

## 14-5 Serial PLC Links

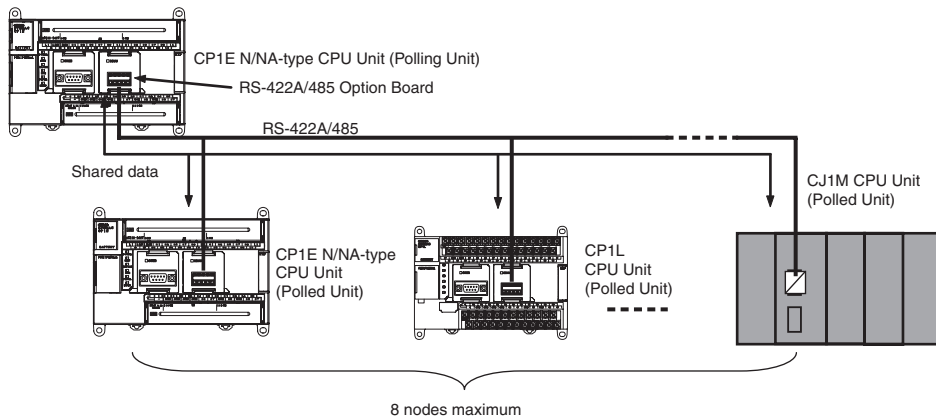
Serial PLC Links can be used only with the CP1E N/NA-type CPU Unit.

### 14-5-1 Overview

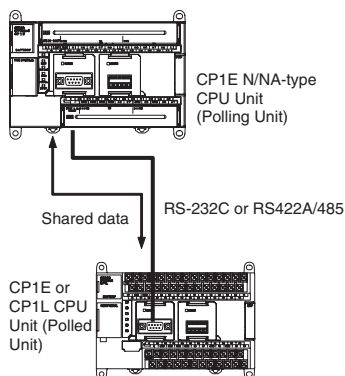
Serial PLC Links enable exchanging data between CP1E N/NA-type CPU Units, CP1L/CP1H CPU Units, or CJ1M CPU Units without using special programming. The serial communications mode is set to Serial PLC Links. Up to 9 PLCs can be linked.

### Configuration

#### ● Connecting CP1E, CP1L, CP1H, or CJ1M CPU Units 1:N (8 Nodes Maximum)



#### ● Connecting CP1E, CP1L, CP1H, or CJ1M CPU Units 1:1



#### Precautions for Correct Use

With the CP1E CPU Units, a Programmable Terminal (PT) cannot be included in a Serial PLC Link.

## 14-5-2 Flow of Operation

- 1 **Wiring communications** Connect the CP1E CPU Unit and the CP1E or other CPU Units using RS-232C or RS-422A/485 ports.
- 2 **PLC Setup** Set *Built-in RS232C Port* or *Serial Option Port* in the PLC Setup and transfer the PLC Setup from the CX-Programmer to the CP1E CPU Unit. (Set the serial communications mode to *Serial PC Link (Master)* or *Serial PC Link (Slave)* and set the communications conditions, link words, and PLC Link method.)
- 3 **Start communications**

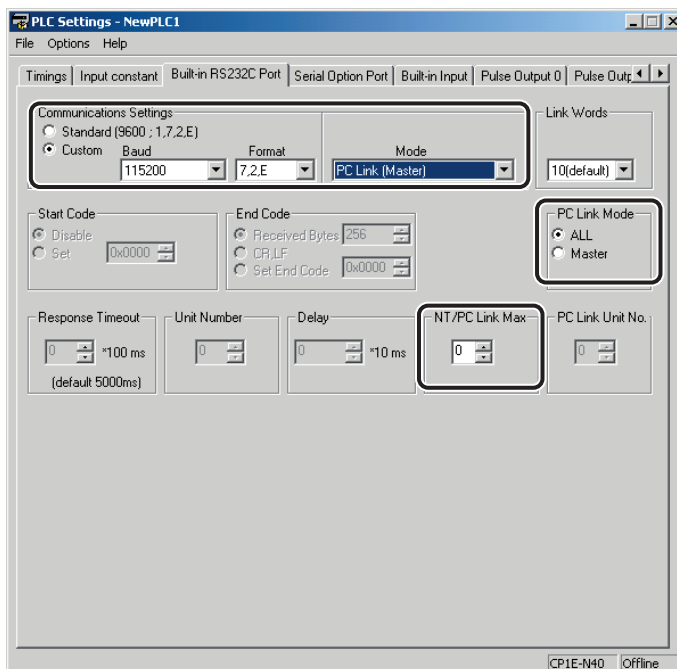
### Precautions for Correct Use

Both serial ports cannot be used for PLC Links at the same time.

