CC-Link Family-compatible Products
Development Method Guide

CC-Link IE Control
CC-Link IE Field
CC-Link IE Field Basic
CC-Link IE Field Motion
CC-Link CC-Link/LT
SLMP
CLPA will back you up in various aspects of your effort toward the development of CC-Link Family-compatible products that attract attention from your customers.

You can count on CLPA for extensive support to develop CC-Link Family-compatible products through a method that best suits you. Our support, for example, includes holding a seminar that assists you in acquiring necessary techniques and helping you to carry through a conformance test program essential to ensuring your customers' confidence in the product that has been developed.

Our assistance extends to every detail, aiding you in launching a promotional campaign timed to coincide with the introduction of your product into the market.
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To develop CC-Link Family-compatible products, the following procedure is applied.

CLPA will support you in all the stages from development to marketing for your CC-Link Family-compatible products.

We have methods designed to expedite and make product development easier in store for you. Taking advantage of such information allows you to effectively develop a compatible product.
**Membership Classification and Fee**

<table>
<thead>
<tr>
<th>Membership category</th>
<th>Registered member</th>
<th>Regular member</th>
<th>Executive member</th>
<th>Board member</th>
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<tbody>
<tr>
<td>Annual dues</td>
<td></td>
<td>JPY 100,000</td>
<td>JPY 200,000</td>
<td>JPY 1,000,000</td>
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<td>Initiation fee</td>
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<tr>
<td>Acquisition of protocol specification</td>
<td></td>
<td>Offered free of charge in response to member’s request</td>
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<td></td>
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<td>SLMP</td>
<td></td>
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<td>Conformance test fee (per device)</td>
<td>CC-Link master/local/intelligent device stations</td>
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<td>JPY 100,000</td>
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<tr>
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<td>CC-Link IE Field intelligent device station</td>
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<td>JPY 20,000</td>
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<td></td>
<td>CC-Link IE Field remote device station</td>
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<td>JPY 20,000</td>
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<tr>
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<td>CC-Link remote device/I/O station</td>
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<td>JPY 20,000</td>
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<tr>
<td></td>
<td>CC-Link/IE Field master/slave station</td>
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<td>JPY 50,000</td>
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<tr>
<td></td>
<td>Cable and others</td>
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<td>Product for software certification</td>
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<td>JPY 50,000</td>
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<td>SLMP</td>
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<td>JPY 100,000</td>
<td>JPY 50,000</td>
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<tr>
<td>Recommended product test fee</td>
<td>JPY 100,000</td>
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<td></td>
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<tr>
<td>Use of CC-Link logo</td>
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<td>JPY 50,000</td>
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<tr>
<td>Technical support</td>
<td></td>
<td>JPY 100,000</td>
<td>JPY 50,000</td>
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<tr>
<td>Posting of products on the home page and product catalog (no charge)</td>
<td>JPY 100,000</td>
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<td>Exhibition at shows</td>
<td></td>
<td>JPY 100,000</td>
<td>JPY 50,000</td>
<td></td>
</tr>
<tr>
<td>Distribution of CC-Link products catalog and CC-Link News information about events</td>
<td>JPY 100,000</td>
<td>JPY 50,000</td>
<td></td>
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</tr>
</tbody>
</table>

*SLMP* (Seamless Message Protocol)

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### Implementing conformance tests

The member firm implements the conformance test according to the "CC-Link Conformance Test" specifications for each product model. To facilitate the conformance testing, CLPA has test centers in Japan and overseas.

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### Marketing

CLPA promotes and expand marketing of compatible products with materials highlighting their innovative, excellent features.

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### Laboratory testing

The member firms use the conformance test facilities to test CC-Link compatible products from various aspects. For more details, see the page concerned.

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### Product promotion

A catalog in a printed and an electronic form (CD-ROM) is available, fully covering all the CC-Link compatible products that the member manufacturers have developed and put on market. CLPA provides users with diversified solutions.

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### Information registered and disclosed on web site

CLPA web site provides information on the CC-Link compatible products developed and marketed by the member manufacturers.
Product Development Steps

**Step 1** Selecting a network type

First identify the type of a network with which your product will comply.

- CC-Link
- CC-Link/LT
- CC-Link IE\textsuperscript{control}
- CC-Link IE\textsuperscript{Field}
- CC-Link IE\textsuperscript{Field Basic}
- CC-Link IE\textsuperscript{Field Motion}
- SLMP

**Step 2** Selecting a station type

Identify the type of a station with which your product will comply.

- Remote I/O station
- Remote Device station
- Intelligent Device station
- Master/Local station

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Process Flow for Developing CC-Link Family-compatible Products

**Step 3** Examining a development methodology

Explore what development methods are available.

- Dedicated communication LSI
- Built-in module
- Driver for a PC board

**Step 4** Selecting a location for development

Identify a location where your development work will be carried out.

- Within your own organization
- A contract product developer is used

**Step 5** Taking a conformance test

Finish your development program with a conformance test conducted at a CLPA facility.

- CLPA facility

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- First identify the type of a network with which your product will comply.
- Identify the type of a station with which your product will comply.
- Explore what development methods are available.
- Identify a location where your development work will be carried out.
- Finish your development program with a conformance test conducted at a CLPA facility.

What is CC-Link Partner Association?
Process Flow for Developing CC-Link Family-compatible Products

Step 1 Selecting a network type

CC-Link is an RS485-based field network. CC-Link offers a fast, stable input/output response and has a great potential for expansion with a high degree of flexibility. On the strength of this overwhelming performance, it has established a significant track record and gained user confidence as an open field network which originated in Japan and has grown into a world standard status. CC-Link is the most popular of the CC-Link Family of networks and continues to move along the path of evolution in the future.

- Abundant relevant products, more than 1,000 varieties, available from the affiliated partners
- A network-compliant product can be developed with ease and at low cost.
- CC-Link Ver. 2 provides for cyclic transmission with higher-capacity.

Advantages

Master station
Local station
Standby master station (local station)
Optical repeater (7.6 km maximum)
Space optical repeater
Repeater (T branch)

Remote station
Various types of device

CC-Link IE Control is a gigabit Ethernet-based controller network. It serves as a main-line network for use within factory premises that manages coordination between a large-scale distributed controller system and individual field networks.

- Employs gigabit Ethernet technology to achieve super-high speed, large-capacity network-type shared-memory communications.
- A redundant transmission path (loop-back communication) enables highly-reliable communication.
- A powerful network diagnostic function

Advantages

SLMP-compatible
CC-Link IE Field is a gigabit Ethernet-based field network. Under an open, seamless network environment, it accommodates multiple control requirements from high-speed I/O control to distributed controller system with a single network. Cables can be flexibly arranged along with the layout of the equipment.

Advantages
- A gigabit transmission capability and a real-time protocol enable communication between control data and administrative data without stress.
- A broad latitude in the choice of network topologies
- A powerful network diagnostic function

CC-Link IE Field Basic is the CC-Link IE communication that utilizes general-purpose Ethernet technology that can easily be applied to the small-scale devices that do not require high speed control, and easily be used and developed. It enables the cyclic transmission of CC-Link IE Field Network using software.

A common protocol which provides for a seamless connection between the CC-Link IE and Ethernet products. All you have to do to make your Ethernet product SLMP-compatible is develop a software program that is needed. It is very simple.
**Step 2 Selecting a station type**

### Master/local station
- **Master station:** The master station controls the entire network. One master station is required for one network.
- **Local station:** The local station performs transient transmission with the master station or other local stations, in addition to cyclic transmission of bit data and word data.

### Control station
- **Control station:** The control station controls the entire network. One control station is required for one network. The control station assigns a scope of cyclic transmission to each station.
- **Normal station:** The normal station performs cyclic transmission and transient transmission according to the scope assigned by the control station.

### Intelligent device station
- The intelligent device station performs transient transmission with the master station, in addition to cyclic transmission of bit data and word data.

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**Cyclic transmission**
Communication performed periodically within the same network is called "cyclic transmission".
The interval at which cyclic transmission takes place can be determined by calculations. This, coupled with small variances, makes cyclic transmission an ideal communication mode for the field network which is required to exhibit a good periodicity in its control functions.

**Transient transmission**
Communication performed only when a communication request is output within the same network is called "transient transmission".
Transient transmission is used to send or receive message(s), in an arbitrary timing independent of the cyclic transmission, as when reading or writing PLC data from an HMI.

**Bit data and word data**
Data handled in cyclic transmission is classified into two major types: bid data (remote input/output) which includes on/off information and word data (remote register) which includes analog information.
A remote I/O station can handle only work with bit data.
Remote device station

- A station where cyclic transmission of bit data and word data can be performed.

Remote I/O station

- A station where the cyclic transmission of bit data can place be performed.

### Number of occupied stations

<table>
<thead>
<tr>
<th>CC-Link</th>
<th>CC-Link/LT</th>
<th>CC-Link IE</th>
<th>CC-Link IE Basic</th>
</tr>
</thead>
</table>

Because, in a CC-Link network, the amount of data assignable to a single station is predetermined, the number of occupied stations is set from 1 to 4 based on the amount of data handled by one piece of equipment.

**Amount of data per station**

- Bit data (remote I/O): 32 bits each for input and output
- Word data (remote register): 4 words each for input and output

The greater the number of occupied stations, the greater the amount of data that can be handled by one piece of equipment however, the number of equipment connectable within the entire network decreases accordingly.

### Number-of-points mode

In a CC-Link/LT network, the number of I/O points can be advantageously utilized by specifying the number of occupied points per station according to system requirements.

Number-of-points mode is classified into three modes: 4-point, 8-point and 16-point mode. Therefore, the number of occupied stations varies even with the same I/O equipment depending on the number-of-points mode selected.
Examining a development methodology

Step 3

CC-Link Partner Association furnishes its members free of cost with documents containing protocol specifications for constituent networks of the CC-Link Family. These specifications will permit you to develop your own product that is connectable to CC-Link. For information about the documents issued by CC-Link Partner Association, see “Documents” on its website (http://www.cc-link.org/).

But we will have trouble starting from scratch on our own, loading the protocol onto our computers.

You will be able to make use of a proven development method that is presented by your fellow partner.

