

# Procontrol P13 Communication

## Intra-Plant Bus Fiber (IPB-F)

### 70DH01A and 70DH02A



The Intra-Plant Bus Fiber (IPB-F) is the seamless evolution of the classic Procontrol P13/42 Intra-Plant Bus over coaxial cables (IPB). It is a deterministic network designed as a system of a maximum of 64 peer-to-peer network nodes, interconnected via a fiber optic ring. The nodes on the bus are either 70DH01a for interface to a P13 local bus or 70DH02a to communicate with an HMI or P13 engineering station. The deterministic nature of the network ensures that all information is available on the bus in a predictable fashion, same as on the classic IPB.

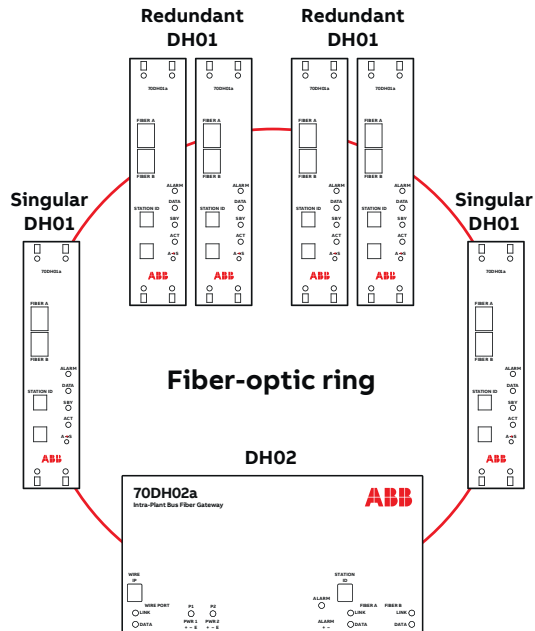
The Intra-Plant Bus Fiber network is a full replacement for the classic P13/42 Intra-Plant Bus. For a minimum operation only one 70DH01a is required per P13 local bus station. The 70DH02a gateway is optional and only required for configuration or HMI access. In a typical configuration, redundant 70DH01a would be used and also multiple 70DH02a for redundant connection to an HMI.

With such a setup, the IPB-F provides communication redundancy and bus redundancy. Communication redundancy is achieved with a ring network topology that ensures continuous communication in the event of a single fiber cable break. No additional hardware is required for communication redundancy. Bus redundancy is achieved by installing two 70DH01a modules on the same P13 local bus: One module operates in an active state, while the other module operates in a standby state. Redundancy may be used as an option on a per-bus basis; the use of redundant modules does not exclude other nodes from being non-redundant as shown below.

Both binary and analog signals may be transferred or marshaled between buses. Binary signals may be marshaled single bits at a time from and to any available local bus address. Using 20ms buses with 256 addresses available, up to 16,384 analog words or 262,144 binary signals or a combination thereof may be marshaled on the network. Data transmission speed on the fiber ring can be configured similar to the P13 local bus and down to 5 ms. On a fully loaded Intra-Plant Bus Fiber network the achievable speed is typically less than 10 ms. This speed applies to all types of signals transmitted as there are no different sequences with different update rates anymore on the IPB-F.

The 70DH02a IPB-F gateway is the primary communication device from the IPB-F network to HMIs running the Procontrol P13 OPC server or a native gateway driver. Up to four HMI connectivity servers (i.e. two redundant pairs) may access information and write to each 70DH02a. All data on any local bus or other 70DH02a is available to each connected HMI server.

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Each 70DH02a can source up to 256 analog commands, 4,096 binary commands or a combination thereof, from the connected HMI servers. When multiple (redundant) HMI servers are connected, conflicting commands are reconciled using a “last command wins” philosophy. Additionally, the 70DH02a is used for configuring all network nodes of the IPB-F from a P13 engineering station. This engineering station connection will not interfere with the communication of the HMI servers and is not subject to the same limit of connections as the HMI servers.