If both serial ports are set for PLC Links (either as polling or polled nodes), a PLC Setup setting error (nonfatal error) will occur and the PLC Setup Setting Error Flag (A402.10) will turn ON.

## 14-5-3 PLC Setup

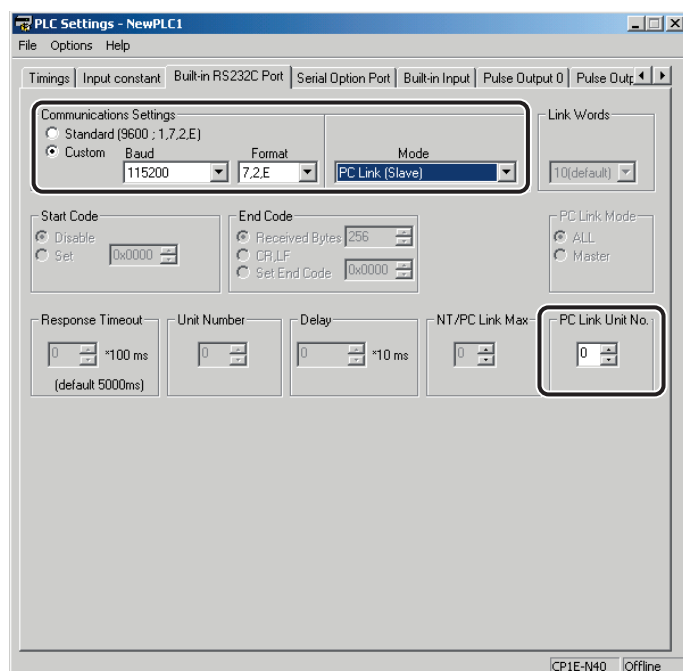
### Settings at the Polling Unit



Built-in RS232C Port or Serial Option Port Tab Page

Parameter	Setting
Communications Settings	Set the communications settings to the same values as the connected PLCs. If the connected PLCs are set to 115,200 bps, two stop bits, and even parity, select the <i>Custom</i> Option, set the baud rate to 115200. Set the format to <i>7,2,E</i> .
Mode	Select <i>PC Link (Master)</i> .
Link Words	Set to 10 (default) for the Master only. 10 words (default)
PC Link Mode	Select <i>All</i> or <i>Master</i> .
NT/PC Link Max.	Set the highest unit number of the connected slaves.

## Settings at the Polled Unit



Built-in RS232C Port or Serial Option Port Tab Page

Parameter	Setting
Communications Settings	Set the communications settings to match those of the connected PLC. If the connected PLC is set to 115,200 bps, two stop bits, and even parity, select the <i>Custom</i> Option and set the baud rate to 115200. Set the format to <i>7,2,E</i> .
Mode	Select <i>PC Link (Slave)</i> .
PC Link Unit No.	Set the unit number (0 to 7).

## 14-5-4 Operating Specifications

Serial PLC Links can be used for both built-in RS-232C ports and serial option ports for N30/40/60 or NA20 CPU Units. However, two serial ports cannot be used simultaneously for Serial PLC Links.

Item	Specifications
Applicable PLCs	CP1E, CP1H, CP1L, CJ1M
Baud rate	38,400 bps, 115,200 bps
Applicable serial ports	Built-in RS-232C ports and serial option ports Both ports cannot be used for Serial PLC Links at the same time. If both ports are set for Serial PLC Links (either as polling node or polled node), a PLC Setup setting error (nonfatal error) will occur and the PLC Setup Setting Error Flag (A402.10) will turn ON.
Connection method	RS-422A/485 or RS-232C connection via RS-422A/485 Option Board or RS232C port.
Words allocated in CIO Area	Serial PLC Link Words: CIO 200 to CIO 289 (Up to 10 words can be allocated for each CPU Unit.)
Maximum number of Units	9 Units max., comprising 1 Polling Unit and 8 Polled Units.
Link methods (data refresh methods)	Complete link method or Polling Unit link method

### Data Refresh Methods

The following two methods can be used to refresh data.