It is possible to develop a product in-house according to the specifications issued by CC-Link Partner Association, but any of development methods disclosed by its members for varying types of network (dedicated communication LSI, built-in module, or driver for a PC board) could be utilized to achieve that goal with ease and in a short period of time.

### Development methodology

#### Network type considered

<table>
<thead>
<tr>
<th>Network type considered</th>
<th>Network type considered</th>
<th>Network type considered</th>
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<tbody>
<tr>
<td>CC-Link</td>
<td>CC-Link</td>
<td>CC-Link</td>
<td>CC-Link</td>
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<tr>
<td>CC-Link/IE</td>
<td>CC-Link/IE</td>
<td>CC-Link/IE</td>
<td>CC-Link/IE</td>
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<tr>
<td>SLMP</td>
<td>SLMP</td>
<td>SLMP</td>
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</tr>
</tbody>
</table>

### CC-Link Family Specifications

Advantages

- A high degree of flexibility in network topologies.
- Development calls for a high level of technical competence and manpower.
- A network-compatible product can be developed without concern for constraints from protocol. Communication circuits can be easily downsized.
- Communication functions can be provided merely by installing the module into an end-user’s board. This methodology can be used on several types of network easily.
- This methodology can be used on various types of operating systems including the real-time operating system.
- This methodology can be used only on personal computers. It is difficult to be applied on field equipment such as remote I/O.
- Just developing a software program enables a new SLMP-compatible product to be created.
- Conformance test is only checking the functions of software.
- Products directly connected to CC-Link IE have a higher performance ability, including communication speed.

Disadvantages

- Cyclic transmission cannot be performed.
- Development requires a higher level of technical competence and manpower.
- Development requires a higher level of technical competence and a longer period of time compared with the built-in module approach.
- There are limits to downsizing.
- Communication circuits can be easily downsized.
- Communication circuits can be easily downsized.
- Communication circuits can be easily downsized.
- Communication circuits can be easily downsized.

### Network type considered

- Remote device station
- Master/local station
- Intelligent device station
- Remote I/O station

### Object to be transmitted

<table>
<thead>
<tr>
<th>Number of occupied station</th>
<th>Number of occupied station</th>
<th>Number of occupied station</th>
<th>Number of occupied station</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 4</td>
<td>1 to 4</td>
<td>1 to 4</td>
<td>1 to 4</td>
</tr>
</tbody>
</table>

### Conformance test

- Conformance test is only checking the functions of software.
- Conformance test is only checking the functions of software.
- Conformance test is only checking the functions of software.
- Conformance test is only checking the functions of software.

### Estimated time required

- 6 to 12 months
- 6 to 12 months
- 6 to 12 months
- 6 to 12 months

### Development methodology

• Developing a product in-house based on the protocol specifications offered
• Dedicated communication LSI
• Built-in module
• Driver for a PC board
• Software
### Selecting a location for development

**Step 4**

#### Developing a product in-house

You can develop a proprietary communication interface in-house by employing various development methods described in this document.

**But**

we will have trouble developing one all on our own.

**You will be able to make use of contract development services.**

As a way to get around problems with the availability of technical expertise and manpower which are associated with the in-house development option, you may commission the building of hardware and/or software needed for the communication interface to a contract developer.

For more details, see the relevant page.

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### Selecting a network/station type

The following table provides a summary of differences among station types, taking the CC-Link network as an example. Duration of time required for development may differ depending on conditions that are involved. Refer to the table as a guide only.

<table>
<thead>
<tr>
<th>Network/Station Type</th>
<th>Amount of Data per Station</th>
<th>Number of Occupied Stations</th>
<th>Communication Method</th>
<th>Object to be Developed</th>
<th>Estimated Duration of Time Required</th>
<th>Conceivable Devices (Examples)</th>
<th>Development Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote I/O station</td>
<td>32 bits each</td>
<td>1 station</td>
<td>Cyclic transmission</td>
<td>Hardware + Software</td>
<td>1 to 2 months</td>
<td>• Digital I/O</td>
<td>Built-in LSI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Solenoid valve</td>
<td></td>
</tr>
<tr>
<td>Remote device station</td>
<td>32 bits each</td>
<td>1 to 4 stations</td>
<td>Cyclic transmission</td>
<td>Hardware + Software</td>
<td>3 to 4 months</td>
<td>• Analog I/O</td>
<td>Built-in LSI</td>
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<td>• Inverter</td>
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<td></td>
<td></td>
<td>• Indicator</td>
<td></td>
</tr>
<tr>
<td>PLC device station</td>
<td>32 bits each</td>
<td>1 to 4 stations</td>
<td>Cyclic transmission</td>
<td>Hardware + Software</td>
<td>6 to 12 months</td>
<td>• HMI</td>
<td>Built-in LSI</td>
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<td></td>
</tr>
<tr>
<td>Master/local station</td>
<td>32 bits each</td>
<td>1 to 4 stations</td>
<td>Cyclic transmission</td>
<td>Hardware + Software</td>
<td>6 to 12 months</td>
<td>• Programmable controller</td>
<td>Built-in LSI</td>
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<td></td>
<td></td>
<td></td>
<td>• Personal computer</td>
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</tbody>
</table>
What is CSP+?
CSP+ stands for CC-Link Family System Profile Plus. This profile describes the information necessary for the launch, operation and maintenance of equipment compatible with CC-Link and CC-Link IE Field, including network parameter information and memory maps. Because CSP+ integrates a number of profile specifications, it can be used to define the protocols for all CC-Link products in one format. In addition, by using CSP+, users who have adopted CC-Link can easily configure the parameters of various models with the same engineering tool.

Benefits of choosing CSP+

1 Integrated engineering tool environment
For CC-Link certified product vendors looking to create CSP+ files that support products in development, there is no need to create a separate engineering tool. In addition, according to the profile descriptions for the employed diagnostics and energy management, the dedicated layout screen specific to the respective application can be displayed using the engineering tool.

2 Reduced support services
Thanks to the network parameter information and memory maps being described by the CSP+ file, CC-Link users are able to configure network parameters and create comments without a manual. Also, because it is possible to configure and monitor equipment parameters without a program, user support services by vendors can be reduced.

3 XML format adoption
Use of the XML format for supportable CSP+ files means it is possible to take advantage of general-purpose XML processing libraries. This means that vendors can reduce the effort put into developing profiles.

CSP+ conformance testing
In conjunction with the additional CSP+ test items, conformance testing will be employed as follows.

1 New CC-Link certified product partners
Since April 2013, based on new conformance test specifications, CSP+ testing has been required in addition to conventional equipment testing.

2 Current CC-Link certified product partners
For those with products that have already been certified, adoption of CSP+ is optional. Conformance testing for only CSP+ will be conducted free of charge.

Flow of operation with CSP+
(1) Certified vendors can use CSP+ support tools (downloadable from the CC-Link Partner Association homepage) to create profiles for CC-Link Family-compatible equipment.

(2) When the file has been created, a conformance test will be performed by the CC-Link Partner Association, and certified files will be posted to the CC-Link Partner Association homepage.

(3) CSP+ files described as profiles for CC-Link protocol family equipment that are made by CC-Link certified product vendors can be downloaded by CC-Link Family users through the CC-Link Partner Association homepage or the vendor’s homepage.

(4) Using the engineering tools capable of handling CSP+, CC-Link Family users can import CSP+ files, which they downloaded in (3), for the equipment they use in order to perform equipment engineering.

See the following URL: http://www.cc-link.org/jp/csp_plus/index.html
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Benefits of choosing CSP+

Integrate engineering tool environment

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New CC-Link certified product partners

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Current CC-Link certified product partners

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Reduced support services

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XML format adoption

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Procedure

<table>
<thead>
<tr>
<th>Target</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-Link certified product vendors</td>
<td>Creation Conformance Release</td>
</tr>
<tr>
<td>CLPA partners/CLPA</td>
<td>Utilization</td>
</tr>
<tr>
<td>Profile creation using CSP+ support tool</td>
<td>Engineering tools (monitoring, diagnostics, parameter configuration, etc.)</td>
</tr>
<tr>
<td>Bundled with products</td>
<td>Internet release</td>
</tr>
</tbody>
</table>

Memo

________________________________________________________________________

________________________________________________________________________
**Step 5  Taking a conformance test**

When your product has been developed, a conformance test conducted by CC-Link Partner Association is performed on the product. Once the product passes the test, it can be marketed as a CC-Link-compatible product.

**What is the conformance test?**

A product to be certified as a CC-Link Family-compatible is subjected to testing on communication operations, the procedure of which is defined by CLPA. The test is conducted to verify whether the product satisfies the prescribed CC-Link communication specification and thus can be connected to CC-Link networks.

**By taking the conformance test**

- Reliability can be assured for your product in terms of CC-Link communications.
- A system can be smoothly configured between products manufactured by different manufacturers or between different models upon interconnection.

**Conformance test items**

1. Noise test
2. Hardware test
3. Software test
4. Combination test
5. Interoperability test
6. Aging test
7. CSP+ verification test

**Caution**

- The conformance test is intended to verify whether the product concerned satisfies the prescribed CC-Link communication specification. Inherent functions of the product are beyond the scope of this test.
- A satisfactory completion of the conformance test does not constitute or imply CLPA’s guarantee or endorsement of the product’s performance or quality.

The test for CC-Link IE Field Network Basic and SLMP is basically performed by developers using a test tool.

**Conformance test fee**

<table>
<thead>
<tr>
<th>Membership category</th>
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<th>Executive member</th>
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<tbody>
<tr>
<td>CC-Link master/local/intelligent device stations</td>
<td>JPY 300,000</td>
<td>JPY 200,000</td>
<td>Included in annual dues</td>
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<tr>
<td>CC-Link IE Control control/normal station</td>
<td></td>
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<tr>
<td>CC-Link IE Field master/local station</td>
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<tr>
<td>CC-Link IE Field intelligent device station</td>
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<tr>
<td>CC-Link IE Field remote device station</td>
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<td>CC-Link remote device/IO station</td>
<td>JPY 200,000</td>
<td>JPY 100,000</td>
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<tr>
<td>CC-Link/LT master/slave station</td>
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<tr>
<td>Cable and others</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Product for software certification</td>
<td>JPY 50,000</td>
<td>JPY 20,000</td>
<td></td>
</tr>
<tr>
<td>CC-Link IE Field Network Basic</td>
<td>JPY 50,000</td>
<td>JPY 20,000</td>
<td></td>
</tr>
<tr>
<td>SLMP* product</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Recommended product test fee (per model)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CC-Link IE Control</td>
<td></td>
<td></td>
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<tr>
<td>CC-Link IE Field</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended network wiring parts</td>
<td>JPY 100,000</td>
<td>JPY 50,000</td>
<td></td>
</tr>
</tbody>
</table>

*SLMP: Seamless Message Protocol*
Procedure for taking a conformance test

Read the regulations for the conformance test.

