IndustrialIT
800xA - Control and I/O
S800 I/O
Version 4.0

Fieldbus Communication Interface
PROFIBUS-DP/DPV1
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PROFIBUS-DP/DPV1
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About This Book

0.1 General

This book provides a description of the S800 field communication using PROFIBUS-DP/DPV1. It provides instructions for site planning and installation, start-up and shutdown procedures, and information regarding capacity and performance. This book is not intended to be the sole source of instruction for the S800 I/O system.

This section provides introductory and background information including guidelines how to find information in the manual related documentation.

**Section 1, Introduction** provides a product and functional overview.

**Section 2, Installation** guides in installation

**Section 3, Configuration** will give you the information needed to obtain the desired function. The main information is structured as follow:

- Design considerations and guidelines are given.
- Capacity and performance.

**Section 4, Operation** discusses the different start modes and operating modes of the FCI.

**Section 5, Maintenance** focus is on fault finding supported by built in diagnostics and use of system status displays in operator station and LEDs on the FCI.

Those people involved in system engineering should attend the applicable system engineering or maintenance courses offered by ABB Automation University.
0.2 Use of Warning, Caution, Information, and Tip Icons

This publication includes **Warning**, **Caution**, and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

- **Electrical warning icon** indicates the presence of a hazard which could result in *electrical shock*.
- **Warning icon** indicates the presence of a hazard which could result in *personal injury*.
- **Caution icon** indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property*.
- **Information icon** alerts the reader to pertinent facts and conditions.
- **Tip icon** indicates advice on, for example, how to design your project or how to use a certain function.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.
## 0.3 Terminology

The following is a list of terms associated with Fieldbus Communication Interface for PROFIBUS-DP/DPV1 that you should be familiar with. The list contains terms and abbreviations that are unique to ABB or have a usage or definition that is different from standard industry usage.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base cluster</td>
<td>Consists of single or red. FCIs plus I/O modules connected directly to the FCI.</td>
</tr>
<tr>
<td>FCI</td>
<td>The Fieldbus Communication Interface (FCI) device contains the interface to the fieldbus PROFIBUS-DP/DPV1, ModuleBus interface and power regulators. The FCI module can manage 24 I/O devices (up to 12 directly and to the others in 1 to 7 I/O clusters).</td>
</tr>
<tr>
<td>HCIR</td>
<td>Hot Configuration In Run, possibility to change configuration in a running system.</td>
</tr>
<tr>
<td>I/O cluster</td>
<td>An extension of the I/O Station's ModuleBus connected to the FCI by fiber optic connections. Up to 12 I/O devices per cluster.</td>
</tr>
<tr>
<td>I/O device</td>
<td>A complete I/O device consists of one MTU and one I/O module.</td>
</tr>
<tr>
<td>I/O module</td>
<td>Is an active, electronic and signal conditioning unit. Can be a part of an I/O device or a S800L I/O module.</td>
</tr>
<tr>
<td>I/O station</td>
<td>An I/O station consists of a base cluster with single or redundant FCI(s), 1-7 I/O clusters and up to 24 I/O devices.</td>
</tr>
<tr>
<td>I.S.</td>
<td>Intrinsic Safety is a protection technique to prevent explosion in hazardous areas of a process plant.</td>
</tr>
<tr>
<td>ModuleBus</td>
<td>Is an incremental, electrical or optical, bus for interconnection of I/O devices.</td>
</tr>
<tr>
<td>(ModuleBus) Extension cable</td>
<td>Is used when extending the electrical ModuleBus (within the max. 2.5 meters 8.2&quot;).</td>
</tr>
</tbody>
</table>
0.4 Applicable Specifications

This product meets the requirements specified in EMC Directive 89/336/EEC and in Low Voltage Directive 72/23/EEC.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTU</td>
<td>The Module Termination Unit is a passive base unit containing process terminals and a part of the ModuleBus.</td>
</tr>
<tr>
<td>OSP</td>
<td>Outputs Set as Predetermined. A user configurable action on an output module when communications is lost to the FCI or Controller.</td>
</tr>
<tr>
<td>PROFIBUS-DP</td>
<td>PROFIBUS-DP is a fieldbus standard.</td>
</tr>
<tr>
<td>PROFIBUS-DPV1</td>
<td>PROFIBUS-DPV1 is a fieldbus standard.</td>
</tr>
<tr>
<td>PROFIBUS</td>
<td>Stands for both PROFIBUS-DP and PROFIBUS-DPV1.</td>
</tr>
<tr>
<td>TC</td>
<td>Thermocoupler</td>
</tr>
</tbody>
</table>
0.5 Related Documentation

The following is a listing of documentation related to Fieldbus Communication Interface for PROFIBUS-DP.

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S800 I/O General Information and Installation</td>
<td>Describes the general installation and configuration information for the S800 I/O system</td>
</tr>
<tr>
<td>S800 I/O Modules and Termination Units</td>
<td>Describes the I/O modules and termination units in the S800 I/O system</td>
</tr>
<tr>
<td>S800 I/O Modules and Termination Units with Intrinsic Safety Interface</td>
<td>Describes I/O modules and termination units with I.S. interface in the S800 I/O system</td>
</tr>
<tr>
<td>S800 I/O PROFIBUS FCI Memory Maps for CI801</td>
<td>Describes the memory mapping on PROFIBUS-DPV1 in CI801 for the S800 I/O system.</td>
</tr>
<tr>
<td>S800 I/O PROFIBUS FCI Memory Maps for CI830</td>
<td>Describes the memory mapping on PROFIBUS-DP in CI830 for the S800 I/O system.</td>
</tr>
<tr>
<td>S800 I/O PROFIBUS FCI Memory Maps for CI840</td>
<td>Describes the memory mapping on PROFIBUS-DPV1 in CI840 for the S800 I/O system.</td>
</tr>
</tbody>
</table>
Section 1  Introduction

The S800 I/O is distributed modular I/O which communicates with numerous controllers over a Advant Fieldbus 100 (AF100), PROFIBUS-DP/DPV1 or directly. The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that I/O modules can be combined to suit many applications. The S800 I/O can be mounted in many configurations to fit most requirements.

*Figure 1-1 S800 I/O Fieldbus Communication Interface with an I/O Module on Compact and Extended MTUs*
1.1 Product Overview

The S800 I/O provides easy installation of the I/O modules and process cabling. It is highly modularized and flexible so that the I/O modules can be combined to suit many applications. The S800 I/O modules and a Fieldbus Communication Interface (FCI) are combined to form an I/O Station.

For more overview information please see the *S800 I/O General Information and Installation* manual.

1.1.1 Product Scope

1.1.1.1 CI801 Fieldbus Communications Interface (FCI)

The CI801 Fieldbus Communication Interface (FCI) module is a configurable communication interface which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of I/O modules. The FCI connects to a controller by way of the PROFIBUS-DPV1 fieldbus.

The FCI has one PROFIBUS-DPV1 interface and uses a PROFIBUS-DPV1 cable with a total length of up to 1200 meters (1312 yards). Up to 32 stations can be configured on one segment. The station address sets by rotary switches that select the address on the fieldbus in the range of 01 to 99.

The FCI modules are DIN rail mounted and have connections for input power, PROFIBUS-DPV and two rotary switches for station address selection.

An I/O Station can consist of the FCI modules, ModuleBus Modems and the I/O modules. The FCI is the bus-master on the S800 I/O ModuleBus and communicates with the S800 I/O modules. It is a pure “slave station” on PROFIBUS-DPV1 which is controlled by a master station.

I/O Station modules are mounted on DIN rails and are connected by the ModuleBus. *Figure 1-2* shows the FCI modules connected to the Optical ModuleBus Port TB842.
The FCI communicates with the PROFIBUS Master, ModuleBus Modems and the I/O modules. The FCI handles the I/O-modules operations such as read and write data, read status and configuration of modules and channels. The FCI has a connection to the TB842 Optical ModuleBus Port mounted on a TB806 to the left, see Figure 1-2.

Figure 1-2 CI801 FCI Module and TB842 Optical ModuleBus Port
The FCI provides 24 V d.c. (from the source) and an isolated 5 V dc power to the base cluster’s I/O modules (12 maximum) by way of the ModuleBus connections. One power source 24 V d.c. can be connected to the power terminals (L+ & L-).

The power source is supervised by the POWER OK status LED.

The size, type and direction of data to be transferred on the PROFIBUS-DP bus depends on and is determined by the I/O module type. The FCI can be configured to send or transmit dynamic data over the PROFIBUS-DP with cycle times in the interval from 1 ms.

**1.1.1.2 CI830 Fieldbus Communications Interface (FCI)**

The CI830 Fieldbus Communication Interface (FCI) module is a configurable communication interface for single configurations which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of I/O modules. The FCI connects to a controller by way of the PROFIBUS-DP fieldbus.

The FCI has one PROFIBUS-DP interface and uses a PROFIBUS-DP cable with a total length of up to 1200 meters (1312 yards). Up to 32 stations can be configured on one segment. The FCI has two rotary switches that select its address on the fieldbus in the range of 01 to 79.

An I/O Station can consist of the FCI module, ModuleBus Modems and the I/O modules. The FCI is the bus-master on the S800 I/O ModuleBus and communicates with the S800 I/O modules. It is a pure “slave station” on PROFIBUS-DP which is controlled by a master station.

I/O Station modules are mounted on DIN rails and are connected by the ModuleBus. This principle allows horizontal and vertical mounting on the wall. Figure 1-3 shows the FCI Module.

The FCI communicates with the PROFIBUS Master, ModuleBus Modems and the I/O modules. The FCI handles the I/O-modules operations such as read and write data, read status and configuration of modules and channels. The FCI has a connector for the TB810/TB811 Optical ModuleBus Port.
Figure 1-3 CI830 FCI Module
The FCI provides 24 V d.c. (from the source) and an isolated 5 V dc power to the base cluster’s I/O modules (12 maximum) by way of the ModuleBus connections. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-) of the FCI.

1:1 redundant power sources can be supervised by connecting the power sources POWER OK status signals to terminals SA and SB.

The size, type and direction of data to be transferred on the PROFIBUS-DP bus depends on and is determined by the I/O module type. The FCI can be configured to send or transmit dynamic data over the PROFIBUS-DP with cycle times in the interval from 1 ms.

*Figure 1-4 CI830 FCI Dimensions*
1.1.1.3 CI840 Fieldbus Communications Interface (FCI)

The CI840 Fieldbus Communication Interface (FCI) module is a configurable communication interface which performs operations such as signal processing, gathering of various supervision information, OSP handling and configuration of I/O modules. The FCI connects to a controller by way of the PROFIBUS-DPV1 fieldbus.