- Complete link method
- Polling Unit link method

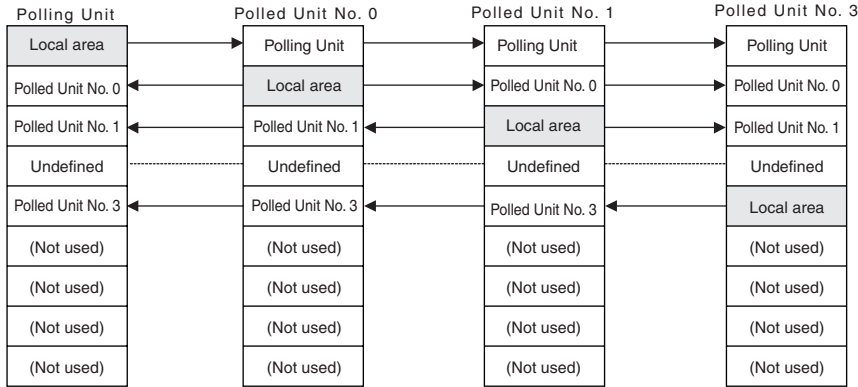
● Complete Link

The data from all nodes in the Serial PLC Links are reflected in both the Polling Unit and the Polled Units.

The only exceptions are the addresses of Polled Units that are not present in the network. These data areas are undefined in all nodes.

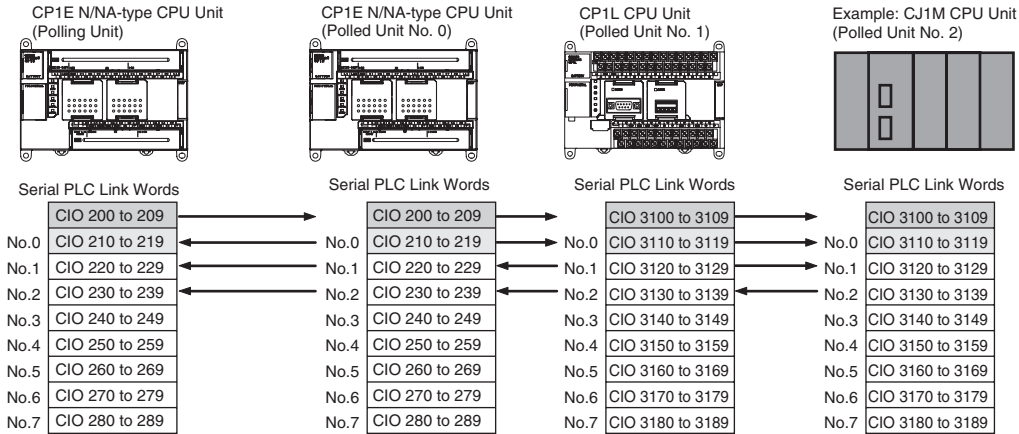
Example: Complete Link Method, Highest Unit Number: 3

In the following diagram, Polled Unit No. 2 is a Unit not present in the network, so the area allocated for Polled Unit No. 2 is undefined in all nodes.



Example for Ten Link Words (Maximum Number of Words)

Each CPU Unit (either CP1E, CP1L, CP1H, or CJ1M) sends data to the same words in all other CPU Units for the Polling Unit and all Polled Units. Data is sent between the words that are allocated to the Polling Unit and Polled Units according to unit numbers.