Request CLPA for the test specification that applies to the developed product.

Perform the test in-house using the test specification or the test tool.

Apply for the conformance test, using the prescribed request form.

A test date is informed by CLPA.

Send CLPA the product and a copy of the in-house test report by the date scheduled for the start of the test.

Test starts.

A test result is reported.

A certificate of conformance and a test report are sent to the applicant.

For information about the conformance test specification, “Documents” on the CLPA’s website (http://www.cc-link.org/).

Your product needs to pass all of the in-house test items before taking a conformance test by CLPA.

The test takes about 2 weeks. The partner company concerned does not need to attend the test in principle. If you wish to witness the test, contact the pertinent CPLA office in advance.
Taking a conformance test

Test items and implementation division

Conformance test items are classified into two groups: those performed beforehand by the partner or member of CC-Link Partner Association and those performed by CLPA. Some of the test items are conducted by both the partner and the association. The partner has to ensure that the product concerned passes all the test items before a test starts at CLPA.

Examples of CC-Link test items to be implemented beforehand by the partner

- Power supply noise test (common mode)
- Cable (bundled cable) noise test
- Measurement of stray capacitance across communication terminals
- Cable limit length test

Recommended parts

For CC-Link and CC-Link/LT, the test contains test items intended to check some of the parts making up the "physical layer" to identify their manufacturer and type name. In regard to CC-link, additional test items are imposed if anything other than CLPA-recommended parts are used.

Document/material and devices required for preliminary testing by the partner

Documents

- **CC-Link conformance test specification**
  For information about the type of the conformance test specification, see "Documents" on the CLPA’s website (http://www.cc-link.org/).

Equipment and material

- **Programmable controller (master station)**
  Use a programmable controller certified.

- **Engineering tool for a programmable controller**
  Use an engineering tool certified.

- **CC-Link cable**
  Use a cable certified. Required cable length (number of pieces): 5m (1), 200m (1)

- **Impulse noise simulator (for power supply noise test and cable bundled cable noise test)**

- **LCR meter (for measurement of stray capacitance across communication terminals)**
  A meter that allows for a measurement frequency requirement of 10MHz.
CC-Link Family-compatible Products
Development Method Guide

Process Flow for Developing CC-Link Family-compatible Products

Introduction to CC-Link Family-compatible Products Development Methodology

Main Specifications for CC-Link Family of Networks

What is CC-Link Partner Association?

Equipment and material

• Programmable controller (master station)
  Use a programmable controller certified.

• Engineering tool for a programmable controller
  Use an engineering tool certified.

• CC-Link cable
  Use a cable certified.
  Required cable length (number of pieces): 5m (1), 200m (1)

• Impulse noise simulator (for power supply noise test and cable (bundled cable) noise test)

• LCR meter (for measurement of stray capacitance across communication terminals)
  A meter that allows for a measurement frequency requirement of 10MHz.

For information about the type of the conformance test specification, see “Documents” on the CLPA’s website (http://www.cc-link.org/).

Document/material and devices required for preliminary testing by the partner

• CC-Link conformance test specification

Examining a development methodology

Selecting a station type

Selecting a network type

Selecting a location for development

Taking a conformance test

Test items and implementation division

Conformance test items are classified into two groups: those performed beforehand by the partner or member of CC-Link Partner Association and those performed by CLPA. Some of the test items are conducted by both the partner and the association. The partner has to ensure that the product concerned passes all the test items before a test starts at CLPA.

Recommended parts

For CC-Link and CC-Link/LT, the test contains test items intended to check some of the parts making up the “physical layer” to identify their manufacturer and type name.

In regard to CC-link, additional test items are imposed if anything other than CLPA-recommended parts are used.

• Power supply noise test (common mode)
• Cable (bundled cable) noise test
• Measurement of stray capacitance across communication terminals
• Cable limit length test

Examples of CC-Link test items to be implemented beforehand by the partner

Memo
For a speedy development of a CC-Link Family-compatible product.

Mitsubishi Electric is ready to assist you from consulting to the provision of product development tools.

Making your products compatible with CC-Link Family, an open field network originating from Japan — That will not only ensure the level of system flexibility distinctively characteristic of multi-vendor products but also provide you with the opportunity to boost the competitiveness of your products to the global level once and for all. With various certifications, including International Organization for Standardization ISO 15745-5, IEC 61158 and 61784, SEMI, Chinese National Standards GB, Korean Industrial Standards KS, and Japanese Industrial Standards JIS, CC-Link has lived up to its name as a global standard. To ensure quick and certain development of CC-Link family compatible products, such as new generation CC-Link IE Control network and CC-Link IE Field network, Mitsubishi Electric will support you in every phase of development, including the provision of development tools.

Technical support for development of CC-Link Family compatible products

- **Backup and support** — A variety of CC-Link Family-related technical documents are available, for a fee, and technical support is provided via member-only e-mail.
- **Open System Center** — Your inquiries are accepted 9:00 to 12:00 and 13:00 to 17:00 (every day of the week - except for Saturdays, Sundays and our company holidays)

E-mail: OSC@rj.MitsubishiElectric.co.jp

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**Driver Development**

Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J71GP21-SX).

**Master Station**

- **Source Code Development**
  Develop a master station using source codes. A master station can be designed with higher flexibility by combining source codes and communication LSI. It is applicable also to the motion function.

**Intelligent Device Station, Remote Device Station**

- **Communication LSI CP520 with GbE-PHY**
  This LSI integrates the CC-Link IE Field network communication ASIC, MPU and GbE-PHY. CP520 allows you to develop devices that perform cyclic transmission and transient transmission without concern about protocol. It is applicable also to the motion function. CP520 is controlled with software.

- **Dedicated communication LSI CP220**
  CP220 is a communication LSI that allows you to develop devices that perform cyclic transmission and transient transmission without concern about protocol. It is applicable also to the motion function. CP220 is controlled with software.

* CP220 is designed for development of intelligent device stations.
Driver Development

Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J71GF11-T2/Q81BD-J71GF11-T2).

Master, Local and Intelligent Device Station

- **Built-in interface board Q50BD-CCV2**
  - In this method, stations are developed using a built-in interface board. The CCLink master station, local station and intelligent device station functions are realized by mounting the interface board on a user circuit board.

- **Object development**
  - In this method, stations are developed using the object code and the device kit. By developing with object codes, a design with higher flexibility can be achieved compared to using the built-in interface board.

Remote Device Station

- **Dedicated communication LSI MFP3N**
  - MFP3N is a communication LSI that allows you to develop devices that handle bit data and word data without concern about protocol. MFP3N is controlled with software. Support of both CCLink Ver. 1 and Ver. 2 is possible by changing the software.

- **Remote I/O Station**
  - **Dedicated communication LSI MFP2N/MFP2AN**
    - MFP2N and MFP2AN are communication LSIs that allow you to develop devices that handle bit data without concern about protocol. The two types are provided for different package sizes (number of pins) and I/O point quantity.
  - **Embedded I/O Adapter**
    - This small-sized Embedded adapter allows you to develop devices that handle bit data without concern about protocol. The adapter can be mounted directly on the circuit board you developed, and allows expansion of the number of I/O points through cascade connection. (A maximum of two adapters can be mounted on a single circuit.)

Driver Development

Drivers for various operating systems can be developed for use of the Mitsubishi Electric PC interface board (Q80BD-J61BT11N).

Master Station

- **Dedicated communication LSI CLC13**
  - CLC13 is a communication LSI that allows you to develop devices compliant with the master station used for network management. The network can be constructed by connecting the various slave stations.

Remote Device Station

- **Dedicated communication LSI CLC31**
  - CLC31 is a communication LSI that allows you to develop devices that handle CCLink/LT word data (16-bit data). The data amount of four words can be handled by a single LSI, allowing development of analog I/O and other remote device stations.

Remote I/O Station

- **Dedicated communication LSI CLC21**
  - CLC21 is a communication LSI that allows you to develop devices that handle bit data without concern about protocol. This LSI enables development of digital I/O and other remote I/O stations.
Hilscher serves as your dependable partner in the development of CC-Link equipment.

Hilscher offers the entire spectrum of CC-Link solutions you need - from the supply of various interface products to the development and production, on a contract basis, of such products to the organization of relevant workshops.

One for all
Industrial communication solutions with a common platform

One Partner » One Chip » All Systems

One Partner – One Chip – All Systems. From the standard product on to an **OEM module PC card**, **Gateway** and up to the **chip** – we offer a suitable solution for all requirements. When it comes to a solution for your industrial communications, place your trust in the technological market leader, **netX**, a solution for all fieldbuses and Real-time Ethernet: Made in Germany.

Features of the Hilscher CC-Link product technology

- Certified to CC-Link V2.0.
- Supports all profiles for a remote device (MFP3 equivalent).
- Dual port memory-based or serial host interfacing facilitates control operations.
- ARM core with built-in netX allows user applications to be installed.
- An application interface common to all the Hilscher products and protocols.
- Ensures a significant reduction in overall product development cost and a timely introduction into market.
- Easy-to-use configuration tool SYCON.net that is common to all.
The CC-Link communication interface provides, at a low cost, all elements including optimum performance capability, functionality, and flexibility, PCI and PCI Express, both of which can be used on standard personal computers (each for use with a slave station only), are now available. Other form factors can be also developed for your projects. Drivers for major RTOSs are also available and come with a full package of software programs necessary for product development, such as configuration tool, driver, example, and manual.

**Built-in module**

Hitachi’s built-in modules represent a single-chip solution in the form of an integrated package of software and hardware suitable for CC-Link slave interface which is directly installed into various automation equipment such as controllers, PLCs, and drives. The high-end network controller “netX” permits all communication tasks to be executed using a microprocessor mounted. Because API is common to all the protocols, compatibility with other field buses or real-time Ethernet networks can be secured with great ease, simply by replacing existing Hitachi built-in modules such as comX and netIC.