CI840 is designed for redundant applications. One CI840 works as a primary FCI and the other as a backup. Both FCIs supervises each other. If a fault occurs in the primary FCI, it results in an automatic switch over to the backup CI840.

The FCI has one PROFIBUS-DPV1 interface and uses a PROFIBUS-DPV1 cable with a total length of up to 1200 meters (1312 yards). Up to 32 stations can be configured on one segment. The station address sets by rotary switches that select the address on the fieldbus in the range of 01 to 99, in redundant configurations 1 to 62.

The FCI modules are mounted on a Module Termination Unit TU846 or TU847. TU846/TU847 are DIN rail mounted and have connections for input power, PROFIBUS-DPV, service tool and two rotary switches for station address selection. TU847 with CI840 are used for single I/O applications and TU846 with CI840 are used for redundant applications.

An I/O Station can consist of the FCI modules, ModuleBus Modems and the I/O modules. The FCI is the bus-master on the S800 I/O ModuleBus and communicates with the S800 I/O modules. It is a pure “slave station” on PROFIBUS-DPV1 which is controlled by a master station.

I/O Station modules are mounted on DIN rails and are connected by the ModuleBus. Figure 1-5 shows the FCI modules mounted on a Module Termination Unit TU847 and connected to the Optical ModuleBus Port TB842. Figure 1-6 shows the FCI modules mounted on TU846 and connected to the Optical ModuleBus Port TB842.
Figure 1-5 CI840 FCI Module, TU847 Termination Unit and TB842 Optical ModuleBus Port
Section 1  Introduction

Product Scope

Figure 1-6 CI840 FCI Module, TU846 Termination Unit and TB842 Optical Module Bus Port
The FCI communicates with the PROFIBUS Master, ModuleBus Modems and the I/O modules. The FCI handles the I/O-modules operations such as read and write data, read status and configuration of modules and channels. The FCI has a connection to the TB842 Optical ModuleBus Port.

The FCI provides 24 V d.c. (from the source) and an isolated 5 V dc power to the base cluster’s I/O modules (12 maximum or 6 pairs) by way of the ModuleBus connections. One power source (single or redundant 24 V d.c.) can be connected to the power terminals (L+ & L-) of the MTU.

1:1 redundant power sources can be supervised by connecting the power sources POWER OK status signals to terminals SA and SB.

The size, type and direction of data to be transferred on the PROFIBUS-DP bus depends on and is determined by the I/O module type. The FCI can be configured to send or transmit dynamic data over the PROFIBUS-DP with cycle times in the interval from 1 ms.

For CI840 FCI and TU846/TU847 dimensions, see Figure 1-7 and Figure 1-8.
Figure 1-7 TU847 Dimensions (Same Dimensions for TU846)
Figure 1-8 CI840 FCI and TU847 Terminal Unit Dimensions (Same Dimensions for TU846)
Section 2  Installation

Please, see the *S800 I/O General Information and Installation* manual.

For PROFIBUS, see Technical Guideline, Installation Guideline for PROFIBUS-DP/FMS (Order No.2.112).
Section 3  Configuration

3.1 CI801 FCI

The FCI needs to be connected to the PROFIBUS-DPV1 and have an address selected. It is also connected to a 24 V d.c. power source to provide power to the I/O Station. Also refer to Configuration and Performance on page 43 for information on how to estimate the fieldbus and power loading of each I/O station configuration.

3.1.1 Address Switches

The CI801 is equipped with two rotary switches used as station address selectors for PROFIBUS-DPV1 connection. The station address can be set in the range of 01 to 99. There can be up to 32 stations per PROFIBUS-DPV1 segment. Figure 3-1 shows the front panel of the CI801.

Figure 3-1 CI801 Front Panel
3.1.2 PROFIBUS Connection

The FCI connects to the PROFIBUS via the 9 pin D-way connector on the front. This allows the FCI (if not the last one at the PROFIBUS segment) to be removed from the PROFIBUS without disconnecting the other nodes of the fieldbus. If CI801 is the last module at a PROFIBUS segment and supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable from CI801 can not be done without disrupting the bus.

See Figure 3-2 for CI801 connection details.

![Figure 3-2 CI801 FCI PROFIBUS Terminal Connections](image-url)
Table 3-1 shows the fieldbus connection assignments.

Table 3-1 FCI PROFIBUS Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive/Transmit data - plus</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Direction control (optional)</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply voltage for the terminating resistors</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive/Transmit data - minus</td>
</tr>
<tr>
<td>9</td>
<td>DGND</td>
<td>Data ground (if RTS is used)</td>
</tr>
</tbody>
</table>
3.1.3 Power Supply Connections

The FCI requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 2.3 Ampere. See Figure 3-3 for power supply connections.

The incoming power can then be distributed to other FCIs or the I/O modules if desired. Refer to S800 I/O General Information and Installation for power supply connection diagrams.

Power connections can accept 0.2 - 2.5 mm² (24 - 14 AWG) wire size.

FCI power supply connections are presented in Table 3-2:

Table 3-2 FCI Power Connection Terminal

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L+</td>
<td>+24 V d.c. Supply</td>
</tr>
<tr>
<td>2</td>
<td>L-</td>
<td>0 V d.c. Supply</td>
</tr>
</tbody>
</table>
3.2 CI830 FCI

The FCI needs to be connected to the PROFIBUS-DP and have an address selected. It is also connected to a 24 V d.c. power source to provide power to the I/O Station. Also refer to Configuration and Performance on page 43 for information on how to estimate the fieldbus and power loading of each I/O station configuration.

3.2.1 Address Switches

The CI830 is equipped with two rotary switches used as station address selectors for PROFIBUS-DP connection. The station address can be set in the range of 01 to 79. There can be up to 32 stations per PROFIBUS-DP segment. Figure 3-4 shows the front panel of the CI830.

![Figure 3-4 Front Panel of the CI830 FCI](image)

3.2.2 PROFIBUS-DP Connections

The FCI connects to the PROFIBUS-DP via the 9 pin D-way connector on the front. This allows the FCI (if not the last one at the PROFIBUS segment) to be removed from the PROFIBUS-DP without disconnecting the other nodes of the fieldbus. If CI830 is the last module at a PROFIBUS segment and supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable from CI830 can not be done without disrupting the bus.
See Figure 3-5 for CI830 connection details.

*Figure 3-5 CI830 FCI PROFIBUS-DP Terminal Connections*
Table 3-3 shows the fieldbus connection assignments.

**Table 3-3 FCI PROFIBUS-DP Connections**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive/Transmit data - plus</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply voltage for the terminating resistors</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive/Transmit data - minus</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>Not used</td>
</tr>
</tbody>
</table>
3.2.3 Power Supply Connections

The FCI requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 1.4 Ampere. See Figure 3-6 for power supply connections.

The incoming power can then be distributed to other FCIs or the I/O modules if desired. Refer to S800 I/O General Information and Installation for power supply connection diagrams.

Power connections can accept 0.2 - 2.5 mm² (24 - 14 AWG) wire size.

FCI power supply connections are presented in Table 3-4:

![Figure 3-6 FCI Power Supply Connections]

Table 3-4 FCI Power Connection Terminal

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L+</td>
<td>+24 V d.c. Supply</td>
</tr>
<tr>
<td>2</td>
<td>L-</td>
<td>0 V d.c. Supply</td>
</tr>
<tr>
<td>3</td>
<td>SA</td>
<td>Redundant Power Supply Monitoring</td>
</tr>
<tr>
<td>4</td>
<td>SB</td>
<td>Redundant Power Supply Monitoring</td>
</tr>
</tbody>
</table>
3.3 CI840 FCI

The FCI needs to be connected to the PROFIBUS-DPV1 and have an address selected. It is also connected to a 24 V d.c. power source to provide power to the I/O Station. Also refer to Configuration and Performance on page 43 for information on how to estimate the fieldbus and power loading of each I/O station configuration.

3.3.1 Address Switches

The TU846/TU847 is equipped with two rotary switches used as station address selectors for PROFIBUS-DPV1 connection. 0-62 are allowed for redundant FCI connections and 0-99 are allowed for single connections. The FCI in position B will not start when addresses between 63 and 99 are used. There can be up to 32 stations per PROFIBUS-DPV1 segment. Figure 3-7 shows the front panel of the TU846/TU847.

Figure 3-7 TU846/TU847 Front Panel
3.3.2 PROFIBUS Connections

The FCI connects to the PROFIBUS via the 9 pin D-way connector on the front of TU846/TU847. This allows the FCI (if not the last one at the PROFIBUS segment) to be removed from the PROFIBUS without disconnecting the other nodes of the fieldbus. If CI840 is the last module at a PROFIBUS segment and supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable from CI840 can not be done without disrupting the bus.

See Figure 3-8 for CI840 connection details.
Table 3-5 shows the fieldbus connection assignments.

**Table 3-5 FCI PROFIBUS Connections**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive/Transmit data - plus</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Direction control (optional)</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply voltage for the terminating resistors</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive/Transmit data - minus</td>
</tr>
<tr>
<td>9</td>
<td>DGND</td>
<td>Data ground (if RTS is used)</td>
</tr>
</tbody>
</table>
3.3.3 Power Supply Connections

The FCI requires 24 V d.c. (19.2 - 30 V) with a maximum current requirement of 2.3 Ampere. See Figure 3-9 for power supply connections.

The incoming power can then be distributed to other FCIs or the I/O modules if desired. Refer to S800 I/O General Information and Installation for power supply connection diagrams.

Power connections can accept 0.2 - 2.5 mm² (24 - 14 AWG) wire size.

FCI power supply connections are presented in Table 3-6:

Table 3-6 FCI Power Connection Terminal

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L+</td>
<td>+24 V d.c. Supply</td>
</tr>
<tr>
<td>2</td>
<td>L-</td>
<td>0 V d.c.</td>
</tr>
<tr>
<td>3</td>
<td>SA</td>
<td>Redundant Power Supply Monitoring Input</td>
</tr>
<tr>
<td>4</td>
<td>SB</td>
<td>Redundant Power Supply Monitoring Input</td>
</tr>
</tbody>
</table>

Figure 3-9 FCI Power Supply Connections
3.4 Configuration and Performance

3.4.1 CI801 Configuration Rules

The maximum number of S800 I/O stations per bus is: 99 stations
Supported communication speeds: 93.75 kbit/s to 12 Mbit/s

The maximum number of S800 I/O stations per bus segment is: 32 stations
The maximum number of I/O modules in a station is: 24 modules
The maximum number of I/O modules per cluster is: 12 modules

Due to the PROFIBUS-DPV1 specification it is not possible to always connect 24 I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DPV1 can handle. Table 3-7 shows maximum number of I/O modules that can be connected to one CI801.