● **Polling Unit Link Method**

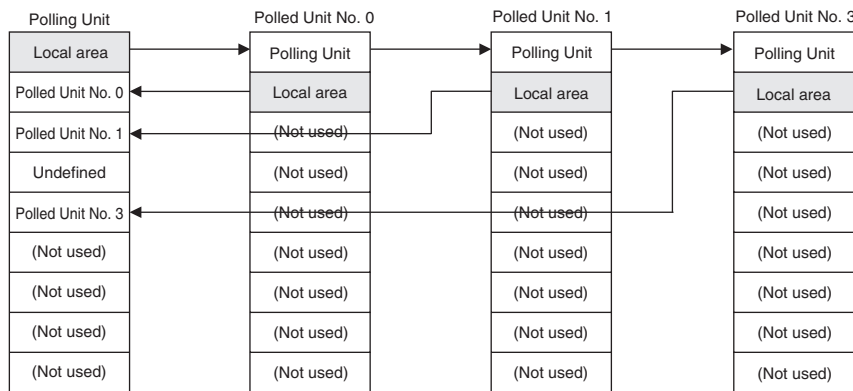
The data for all the Polled Units in the Serial PLC Links are reflected in the Polling Unit only, and each Polled Unit reflects the data of the Polling Unit only.

The advantage of the Polling Unit link method is that the addresses allocated for the local Polled Unit data are the same in each Polled Unit, allowing data to be accessed using common ladder programming.

The areas allocated for Polled Units not present in the network are undefined in the Polling Unit only.

Example: Polling Unit Link Method, Highest Unit Number: 3

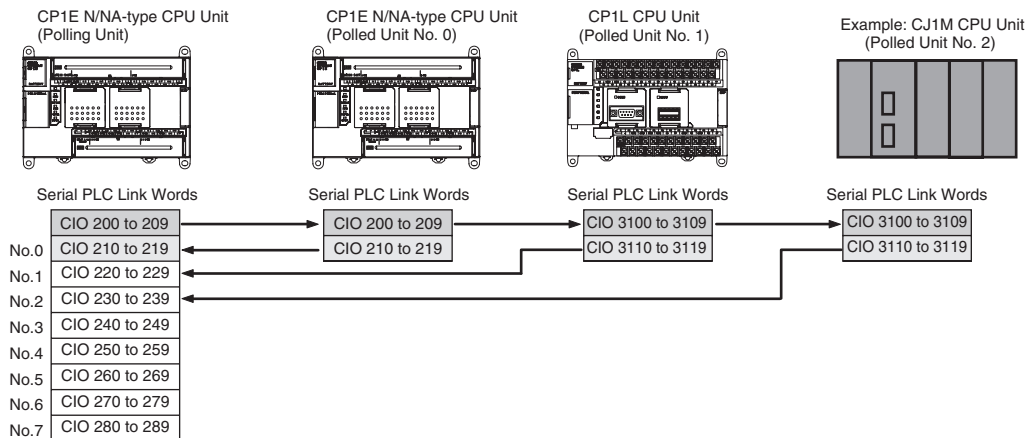
In the following diagram, Polled Unit No. 2 is a Unit not participating in the network, so the corresponding area in the Polling Unit is undefined.



Example for Ten Link Words (Maximum Number of Words)

The CPU Unit that is the Polling Unit (either CP1E, CP1H, CP1L, or CJ1M) sends its data (CIO 200 to CIO 209) to the same words (CIO 200 to CIO 209) in all other CPU Units.

The Polled Units (either CP1E, CP1H, CP1L, or CJ1M) send their data (CIO 210 to CIO 219) to consecutive sets of 10 words (CIO 210 to CIO 289) in the Polling Unit.



● **Allocated Words**

**Complete Link Method**

Address		Link words	1 word	2 words	3 words	to	10 words
CIO 200	Serial PLC Link Area	Polling Unit	CIO 200	CIO 200 to 201	CIO 200 to 202		CIO 200 to 209
		Polled Unit No. 0	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 1	CIO 202	CIO 204 to 205	CIO 206 to 208		CIO 220 to 229
		Polled Unit No. 2	CIO 203	CIO 206 to 207	CIO 209 to 211		CIO 230 to 239
		Polled Unit No. 3	CIO 204	CIO 208 to 209	CIO 212 to 214		CIO 240 to 249
		Polled Unit No. 4	CIO 205	CIO 210 to 211	CIO 215 to 217		CIO 250 to 259
		Polled Unit No. 5	CIO 206	CIO 212 to 213	CIO 218 to 220		CIO 260 to 269
		Polled Unit No. 6	CIO 207	CIO 214 to 215	CIO 221 to 223		CIO 270 to 279
		Polled Unit No. 7	CIO 208	CIO 216 to 217	CIO 224 to 226		CIO 280 to 289
CIO 289			Not used.	CIO 209 to 289	CIO 218 to 289	CIO 227 to 289	