**Gateway**

The netTAP 100 gateway is a solution ideal for users who want to connect products designed for use with varied networks (field bus, real-time Ethernet and serial) readily and reliably to CC-Link network. Acting as a CC-Link slave, the versatile netTAP 100 can work well with virtually all conceivable network settings on the market. It comes with SYCON.net, a dedicated configuration tool. With a simple drag-and-paste operation on GUI, tasks such as firmware downloading, setting, and diagnosis can be performed via a USB on a personal computer.

**ASIC (communication controller)**

The netX family of products comprises several multi-protocol network controllers which Hilscher developed to provide for an integration into automation equipment of every description (such as a drive, I/O, PLC, and barcode reader). The netX chip, is equipped with an ARM core CPU and contains a comprehensive set of peripheral functions. It also supports a variety of major protocols like field bus and industrial real-time Ethernet with one piece of hardware. Utilizing firmware supplied by Hilscher allows you to design your original CC-Link interface.

Using a special netX software development boards also enables you to easily evaluate and develop CC-Link interfaces and user applications. Besides general-purpose hardware, netX has a built-in JTAG-USB interface as well as a JTAG interface that is the most common as a debugging interface so that netX Studio CDT, the Eclipse-based integrated development environment from Hilscher, can be used.

**Products compliant with CC-Link IE Field and CC-Link IE Field Basic**

- CC-Link IE Field / PROFINET coupler
- PCI Express card
- Built-in module

---

**CC-Link IE Field**

- All existing netX-based products are compliant. (Chip, Built-in module, PC card, Gateway)

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**CC-Link IE Field Basic**

- CC-Link IE Field / PROFINET coupler
- PCI Express card
- Built-in module
Anybus solutions offer you a sure way to easily succeed in the development of CC-Link/CC-Link IE Field equipment in a short period of time.

HMS has a host of solutions to offer for creating products which are compliant with CC-Link/CC-Link IE field networks.

Chances are that you'll find the right solution for your needs.

Anybus solutions enable you to put your CC-Link-compatible product to market in a short time.

Anybus CompactCom 40 - CC-Link / CC-Link IE Field

Communication module provided in three built-in forms selectable according to hardware or specifications

With Anybus CompactCom’s three built-in forms of chip, brick, or module, choosing the optimum form to introduce is easy.

No matter which form is adopted, development man-hour and investment allow for the development of CC-Link / CC-Link IE Field* (slave) compatible devices, at a minimum, in order to ensure software compatibility

Development using the Anybus CompactCom provides the hardware compatibility and the developed hardware can be easily used on other networks.

* No chip is available for C40 CC-Link IE Field.

A circuit board of a host device has an Anybus slot and 50 pin CompactFlash connector.

---

### Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Chip</th>
<th>Brick</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-Link</td>
<td>AB6672</td>
<td>AB6602, AB6702 (without housing)</td>
<td></td>
</tr>
<tr>
<td>CC-Link IE Field</td>
<td>AB6679</td>
<td>AB6609, AB6709 (without housing)</td>
<td></td>
</tr>
</tbody>
</table>

- **Chip**
  - The core technology (API) can be directly implemented on a host circuit board.
- **Brick**
  - A connector can be selected.
- **Module**
  - Fully equipped and pluggable

**Chip**

- Application interface
  - 8/16-bit parallel (30ns access)
  - High-speed SPI, The baud rate can be set at up to 20MHz.
  - Shift register (For I/O devices, cyclic transmission time: 82µs)
  - UART (Backward compatibility with 30 series, up to 625kbps)

- Application connector or PKG
  - BGA VF400 0.8mm pitch
  - 1.27mm pitch
- Power supply
  - 3.3 VDC, 2.5V, 1.2V
  - 3.3 VDC

- Operating temperature
  - -40 to 100 °C
  - -40 to 85 °C
  - -40 to 70 °C
  - -40 to 85 °C (without housing)

**Brick**

- Number of I/O points: Supports up to 1536 bytes of I/O data

**Module**

- Number of I/O points: Supports up to 512 bytes of I/O data
- Supports 1Gbps
- Supports SLMP servers
- Supports 1Gbps

---

* For types, please contact HMS Industrial Networks.
Anybus Communicator RS232/422/485, CAN - CC-Link, CC-Link IE Field

Protocol converter that connects serial devices or CAN devices to CC-Link / CC-Link IE Field

Anybus Communicator RS232/422/485 and Anybus Communicator CAN are high-performance externally mounted serial converters that allow CC-Link / CC-Link IE Field support using the existing RS232/422/485 or CAN serial interface of your equipment.

Without taking up any space inside the control cabinet, this extremely compact product requires no program changes on the equipment side and can be easily mounted on a DIN standard rail.

Anybus X-gateway - CC-Link / CC-Link IE Field

Network converter that connects CC-Link / CC-Link IE Field to other industrial networks

Anybus Communicator X-gateway facilitates I/O data transfers between varying types of networks and PLC systems, allowing for consistent communication of information throughout the entire plant. Connecting CC-Link and CC-Link IE Field to various types of industrial networks is also possible.

**Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Communicator RS232/422/485</th>
<th>Communicator CAN</th>
<th>Features</th>
</tr>
</thead>
</table>
| CC-Link | AB7008                    | AB7321           | • CC-Link remote device station  
• Number of I/O points for CC-Link v.2.0:  
Up to 896 points of bit data, 128 points of word data  
• Supports baud rates in the range of 156kbps to 10Mbps  
• One to four stations can be occupied. 1X to 4X extended cyclic settings (v.2.0) only |
| CC-Link IE Field | AB7077          | n.a.             | • Intelligent device station  
• Number of I/O points: Supports up to 512 bytes of I/O data  
• Supports 1Gbps |

**Features**

• CC-Link remote device station  
• Number of I/O points for CC-Link v.2.0:  
Up to 896 points of bit data, 128 points of word data  
• Supports baud rates in the range of 156kbps to 10Mbps  
• One to four stations can be occupied. 1X to 4X extended cyclic settings (v.2.0) only  

**Specifications**

<table>
<thead>
<tr>
<th>Type/Network</th>
<th>PROFIBUS</th>
<th>DeviceNet</th>
<th>ASI</th>
<th>MODBUS-TCPI</th>
<th>CAN</th>
<th>DeviceNet</th>
<th>CAN</th>
<th>DeviceNet</th>
<th>CAN</th>
<th>CC-Link</th>
<th>CC-Link IE Field</th>
<th>CAN</th>
<th>DeviceNet</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>CC-Link</td>
<td>AB7810</td>
<td>AB7819</td>
<td>AB7893</td>
<td>AB7860</td>
<td>AB9009</td>
<td>AB7841</td>
<td>AB7643</td>
<td>AB7661</td>
<td>AB7694</td>
<td>n.a.</td>
<td>n.a.</td>
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<tr>
<td>CC-Link IE Field</td>
<td>AB7953</td>
<td>AB7955</td>
<td>n.a.</td>
<td>AB7957</td>
<td>n.a.</td>
<td>AB7956</td>
<td>AB7958</td>
<td>AB7954</td>
<td>AB7961</td>
<td>n.a.</td>
<td>n.a.</td>
<td></td>
<td>n.a.</td>
</tr>
</tbody>
</table>

**Examples**

Example: CC-Link IE Field - PROFINET

![Example: CC-Link IE Field - PROFINET](image)
The R-IN32 series supports development of CC-Link Family-compatible products.

Providing total solutions to support customer product development, including LSI, development tools, and sample software and drivers.

The “R-IN32 series” developed by Renesas Electronics for industrial communication is a product that can be used for slave device development for CC-Link Family products.

As a total solution including development tools such as an Arm development environment and development kit as well as sample software and drivers, and of course LSI, speedy and easy product development is possible.

In addition, various communication protocols including CC-Link are supported, allowing development as a platform.

Intelligent device station

**Communication LSI <R-IN32M3-CL, R-IN32M4-CL2>**

Equipped with a function equivalent to CP220, this communication LSI allows for product development of various types of equipment where cyclic transmission and transient transmission can be performed regardless of protocol. Application implementation is also possible as Arm’s Cortex-M3/M4 is installed as the CPU core. In addition, the following are offered in conjunction with the R-IN32M3-CL.

- CC-Link IE development manual
- Sample software

Intelligent device station / remote device station

**Communication LSI <R-IN32M3-CL/EC, R-IN32M4-CL2>**

Equipped with functions equivalent to MFP1N and MFP3N, this communication LSI allows for product development of equipment regardless of protocol. By switching the software for this LSI, both Ver. 1.10 and Ver. 2.00 can be supported. Application implementation is also possible as Arm’s Cortex-M3 is installed as the CPU core. In addition, the following are offered in conjunction with the R-IN32M3-CL/R-IN32M3-EC.

- CC-Link development manual
- Sample software
The R-IN32 series supports development of CC-Link Family-compatible products.

**Product summary**

<table>
<thead>
<tr>
<th>R-IN32M4-CL2</th>
<th>R-IN32M3-CL</th>
<th>R-IN32M3-EC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
<td>Arm® Cortex® M3 Processor with FPU</td>
<td>Arm® Cortex® M3 32-bit RISC CPU(100MHz)</td>
</tr>
<tr>
<td><strong>R-IN32 engine</strong></td>
<td>Real-time OS accelerator</td>
<td>Real-time OS accelerator</td>
</tr>
<tr>
<td><strong>Ethernet Controller</strong></td>
<td>CC-Link IE Field (Intelligent device station)</td>
<td>EtherCAT Slave controller</td>
</tr>
<tr>
<td><strong>Built-in RAM</strong></td>
<td>16/32bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 106)</td>
<td>2port Ether PHY (10Base-T, 100Base-Tx/Fx)</td>
</tr>
<tr>
<td><strong>External I/F</strong></td>
<td>116/32bit CPU I/F, memory I/F, serial flash I/F, GPIO (max. 96)</td>
<td></td>
</tr>
<tr>
<td><strong>Built-in peripheral functions</strong></td>
<td>Timer (32bit/4ch, 16bit/16ch), Wdtmg-Timer (1ch), UART (2ch), I2C (2ch), CAN (2ch), CC-Link (1ch)</td>
<td>Timer (4ch), Wdtmg-Timer (1ch), UART (2ch), I2C (2ch), CAN (2ch), CC-Link (1ch)</td>
</tr>
<tr>
<td><strong>Package</strong></td>
<td>484pin PBGA (23mm x 23mm, 1mm pitch)</td>
<td>324pin PBGA (19mm x 19mm, 1mm pitch)</td>
</tr>
</tbody>
</table>

**Evaluation tool**

This kit simplifies development and evaluation of a product. Start software development for CC-Link IE now!