Table 3-7 Maximum Number of Modules on CI801

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI801, AI810, AI830, AI835, AI890, AI893, AI895</td>
<td>14</td>
</tr>
<tr>
<td>AI820</td>
<td>24</td>
</tr>
<tr>
<td>AI843</td>
<td>11</td>
</tr>
<tr>
<td>AI845</td>
<td>14</td>
</tr>
<tr>
<td>AO801, AO810, AO890, AO895</td>
<td>7</td>
</tr>
<tr>
<td>AO820</td>
<td>14</td>
</tr>
<tr>
<td>AO845</td>
<td>7</td>
</tr>
<tr>
<td>DI840</td>
<td>17</td>
</tr>
<tr>
<td>DI8XX</td>
<td>24</td>
</tr>
<tr>
<td>DO801, DO810, DO814</td>
<td>22</td>
</tr>
</tbody>
</table>
In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in table Table 3-8.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes.
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.
- Check that:
  - ParamSize is less than or equal to 221 (220 if HCIR is used)
  - InSize is less than or equal to 239
  - OutSize is less than or equal to 112.

If any of these three values is too high then the configuration can **not** be used.
### Table 3-8 Calculation of Number of Modules on CI801

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input Bytes</th>
<th>Output Bytes</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI801</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI810</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI820</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI830</td>
<td>12</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI835</td>
<td>15</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI843</td>
<td>16</td>
<td>20</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI845</td>
<td>13</td>
<td>17</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI890</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI893</td>
<td>15</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI895</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO801</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO810</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO820</td>
<td>11</td>
<td>1</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO845</td>
<td>18</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO890</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO895</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI801</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI802</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI803</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI810</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI811</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 3-8 Calculation of Number of Modules on CI801 (Continued)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input Bytes</th>
<th>Output Bytes</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI814</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI820</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI821</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI840</td>
<td>13</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI890</td>
<td>7</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO801</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO802</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO810</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO814</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO815</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO820/821</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO840</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO890</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP820</td>
<td>12</td>
<td>18</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP840</td>
<td>10</td>
<td>34</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Drives</td>
<td>4</td>
<td>13</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ParamSize</td>
<td>InSize</td>
<td>OutSize</td>
<td></td>
</tr>
</tbody>
</table>
3.4.2 CI830 Configuration Rules

The maximum number of S800 I/O stations per bus is: 99 stations.
Supported communication speed: 9.6 kbits/s to 12 Mbit/s.

The maximum number of S800 I/O stations per bus segment is: 32 stations.
The maximum number of I/O modules in a station is: 24 modules

The maximum number of I/O modules per cluster is: 12 modules

Due to the PROFIBUS-DP specification it is not possible to always connect 24 I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DP can handle. Table 3-9 shows maximum number of I/O modules that can be connected to one CI830.

Table 3-9 Maximum Number of Modules on CI830

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI801, AI810, AI830, AI835,</td>
<td>12</td>
</tr>
<tr>
<td>AI890, AI893</td>
<td></td>
</tr>
<tr>
<td>AI820</td>
<td>20</td>
</tr>
<tr>
<td>AO801, AO810, AO890</td>
<td>13</td>
</tr>
<tr>
<td>AO820</td>
<td>21</td>
</tr>
<tr>
<td>DP820</td>
<td>11</td>
</tr>
<tr>
<td>DP840</td>
<td>6</td>
</tr>
<tr>
<td>All DI and DO modules</td>
<td>24</td>
</tr>
<tr>
<td>Standard Drives</td>
<td>17/24(^{(1)})</td>
</tr>
</tbody>
</table>

\(^{(1)}\) See Table 3-10.
In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in table Table 3-10.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes.
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.
- Check that:
  - ParamSize is less than or equal to 237
  - InSize is less than or equal to 244
  - OutSize is less than or equal to 244.

If any of these three values is too high then the configuration can not be used.

- Round up the values InSize, OutSize and the sum of ParamSize + 15 to the nearest multiple of eight (8), for example, 233 is rounded to 240.

- Finally calculate the memory size with the formula:
  \[ \text{MemSize} = a + 2 \times \text{RoundParamSize} + 3 \times (\text{RoundInSize} + \text{RoundOutSize}) \]
  
a=656 for firmware release 1.0 and 1.1.

  a=728 for firmware release 1.2 or later.

Check that MemSize is less than or equal to 2048. If not, the configuration can not be used.

Data with * are valid for CI830 firmware 1.0 to 1.2.
Data inside parenthesis ( ) are valid for CI830 firmware version 1.3 or higher.
### Table 3-10 Calculation of Number of Modules on CI830

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input Bytes</th>
<th>Output Bytes</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI830</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>AI801</td>
<td>7</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI810</td>
<td>11</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI820</td>
<td>7</td>
<td>12</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI830</td>
<td>11</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI835</td>
<td>13</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI890</td>
<td>7</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI893</td>
<td>13</td>
<td>20</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO801</td>
<td>16</td>
<td>4</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO810</td>
<td>16</td>
<td>4</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO820</td>
<td>10</td>
<td>4</td>
<td>10</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AO890</td>
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<td>4</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI801</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI802</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI803</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI810</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI811</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI814</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI820</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI821</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td></td>
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</tr>
</tbody>
</table>
### Table 3-10 Calculation of Number of Modules on CI830 (Continued)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input</th>
<th>Output</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI890</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO801</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO802</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO810</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO814</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO815</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO820/821</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO890</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP820</td>
<td>11</td>
<td>22</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP840</td>
<td>7</td>
<td>36</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Drives</td>
<td>3* (4)</td>
<td>14* (8)</td>
<td>12* (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total sum: - - - ParamSize InSize OutSize

Rounded sum: - - - Round ParamSize Round InSize Round OutSize

Data with * are valid for CI830 firmware 1.0 to 1.2.
Data inside parenthesis ( ) are valid for CI830 firmware version 1.3 or higher.
3.4.3 CI840 Configuration Rules

The maximum number of S800 I/O stations per bus is:
- Redundant CI840: 62 stations
- Single CI840: 99 stations

Supported communication speeds: 93.75 kbit/s to 12 Mbit/s

The maximum number of S800 I/O stations per bus segment is:
- Communication speed 12Mbit/s: 20 stations
- Communication speed ≤1.5Mbit/s or less: 32 stations

The maximum number of I/O modules in a station is: 24 modules

The maximum number of I/O modules per cluster is: 12 modules

Due to the PROFIBUS-DPV1 specification it is not possible to always connect 24 I/O modules to one FCI. The reason is that the S800 I/O system includes more data and user parameters than PROFIBUS-DPV1 can handle. Table 3-11 shows maximum number of I/O modules that can be connected to one CI840.

Table 3-11 Maximum Number of Modules on CI840

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI801, AI810, AI830, AI835, AI890, AI893, AI895</td>
<td>14</td>
</tr>
<tr>
<td>AI820</td>
<td>24</td>
</tr>
<tr>
<td>AI843</td>
<td>11</td>
</tr>
<tr>
<td>AI845</td>
<td>14</td>
</tr>
<tr>
<td>AO801, AO810, AO890, AO895</td>
<td>7</td>
</tr>
<tr>
<td>AO820</td>
<td>14</td>
</tr>
<tr>
<td>AO845</td>
<td>7</td>
</tr>
<tr>
<td>DI8XX</td>
<td>24</td>
</tr>
<tr>
<td>DI840</td>
<td>17</td>
</tr>
</tbody>
</table>
In order to find out if a given configuration of analog and digital modules can be used the following method should be used:

- Fill in number of modules in table Table 3-12.
- Calculate the sum in the three columns:
  - Sum User Parameters
  - Sum Input Bytes
  - Sum Output Bytes.
- Calculate the three total sums for:
  - ParamSize
  - InSize
  - OutSize.
- Check that:
  - ParamSize is less than or equal to 221 (220 if HCIR is used)
  - InSize is less than or equal to 239
  - OutSize is less than or equal to 112.

If any of these three values is too high then the configuration can **not** be used.
Table 3-12 Calculation of Number of Modules on CI840

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input Bytes</th>
<th>Output Bytes</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI801</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI810</td>
<td>13</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI820</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI830</td>
<td>12</td>
<td>17</td>
<td>0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AI835</td>
<td>15</td>
<td>17</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI843</td>
<td>16</td>
<td>20</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI845</td>
<td>13</td>
<td>17</td>
<td>-</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AI890</td>
<td>13</td>
<td>17</td>
<td>0</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI893</td>
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<td>17</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI895</td>
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<td>17</td>
<td>0</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AO801</td>
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<td>1</td>
<td>16</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO810</td>
<td>17</td>
<td>1</td>
<td>16</td>
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<td>AO820</td>
<td>11</td>
<td>1</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO845</td>
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<td>1</td>
<td>16</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AO890</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AO895</td>
<td>17</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI801</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI802</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI803</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI810</td>
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<td>4</td>
<td>0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>DI811</td>
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<td>4</td>
<td>0</td>
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</tr>
</tbody>
</table>
### Table 3-12 Calculation of Number of Modules on CI840 (Continued)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>User Parameters</th>
<th>Input Bytes</th>
<th>Output Bytes</th>
<th>Number of Modules</th>
<th>Sum User Parameters</th>
<th>Sum Input Bytes</th>
<th>Sum Output Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI814</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI820</td>
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<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI821</td>
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<td>2</td>
<td>0</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>DI840</td>
<td>13</td>
<td>4</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI890</td>
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<td>2</td>
<td>0</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>DO801</td>
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<td>2</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO810</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO814</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO815</td>
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<td>1</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>DO820/821</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>DO840</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO890</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP820</td>
<td>12</td>
<td>18</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP840</td>
<td>10</td>
<td>34</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sum</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td>ParamSize</td>
<td>InSize</td>
<td>OutSize</td>
</tr>
</tbody>
</table>

**Notes:**
- **ParamSize:** Sum of User Parameters, Input Bytes, and Output Bytes.
- **InSize:** Input Bytes.
- **OutSize:** Output Bytes.
3.4.4 Supported I/O Modules and Drives via PROFIBUS and CI801

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI801:

- AI801, AI810, AI820, AI830, AI835, AI843, AI845, AI890, AI893, AI895
- AO801, AO810, AO820, AO845, AO890, AO895
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI840 (SOE handling not supported), DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO840, DO890
- DP820, DP840
- ABB Standard Drives. Have to be connected via TB820.
  - ACS600/ACS800 with standard application
  - ACS600/ACS800 with crane application
  - ACS600/ACS800 with pump and fan application (PFC)
  - ACS400/ACS500/DCS400 with standard drive

3.4.5 Supported I/O Modules and Drives via PROFIBUS and CI830

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI830:

- AI801, AI810, AI820, AI830, AI835, AI890, AI893
- AO801, AO810, AO820, AO890
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO821, DO890
- DP820, DP840
- ABB Standard Drives
  - ACS600/ACS800 with standard application
  - ACS600/ACS800 with crane application
  - ACS600/ACS800 with pump and fan application (PFC)
  - ACS400/ACS500/DCS400 with standard drive
### 3.4.6 Supported I/O Modules via PROFIBUS and CI840

The following I/O modules are supported by the PROFIBUS Field Communication Interface module CI840:

- AI801, AI810, AI820, AI830, AI835, AI843, AI845, AI890, AI893, AI895
- AO801, AO810, AO820, AO845, AO890, AO895
- DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821, DI840 (SOE handling not supported), DI890
- DO801, DO802, DO810, DO814, DO815, DI820, DO821, DO840, DO890
- DP820, DP840
3.4.7 Data Scanning

ModuleBus data is scanned (read or written) cyclically, depending on the I/O module configuration. To calculate the I/O scan cycle time in the FCI do as follows:

Totalize \((\text{number of module type } x) \times \text{(used execution time for type } x)\)
(see Table 3-13) if the value is a multiple of 2 add 2 to the value. Otherwise increase the total value to the nearest higher multiple of two (2) to get the I/O scan cycle time.