**Polling Unit Link Method**

Address		Link words	1 word	2 words	3 words	to	10 words
CIO 200	Serial PLC Link Words	Polling Unit	CIO 200	CIO 200 to 201	CIO 200 to 202		CIO 200 to 209
		Polled Unit No. 0	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 1	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 2	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 3	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 4	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 5	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 6	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
		Polled Unit No. 7	CIO 201	CIO 202 to 203	CIO 203 to 205		CIO 210 to 219
CIO 289			Not used.	CIO 202 to 289	CIO 204 to 289	CIO 206 to 289	

## ● Related Auxiliary Area Bits and Words

### Built-in RS-232C Port

Name	Address	Details	Read/write	Refresh timing
Built-in RS-232C Port Communicating with Polled Unit Flags*	A393.00 to A393.07	When built-in RS-232C port is being used in NT link mode, the bit corresponding to the Unit performing communications will be ON. Bits 00 to 07 correspond to unit numbers 0 to 7, respectively. ON: Communicating OFF: Not communicating	Read	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>Turns ON the bit corresponding to the unit number of the Polled Unit that is communicating via built-in RS-232C port in NT link mode or Serial PLC Link mode.</li> <li>Bits 00 to 07 correspond to unit numbers 0 to 7, respectively.</li> </ul>
Built-in RS-232C Port Restart Bit	A526.00	Turn ON this bit to restart built-in RS-232C port.	Read/write	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>Turn ON to restart built-in RS-232C port.</li> </ul> <p><b>Note</b> The bit is automatically turned OFF by the system when restart processing has been completed.</p>
Built-in RS-232C Port Error Flags	A528.00 to A528.07	When an error occurs at built-in RS-232C port, the corresponding error bit is turned ON. Bit 0: Not used. Bit 1: Not used. Bit 2: Parity error Bit 3: Framing error Bit 4: Overrun error Bit 5: Timeout error Bit 6: Not used. Bit 7: Not used.	Read/write	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>When an error occurs at built-in RS-232C port, the corresponding error bit is turned ON.</li> <li>The flag is automatically turned OFF by the system when built-in RS-232C port is restarted.</li> <li>In NT link mode, only bit 05 (timeout error) is enabled.</li> <li>In Serial PLC Link mode, only the following bits are enabled. Errors at the Polling Unit: Bit 05: Timeout error Errors at Polled Units: Bit 05: Timeout error Bit 04: Overrun error Bit 03: Framing error</li> </ul>

### Serial Option Port

Name	Address	Details	Read/write	Refresh timing
Serial Option Port Communicating with Polled Unit Flags*	A394.00 to A394.07	When serial option port is being used in NT link mode, the bit corresponding to the Unit performing communications will be ON. Bits 00 to 07 correspond to unit numbers 0 to 7, respectively. ON: Communicating OFF: Not communicating	Read	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>Turns ON the bit corresponding to the unit number of the Polled Unit that is communicating via serial option port in NT link mode or Serial PLC Link mode.</li> <li>Bits 00 to 07 correspond to unit numbers 0 to 7, respectively.</li> </ul>
Serial Option Port Restart Flags	A526.01	Turn ON this bit to restart serial option port.	Read/write	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>Turn ON to restart serial option port.</li> </ul> <p><b>Note</b> The bit is automatically turned OFF by the system when restart processing has been completed.</p>
Serial Option Port Error Flags	A528.08 to A528.15	When an error occurs at serial option port, the corresponding error bit is turned ON. Bit 8: Not used. Bit 9: Not used. Bit 10: Parity error Bit 11: Framing error Bit 12: Overrun error Bit 13: Timeout error Bit 14: Not used. Bit 15: Not used.	Read/Write	<ul style="list-style-type: none"> <li>Cleared when power is turned ON.</li> <li>When an error occurs at serial option port, the corresponding error bit is turned ON.</li> <li>The flag is automatically turned OFF by the system when serial option port is restarted.</li> <li>In NT link mode, only bit 13 (timeout error) is enabled.</li> <li>In Serial PLC Link mode, only the following bits are enabled. Errors at the Polling Unit: Bit 13: Timeout error Errors at Polled Units: Bit 13: Timeout error Bit 12: Overrun error Bit 11: Framing error</li> </ul>