The evaluation board equipped with various peripheral functions enables you to evaluate R-IN32M4-CL2 comprehensively.

**Specifications comparison of solution kits**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>IAR Systems</th>
<th>TESSERA TECHNOLOGY INC.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Board size</strong></td>
<td>80mm (W) x 80mm (D)</td>
<td>145mm (W) x 95mm (D)</td>
</tr>
<tr>
<td><strong>RJ45</strong></td>
<td>2 ports (10M/100M/1G)</td>
<td>2 ports (10M/100M/1G)</td>
</tr>
<tr>
<td><strong>External memory</strong></td>
<td>1MB flash memory</td>
<td>8MBW Serial flash memory</td>
</tr>
<tr>
<td><strong>External microcontroller</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>5V (power supplied via USB)</td>
<td>5V (AC adapter) or 24V (power also supplied via PLC)</td>
</tr>
<tr>
<td><strong>CIS</strong></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>ICD</strong></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>UART</strong></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>General purpose I/O</strong></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>CC-Link</strong></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>ADC</strong></td>
<td>8ch</td>
<td>8ch</td>
</tr>
<tr>
<td><strong>Debug</strong></td>
<td>RJ45 interface (20-pin half-pitch)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td>Approx. JPY 30,000</td>
<td>Approx. JPY 70,000</td>
</tr>
</tbody>
</table>

**Arm and Cortex are trademarks or registered trademarks of Arm Limited.**
**Ethernet is a registered trademark of Fujitsu Xerox Co., Ltd.**
**CC-Link and CC-Link IE Field are registered trademarks of CC-Link Partner Association.**
**EtherCAT is a registered trademark of Beckhoff Automation GmbH, Germany.**
**Other product or service names on this page are trademarks or registered trademarks of their respective owners.**
Introduction to CC-Link Family-compatible Products Development Methodology

MACNICA, Inc.

Contact addresses
MACNICA, Inc. ALTIMA Company
Headquarters: +81-45-476-2155
Nagoya: +81-52-533-0252
Osaka: +81-6-6397-1053
Utsunomiya: +81-28-627-1071
URL: https://www.alt Macronica.co.jp
<Contact Us>
https://tmsgs.jp/webapp/form/16344_qey_26/index.do

Indusrial 1st certified CC-Link IE Field IP Core for FPGA

Developed for Intel® FPGA and equivalent to the CP220 CC-Link IE Field intelligent device ASIC, it supports both cyclic & transient data exchange. Enabling CPU load off by specified & optimized to CC-Link IE Filed transmission.

Integrated CP220 equivalent function
- Integrated equivalent function to MITSUBISHI ELECTRIC’s specified ASIC(CP220)
- For Intelligent device use
- Support both cyclic & transient data exchange
- RX/RY=each 2,048bits, RWr/RWw=each 1,024 words
- Enabling CPU load off by using Intel® Corporation’s soft core CPU Nios® II

IP Core Resource(ALT-CLIEFA-USOC)
- Support low cost FPGA Cyclone® V E
- Logic Element : 37,000LEs
- Internal RAM : 1,400,000 bits
- DSP block : 4blocks
- PLL : 4 pcs
- Controlled by Nios® II connected to Avalon®-MM via Intel® Corporation’s Qsys system-level integration tool

Utilize FPGA’s merit
- It’s possible to integrate this IP & user’s own design into ALTERA FPGA which is widely used in the industrial equipment market.
- Same to typical FPGA design flow & method by using Quartus® Prime
- Protect IP core by using external CPLD as of security chip

Development environment
- Industrial network kit (INK) as evaluation platform (should be prepared in addition to IP Core)
- Anctypted IP Core
- IP Core user’s manual
- User’s manual
- Sample design

MACNICA, Inc.
Foundation: 1991
Headquarters: Yokohama city, Kanagawa
Sites: Osaka, Nagoya, Utsunomiya
Mission : Leading Edge Solution Provider
Top class distributor of both Intel® Corporation and so many leading edge foreign semiconductor suppliers, holding technical workshop, PLD design service, developing original board
Support CC-Link IE Field Intelligent Device Field High-performance built-in module (TB-7Z-IAE)

inrevium, TOKYO ELECTRON DEVICE original brand, developed TB-7Z-IAE. It is High-performance built-in module which has Xilinx Zynq™-7000 All Programmable SoC and 2ch Gigabit Ethernet in small area. Also, CC-Link IE Field intelligent device Field High-performance built-in module (TB-7Z-IAE) launches efficiently.

**TB-7Z-IAE spec**

Xilinx Zynq-7000 All Programmable SoC combines 667MHz Dual ARM® Cortex™-A9 MPcore with the programmable logic like high speed DSP slice.

Connecting to DDR3 SDRAM, TB-7Z-IAE offers high performance which has been conventionally difficult to realize.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>TB-7Z-IAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoC</td>
<td>Xilinx XC7Z2020</td>
</tr>
<tr>
<td>Memory</td>
<td>512MByte SDRAM 1066Mbps (ECC)</td>
</tr>
<tr>
<td></td>
<td>16MByte Flash memory</td>
</tr>
<tr>
<td></td>
<td>64Kbit Non-volatile F-RAM</td>
</tr>
<tr>
<td>Connector</td>
<td>100 pin connector, 1.27mm pitch</td>
</tr>
<tr>
<td>Interface</td>
<td>Gigabit Ethernet x 2</td>
</tr>
<tr>
<td></td>
<td>micro SD card socket</td>
</tr>
<tr>
<td>Other</td>
<td>JTAG connector, LED</td>
</tr>
<tr>
<td>Clock</td>
<td>PS/PL clock and RTC device</td>
</tr>
<tr>
<td>Power</td>
<td>Single voltage DC5V</td>
</tr>
<tr>
<td>PCB size</td>
<td>60mm(W) x 85mm(H)</td>
</tr>
<tr>
<td>operating temperature</td>
<td>0°C to +50°C</td>
</tr>
</tbody>
</table>

**Evaluation Kit (TB-7Z-ISDK)**

- Can evaluate many interface with combining TB-7Z-IAE.
- Interface
  - RS232C
  - CAN
  - RS485
  - USB mini Type AB
  - Pin Header
  - PoCL Base (Power over CameraLink)
  - DVI-TX
- Sample design

*Please contact us about Xilinx FPGA CC-Link IE Field IP core (TIP-CCLIE-PROJ).
*TB-7Z-IAE/TB-7Z-ISDK is still developing. The specification may change without prior notice.
Introduction to CC-Link Family-compatible Products Development Methodology

Contact addresses
Texas Instruments Incorporated
12500 TI Blvd. Dallas, TX 75243
Phone: +1-972-995-2011
URL: www.ti.com

TI Sitara™ processors support CC-Link IE Field Basic and provide industrial grade solutions

Texas Instruments offers industrial grade devices to support 10+ year solutions with features like 100,000 power-on-hours at 105°C, high temperature availability up to 125°C, scalability through a combination of portfolio and unified Processor Software Development Kit (SDK), and excellent support through the E2E forums.

TI’s Sitara processors: designed for multiprotocol communications

Single to multicore Arm® processors with application-specific accelerators

1. CC-Link IEF Basic slave and master support on RTOS and Linux
2. Support for 10+ industrial communication protocols on each device
3. Tools, software and training resources available on TI.com

CC-Link IE Field Basic reference design for master and slave on TI Sitara processors

Supported by Processor SDK Linux and RTOS across Sitara processors including AMIC110, AM335x, AM437x, AM57x

Demonstrates that the implementation of CC-Link IE Field Basic on Sitara processors can meet CLPA certification criteria

Key features include:
- SLMP supported on slave station
- Up to 64 slave stations supported by master
- Fully customizable with source code available

Find more information on TI’s CC-Link IE Field Basic reference design at www.ti.com/tool/TIDEP-0089.
For more information on TI’s Arm-based Sitara processors, visit www.ti.com/sitara.
**Sitara processors that support CC-Link IE Field Basic**

<table>
<thead>
<tr>
<th>AMIC110</th>
<th>AM335x</th>
<th>AM437x</th>
<th>AM57x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core(s)</td>
<td>Cortex®-A8 up to 300MHz</td>
<td>Cortex®-A8 up to 1GHz</td>
<td>Cortex®-A9 up to 1GHz</td>
</tr>
<tr>
<td>Co-Processor</td>
<td>PRU-ICSS</td>
<td>2x PRU-ICSS</td>
<td>2x PRU-ICSS</td>
</tr>
<tr>
<td>Ethernet(1)</td>
<td>2x 10/100 MAC</td>
<td>2x 10/100 MAC + 2-port Gb switch</td>
<td>4x 10/100 MAC</td>
</tr>
<tr>
<td>Serial I/O</td>
<td>CAN, I2C, SPI, UART, USB2.0, GPIO</td>
<td>CAN, I2C, SPI, UART, USB2.0, GPIO</td>
<td>PCIe: CAN, I2C, SPI, QSPI, UART, USB2.0, GPIO</td>
</tr>
<tr>
<td>Additional features</td>
<td>—</td>
<td>Display subsystem</td>
<td>Display subsystem</td>
</tr>
<tr>
<td>Evaluation Module</td>
<td>TMDXICE110</td>
<td>TMDSXICE3359</td>
<td>TMDSDIK437x</td>
</tr>
<tr>
<td>Operating Temp (°C)</td>
<td>-40 to 105 °C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) PRU-ICSS is an acronym for Programmable Real-time Unit Industrial Communications Subsystem. Each instance of PRU-ICSS contains two programmable real-time cores with a max performance of 200MHz, among other peripherals.

(2) The 10/100 MACs are located in the PRU-ICSS and can be used for general-purpose Ethernet or industrial Ethernet.