**Table 3-13 I/O Scan Cycle Time in the FCI**

<table>
<thead>
<tr>
<th>Module Type</th>
<th>CI801</th>
<th>CI830</th>
<th>CI840</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single I/O</td>
</tr>
<tr>
<td>AI801, AI810, AI890, AI895</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>AI820</td>
<td>1.50</td>
<td>1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>AI830, AI835, AI893</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>AI843</td>
<td>0.40</td>
<td>-</td>
<td>0.40</td>
</tr>
<tr>
<td>AI845</td>
<td>3.00</td>
<td>-</td>
<td>3.00</td>
</tr>
<tr>
<td>AO801, AO810, AO890, AO895</td>
<td>1.20</td>
<td>1.20</td>
<td>1.20</td>
</tr>
<tr>
<td>AO820</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>AO845</td>
<td>1.20</td>
<td>-</td>
<td>1.20</td>
</tr>
<tr>
<td>DI801, DI802, DI803, DI810, DI811, DI814, DI820, DI821</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>DI840</td>
<td>0.43</td>
<td>-</td>
<td>0.43</td>
</tr>
<tr>
<td>DI890</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>DO801, DO802, DO810, DO814, DO815, DO820, DO821</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>DO840</td>
<td>0.43</td>
<td>-</td>
<td>0.43</td>
</tr>
</tbody>
</table>
Analog modules will be scanned every fourth I/O scan cycle time except for AI830 and AI835 modules which will be scanned every tenth time. DI, DO modules and standard drives will be scanned each I/O scan cycle time.

Table 3-13 I/O Scan Cycle Time in the FCI (Continued)

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Execution Time Used in ms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CI801</td>
</tr>
<tr>
<td>DO890</td>
<td>0.43</td>
</tr>
<tr>
<td>DP820</td>
<td>1.72</td>
</tr>
<tr>
<td>DP840</td>
<td>3.00</td>
</tr>
<tr>
<td>Engineered drives</td>
<td>-</td>
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<tr>
<td>Standard drives</td>
<td>0.71</td>
</tr>
<tr>
<td>FCI CI801</td>
<td>1.18</td>
</tr>
<tr>
<td>FCI CI830 firmware 1.0 to 1.2</td>
<td>-</td>
</tr>
<tr>
<td>FCI CI830 firmware 1.3 or later</td>
<td>-</td>
</tr>
<tr>
<td>FCI CI840</td>
<td>-</td>
</tr>
</tbody>
</table>
For example, a non redundant station with CI830 with firmware 1.3, two AI810, one AO810, two DI810, two DO820 and one AI830 will give the following I/O scan cycle time:

<table>
<thead>
<tr>
<th>Component</th>
<th>Time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 AI810</td>
<td>6.00 ms</td>
</tr>
<tr>
<td>1 AO810</td>
<td>1.50 ms</td>
</tr>
<tr>
<td>2 DI810</td>
<td>0.86 ms</td>
</tr>
<tr>
<td>2 DO810</td>
<td>0.86 ms</td>
</tr>
<tr>
<td>1 AI830</td>
<td>0.40 ms</td>
</tr>
<tr>
<td>1 CI830A</td>
<td>2.24 ms</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11.86 ms</strong></td>
</tr>
</tbody>
</table>

11.86 ms is not a multiple of 2, so increase of the value to the nearest multiple of 2 gives 12 ms.

That will give an I/O scan cycle time of 12 ms between the FCI and its I/O modules. This means that the DIs and DOs will be scanned every 12 ms, the AI810s and the AO810 every (4*12 ms) 48ms and the AI830 every (10*12 ms) 120 ms.

Minimum I/O scan cycle time = 4 ms with firmware 1.0 to 1.2.
Minimum I/O scan cycle time = 6 ms with firmware 1.3 or later.

For example, a single station with CI801 or a redundant station with CI840, two AI810, one AO810, two DI810, two DO820 and one AI830 will give the following I/O scan cycle time:

<table>
<thead>
<tr>
<th>Component</th>
<th>Time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 AI810</td>
<td>6.00 ms</td>
</tr>
<tr>
<td>1 AO810</td>
<td>1.20 ms</td>
</tr>
<tr>
<td>2 DI810</td>
<td>0.86 ms</td>
</tr>
<tr>
<td>2 DO810</td>
<td>0.86 ms</td>
</tr>
<tr>
<td>1 AI830</td>
<td>0.40 ms</td>
</tr>
<tr>
<td>1 CI840</td>
<td>1.18 ms</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10.50 ms</strong></td>
</tr>
</tbody>
</table>

10.50 ms is not a multiple of 2, so increase of the value to the nearest multiple of 2 gives 12 ms.
That will give an I/O scan cycle time of 12 ms between the FCI and its I/O modules. This means that the DIs and DOs will be scanned every 12 ms, the AI810s and the AO810 every \((4 \times 12\text{ ms})\) 48 ms and the AI830 every \((10 \times 12\text{ ms})\) 120 ms.

Minimum I/O scan cycle time = 4 ms
Section 4  Operation

4.1 Operating Overview

An I/O station is an autonomous station which normally is not handled by an operator. Of course, it is started and sometimes stopped manually. This is done, however, in specific situations such as the time of installation work and maintenance.

Accordingly, operating instructions are spread out in this manual. See where the specific activity is treated.

For general descriptions, see the beginning of this section. For concrete instructions, see Section 2, Installation and Section 5, Maintenance.

4.2 Getting Started

4.2.1 Functional Description

This section describes the functionality and services that the FCI (Fieldbus Communication Interface) offers for a PROFIBUS Master via PROFIBUS-DP. This includes a general description of the data flow on PROFIBUS-DP, and how the S800 I/O modules are operated and treated.

The FCI acts as a pure slave station on PROFIBUS-DP. The FCI controls all operations of an S800 I/O station. It is the bus-master on the S800 I/O ModuleBus. It does this by handling all communications between the PROFIBUS Master and the S800 I/O modules.

The FCI scans all dynamic input data from the input modules and sends it on PROFIBUS-DP, and writes all dynamic output data received from PROFIBUS-DP to the output modules.
The FCI is responsible for:
- Module configuration and supervision.
- Performing signal conditioning on input and output values.
- Dynamic data transfer.

4.2.1.1 Module Configuration and Supervision
The FCI stores the configuration for all configured I/O Modules in the station. The FCI will continuously supervise all I/O modules being configured by the PROFIBUS Master. It sends the status of all modules to the PROFIBUS Master via PROFIBUS-DP.
When the FCI detects an I/O module without configuration, which it has configuration data for, it will automatically load the parameters to the module. The module is then automatically set into operation by the FCI.

4.2.1.2 Signal Conditioning
The FCI performs the signal conditioning (for example, linearization and filtering) for the more basic I/O modules. This means that the FCI has to make some computation before moving the value to the module or after reading the value from the module. The type of signal conditioning to perform depends on the module type and its configuration (parameter settings).
Intelligent I/O modules do signal conditioning themselves. In this case the FCI only has to move the value to or from the module. This means less load on the FCI which can be used on other modules or services.

4.2.1.3 Dynamic Data Transfer
Figure 4-1 gives an overview of how the exchange of dynamic process data is transferred back and forth between the user application and the actual process.
The transportation of dynamic data between PROFIBUS-DP and the ModuleBus is the main task for the FCI. The FCI has a dedicated memory area where it sends the output values and reads the input values. The CPU in the FCI performs the rest of the data transportation. It reads output values from the memory and writes to the I/O Modules via the ModuleBus and vice versa.
Dynamic Data Exchange

PROFIBUS Master (Class 1)

The PROFIBUS Master uses Data Exchange request towards the FCI according to its scheduling scheme.

PROFIBUS-DP

3 and 4
Data exchange with PROFIBUS-DP is cyclic and consists of both writing of data from Master to FCI as well as data read from FCI to Master.

Fieldbus Communication Interface (FCI)
Communication Memory

2 and 5
Input and output values are updated as fast as possible (depends on the configuration). Signal conditioning is also performed in this loop.

1 and 6
Input and output values are updated "as fast as possible" (depends on the S800 I/O module configuration).

Figure 4-1 Dynamic Data Exchange for PROFIBUS-DP in Runtime
4.2.1.4 Data Scanning Principles

The data transfer between PROFIBUS-DP and the ModuleBus is not synchronized. Read and write operations are performed from and to a dual port memory in the FCI.

The ModuleBus data is scanned (read or written) cyclically, depending on the I/O module configuration. On one scan all digital modules, 1/4 of the analog modules and 1/10 of the slow analog modules are scanned. It takes 4 scans to read all analog modules and 10 scans to read all slow analog modules.

4.2.1.5 Redundant FCI

CI840 can work as a redundant pair where one FCI is primary and one is backup. As long as the primary works correct it will handle both the PROFIBUS and the ModuleBus. Both FCIs supervise each other. If a fault occurs in the primary the backup will automatically take over.

4.2.1.6 Hot Configuration In Run

CI801 and CI840 supports the function Hot Configuration In Run (HCIR).