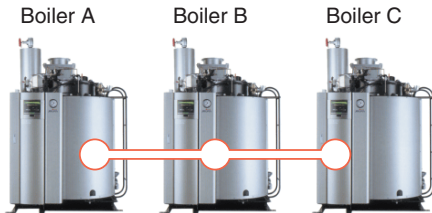
\* In the same way as for the existing 1:N NT Link, the status (communicating/not communicating) of the Polled Unit in Serial PLC Links can be checked from the Polling Unit (CPU Unit) by reading the Built-in RS-232C Port Communicating with Polled Unit Flag (A393.00 to A393.07 for unit numbers 0 to 7) or the Serial Option Port Communicating with Polled Unit Flag (A394.00 to A394.07 for unit numbers 0 to 7).



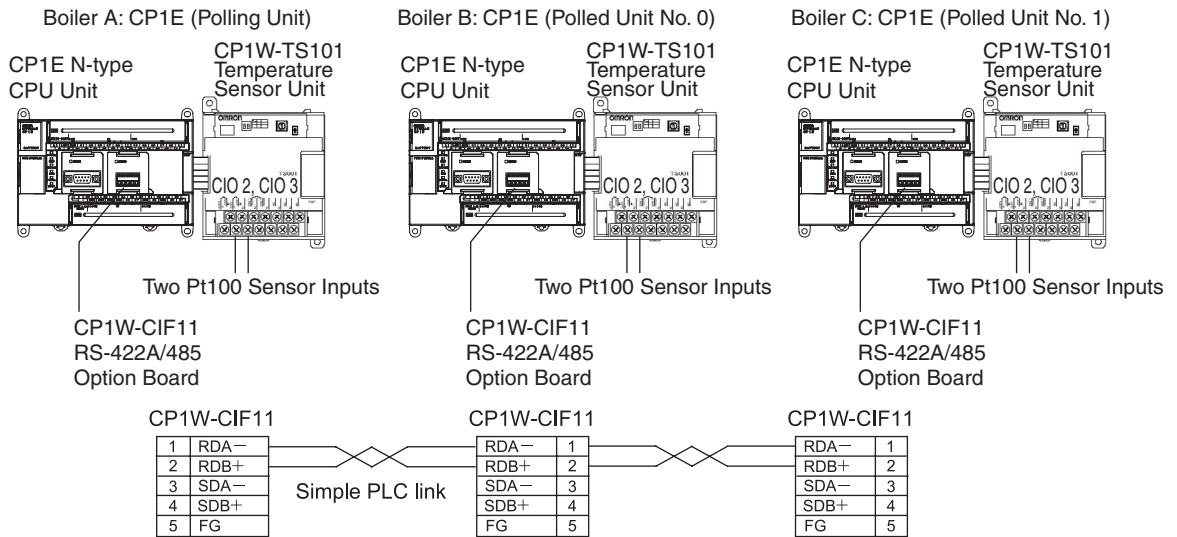
### 14-5-5 Example Application

#### Operation

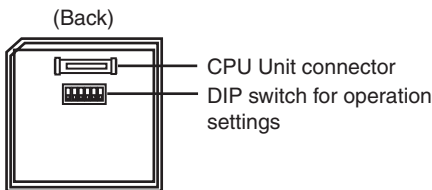
The present temperature information is exchanged between the boilers. This information is used to adjust the temperature control of one boiler depending on the status of the other boilers and for monitoring individual boilers.