**Development Kits**

TI’s Industrial Development Kits (IDK) and Industrial Communications Engines (ICE) are standalone test, development, and evaluation modules that enable developers to write software and develop hardware for industrial control and industrial communications applications. Order one to start your CC-Link IEF Basic design now!

- **TMDXICE110**
  - Key features: AMIC110 processor
  - Two 10/100 industrial Ethernet connectors with external magnetics
  - 5-V input supply, single-chip power management IC (TPS650255) to power the entire board
  - 512MB of DDR3 Texas Instruments™ LaunchPad™ compatible BoosterPack™ format
  - 3.3-V SPI interface to C2000 F28069M LaunchPad

- **TMDSXICE3359**
  - Key features: AM3359 processor
  - On-board OLED display
  - 1GB DDR3 memory
  - Support for NOR Flash up to 32Mb
  - SPI Flash
  - Power management IC (TPS65915)
  - RoHS compliant

- **TMDSDIK437x**
  - Key features: AM4379 processor
  - 1GB DDR3
  - QSPI-NOR Flash
  - Discrete power solution
  - On-board 2Mp camera
  - EnDat2.2 connectivity for motor control

- **TMDXIDK5728**
  - Key features: AM5728 processor
  - 2GB DDR3
  - 4 Ethernet ports with concurrent operation (including 2 from PRU-ICSS)
  - On-board eMMC
  - Mini PCIe, USB3.0, and HDMI connectors
Ze-PRO® CC-Link IE Safety SDK - Compliant with IEC 61508

Total support of introduction to certification of CC-Link IE Safety accelerates the development of the product that supports the functional safety communications.

Third-party certification supports are also available for functional safety product certification.

**Product features**

**Functional safety solution for industrial field**

- Safety Package: Self-test diagnostic software for microcontrollers
- Safety Reference Kit: Safety part design data

**Ze-PRO® CC-Link IE Safety SDK**

- Providing a CPU/OS-independent safety protocol stack development environment
  - The CC-Link IE Safety protocol is specialized in safety communications and certified in accordance with international standards, IEC 61508 SIL3 and IEC 61784-3.

**Product configuration**

**Ze-PRO® CC-Link IE Safety SDK**

- CC-Link IE stack
- SDK wrapper

**Renesas Electronics Corporation**

- Industrial network controller
  - R-IN32M3-CL evaluation kit
  - R-IN32M4-CL2 evaluation kit

**Functional safety solution**

- Safety package
- Safety reference kit

**JAPAN QUALITY ASSURANCE ORGANIZATION**

- Third-party certification support
- Functional safety seminar
- Risk assessment support
- Escorting support

**Contact addresses**

**ZUKEN ELMIC, Inc.**

- Head Office: 3-1-1, Shin-Yokohama, Kouhoku-ku, Yokohama, Kanagawa, 222-8505, Japan
  - Phone: +81-45-624-8002 / Fax: +81-45-476-1102
- Osaka Office: 8F Shin-Osaka Hase Bldg.,3-22, Nishinakajima 4, Yodogawa-ku, Osaka, 532-0011, Japan
  - Phone: +81-6-6195-7800 / Fax: +81-6-6309-3830
  - URL: http://www.elmic.co.jp
  - E-mail: info@elmic.co.jp

**Renesas Electronics Corporation**

- 5-20-1, Josuihon-cho, Kodaira-shi, Tokyo, 187-8588, Japan
  - Phone: +81-42-320-7300 / Fax: +81-42-327-8656
  - URL: http://www.renesas.com

**Japan Quality Assurance Organization**

- 1-25, Kandasudacho, Chiyoda-ku, Tokyo 101-8555, Japan
  - Phone: +81-3-4560-9002 / Fax: +81-3-4560-9002
  - URL: http://www.jqa.jp
  - E-mail: cert-scheme-dp@jqa.jp
Memo
Main CC-Link Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
<th>Ver.1.10</th>
<th>Ver.2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote I/O (RX, RY)</td>
<td>2048 bits each</td>
<td>8192 bits each</td>
<td></td>
</tr>
<tr>
<td>Remote register (RW)</td>
<td>256 words</td>
<td>2048 words (master station ← slave station)</td>
<td></td>
</tr>
<tr>
<td>Remote register (RWw)</td>
<td>256 words</td>
<td>2048 words (master station → slave station)</td>
<td></td>
</tr>
</tbody>
</table>

Control specification

<table>
<thead>
<tr>
<th>Maximum number of link points per station</th>
<th>Specifications</th>
<th>Ver.1.10</th>
<th>Ver.2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 station occupied</td>
<td>RX, RY</td>
<td>32 bits each</td>
<td>32 bits each</td>
</tr>
<tr>
<td></td>
<td>RW, RWw</td>
<td>8 words each</td>
<td>16 words each</td>
</tr>
<tr>
<td>2 stations occupied</td>
<td>RX, RY</td>
<td>64 bits each</td>
<td>96 bits each</td>
</tr>
<tr>
<td></td>
<td>RW, RWw</td>
<td>16 words each</td>
<td>32 words each</td>
</tr>
<tr>
<td>3 stations occupied</td>
<td>RX, RY</td>
<td>96 bits each</td>
<td>160 bits each</td>
</tr>
<tr>
<td></td>
<td>RW, RWw</td>
<td>24 words each</td>
<td>48 words each</td>
</tr>
<tr>
<td>4 stations occupied</td>
<td>RX, RY</td>
<td>128 bits each</td>
<td>224 bits each</td>
</tr>
<tr>
<td></td>
<td>RW, RWw</td>
<td>64 words each</td>
<td>64 words each</td>
</tr>
</tbody>
</table>

Maximum number of occupied stations: 4

Communication specification

<table>
<thead>
<tr>
<th>Transmission rate</th>
<th>10M/5M/2.5M/625k/156kbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication method</td>
<td>Broadcast-polling</td>
</tr>
<tr>
<td>Synchronization method</td>
<td>Frame synchronization</td>
</tr>
<tr>
<td>Encoding method</td>
<td>NRZI</td>
</tr>
<tr>
<td>Type of transmission path</td>
<td>Bus transmission (EIA RS485-compliant)</td>
</tr>
<tr>
<td>Transmission format</td>
<td>HDLC-compliant</td>
</tr>
<tr>
<td>Error control method</td>
<td>CRC (X^16+X^12+X^5+1)</td>
</tr>
<tr>
<td>Maximum number of modules connected</td>
<td>64</td>
</tr>
<tr>
<td>Slave station number</td>
<td>1 to 64</td>
</tr>
</tbody>
</table>

Maximum total cable length and inter-station cable length

<table>
<thead>
<tr>
<th>Transmission rate</th>
<th>Inter-station cable length</th>
<th>Maximum total cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>156kbps</td>
<td>1200m</td>
<td></td>
</tr>
<tr>
<td>625kbps</td>
<td>900m</td>
<td></td>
</tr>
<tr>
<td>2.5Mbps</td>
<td>400m</td>
<td></td>
</tr>
<tr>
<td>5Mbps</td>
<td>160m</td>
<td></td>
</tr>
<tr>
<td>10Mbps</td>
<td>100m</td>
<td></td>
</tr>
</tbody>
</table>

When Ver.1.10- and Ver.1.00-compliant cables are used together, the maximum total cable length and inter-station cable length for the Ver.1.00-compliant cable apply.

Connection cable

CC-Link Ver.1.10-compliant cable (shielded 3-wire twisted-pair cable)
- Cables manufactured by different manufacturers can be used together if the cables are Ver.1.10-compliant.
### CC-Link Recommended Part

<table>
<thead>
<tr>
<th>Item name</th>
<th>Type designation</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>MCT7050-A401</td>
<td>Sinka Japan Co., Ltd.</td>
</tr>
<tr>
<td>RS485 transceiver</td>
<td>SN75ALS181NS</td>
<td>Texas Instruments, Ltd.</td>
</tr>
<tr>
<td>Zener diode</td>
<td>RD6.2Z</td>
<td>Renesas Electronics Corporation</td>
</tr>
<tr>
<td></td>
<td>PESD5V0U1UA</td>
<td>NXP Semiconductors Japan, Ltd.</td>
</tr>
</tbody>
</table>

**<With transmission line insulation provided>**

<table>
<thead>
<tr>
<th>Item name</th>
<th>Type designation</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>For communication signal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocoupler</td>
<td>HCPL-7720-500E</td>
<td>Broadcom Ltd.</td>
</tr>
<tr>
<td></td>
<td>HCPL-0720-500E</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACPL-072L</td>
<td></td>
</tr>
<tr>
<td>Digital isolator</td>
<td>ISO721</td>
<td>Texas Instruments, Ltd.</td>
</tr>
<tr>
<td></td>
<td>ISO7221C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISO7231C</td>
<td></td>
</tr>
<tr>
<td>For gate control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photocoupler</td>
<td>HCPL-2611-500E</td>
<td>Broadcom Ltd.</td>
</tr>
<tr>
<td></td>
<td>HCPL-M611-500E</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HCPL061N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PS9117A</td>
<td>Renesas Electronics Corporation</td>
</tr>
<tr>
<td>Digital isolator</td>
<td>ISO721</td>
<td>Texas Instruments, Ltd.</td>
</tr>
<tr>
<td></td>
<td>ISO7221C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISO7231C</td>
<td></td>
</tr>
</tbody>
</table>
## Differences in the number of modules connected between CC-Link Ver.1.10 and Ver.2.00

<table>
<thead>
<tr>
<th>Ver.1.10</th>
<th>Number of modules connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 64, provided, however, that the following conditions are met:</td>
<td></td>
</tr>
</tbody>
</table>
| ① Total number of stations:  
\[ a + b \times 2 + c \times 3 + d \times 4 \times 64 \]  
a: Number of modules occupying 1 station  
b: Number of modules occupying 2 stations  
c: Number of modules occupying 3 stations  
d: Number of modules occupying 4 stations |
| ② Number of modules connected:  
\[ 16 \times A + 54 \times B + 88 \times C \times 2304 \]  
A: Remote I/O station: up to 64  
B: Remote Device station: up to 42  
C: Local and Intelligent Device stations: up to 26 |