While the 70DH01a is primarily used for bus-to-bus communication, it may also be used as a diagnostic station that monitors the cumulative alarms of multiple signals on the bus or hardwired signals replaced from a 70BK02. The source of these signals can be freely programmed with the P13 engineering tools. The alarms are combined into a single station status word and automatically transmitted to the local bus and IPB-F to be read by other devices on the fiber ring and any connected HMI. Similarly, an optional status address is available to relay indications of fiber connections, missing data and other network information related to the 70DH01a itself. Since the IPB-F can also operate with only 70DH01a present in the fiber ring, it is also a suitable replacement for any serial Token-ring or multi-drop connection between 2 or more 70BK03 modules, e.g., in a typical P13 turbine control and protection application. Compared to the serial link, the IPB-F can achieve a much higher throughput at lower cycle times and, most importantly, offers full redundancy on the communication link and module level.

### Feature Highlights

- The Intra-Plant Bus Fiber network is a protected and restricted IEEE 802.3u style network.
- The IPB-F network is based on four OSI layers: physical, data link, transport and application.
- The physical layer of the network is a standard, CSMA/CD, 100Base-FX, full duplex, fiber optic, Ethernet. The physical layer conforms to IEEE 802.3u.
- The data link layer utilizes the standard 802.2 LLC packet encapsulation as is outlined in RFC1042.
- The transport protocol on the fiber network is proprietary and specific to the IPB-F. This system is isolated utilizing integrated circuit switch fabric technology to eliminate the possibility of packet collisions that affect system determinism. An additional feature of the transport protocol is the utilization of a proprietary STP (spanning tree protocol) to account for and heal in the face of cable or unit failures.
- The transport layer is proprietary and connectionless. The transport protocol is compliant with IEC 61508 and EN 50159 standards for networks used in safety control systems and railroad applications. It defends against the following specific message threats anticipated by EN 50159-2: 1) Repetition, 2) Deletion, 3) Insertion, 4) Re-sequencing, 5) Corruption, 6) Delay, and 7) Masquerade.
- The 70DH02a provides a gateway interface to external systems. The physical layer is a standard IEEE 802.3u 100Base-TX Ethernet. The Link layer conforms to LLC and RFC1042.
- The interface communicates at the network layer using a limited set of the Internet Protocol Suite. The network layer employs two protocols. The IP based packets conform to the RFC791.
- The transport layer utilizes TCP as described in RFC793 and RFC1122.
- The application layer is proprietary, closed and specific to the IPB-F. The application is a data server. The protocol is designed for high speed data access and transfer.

## Technical Data

### 70DH01a



Type	70DH01a
Identification Number	2VAA007613R0001
Fiber Optic Cable	LC/LC 50/125 or 62.5/125 Multimode Duplex Fiber
Fiber Optic Connections	2 x LC Multimode Fiber optic connectors
Wire Network Connection	none
Mounting and Dimensions	P13 Standard Card, 2T wide
LED Indications	<ul style="list-style-type: none"> <li>• Alarm</li> <li>• Data missing</li> <li>• Standby</li> <li>• Active</li> <li>• Station ID (Hex)</li> </ul>
Controls	Active → Standby push button
Power	via P13 local bus rack
Alarm Output	SME (on backplane)

### 70DH02a



Type	70DH02a
Identification Number	2VAA007614R0001
Fiber Optic Cable	LC /LC 50 /125 or 62.5 /125 Multimode Duplex Fiber
Fiber Optic Connections	2 x LC Multimode Fiber optic connectors
Wire Network Connection	100 Base-TX Ethernet, RJ45
Mounting and Dimensions	DIN Rail (W/H/D: 24cm/12.7cm/7cm)
LED Indications	<ul style="list-style-type: none"> <li>• Alarm</li> <li>• Fiber A/B Data and Link Status</li> <li>• Power 1 and 2</li> <li>• Ethernet Data and Link Status</li> <li>• Ethernet IP (Scrolling)</li> <li>• Station ID (Hex, Scrolling)</li> </ul>
Controls	none
Power	Redundant power connections (DC +24V with Ground and Earth)
Alarm Output	Terminal Block (+24V, Ground)

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