#### ● Wiring Example (CP1E N30/40 CPU Units)



#### ● CP1W-CIF11 RS422/485 Option Board DIP Switch Settings



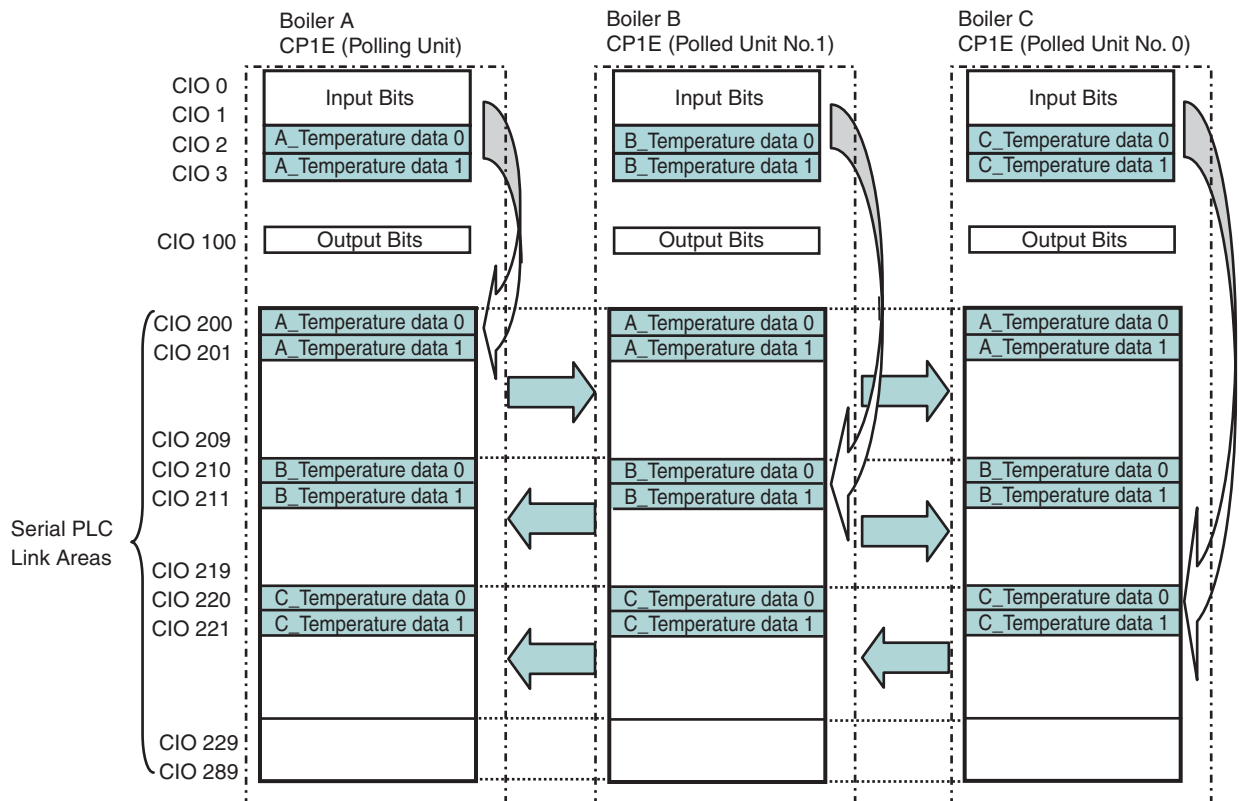
No.	Settings	Polling Unit	Polled Unit No. 0	Polled Unit No. 1	Description
1	Terminating resistance selection	ON	OFF	ON	PLCs at both ends must have terminating resistance connected.
2	2-wire or 4-wire selection	ON	ON	ON	2-wire
3	2-wire or 4-wire selection	ON	ON	ON	2-wire
4	—	OFF	OFF	OFF	Always OFF
5	RS control selection for RD	OFF	OFF	OFF	Control disabled
6	RS control selection for SD	ON	ON	ON	Control enabled

● PLC Setup

Item	Boiler A (Polling Unit)	Boiler B (Polled Unit No. 0)	Boiler C (Polled Unit No. 1)
Communications Settings	Custom		
Baud Rate	115200bps		
Parameters	7.2.E (default)		
Mode	PC Link (Master)	PC link (Slave)	
Link words	10 (default)	-	-
PC Link Mode	ALL	-	-
NT/PC Link Max.	1	-	-
PC Link Unit No.	-	0	1

● Programming Example

Data in the Serial PLC Link Areas are transferred using data links by the Serial PLC Link and without using any special programming. The ladder program is used to transfer the data that needs to be linked to the data link area.



● Ladder Diagram