<table>
<thead>
<tr>
<th>Ver.2.00</th>
<th>Number of modules connected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 64, provided, however, that the following conditions are met:</td>
<td></td>
</tr>
</tbody>
</table>
| ① Total number of stations:  
\[ (a + a_2 + a_4 + a_8) + (b + b_2 + b_4 + b_8) \times 2 + (c + c_2 + c_4 + c_8) \times 3 + (d + d_2 + d_4 + d_8) \times 4 \times 64 \]  
a: Number of modules, 1X setting, occupying 1 station  
b: Number of modules, 1X setting, occupying 2 stations  
c: Number of modules, 1X setting, occupying 3 stations  
d: Number of modules, 1X setting, occupying 4 stations  
a_2: Number of modules, 2X setting, occupying 1 station  
b_2: Number of modules, 2X setting, occupying 2 stations  
c_2: Number of modules, 2X setting, occupying 3 stations  
d_2: Number of modules, 2X setting, occupying 4 stations  
a_4: Number of modules, 4X setting, occupying 1 station  
b_4: Number of modules, 4X setting, occupying 2 stations  
c_4: Number of modules, 4X setting, occupying 3 stations  
d_4: Number of modules, 4X setting, occupying 4 stations  
a_8: Number of modules, 8X setting, occupying 1 station  
b_8: Number of modules, 8X setting, occupying 2 stations  
c_8: Number of modules, 8X setting, occupying 3 stations  
d_8: Number of modules, 8X setting, occupying 4 stations |
| ② Number of modules connected:  
\[ 16 \times A + 54 \times B + 88 \times C \times 2304 \]  
A: Remote I/O station: up to 64  
B: Remote Device station: up to 42  
C: Local and Intelligent Device stations: up to 26 |

*: For Ver.1-compliant equipment, calculations are made on the basis of 1X setting being used.
## CC-Link Ver.1.00 specifications (differences from Ver.1.10)

Specifications for CC-Link Ver.1.00 and Ver.1.10 differ in the following two particulars:
- Maximum total cable length and inter-station cable length
- Connection cable

### Maximum total cable length and inter-station cable length

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master station</td>
<td>Remote I/O station or remote device station</td>
</tr>
<tr>
<td></td>
<td>Remote I/O station or remote device station</td>
</tr>
<tr>
<td></td>
<td>Local station or intelligent device station</td>
</tr>
<tr>
<td></td>
<td>Local station or intelligent device station</td>
</tr>
</tbody>
</table>

Maximum total cable length

*1 Inter-station cable length between remote I/O stations or remote device stations

*2 Inter-station cable length between master/local station or intelligent device station and preceding/following station

### CC-Link dedicated cable (terminal resistance used: 110)

<table>
<thead>
<tr>
<th>Transmission rate</th>
<th>Inter-station cable length</th>
<th>Maximum total cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>156kbps</td>
<td>More than 30cm</td>
<td>1200m</td>
</tr>
<tr>
<td>625kbps</td>
<td>More than 30cm</td>
<td>600m</td>
</tr>
<tr>
<td>2.5Mbps</td>
<td>30cm to 59cm</td>
<td>200m</td>
</tr>
<tr>
<td></td>
<td>More than 60cm</td>
<td>110m</td>
</tr>
<tr>
<td>5Mbps</td>
<td>30cm to 59cm</td>
<td>150m</td>
</tr>
<tr>
<td></td>
<td>/ more than 2m</td>
<td></td>
</tr>
<tr>
<td>10Mbps</td>
<td>60cm to 99cm</td>
<td>50m</td>
</tr>
<tr>
<td></td>
<td>More than 1m</td>
<td>80m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100m</td>
</tr>
</tbody>
</table>

(A): Cables longer than 1m are used in a system configuration comprised of only remote I/O and remote device stations.

(B): Cables longer than 2m are used in a system configuration including local and intelligent device stations.

*: If a cable has a length within this range in any one section between remote I/O stations or intelligent device stations, the maximum total cable length listed applies.

### Connection cable

- CC-Link Ver.1.00- or Ver.1.10-compliant cable (shielded 3-wire twisted-pair cable)
  - Cables manufactured by different manufacturers cannot be used together.
## Main Specifications of CC-Link/LT

### Control specification

<table>
<thead>
<tr>
<th>Item</th>
<th>4-point mode</th>
<th>8-point mode</th>
<th>16-point mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of link points</td>
<td>256 bits (512 bits)</td>
<td>512 bits (1024 bits)</td>
<td>1024 bits (2048 bits)</td>
</tr>
<tr>
<td>Number of link points per station</td>
<td>4 bits (8 bits)</td>
<td>8 bits (16 bits)</td>
<td>16 bits (32 bits)</td>
</tr>
</tbody>
</table>

**Link scan time (ms)**

- **With 32 stations connected**
  - Number of points: 128 bits, 256 bits, 512 bits
  - 2.5Mbps: 0.7, 0.8, 1.0
  - 625kbps: 2.2, 2.7, 3.8
  - 156kbps: 8.0, 10.0, 14.1

- **With 64 stations connected**
  - Number of points: 256 bits, 512 bits, 1024 bits
  - 2.5Mbps: 1.2, 1.5, 2.0
  - 625kbps: 4.3, 5.4, 7.4
  - 156kbps: 15.6, 20.0, 27.8

### Communication specification

- **Transmission rate**: 2.5M / 625k / 156kbps
- **Type of transmission path**: T-branch
- **Error control method**: CRC
- **Maximum number of modules connected to branch line (per branch line)**: 8
- **Distance between stations**: No limit
- **Distance between T-branches**: No limit
- **Location for master station connection**: At the end of a main line
- **RAS functions**: Network diagnosis, internal loopback diagnosis, slave station disconnection, and automatic return

### Connection cable

- **Dedicated flat cable (0.75mm² x 4)**
- **Dedicated cable for moving components (0.75mm² x 4)**
- **VCTF cable (JIS C 3306-compliant, 0.75mm² x 4)**

### Network cabling specification

- **Main line length (not including branch lines)**
- **Distance between T-branches**
- **Branch line length**

### Table: Example

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission rate</td>
<td>2.5Mbps, 625kbps, 156kbps</td>
<td></td>
</tr>
<tr>
<td>Inter-station distance</td>
<td>No limit</td>
<td></td>
</tr>
<tr>
<td>Maximum number of modules connectable to branch line (per branch line)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Maximum main line length</td>
<td>35m, 100m, 500m</td>
<td>Cable length between terminal resistors (not including branch lines)</td>
</tr>
<tr>
<td>Distance between T-branches</td>
<td>No limit</td>
<td></td>
</tr>
<tr>
<td>Maximum branch line length</td>
<td>4m, 16m, 60m</td>
<td>Cable length per branch line (including cable run from a connector to equipment)</td>
</tr>
<tr>
<td>Total branch line length</td>
<td>15m, 50m, 200m</td>
<td>Aggregated total of branch line lengths</td>
</tr>
</tbody>
</table>

* Dedicated flat cables, VCTF cables, and dedicated cables for moving components can be used together for branch lines.
* Different cables cannot be used on a main line.
* Different cables cannot be used together on the same branch line.

*: For Ver.1-compliant equipment, calculations are made on the basis of 1X setting being used.
## Recommended CC-Link/LT Components

<table>
<thead>
<tr>
<th>Equipment type</th>
<th>Item name</th>
<th>Type designation</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master station</td>
<td>Filter</td>
<td>CM04RC04T</td>
<td>TAIYO YUDEN Co., Ltd.</td>
</tr>
<tr>
<td></td>
<td>RS485 driver/receiver</td>
<td>MAX1487CSA</td>
<td>Maxim Integrated Products, Inc.</td>
</tr>
<tr>
<td></td>
<td>Zener diode*</td>
<td>(1) PESD5V0U11UA</td>
<td>NXP Semiconductors Japan, Ltd.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) UDZU5.6B</td>
<td>ROHM Co., Ltd.</td>
</tr>
<tr>
<td></td>
<td>Photocoupler</td>
<td>PS9117A</td>
<td>Renesas Electronics Corporation</td>
</tr>
<tr>
<td></td>
<td>Connector (board side) right angle</td>
<td>38204-52S3-MOM PL</td>
<td>Sumitomo 3M Limited</td>
</tr>
<tr>
<td></td>
<td>Connector (board side) straight type</td>
<td>38204-62S3-MOM PL</td>
<td>Sumitomo 3M Limited</td>
</tr>
<tr>
<td>Slave station</td>
<td>Filter</td>
<td>DLW31SN1025Q2</td>
<td>Murata Manufacturing Company, Ltd.</td>
</tr>
<tr>
<td></td>
<td>RS485 driver/receiver</td>
<td>MAX1487CSA</td>
<td>Maxim Integrated Products, Inc.</td>
</tr>
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</tbody>
</table>

* Both products (1) and (2) (two each) are used in combination.
Main Specifications of CC-Link IE Controller Network

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum number of link points per network</td>
<td>32768 bits</td>
</tr>
<tr>
<td>Maximum number of link points per station</td>
<td>16384 bits</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>1Gbps</td>
</tr>
<tr>
<td>Number of stations connected per network</td>
<td>up to 120</td>
</tr>
<tr>
<td>Maximum number of networks</td>
<td>239</td>
</tr>
<tr>
<td>Maximum number of groups</td>
<td>32</td>
</tr>
</tbody>
</table>

**Optical fiber**
- **Standard**: IEC60793-2-10 Types A1a.1 (50/125m multimode)
- **Transmission loss (max.)**: Less than 3.5 (dB/km) (λ=850nm)
- **Transmission band (min.)**: More than 500 (MHz·km) (λ=850nm)
- **Total length (of an optical cable)**: 66km (with 120 stations being connected)
- **Inter-station distance (max.)**: 550m (core/clad = 50/125 (m))
- **Connector**: Type LC duplex connector
- **Standard**: IEC61754-20: Type LC connector
- **Connection loss**: Less than 0.3 (dB)
- **Polished area**: PC-polished
- **Transmission line type**: Double loop

**Twisted-pair cable**
- **Communication medium**: Shielded twisted-pair cable (Category 5e)
- **Connector**: RJ45 connector, M12 X-Code connector
- **Inter-station distance (max.)**: 100m

CC-Link IE Controller Network provides a baud rate of 1Gbps and uses a token-passing method to achieve data transfer control. This method, due to freedom from frame collisions on the transmission line, runs with an improved transmission throughput and thus is ideally suited for any network which is required to ensure a periodicity in transmission.