HCIR is a function for modifying field device configuration without disturbing the running system. The following actions can be done:

- Delete modules
- Insert modules
- Parameter changes

During the configuration the values are frozen for a short moment. The time is dependent of the PROFIBUS master, communication speed, CI801, CI840, type of configuration and type of changes. Typical 300 ms at a communication speed of 1.5 MHz.

The configuration time is supervised by a watchdog. If the watchdog time elapse, the outputs will go to OSP (Output Set as Predefined). The watchdog time consists of two parts, one part calculated by the PROFIBUS master and one fix part for the slave (CI801 and CI840 1200 ms).
4.2.2 I/O Module Functionality

All S800 I/O modules have some common functionality. This section describes these common functions of the I/O modules.

An S800 I/O module complies with the following framework:

- **General**
  - It has a Module Identity (see Module Identity on page 65).
  - It has a state that can be controlled (see Module States on page 66).
  - It reports status for modules and channels.

- **Parameters**
  - It may have configuration parameters for the module and the channels.
  - It may have non-volatile parameters for each channel (factory settings).

- **Dynamic values**
  - All channels have dynamic values including quality indications.
  - All output channels can be read for verification of the performance and health.

### 4.2.2.1 Module Identity

All S800 I/O modules contain a module identity. The module identity is used to verify that an I/O module of the expected (user configured) type is mounted before taking it operational. It protects the system from performing unexpectedly.
4.2.2.2 Module States

The figure below shows the states of the I/O modules.

![Diagram showing I/O module states](image-url)

Figure 4-2 I/O Module States
The states are described in more detail below:

### 4.2.2.3 Init State
In the Init state the actual initialization of the module is performed, including a self-test.

- **Inputs**: Not scanned
- **Outputs**: Inactive: 0 V
- **LEDs**: Fault

### 4.2.2.4 Not Configured State
In the Not Configured state the module waits to be configured. The FCI performs the parameter download to the module.

- **Inputs**: Not scanned
- **Outputs**: Inactive: 0 V
- **LEDs**: Fault until first ModuleBus dialog, then None (and/or Warning if diagnostic warning)

### 4.2.2.5 Ready State
Entering the Ready state starts input channel scanning. All active channels are scanned before the state is completely entered. In this state the module just waits to be commanded to the Operational state.

- **Inputs**: Scanned
- **Outputs**: Inactive: 0 V
- **LEDs**: None (or Warning if diagnostic warning)

### 4.2.2.6 Operational State
This is the state for normal operation. After entering the Operational state (from Ready or OSP), output channels are still unchanged until a valid output value is written.

- **Inputs**: Scanned
- **Outputs**: Active
- **LEDs**: Run (and Warning if diagnostic warning)
4.2.2.7 OSP (Outputs Set as Predefined) State

The OSP state is only used by modules with output channels. If OSP is activated it is entered from the Operational state in two cases:

- The supervision time-out on PROFIBUS-DP has elapsed.
- The OSP-watchdog expires, no access has been done to the module within 1024 ms (analog) 256 ms (digital).

See OSP-Watchdog on page 69.

Entering the OSP state the module sets its outputs to the predetermined values. This means “Keep value” or output the configured OSP value. The outputs are kept unchanged as long as the module stays in the OSP state.

When the PROFIBUS-DP network is operating again the FCI orders the module out of the OSP state.

After re-entering the Operational state, the outputs are still unchanged until valid values are written.

**Inputs**
Not applicable

**Outputs**
According to configuration (keep value or OSP value)

**LEDs**
Run, OSP (and Warning if diagnostic warning)

4.2.2.8 Error State

This the state that will be entered if a fault is detected.

**Inputs**
Not scanned

**Outputs**
Inactive (0 V)

**LEDs**
Fault

4.2.2.9 Configuration, Parameters

Configuring an I/O module is equal to writing the parameters to it.

The parameters for a module can mainly be divided into configuration parameters and non-volatile parameters.
4.2.2.10 Loading Parameters

At start-up, the configuration parameters are loaded by the FCI in the NotConfigured state. When valid configuration parameters are written to the module, it will change from the Not Configured state to the Ready state. After entering the Ready state the module may be set to Operational.

The parameters do not need to be remembered on the modules after a reset of the module since they are saved in the FCI.

4.2.2.11 Loading Invalid Parameters

If parameters that are in some way invalid are sent to a module, this is indicated with a warning in the module status and by a diagnostic message. If channel parameters are invalid an error on the channel is indicated.

4.2.2.12 Non-volatile Parameters

Each channel may, apart from the configuration parameters, also have non-volatile parameters that are stored on the module and written during production and are not changed by a running system.

4.2.2.13 OSP-Watchdog

The OSP-watchdog is a watchdog timer that all I/O modules with output channels have. It supervises the communication to discover if the traffic on the ModuleBus is interrupted. The OSP-watchdog is refreshed when the module is accessed. If this is not done within the time limit the watchdog will force the module to the OSP state (see Module States on page 66).

The OSP-watchdog is also activated when the PROFIBUS-DP watchdog has elapsed. The supervision time for PROFIBUS-DP is defined in the PROFIBUS configuration tool.

The watchdog on PROFIBUS must be enable to get the OSP function to work on AO and DO modules at communication error on PROFIBUS.

The watchdog time-out should be set to at least four times the PROFIBUS’s cycle time.
Section 5  Maintenance

5.1 Preventive Maintenance

Please see the S800 I/O General Information and Installation manual.

5.2 Hardware Indicators

5.2.1 CI801 FCI Module LEDs

The CI801 FCI has indicators for FAULT, RUN, POWER OK, PROFIBUS-DP communication traffic. For color and functions see Table 5-3 and the for the location, see Figure 5-3.

Table 5-1 Standard LEDs on CI840 FCI Module

<table>
<thead>
<tr>
<th>LED Marking</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F (Fault)</td>
<td>Red</td>
<td>Fault in the module (1)</td>
</tr>
<tr>
<td>R (Run)</td>
<td>Green</td>
<td>Operational state</td>
</tr>
<tr>
<td>P (Power ok)</td>
<td>Green</td>
<td>Internal power OK</td>
</tr>
<tr>
<td>T (Traffic)</td>
<td>Yellow</td>
<td>Receive transmit data on PROFIBUS</td>
</tr>
</tbody>
</table>

(1) The F-LED will switch on at power up, restart of the module or when the module goes to Error state. At start up the module will do a self test, if the self test has gone OK the module will switch off the F-LED.
Figure 5-1 CI801 FCI with Status LEDs Location
5.2.2 CI830 FCI Module LEDs

The CI830 FCI has indicators for FAULT, RUN, POWER OK, two for PROFIBUS-DP communication and two for optical ModuleBus communications. For color and functions see Table 5-2 and the for the location see Figure 5-2.

Table 5-2 Standard LEDs on CI830 FCI Module with TB810/TB811

<table>
<thead>
<tr>
<th>LED Marking</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F (Fault)</td>
<td>Red</td>
<td>Fault in the module (1)</td>
</tr>
<tr>
<td>R (Run)</td>
<td>Green</td>
<td>Operational state</td>
</tr>
<tr>
<td>P (Power ok)</td>
<td>Green</td>
<td>Internal power OK</td>
</tr>
<tr>
<td>RX (Receive)</td>
<td>Yellow</td>
<td>Receive data on PROFIBUS-DP</td>
</tr>
<tr>
<td>TX (Transmit)</td>
<td>Yellow</td>
<td>Transmit data on PROFIBUS-DP</td>
</tr>
<tr>
<td>Tx (TB810/TB811)</td>
<td>Yellow</td>
<td>Transmit data on the optical ModuleBus</td>
</tr>
<tr>
<td>Rx (TB810/TB811)</td>
<td>Yellow</td>
<td>Receive data on the optical ModuleBus</td>
</tr>
</tbody>
</table>

(1) The F-LED will switch on at power up, restart of the module or when the module goes to Error state. At start up the module will do a self test, if the self test has gone OK the module will switch off the F-LED.
Figure 5-2 CI830 FCI with TB810/TB811 Status LEDs Location
5.2.3 CI840 FCI Module LEDs

The CI840 FCI has indicators for FAULT, RUN, POWER OK, PROFIBUS-DP communication Rx/Tx and two for redundant configurations PRIMARY and DUAL. For color and functions see Table 5-3 and the for the location, see Figure 5-3.

Table 5-3 Standard LEDs on CI840 FCI Module

<table>
<thead>
<tr>
<th>LED Marking</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F (Fault)</td>
<td>Red</td>
<td>Fault in the module (1)</td>
</tr>
<tr>
<td>R (Run)</td>
<td>Green</td>
<td>Operational state</td>
</tr>
<tr>
<td>P (Power ok)</td>
<td>Green</td>
<td>Internal power OK</td>
</tr>
<tr>
<td>Rx/Tx (Traffic)</td>
<td>Yellow</td>
<td>Receive transmit data on PROFIBUS</td>
</tr>
<tr>
<td>PRIM (Primary)</td>
<td>Yellow</td>
<td>Working as Primary</td>
</tr>
<tr>
<td>DUAL</td>
<td>Yellow</td>
<td>Working with a partner</td>
</tr>
</tbody>
</table>

(1) The F-LED will switch on at power up, restart of the module or when the module goes to Error state. At start up the module will do a self test, if the self test has gone OK the module will switch off the F-LED.
Figure 5-3 CI840 FCI with Status LEDs Location
Section 5  Maintenance

5.3 Error Messages

Please see the relevant PROFIBUS Master documentation.

5.4 Fault Finding and User Repair

5.4.1 Communication Module Replacement

5.4.1.1 General

Communications modules CI801, CI830 and TB820 can not be exchanged on-line. Communications modules CI840 and TB840 can be exchanged on-line.

It is important to understand the consequences of a module exchange and how it affects the process.

- Replacement of a communication module type CI801 and CI830 affects all channels on all the modules in an I/O station. The station will loose power.
- Replacement of a communication module type CI840 in a redundant configuration has no affects on channels in an I/O station.
- Replacement of an optical port type TB810/TB811/TB842 affects all channels on all the modules in all clusters except cluster 0. The communication will be broken to all clusters except for cluster 0.
- Replacement of an optical modem type TB820, or TB840 in a single configuration, connected via a simplex optical cable, affects all channels on all the modules in all clusters except cluster 0. The communication will be broken to all clusters except for cluster 0. The cluster where the TB820 should be replaced will be power less.
- Replacement of an optical modem type TB820 or TB840, in a single configuration, connected via a duplex optical cable, affects all channels on all the modules in all clusters after and including the cluster where the replaced TB820 or TB840 is located. The communication will be broken to all clusters after where the replaced TB820 or TB840 is located. The cluster where TB820 or TB840 should be replaced will be power less.
Communication Module Replacement

Section 5  Maintenance

- Replacement of a communication module type TB840 in a redundant configuration has no affects on channels in an I/O station.

