Open PLC Network

FL-net (OPCN-2)

The Standard Network Evolving Factory Automation

Fields of Application

Fields of application of FL-net (OPCN-2) have been expanded to include the [Processing industries/food and pharmaceutical industries] and furthermore [Public and social systems], in addition to the [Assembly processing industries] which established the standardization of FL-net.

Information on FL-net (OPCN-2)

Manufacturers developing FL-net equipment and devices and users constructing networks that utilize FL-net are welcome to visit OPCN websites:


English  http://www.jema-net.or.jp/English/standard/opcn_e/top-opcn.htm

Reasons for adoption and assessment

Reasons for adoption

- Designated by user
- As standard network
- Communication among different manufacturers
- Ethernet-based
- High-speed link access performance

Evaluation after adoption

- Dissatisfied 6%
- Others
- Total cost reduction
- Transmission specifications
- Easy handling including software design
- Easy wire installation and workability
- Satisfied: 94%

Reasons for adoption

- As standard network
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Evaluation after adoption

- Total cost reduction
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FL-net (OPCN-2)

FL-net is an industrial-use open network built on Ethernet and common memory systems. FL-net Version 3 (Ver.3) has been established for device level networks in addition to the controller level network of FL-net Version 2 (Ver.2), defining I/O equipment and devices mounted on common memory systems. Flattening of networks is now possible.

Very easy to configure multiple-vendor environment

- 31 companies support the open network developed in Japan.

With a solid track record as a multiple-vendor controller system, FL-net has been highly appreciated in the industry.

User-oriented and easy to use specifications and performances

- Controller systems that do not rely on specific stations can be configured easily.
- Real-time control systems can be configured easily, because punctuality of the refreshing process is guaranteed.
- Data may be exchanged even when the applications of destination stations are unknown.

Establishment of standardization and certification systems

- Certification is done based on conformity tests at certification facility in Japan.

What is FL-net?

Specifications of FL-net (OPCN-2)

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FL-net (OPCN-2), a flexible and open PLC network, interconnect different manufacturers’ equipment and devices

Progress of FA has led to increased needs for integrated systems that interconnect various controllers and FA devices. Hence, standardization of networks has become an international trend. The Japan Electrical Manufacturers’ Association (JEMA), in cooperation with the Manufacturing Science and Technology Center, the Japan Automobile Manufacturers Association, Inc., the Japan Machine Tool Builders’ Association, the Japan Robot Association, the Japan Electric Measuring Instruments Manufacturers’ Association and other relevant bodies, has engaged in the development, standardization, conformity testing and certification, and promotion activities for an open network FL-net (OPCN-2) comprising mainly programmable controllers (PLCs). Dissemination of the FL-net (OPCN-2) enables interconnection among different manufacturers’ equipment and devices, and configuration of flexible and open FA systems.

What is FL-net?

FL-net is an industrial-use open network built on Ethernet and common memory systems. FL-net Version 3 (Ver.3) has been established for device-level networks in addition to controller-level network of FL-net Version 2 (Ver.2). FL-net Ver.3 defines I/O devices mounted on FL-net Ver.2, and allows flattening of networks.

Easy configuration of multiple-vendor environment
- ST companies support the open network developed in Japan.
- FL-net has a solid track record as a multi-vendor control system.

User-friendly specifications and performances
- Easy configuration of independent control systems.
- Easy configuration of real-time control systems.
- Allow data exchange even when the applications of destination stations are unknown.

Establishment of standardization and certification systems
- Certification is done based on conformity tests at certification facility in Japan.

New Functions of FL-net Ver.3

Interconnection with upper-level systems and information systems - Simultaneous TCP/IP communications are possible
- Even more flexible information system application is possible, such as connections to office automation equipment, the Internet, etc.
- System solutions are now possible, integrated with ERP, MES, and other monitoring, information, and office automation systems.

Enhanced user convenience - Integrated setting/monitoring tools are offered
- Communication setting, monitoring, and diagnosis are possible from a computer connected to the Ethernet, on all FL-net equipment and devices provided by all vendors.
- The integrated setting tool is offered as software.
- Setting is possible with a single user interface, thereby reducing setup errors and start-up time.

Interconnection at device level
- A shared input/output from all stations can be installed on FL-net.
- A multi-master device level network, where devices of several vendors are interconnected, can be easily configured.
- Management is possible without difficulties from HMIs, industrial-use computers and others, thereby reducing total system cost.

