display Unit status and network status

Unit number setting switch (0 to F)
A single rotary switch. Use to set the Unit number on the PC as a single hexadecimal digit.

Node address setting switch
Two rotary switches. Use to set the node address on the Controller Link network as a 2-digit decimal number.

Optical connector
Connect the optical fiber communications cable from the Controller Link Network.

Power supply terminal block
Connect the backup power supply for the node address function.

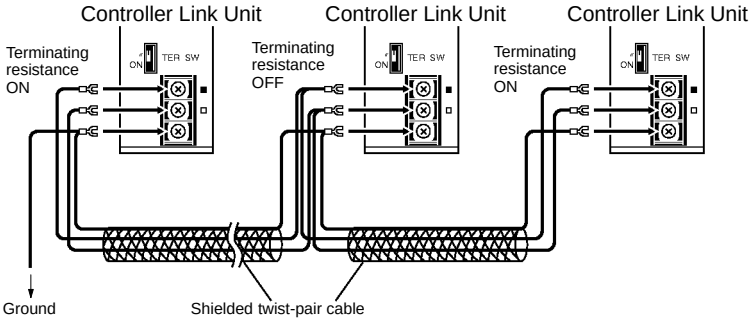
LED Indicators

Indicator	Color	Indicator	Operating status	
RUN (operating)	Green	Lit	Operating in normal mode.	
		Not lit	Unit error	
ERC (error detected by Unit)	Red	Lit	Communications error, node address setting error, hardware error	
		Not lit	Communications operating normally	
ERH (error in the CPU Unit)	Red	Lit	CPU Unit error, CPU Unit interface error, EEPROM error, unit number setting error, I/O table not set, etc.	
		Not lit	Operating	
INS (participating in network)	Yellow	Lit	Participating in network	
		Not lit	Not participating in network	
SD (sending data)	Yellow	Lit	Sending data	
		Not lit	Not sending data	
RD (receiving data)	Yellow	Lit	Receiving data	
		Not lit	Not receiving data	
M/A (data link mode)	Yellow	---	Network data link operating	Network data link not operating
		Lit	Manual setting	Always OFF
		Not lit	Automatic setting	
LNK (data link)	Yellow	Lit	Participating in data link	
		Flashing	Data link table settings error	
		Not lit	Not participating in data links or data links stopped	
TER (terminating resistance) (Wired Unit only)	Yellow	Lit	Terminating resistance switch ON	
		Not lit	Terminating resistance switch OFF	
P/S (power ON) (Optical Unit only	Green	Lit	Backup power supply ON	
		Not lit	Backup power supply OFF	

■ External Connections

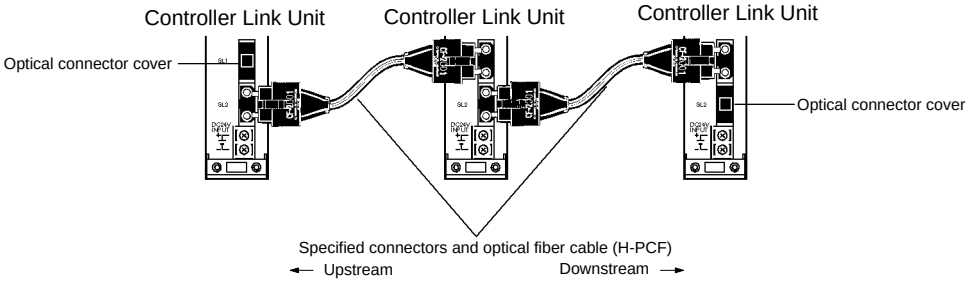
Wired Units

Connect each node using multidrop connections with the specified communications cable (twisted-pair cable).



Optical Units

Connect all the nodes in series in a daisy chain using the optical fiber cable (H-PCF cable)

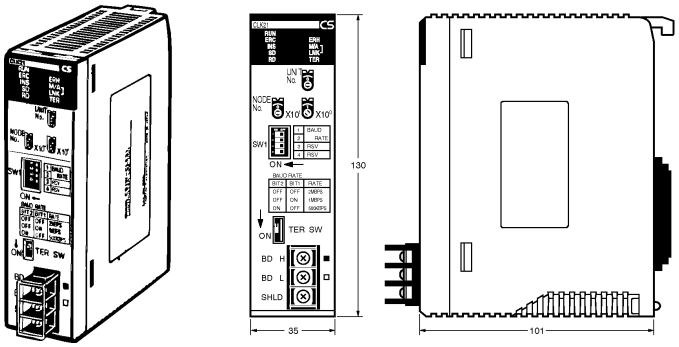


■ Dimensions

Wired Unit

CS1W-CLK21

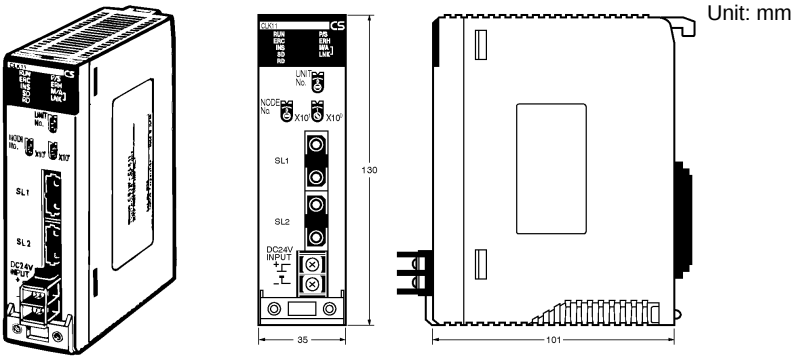
Unit: mm



Optical Unit

CS1W-CLK11

Unit: mm



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.