The following headings include general instructions for replacement of modules and aspects on the handling of individual modules are presented in Table 5-4.

5.4.1.2 Practical Execution

Replace faulty or suspect communication modules in the following way:

For CI840, only perform the steps 1, 2, 3, 8, 11 and 12.

1. Read the S800 I/O General Information and Installation manual.

2. Special restrictions apply to each module type. See descriptions in Table 5-4 for useful information on individual module types.

3. Check that the new module can replace the old for CI801/CI830/CI840, also check the software version. If the wrong software version is found, then load new software; see Backup/Restore Procedures on page 83.

4. Disconnect the power supply/supplies from the module.

5. Disconnect the PROFIBUS-DP and ModuleBus from the module.

6. Extract the module.

7. Set the current Station address or Cluster address on the new module.

8. Insert the new module carefully.

9. Connect the PROFIBUS-DP and ModuleBus to the module.

10. Connect the power supply/supplies to the module.

11. Store extracted modules in protective envelopes.

12. Modules are initialized automatically by the system and it will takes approximately 60 seconds for a CI801/CI830/CI840 to start up.

5.4.1.3 Additional Aspects on Individual S800 Communications Modules

Table 5-4 lists S800 I/O modules. Descriptions of these types are referred individually in the table below.
### Table 5-4 Replacement Aspects of S800 I/O Modules

<table>
<thead>
<tr>
<th>Module Type - Settings</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch setting for PROFIBUS-DP address</td>
<td><strong>Can not</strong> be replaced with power applied. Needs room to the left in order to be removed. In normal operation mode, before a CI801 is replaced, the supply to the S800 I/O is to be switched off. Power connections can be removed by pulling the header terminals out of the unit. Optical ModuleBus Port TB842 can not be removed with power applied. If a TB842 connected to a CI801 shall be changed in a running system, TB806 has to be disconnected from the FCI first. The fuse for Modulebus 24 V can be changed if the top cover of the module is removed. Fuse type, see CI801 Technical Data. Fieldbus connections can be removed by pulling the D-way connector out of the unit. ![Warning Symbol] If the last CI801 on a PROFIBUS segment supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable to CI801 can not be done without disrupting the bus.</td>
</tr>
<tr>
<td>CI801 FCI</td>
<td></td>
</tr>
</tbody>
</table>
Table 5-4 Replacement Aspects of S800 I/O Modules

<table>
<thead>
<tr>
<th>Module Type - Settings</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CI830/FCl</td>
<td><strong>Switch setting for PROFIBUS-DP address</strong></td>
</tr>
<tr>
<td></td>
<td>Can <em>not</em> be replaced with power applied. Needs room to the left in order to be removed. In normal operation mode, before a CI830 is replaced, the supply to the S800 I/O is to be switched off. Power connections can be removed by pulling the header terminals out of the unit. Optical ModuleBus Port TB810/TB811 can not be removed with power applied. Fieldbus connections can be removed by pulling the D-way connector out of the unit. If the last CI830 on a PROFIBUS segment supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable to CI830 can not be done without disrupting the bus.</td>
</tr>
<tr>
<td>CI840/TB840</td>
<td>CI840/TB840: Can be replaced with power applied. In redundancy applications one CI840/TB840 can be replaced without any affects on channel in an I/O station. If a TB842 connected to a TU846/TU847 shall be changed in a running system, TB806/TB846 has to be disconnected from TU846/TU847 first. If the last CI840 on a PROFIBUS segment supplies an active termination in the cable connector, disconnection of the power supply or the PROFIBUS cable to CI840 can not be done without disrupting the bus.</td>
</tr>
<tr>
<td>TU846/TU847</td>
<td>TU846/TU847: Needs room to the left in order to be removed. Can not be replaced with power applied.</td>
</tr>
</tbody>
</table>
5.4.2 Application Memory Reset

A CI830 can keep an application program in memory for a long time even with the power supply disconnected. To avoid a problem with an FCI that may have an “old application” program, the application memory should be cleared. To clear the application memory in a CI830:

1. Set the address switches to 99.
2. Take away the power supply for a short moment.
3. Apply power and let the FCI restart -- waiting 45 seconds.
   Now the application memory is cleared.
4. Set the address switches to the desired station address.
5. Take away the power supply for a short moment.
6. Apply power and let the FCI restart -- waiting 45 seconds.
   Now the FCI is cleared and ready for application programming.

5.4.3 CI801 Firmware version

Firmware version is possible to read from the service port (Profibus connection) at startup.

Do like this:

- Connect a PC to the service port of the CI801 via the service adapter (FS801 and TK802) and cable TK812, see Figure 5-4.
- Start a terminal program in the PC e.g. Hyperterminal.
- Set the communication parameters to 9600 bps, 8 bits word length, no parity, 1 bit stop.
- Set the station address to 0.
- Disconnect power to the CI801 and connect again.
- When the CI801 has started up to operational state it will print out a text string on the terminal containing version name and number, e.g. CI801 SW 1.0/0.
5.4.4 CI840 Firmware version

From CI840 firmware version 3.0/0 and onwards it will be possible to read its firmware version from the service port at startup.

Do like this:

- Connect a PC to the service port of the CI840 via a serial cable (i.e. TK812).
- Start a terminal program in the PC e.g. Hyperterminal.
- Set the communication parameters to 9600 bps, 8 bits word length, no parity, 1 bit stop.
- Disconnect power to the CI840 and connect again.
- When the CI840 has started up to operational state it will print out a text string on the terminal containing version name and number, e.g. CI840 SW 3.0/0.
5.5 Backup/Restore Procedures

5.5.1 Load the CI801 Software Upgrade

Hardware
PC with WINDOWS NT 4 or 2000.
Service adapter (FS801 + cable TK802) 3BSE038407R1
Connection cable TK212 3BSC630167R2

5.5.1.1 Connection
Connect your PC and the CI801, using a TK212 cable and the service adapter (FS801+TK802) between the service port (Profibus connection) on CI801 and the COM1 or COM2 on the PC. Set the station address on CI801 to 0.

*Figure 5-4 CI801 Connection*
5.5.1.2 Loading the BASE Software, single FCI

1. Run the program “loader32.exe”
2. Press the button “Next”
3. Choose the setting “User defined: Select COM-Port and speed manually”
4. Press the button “Next”
5. Select COM-Port to use, and type in the path to the image-file
6. Check the box “Disable optimization of speed (Fix to 9600 BD)” and uncheck the remaining check boxes
7. Press the button “Download”
8. Loading (takes approx. 15 minutes)
9. Set back the station address to used address.
10. Switch off and then on the power supply to the CI801 and it will start up.

5.5.1.3 What to do in Case of Problems?

Cable was disconnected during download or the power went down.

Solution
Restart CI801 by switching power OFF and ON again.
Repeat the process described above.
5.5.2 Load the CI830 Software Upgrade

**Hardware**
PC with WINDOWS NT 4 or 2000.
Connection cable TK527 (3BSC950004R1)
It is assumed that the PC communication port is COM1: and the diskette drive is A.

5.5.2.1 Reset of the CI830 Application Memory
See Application Memory Reset on page 81.

5.5.2.2 Connection
Connect your PC and the CI830, using a TK527 (3BSC950004R1) cable between the RS232 service port on the CI830 and the COM1 or COM2 on the PC.

5.5.2.3 Loading the BASE Software
- Run the program “loader32.exe”
- Press the button “Next”
- Choose the setting “User defined: Select COM-Port and speed manually”
- Press the button “Next”
- Select COM-Port to use, and type in the path to the image-file
- Check the box “Disable optimization of speed (Fix to 9600 BD)” and uncheck the remaining check boxes
- Press the button “Download”
- Loading (takes approx. 5 minutes)
5.5.2.4 What to do in Case of Problems?

Cable was disconnected during download or the power went down.

Solution

Restart CI830 by switching power OFF and ON again. Repeat the process described above.

Put the largest label on the back of the CI830 and the smaller one on the front of CI830 according to Figure 5-5.

![Figure 5-5 CI830 Software Label Location](image_url)
5.5.3 Load the CI840 Software Upgrade

**Hardware**
PC with WINDOWS NT 4 or 2000.
Connection cable TK212 3BSC630167R2.
It is assumed that the PC communication port is COM1: and the diskette drive is A.

**5.5.3.1 Connection**
Connect your PC and the CI840 (TU846/TU847), using a TK212 (3BSC630167R2) cable between the RS232 service port A or B on the TU846/TU847 (CI840) and the COM1 or COM2 on the PC.

**5.5.3.2 Loading the BASE Software, single FCI**
1. Run the program “loader32.exe”
2. Press the button “Next”
3. Choose the setting “User defined: Select COM-Port and speed manually”
4. Press the button “Next”
5. Select COM-Port to use, and type in the path to the image-file
6. Check the box “Disable optimization of speed (Fix to 9600 BD)” and uncheck the remaining check boxes
7. Press the button “Download”
8. Loading (takes approx. 15 minutes). When down load is finished the CI840 will start up automatically.

**5.5.3.3 Loading the BASE Software in the Backup FCI when the Primary is Running**
1. Follow the instructions according to Loading the BASE Software, single FCI on page 87 until step 7.
2. The red fault LED is lit.
3. Disconnect the power supply from the backup FCI by unlocking the screw and locking it again.

4. Continue the procedure from step 7 in *Loading the BASE Software, single FCI* on page 87 without any waiting.

5. If the downloading doesn’t start, step 3 and 4 have to be repeated.
5.5.3.4 What to do in Case of Problems?

Cable was disconnected during download or the power went down.

Solution
Restart CI840 by switching power OFF and ON again. Repeat the process described above.

Figure 5-6 CI840 and TU847
Appendix A Specifications

A.1 CI801 Fieldbus Communications Interface (FCI)

A.1.1 Features

- PROFIBUS-DPV1 fieldbus interface.
- Supervisory functions of I/O ModuleBus
- Isolated power supply to I/O modules
- OSP handling and configuration
- Input power fused
- Hot Configuration In Run
- HART pass-through

A.1.2 Description

The CI801 Fieldbus Communications Interface (FCI) is an intelligent communication interface between a Controller via the PROFIBUS-DPV1 fieldbus and the S800 I/O modules via the ModuleBus.

CI801 contains one PROFIBUS-DPV1 interface, electrical ModuleBus interfaces, LED indicators and a service port.