Features

Flexible system configuration
- 110Mbps and 100Mbps equipment and devices in the same network
- Automatic jointing/ring of a node (a station)
- Repeaters, transceivers, HUBs, etc., for Ethernet

High speed, large quantity data transmission
- Support connection to device level and controller level
- Support General-purpose Ethernet communication (TCP/IP, UDP/IP, etc.) in the same network
- Implement UDP/IP-based FA link protocol (US B 3521, JEM 1479) for FA needs
- High speed cyclic transmission: within 50ms at 20#x23#X (JIS X 6446+6465) x 32 stations
- Easy-to-use common memory technology acknowledged as a PLC network
- 1,024 bytes data per transmission from a station
- 1,024 bytes per frame for messaging service

Easy development of connected devices
1) Open specifications
- Ethernet as physical layer, with available parts on the market
- Available analyzers and testers on the market
2) Low development costs
- Ethernet as physical layer, with available parts on the market
- Available analyzers and testers on the market

Economic efficiency
- Low-cost parts of Ethernet
- Standardized circuit connection specifications to reduce development cost and time

High reliability
- Master-less token system used at controller level
- Excellent RAS functions

Scalability
- Enhanced performances by future technical development of Ethernet

Specifications of FL-net (OPCN-2)

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<th>Specifications Items</th>
<th>Specifications</th>
<th>Remarks</th>
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</thead>
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<tr>
<td>Transmission media</td>
<td>10BASE-2, 5, T, 100BASE-TX, TX, FX</td>
<td>Extend transmission distance by using repeaters, optical media converters, etc.</td>
</tr>
<tr>
<td>Physical layer specifications</td>
<td>IEEE 802.3</td>
<td></td>
</tr>
<tr>
<td>Topology</td>
<td>Bus-type and star-type</td>
<td>Recommend 100 Mbps Ethernet switches</td>
</tr>
<tr>
<td>Maximum connected stations (node)</td>
<td>254 stations</td>
<td></td>
</tr>
<tr>
<td>Correspondence right control system</td>
<td>Token passing</td>
<td>No specific master station (controller level)</td>
</tr>
<tr>
<td>Communication station control system</td>
<td>Masterless system</td>
<td>Guarantees delivery time for cyclic transmission</td>
</tr>
<tr>
<td>Protocol</td>
<td>UDP/IP-based FA link protocol</td>
<td></td>
</tr>
<tr>
<td>Transmission services</td>
<td>Cyclic transmission service, 96Kb/s-512kb/s common memory at all stations</td>
<td></td>
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<tr>
<td>Message transmission service</td>
<td>Message transmission service, 1/1 transmission, up to 1,024 bytes</td>
<td>Offer delivery confirmation for 1/1 transmission</td>
</tr>
<tr>
<td>Load measurement service</td>
<td></td>
<td>Measure general-purpose communication loads</td>
</tr>
<tr>
<td>I/O definition setup service, solicitation service</td>
<td></td>
<td>Used in flexible map mode</td>
</tr>
<tr>
<td>Transmission performance</td>
<td>Refresh data of 2Kbit+2Kword of 32 stations in 50ms or less</td>
<td>Use vacuum band</td>
</tr>
<tr>
<td>Compatibility with device level network</td>
<td>Fixed map/ flexible map Two systems</td>
<td>Vendor-dependent for implementation class</td>
</tr>
<tr>
<td>General-purpose communication superimposition</td>
<td>Superimpose packet communications other than those of TCP/IP, UDP/IP, and other FA link protocols</td>
<td></td>
</tr>
<tr>
<td>Network settings</td>
<td>Implement server functions for network setup parameters</td>
<td>Centralized management of node settings</td>
</tr>
</tbody>
</table>
FL-net (OPCN-2), a flexible and open PLC network, interconnect different manufacturers’ equipment and devices

FL-net (OPCN-2) enables interconnection among different manufacturers’ equipment and devices, and configuration of flexible and open FA systems.

What is FL-net?
FL-net is an industrial-use open network built on Ethernet and common memory systems. FL-net Version 3 (Ver.3) has been established for device-level networks in addition to controller-level network of FL-net Version 2 (Ver.2). FL-net Ver.3 defines I/O devices mounted on FL-net Ver.2, and allows flattening of networks.

Easy configuration of multiple-vendor environment
- S1 companies support the open network developed in Japan.
- FL-net has a solid track record as a multiple vendor controller systems.