* For installation instructions, see the “CC-Link IE Controller Network Installation Manual” issued by CC-Link Partner Association.
## Main Specifications of CC-Link IE Field Network

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet standard</td>
<td>Per IEEE802.3 (1000base-T)</td>
</tr>
<tr>
<td>Transmission rate</td>
<td>1Gbps</td>
</tr>
<tr>
<td>Communication medium</td>
<td>Shielded twisted-pair cable (Category 5e), RJ-45 connector</td>
</tr>
<tr>
<td>Communication control method</td>
<td>Token passing</td>
</tr>
<tr>
<td>Topology</td>
<td>Line, star, and ring</td>
</tr>
<tr>
<td>Maximum number of stations connected</td>
<td>254 (combined total of master and slave stations)</td>
</tr>
<tr>
<td>Maximum inter-station distance</td>
<td>100m</td>
</tr>
<tr>
<td>Cyclic transmission (master-slave method)</td>
<td></td>
</tr>
<tr>
<td>RX (Slave → Master)</td>
<td>16384 bits</td>
</tr>
<tr>
<td>RY (Master → Slave)</td>
<td>16384 bits</td>
</tr>
<tr>
<td>Control data (word data)</td>
<td>up to 16384 words (32768 bytes)</td>
</tr>
<tr>
<td>RWr (Slave → Master)</td>
<td>8192 words</td>
</tr>
<tr>
<td>RWw (Master → Slave)</td>
<td>8192 words</td>
</tr>
<tr>
<td>Transient transmission (message transmission)</td>
<td>Message size: up to 2048 bytes</td>
</tr>
</tbody>
</table>
CLPA further accelerates the momentum of the CC-Link that opens potential on a global scale.

What is “CC-Link Partner Association”?

“CC-Link Partner Association” is an organization made up of partner-manufacturers developing “CC-Link” products, and was established to expand “CC-Link” throughout the world.

English name: CC-Link Partner Association (CLPA)

(CC-Link products: CC-Link, CC-Link/LT, CC-Link/Safety, CC-Link IE)

We help users build automation systems, and vendors develop CC-Link compatible products.

Under the motto “CC-Link, the open field network, will become world’s de facto standard”, CLPA was established in November 2000.

Ever since, the Board of directors, Marketing Task Force and Technical Task Force have joined forces to help the vendors develop compatible products and the users build up FA systems.

If you become a member in the CC-Link Partner Association

• You can obtain the latest technical information about the CC-Link.

• You can obtain the CC-Link Specification free of charge.

• You are informed of the latest CC-Link specifications and can, therefore, develop new products ahead of your competitors.

• You can utilize developed product PR.

What is CC-Link Partner Association?

Accumulated number of CLPA partner companies, which was only 300 in November 2000, has grown to more than 1,666. To keep its members aware of unsurpassed variations and features of products from their fellow partners, CLPA has reference materials available for free distribution.

As affiliated vendors increased in number year after year, the cumulative total of CC-Link-compatible products has reached more than 84,000. To keep its members informed of latest product developments and specifications, CLPA has reference materials available for free distribution.

The number of CLPA partner companies has exceeded the 19 million mark. Ever since, the Board of directors, Marketing Task Force and Technical Task Force have joined forces to help the vendors develop compatible products, and the users build up FA systems.
Global support system
The CC-Link Partner Association has branches only in Japan but also in overseas countries to find more partner companies and seek for customers’ convenience.

The high-level technology and ease-of-use
Acquisition of the international standards IEC as well as the international standards SEMI for the semiconductor and FPD industries, JIS, GB (Guo jia biao zhu) Standard, International Standard, Korean Industrial Standards, and BSMI Standard has had it recognized both in reality and in name as a global standard rather than a Japanese de-facto standard.
CC-Link open technology, the wide variety of compatible products, and the ease of application integration makes it efficient and convenient for system designers and users across the globe.

Member structure

<table>
<thead>
<tr>
<th>Member Category</th>
<th>Registered Member</th>
<th>Regular Member</th>
<th>Executive Member</th>
<th>Board Member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual dues</td>
<td>JPY 100,000</td>
<td>JPY 200,000</td>
<td>JPY 500,000</td>
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<tr>
<td>Acquisition of protocol specification</td>
<td>Offered free of charge in response to member’s request</td>
<td>JPY 100,000</td>
<td>JPY 200,000</td>
<td>JPY 500,000</td>
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<tr>
<td>CC-Link technology use right</td>
<td>Other than SLMP</td>
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<tr>
<td>Conformance test fee (per device)</td>
<td>JPY 300,000</td>
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<td>Recommended product test fee (per model)</td>
<td>JPY 100,000</td>
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Global support system

From a Japanese defacto standard to a Global Standard!!

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What is CC-Link Partner Association?

CC-Link Family-compatible Products
Development Method Guide

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A Listing of CC-Link Family Specifications

**CC-Link specifications**

- General Description / Protocol: <BAP-C2001-001>
- Implementation Rules: <BAP-C2001-002>
- Profile: <BAP-C2001-003>

**CC-Link/LT specifications**

- <BAP-C2002-001>

**CC-Link IE Controller Network specifications**

- General Description: <BAP-C2004-001>
- Application Layer - Services: <BAP-C2004-002>
- Application Layer - Protocol: <BAP-C2004-003>
- Communication Profile: <BAP-C2004-004>
- Implementation Rules: <BAP-C2004-005>
- Device Profile: <BAP-C2004-006>

**CC-Link IE Field Network specifications**

- General Description: <BAP-C2005-001>
- Physical Layer - Data Link: <BAP-C2005-002>
- Application Layer - Services: <BAP-C2005-003>
- Application Layer - Protocol: <BAP-C2005-004>
- Communication Profile: <BAP-C2005-005>
- Implementation Rules: <BAP-C2005-006>
- Device Profile: <BAP-C2005-007>
- Motion Function Application Profile: <BAP-C2005-008>

**CC-Link IE Field Network Basic specifications**

- General Description: <BAP-C2010-001>
- Physical Layer - Data Link: <BAP-C2010-002>
- Application Layer - Services: <BAP-C2010-003>
- Application Layer - Protocol: <BAP-C2010-004>
- Communication Profile: <BAP-C2010-005>
- Implementation Rules: <BAP-C2010-006>

**SLMP (Seamless Message Protocol) specifications**

- General Description: <BAP-C2006-001>
- Services: <BAP-C2006-002>
- Protocol: <BAP-C2006-003>
- Separate volume: IO-Link: <BAP-C2006-004>
- Separate volume: MODBUS: <BAP-C2006-005>

*As of January 2017*
CC-Link Partner Association

Ozone Front Building 6th Fl.,
15-58, Ozone 3-chome, Kita-ku, Nagoya, 462-0825
Phone: +81-52-919-1588 Fax: +81-52-916-8655
E-mail: info@cc-link.org

http://www.cc-link.org
CLPA Office Locations

CLPA – Japan (Head Office)
6F Ozone Front Bldg., 3-15-58, Ozone, Kita-ku, Nagoya 462-0825, Japan
Phone: +81-52-919-1588 Fax: +81-52-916-8655
E-mail: info@cc-link.org
URL: http://www.cc-link.org

CLPA – Americas
500 Corporate Woods Parkway, Vernon Hills, IL, 60061, U.S.A.
Phone: +1-847-478-2647 Fax: +1-847-876-9611
E-mail: info@cc-linkamerica.org
URL: http://www.cclinkamerica.org

CLPA – Europe (Germany)
Postfach 10 12 17, 40832 Ratingen, Germany
Phone: +49-2102-532-9740 Fax: +49-2102-532-9740
E-mail: partners@eu.cc-link.org
URL: http://www.clpa-europe.com

CLPA – Europe (U.K. Office)
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB U.K.
(P.O. Box 50, Hatfield, AL10 8XB U.K.)
Phone: +44-1707-282873 Fax: +44-1707-282873
E-mail: partners@eu.cc-link.org
URL: http://www.clpa-europe.com

CLPA – Korea
RM. 711, 7F GANGSEO HANGANG XI-TOWER A,
401 Yangcheon-ro, Gangseo-gu, Seoul 07528 Korea
Phone: +82-2-3663-6178 Fax: +82-2-6224-0158
E-mail: clpaskor@meak.co.kr
URL: http://www.cc-link.or.kr/

CLPA – Turkey
Serifalı Mahallesı Nutuk Sokak,No:5 34775 Umranıye-istanbul, Turkey
Phone: +90-216-526-39-90 Fax: +90-216-526-39-95
E-mail: partners@tr.cc-link.org
URL: http://www.clpa-europe.com

CLPA – China
Headquarters (Tongji University) : School of Electronics and Information Engineering,
Jiaqing Campus, Tongji University, Shanghai, P.R.China
Head Office: 19F No.1386 Hong Qiao Road, Shanghai, P.R.China
Phone: +86-21-64940523 Fax: +86-21-64940525
E-mail: support@cn.cc-link.org
URL: http://cn.cc-link.org/zh/

CLPA – Taiwan
6th Fl, No.105, Wu Kung 3rd. Rd., Wu-Ku Hsiang, Taipei, Taiwan
Phone: +886-2-8990-1573 Fax: +886-2-8990-1572
E-mail: cclink01@ms63.hinet.net
URL: http://www.cc-link.org.tw/

CLPA – ASEAN (Singapore)
307 Alexandra Road #05-01/02, Mitsubishi Electric Bldg., Singapore 159943
Phone: +656-470-2480 Fax: +656-476-7439
E-mail: cclink@asia.meap.com

CLPA – India
2nd Floor, Tower A & B, Cyber Greens, DLF Cyber City,
DLF Phase-III, Gurgaon-122002 Haryana, India
Phone: +91-124-4630300 Fax: +91-124-4630399
E-mail: cplamaei-india.com

CLPA – Mexico
Mariano Escobedo 69, Zona Industrial - Tlalnepantla, 54030, Estado de Mexico, Mexico
Phone: +52-55-3067-7517
E-mail: info@cc-linkamerica.org

CLPA – Thailand
9th Floor, SV City Building, Office Tower1, 896/19 and 20, Rama3 Rd., Bangpongpong,
Yanawa, Bangkok 10120 Thailand
Phone: +66-2-682-6502 Fax: +66-2-682-9750
E-mail: info@cclinkthailand.com

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