The Profibus connector is also used for service.

Two rotary switches for station address 0-99 settings (0 is used for service).
CI801 has isolated power converters that generates internal power for CI801 and current limited +5 V supply for electrical ModuleBuses.

Besides +5 V CI801 also distribute a fused 24 V for the ModuleBus.

The module is DIN-rail mounted and grounded to the DIN-rail. The module detachable screw terminals for power supply D-way terminals for PROFIBUS-DPV1, one connector for the Optical ModuleBus Port TB842, mounted on TB806, and one electrical ModuleBus.
### A.1.3 Technical Data

Table A-1 CI801 FCI Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microprocessor (CPU)</td>
<td>Motorola MCF5307 with a speed of 64 MHz</td>
</tr>
<tr>
<td>Flash PROM</td>
<td>1 Mbyte</td>
</tr>
<tr>
<td>Fast RAM</td>
<td>8 Mbyte</td>
</tr>
<tr>
<td>Power Input</td>
<td>24 V d.c. (19.2 - 30)</td>
</tr>
<tr>
<td>Power Input Fuse</td>
<td>2 AF</td>
</tr>
<tr>
<td>Power Consumption at 24 V d.c.</td>
<td>140 mA</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>5.4 W</td>
</tr>
<tr>
<td>Maximum Ambient Temperature</td>
<td>55°C (131°F) horizon and 40°C (104°F) vertical</td>
</tr>
<tr>
<td>PROFIBUS-DPV1 (D-sub 9-pole female socket, also used as Service Port)</td>
<td>Opto-isolated (RS-485); 12 Mbit/s maximum</td>
</tr>
<tr>
<td>ModuleBus</td>
<td>Maximum of 12 I/O modules</td>
</tr>
<tr>
<td>Power Output - ModuleBus</td>
<td>24 V max. = 1.5 A fused(1)</td>
</tr>
<tr>
<td></td>
<td>5 V max. = 1.5 A current limited</td>
</tr>
<tr>
<td>Safety classification</td>
<td>Class I according to IEC 536; (earth protected)</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP20 according to IEC 529, (IEC 144)</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Dielectric test voltage</td>
<td>500 V a.c.</td>
</tr>
<tr>
<td>Width</td>
<td>86.1 mm (3.39”)</td>
</tr>
<tr>
<td>Depth</td>
<td>58.5 mm (2.30”)</td>
</tr>
</tbody>
</table>
Table A-1 CI801 FCI Specification (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>110 mm (4.33&quot;)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.3 kg (0.66 lb.)</td>
</tr>
</tbody>
</table>

(1) Fuse type: Subminiature fuse 3.15 A
- LT-5 Fast-Acting 622 series according to Littel fuse
- TR5-F Fuse-link No. 370 according to Wickmann
- MSF 250 according to Schurter

A.1.4 Dimensions

![Figure A-1 CI801 FCI Dimensions](image-url)
A.1.5 Connections

Table A-2 Power Supply Connections (XI)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L+</td>
<td>+24 V d.c. Supply</td>
</tr>
<tr>
<td>2</td>
<td>L-</td>
<td>0 V d.c. Supply</td>
</tr>
</tbody>
</table>

Table A-3 FCI PROFIBUS Connections (X2), Also Used as Service Port

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive data/transmit data positive</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Direction control (optional)</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply of termination resistance (5V)</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive data/transmit data negative</td>
</tr>
<tr>
<td>9</td>
<td>DGND</td>
<td>Data ground (if RTS is used)</td>
</tr>
</tbody>
</table>
A.1.6 Block Diagram CI801

Figure A-2 Block Diagram CI801
A.2 CI830 Fieldbus Communications Interface (FCI)

A.2.1 Features

- PROFIBUS-DP fieldbus interface.
- Supervisory functions of I/O ModuleBus
- Isolated power supply to I/O modules
- OSP handling and configuration
- DIN rail mounting

A.2.2 Description

The CI830 Fieldbus Communications Interface (FCI) is an intelligent communication interface between a Controller via the PROFIBUS-DP fieldbus and the S800 I/O modules via the ModuleBus.

CI830 has four basic parts: Module termination board, power supply board, processor board and the optical port (see block diagram).

The power supply board has an isolated power converter that generates a short circuit proof +5 V supply for the CI830 and I/O modules. It also contains opto-isolated RS232 drivers/receivers for the service port.

The Processor board contains the CPU, RAM, Flash PROM, ModuleBus interfaces, PROFIBUS-DP protocol chip, LED indicators and two rotary switches for the units PROFIBUS station address.

The termination board is a unit where most of the connections to the outside takes place. It is grounded to the DIN-rail through a metallic spring connector. The board carries screw terminals for power supply and redundant power supply monitoring.
D-way terminal for PROFIBUS-DP, connector for the service port, connector for the Optical ModuleBus Port TB810/TB811 and the electrical ModuleBus.
## A.2.3 Technical Data

### Table A-4 CI830 FCI Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microprocessor (CPU)</td>
<td>Motorola MC68340 running at 8 bit mode with a speed of 16 MHz</td>
</tr>
<tr>
<td>Flash PROM</td>
<td>512 kbyte</td>
</tr>
<tr>
<td>Fast RAM</td>
<td>256 kbyte (backed-up)</td>
</tr>
<tr>
<td>Power Input</td>
<td>24 V d.c. (19.2 - 30)</td>
</tr>
<tr>
<td>Power Consumption at 24 V d.c.</td>
<td>110 mA</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>2.6 W</td>
</tr>
<tr>
<td>Maximum Ambient Temperature</td>
<td>55°C (131°F)</td>
</tr>
<tr>
<td>Power Supply Monitoring Inputs</td>
<td>Max. input voltage: 30 V</td>
</tr>
<tr>
<td></td>
<td>Min. input voltage for high level: 15 V</td>
</tr>
<tr>
<td></td>
<td>Max. input voltage for low level: 8 V</td>
</tr>
<tr>
<td>Service Port (D-sub 9-pole female socket)</td>
<td>Opto-isolated (RS-232); 19.2 Kbaud/s maximum</td>
</tr>
<tr>
<td>PROFIBUS-DP (D-sub 9-pole female socket)</td>
<td>Opto-isolated (RS-485); 12 Mbit/s maximum</td>
</tr>
<tr>
<td>ModuleBus</td>
<td>Maximum of 12 I/O modules</td>
</tr>
<tr>
<td>Power Output - ModuleBus</td>
<td>24 V max. = 1.4 A</td>
</tr>
<tr>
<td></td>
<td>5 V max. = 1.5 A</td>
</tr>
<tr>
<td></td>
<td>Current limited</td>
</tr>
<tr>
<td>Safety classification</td>
<td>Class I according to IEC 536; (earth protected)</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP20 according to IEC 529, (IEC 144)</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Dielectric test voltage</td>
<td>500 V a.c.</td>
</tr>
</tbody>
</table>
A.2.4 Dimensions

Table A-4 CI830 FCI Specification (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>84 mm (3.3&quot;)</td>
</tr>
<tr>
<td>Depth</td>
<td>122 mm (4.8&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>170 mm (6.7&quot;) including latch</td>
</tr>
<tr>
<td>Weight</td>
<td>0.45 kg (1.0 lb.)</td>
</tr>
</tbody>
</table>

Figure A-3 CI830 FCI Dimensions
### A.2.5 Connections

**Table A-5 Power Supply Connections (XI)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>L+</td>
<td>+24 V d.c. Supply</td>
</tr>
<tr>
<td>3</td>
<td>L-</td>
<td>0 V d.c. Supply</td>
</tr>
<tr>
<td>2</td>
<td>SA</td>
<td>Redundant Power Supply “A” Monitoring Input</td>
</tr>
<tr>
<td>1</td>
<td>SB</td>
<td>Redundant Power Supply “B” Monitoring Input</td>
</tr>
</tbody>
</table>

**Table A-6 Service Port (X3)**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TD</td>
<td>Transmit Data channel B</td>
</tr>
<tr>
<td>3</td>
<td>RD</td>
<td>Receive Data channel B</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SG</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RDA</td>
<td>Receive Data channel A (for debugging only)</td>
</tr>
<tr>
<td>8</td>
<td>TDA</td>
<td>Transmit Data channel A (for debugging only)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A-7 FCI PROFIBUS Connections (X2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive/Transmit data - plus</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply voltage for the terminating resistors</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive/Transmit data - minus</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>Not used</td>
</tr>
</tbody>
</table>
A.2.6 Block Diagram CI830

Fiber Optical Modulebus Module

• RX
• TX

STN, ADDR

GLUE

MC68340

FLASH

RAM

Reset logic,
+5 V Supervision

Rx

Px

Px

Rx

Rx

Rx

F(ault)

Tx

P(owok)

R(un)

RxD/TxD-N

RxD/TxD-P

VP

vp

DPD

DDCC+

DDCC-

DDCC-

DDCC+

DDCC+

DDCC-

DDCC-

DDCC+

DDCC-

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A.3 CI840 Fieldbus Communications Interface (FCI)

A.3.1 Features

- PROFIBUS-DPV1 fieldbus interface.
- Supervisory functions of I/O ModuleBus
- Isolated power supply to I/O modules
- OSP handling and configuration
- Input power fused
- Hot Configuration In Run
- HART pass-through

A.3.2 Description

The CI840 Fieldbus Communications Interface (FCI) is an intelligent communication interface between a Controller via the PROFIBUS-DPV1 fieldbus and the S800 I/O modules via the ModuleBus.

CI840 is designed to be used in redundant applications.

CI840 contains one PROFIBUS-DPV1 interface, two electrical ModuleBus interfaces, LED indicators and a opto-isolated RS232 service port.

CI840 has isolated power converters that generates internal power for CI840 and current limited +5 V supply for two electrical ModuleBuses.

Besides +5 V CI840 also distribute a current limited 24 V for the two ModuleBuses.

CI840 must be mounted on a Module Termination Unit TU846 or TU847. With CI840 mounted on a TU847, only one electrical ModuleBus is connected. When mounted on a TU846, two electrical ModuleBuses are connected.
The Module Termination unit is DIN-rail mounted and grounded to the DIN-rail. The Module Termination Unit TU847 carries screw terminals for power supply and redundant power supply monitoring, two D-way terminals for PROFIBUS-DPV1, two connectors for the service ports, one connector for the Optical ModuleBus Port TB842, mounted on TB806, and one electrical ModuleBus.