User-friendly specifications and performances
- Easy configuration of independent controller systems.
- Easy configuration of real-time control systems.
- Allows data exchange even when the applications of destination stations are unknown.

Establishment of standardization and certification systems
- Certification is done based on conformity tests at certification facility in Japan.

New Functions of FL-net Ver.3
- Connection of upper-level and information systems on the same Ethernet (Ver.3 function)
- Connection of device on the same Ethernet (Ver.3 function)
- Connection of different manufacturers’ equipment and devices on the same Ethernet (Ver.3 function)
- Connection of device on the same Ethernet (Ver.3 function)

Specifications of FL-net (OPCN-2)

- Transmission media: 10BASE-2, 5, T, 100BASE-TX, FX
- Physical layer specifications: IEEE 802.3
- Topology: Bus-type and star-type
- Maximum connected stations (nodes): 254 stations
- Correspondence right control system: Token passing
- Communication status control system: Masterless system
- Protocol: UDP/IP-based FA link protocol
- Transmission services: Cyclic transmission service, Message transmission service, Load measurement service, I/O definition setup service, solicitation service
- Transmission performance: Refresh data of 2Kbit+2Kword of 32 stations in 50ms or less
- Compatibility with device level network: Fixed map/ flexible map
- General-purpose communication superimposition: Use vacant band
- Network settings: Implement server functions for network setup parameters

Interconnection with upper-level systems and information systems
- Simultaneous TCP/IP communications are possible
- Even more flexible information system application is possible, including connections to office automation equipment, the Internet, etc.

Enhanced user convenience
- Integrated setting/monitoring tools are offered
- Communication setting, monitoring, and diagnosis are possible from a computer connected to the Ethernet, on all FL-net equipment and devices provided by all vendors.
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Interconnection at device level
- A shared input/output from all stations can be installed on FL-net.
- A multiple-master device level network, where devices of several vendors are interconnected, can be easily configured.
- Management is possible without difficulties from HMIs, industrial-use computers and others, thereby reducing total system cost.

Flexible System Configuration
- Support connection to device level and controller level
- Support General-purpose Ethernet communication (TCP/IP, UDP/IP, etc.) on the same network
- Implement UDP/IP-based FA link protocol (15Mbit/1470) by FA needs
- High-speed cyclic transmission within 50ms at 2964+96Kbit x 32 stations
- Easy-to-use common memory technology acknowledged as a PLC network
- 1,024 bytes data per transmission from a station
- 1,024 bytes per frame for messaging services

End-users’ Merits
- Low development costs
- Vendor-dependent for implementation
- Fixed map/ flexible map
- Two systems
- Centralized management of node settings

Economic Efficiency
- Low-cost parts of Ethernet
- Standardized circuit connection specifications to reduce development cost and time

High Reliability
- Master-less token system used at controller level
- Excellent R&D functions

FL-net Ver.3, which incorporates results of the recent user requirements survey, is designed to provide continuity of information with computer level and device level, and can be connected to other network at device level. Setting and monitoring can be performed from a general computer on the network.

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<thead>
<tr>
<th>Abstraction and assembly industries</th>
<th>Process industries/food and pharmaceutical industries</th>
<th>Public and social systems, and others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile manufacturing</td>
<td>Iron and steel manufacturing</td>
<td>Dam monitoring and management</td>
</tr>
<tr>
<td>Semiconductor manufacturing</td>
<td>Paper and pulp</td>
<td>Water supply and sewage systems</td>
</tr>
<tr>
<td>Display device manufacturing</td>
<td>Chemical products</td>
<td>Garbage treatment</td>
</tr>
<tr>
<td>Electrical device and wire manufacturing</td>
<td>Ceramics</td>
<td>Electric power monitoring and control</td>
</tr>
<tr>
<td>Machinery manufacturing</td>
<td>Petroleum</td>
<td>Building management</td>
</tr>
<tr>
<td>Transportation devices</td>
<td>Food products</td>
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<td></td>
<td>Pharmacetical products</td>
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<td>Printing</td>
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Reasons for adoption and assessment

- Designated by user
- Ethernet-based
- High-speed link access performance
- Communication among different manufacturers
- Communication among different devices
- As standard network

Evaluation after adoption

- Others
- Dissatisfied 6%
- Transmission specifications
- Easy wire installation and workability
- Total cost reduction
- Easy handling including software design

Satisfied: 94%

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