The Module Termination Unit TU846 carries screw terminals for power supply and redundant power supply monitoring, two D-way terminals for PROFIBUS-DPV1, two connectors for the service ports, two connectors for the Optical ModuleBus Port TB842, mounted on TB846, and two electrical ModuleBuses.
Figure A-4 CI840 and TU847
### A.3.3 Technical Data

**Table A-8 CI840 FCI Specification**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microprocessor (CPU)</td>
<td>Motorola MCF5307 with a speed of 64 MHz</td>
</tr>
<tr>
<td>Flash PROM</td>
<td>1 Mbyte</td>
</tr>
<tr>
<td>Fast RAM</td>
<td>8 Mbyte</td>
</tr>
<tr>
<td>Power Input</td>
<td>24 V d.c. (19.2 - 30)</td>
</tr>
<tr>
<td>Power Input Fuse</td>
<td>2 AF</td>
</tr>
<tr>
<td>Power Consumption at 24 V d.c.</td>
<td>190 mA</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>7.7 W</td>
</tr>
<tr>
<td>Maximum Ambient Temperature</td>
<td>55°C (131°F) horizontal mounted 40°C (104°F) vertical mounted</td>
</tr>
<tr>
<td>Power Supply Monitoring Inputs</td>
<td>Max. input voltage: 30 V Min. input voltage for high level: 15 V Max. input voltage for low level: 8 V</td>
</tr>
<tr>
<td>Service Port (RJ 45 connector on TU847)</td>
<td>Opto-isolated (RS-232); 19.2 Kbaud/s maximum</td>
</tr>
<tr>
<td>PROFIBUS-DPV1 (D-sub 9-pole female socket)</td>
<td>Opto-isolated (RS-485); 12 Mbit/s maximum</td>
</tr>
<tr>
<td>ModuleBus</td>
<td>Maximum of 12 I/O modules</td>
</tr>
<tr>
<td>Power Output - ModuleBus</td>
<td>24 V max. = 1.4 A 5 V max. = 1.5 A Current limited</td>
</tr>
<tr>
<td>Switch over time at failure in a redundant CI840 configuration</td>
<td>Typical &lt;100 ms Maximum 150 ms</td>
</tr>
<tr>
<td>MTU Keying code</td>
<td>AA</td>
</tr>
</tbody>
</table>
A.3.4 Connections

See Connections on page 120.

Table A-8 CI840 FCI Specification (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety classification</td>
<td>Class I according to IEC 536; (earth protected)</td>
</tr>
<tr>
<td>Protection rating</td>
<td>IP20 according to IEC 529, (IEC 144)</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Dielectric test voltage</td>
<td>500 V a.c.</td>
</tr>
<tr>
<td>Width</td>
<td>54 mm (2.13&quot;)</td>
</tr>
<tr>
<td>Depth</td>
<td>96 mm (3.78&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>119 mm (4.69&quot;)</td>
</tr>
<tr>
<td>Weight</td>
<td>0.2 kg (0.44 lb.)</td>
</tr>
</tbody>
</table>
A.3.5 Block Diagram CI840, single ModuleBus

Figure A-5 Block Diagram CI840, single ModuleBus
Figure A-6 Block Diagram CI840, dual ModuleBus
A.4 TU846 Redundant MTU for CI840, dual ModuleBus

A.4.1 Features

- Power supply connection
- Two PROFIBUS connections
- Two service tool connections
- Two rotary switch for station address setting
- Connection for two ModuleBuses
- Connector for ModuleBus Optical Port
- Mechanical keying prevents insertion of the wrong module type
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

A.4.2 Description

The TU846 is a module termination unit (MTU) for redundant configuration of the field communication interface CI840 and redundant I/O.

The MTU is a passive unit having connections for power supply, two electrical ModuleBuses, two CI840 and two rotary switches for station address (0 to 99) settings.

A ModuleBus Optical Port TB842 can be connected to TU846 via TB846.

Four mechanical keys, two for each position, are used to configured the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.
The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

The MTU has two BLOCK signals, one for each module position, that keeps the modules in its init state until it is locked in its position.

### A.4.3 Technical Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power input</td>
<td>24 V d.c. (19.2 - 30 V)</td>
</tr>
<tr>
<td>PROFIBUS connection</td>
<td>DSUB9 connector</td>
</tr>
<tr>
<td>Service ports</td>
<td>RJ45 connector</td>
</tr>
<tr>
<td>ModuleBus current distribution</td>
<td></td>
</tr>
<tr>
<td>Maximum 5 V</td>
<td>1.5 A</td>
</tr>
<tr>
<td>Maximum 24 V</td>
<td>1.5 A</td>
</tr>
<tr>
<td>Mechanical keys (2)</td>
<td>36 different combinations</td>
</tr>
<tr>
<td>Safety Classification</td>
<td>Class I according to IEC 536; (earth protected)</td>
</tr>
<tr>
<td>Protection Rating</td>
<td>IP20 according to IEC 529, (IEC 144)</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Dielectric test voltage</td>
<td>500 V a.c.</td>
</tr>
<tr>
<td>Width</td>
<td>124 mm (4.88&quot;)</td>
</tr>
<tr>
<td>Depth</td>
<td>47 mm (1.85&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>186 mm (7.32&quot;) including latch</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5 kg (1.1 lbs.)</td>
</tr>
</tbody>
</table>
A.4.4 Dimensions

Figure A-7 Dimensions TU846
A.4.5 Connections

Table A-10 TU846 Power Supply Connections

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L+</td>
<td>+24 V d.c. Supply In</td>
</tr>
<tr>
<td>L-</td>
<td>0 V d.c. Supply In</td>
</tr>
<tr>
<td>SA</td>
<td>Redundant Power Supply “A” Monitoring Input</td>
</tr>
<tr>
<td>SB</td>
<td>Redundant Power Supply “B” Monitoring Input</td>
</tr>
</tbody>
</table>

Table A-11 PROFIBUS Connector Pin-out

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive data/transmit data positive</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Direction control (optional)</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply of termination resistance (5V)</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive data/transmit data negative</td>
</tr>
<tr>
<td>9</td>
<td>DGND</td>
<td>Data ground (if RTS is used)</td>
</tr>
</tbody>
</table>

Table A-12 Service Port Connector Pin-out

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>Tx</td>
<td>Transmitted data</td>
</tr>
</tbody>
</table>
Table A-12 Service Port Connector Pin-out (Continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>Rx</td>
<td>Receive data</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>Not used</td>
</tr>
</tbody>
</table>
A.4.6 Block Diagram TU846

Figure A-8 Block Diagram TU846
A.5 TU847 Redundant MTU for CI840, single ModuleBus

A.5.1 Features

- Power supply connection
- Two PROFIBUS connections
- Two service tool connections
- Two rotary switch for station address setting
- ModuleBus connections
- Connector for ModuleBus Optical Port
- Mechanical keying prevents insertion of the wrong module type
- Latching device to DIN rail for locking and grounding
- DIN rail mounted.

A.5.2 Description

The TU847 is a module termination unit (MTU) for redundant configuration of the field communication interface CI840.

The MTU is a passive unit having connections for power supply, electrical ModuleBus, two CI840 and two rotary switches for station address (0 to 99) settings.

A ModuleBus Optical Port TB842 can be connected to TU847 via TB806.

Four mechanical keys, two for each position, are used to configure the MTU for the right types of modules. Each key has six positions, which gives a total number of 36 different configurations. The configurations can be changed with a screwdriver.
The MTU can be mounted on a standard DIN rail. It has a mechanical latch that locks the MTU to the DIN rail. The latch can be locked/unlocked with a screwdriver.

The MTU has two BLOCK signals, one for each module position, that keeps the modules in its init state until it is locked in its position.

### A.5.3 Technical Data

**Table A-13 TB847 Redundant MTU for CI840**

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power input</td>
<td>24 V d.c. (19.2 - 30 V)</td>
</tr>
<tr>
<td>PROFIBUS connection</td>
<td>DSUB9 connector</td>
</tr>
<tr>
<td>Service ports</td>
<td>RJ45 connector</td>
</tr>
<tr>
<td>ModuleBus current distribution</td>
<td></td>
</tr>
<tr>
<td>Maximum 5 V</td>
<td>1.5 A</td>
</tr>
<tr>
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<td>1.5 A</td>
</tr>
<tr>
<td>Mechanical keys (2)</td>
<td>36 different combinations</td>
</tr>
<tr>
<td>Safety Classification</td>
<td>Class I according to IEC 536; (earth protected)</td>
</tr>
<tr>
<td>Protection Rating</td>
<td>IP20 according to IEC 529, (IEC 144)</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Dielectric test voltage</td>
<td>500 V a.c.</td>
</tr>
<tr>
<td>Width</td>
<td>124 mm (4.88&quot;)</td>
</tr>
<tr>
<td>Depth</td>
<td>47 mm (1.85&quot;)</td>
</tr>
<tr>
<td>Height</td>
<td>186 mm (7.32&quot;) including latch</td>
</tr>
<tr>
<td>Weight</td>
<td>0.5 kg (1.1 lbs.)</td>
</tr>
</tbody>
</table>
A.5.4 Dimensions

Figure A-9 Dimensions TU847
A.5.5 Connections

Table A-14 TU847 Power Supply Connections

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L+</td>
<td>+24 V d.c. Supply In</td>
</tr>
<tr>
<td>L-</td>
<td>0 V d.c. Supply In</td>
</tr>
<tr>
<td>SA</td>
<td>Redundant Power Supply “A” Monitoring Input</td>
</tr>
<tr>
<td>SB</td>
<td>Redundant Power Supply “B” Monitoring Input</td>
</tr>
</tbody>
</table>

Table A-15 PROFIBUS Connector Pin-out

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield/protective ground</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>RxD/TxD-P</td>
<td>Receive data/transmit data positive</td>
</tr>
<tr>
<td>4</td>
<td>RTS</td>
<td>Direction control (optional)</td>
</tr>
<tr>
<td>5</td>
<td>DGND</td>
<td>Data ground</td>
</tr>
<tr>
<td>6</td>
<td>VP</td>
<td>Supply of termination resistance (5V)</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>RxD/TxD-N</td>
<td>Receive data/transmit data negative</td>
</tr>
<tr>
<td>9</td>
<td>DGND</td>
<td>Data ground (if RTS is used)</td>
</tr>
</tbody>
</table>

Table A-16 Service Port Connector Pin-out

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>3</td>
<td>Tx</td>
<td>Transmitted data</td>
</tr>
</tbody>
</table>
Table A-16 Service Port Connector Pin-out (Continued)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>6</td>
<td>Rx</td>
<td>Receive data</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>Not used</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>Not used</td>
</tr>
</tbody>
</table>
A.5.6 Block Diagram TU847

Figure A-10 Block Diagram TU847
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