

# AC 800M

## Controller Hardware

System Version 5.1

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# **AC 800M**

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**System Version 5.1**

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# Safety Summary

## General

In order to minimize the risk of injury to personnel and/or damage to the equipment, always comply with the following safety instructions when installing and operating an AC 800M Controller system. Local, stricter statutory regulations must always take precedence over the safety instructions given here.

The Safety Instructions are classified as mandatory reading for all suitably qualified personnel intending to operate the AC 800M Controller.

## Warnings and Information Symbols in the Text Margin

Observe the symbols for warnings and information located in other Chapters and Appendices of this book. The symbols are placed in the left-hand margin, adjacent to paragraphs requiring special attention. For an explanation of the symbols, see [About This User Manual - Warning, Caution, Information, and Tip Icons](#) on page 24.

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# Safety Summary

## Personnel and Process Safety

**TAKE CARE AT ALL TIMES** – This will prevent accidents from occurring and help protect valuable equipment.

A control system is a tool used to control various processes. Responsibility for attaining and maintaining a satisfactory level of safety rests with the personnel who engineer, operate and maintain the equipment. It is important to have an extensive knowledge of all control functions, the inherent safety risks that may be involved in the process, and to possess the imaginative ability to anticipate situations in which accidents may occur.

The following Safety Instructions must be observed:

- Take care when:
  - fitting or removing units
  - connecting or disconnecting cables
  - resetting or switching units to manual operation
- For hazardous locations special restrictions apply, see [Appendix E, Standards](#).
- Never connect the equipment to the mains power supply during installation work.
- Take extreme care when connecting the system to the mains power supply. Injury or death can be the result of incorrect procedures.
- Ensure that all personnel operating or maintaining the installation know the exact location of and how to operate the equipment isolating safety switch and the mains power supply isolating switch.
- When the process sub-sections have been checked and a test run has been performed, a person responsible must check the interlocking chains etc. All concerned personnel must be fully informed regarding test runs to be performed.

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## Safety Summary (continued)

- Process technicians are to be present when testing and operating process objects.
- Never activate any System Initialization push-button if any uncertainty exists regarding exactly what occurs within the system during initialization. **ALWAYS CHECK FIRST.**
- Remember at all times, that the control system can be controlled from a remote engineering station, connected at another node via Control Network.
- Remember, the AC 800M Controller will start automatically when voltage is applied.

Taking steps to bring the process to a safe state, provides an improved level of safety when power supplies, communication links or parts of the control system fail. Such steps may require, for example, the installation of valves or relays that automatically return to a fail-safe position.

## Product Safety

The following safety rules must be observed at all times:

- To avoid discharging static electricity, ground both yourself and any tools before handling printed circuit boards, batteries, memory cards, and other sensitive pieces of the equipment
- All electronic devices are sensitive to ESD (electrostatic discharge). To avoid accidental damage while handling printed circuit boards, it is recommended to wear a wrist strap, grounded to the chassis. The strap must have a built-in protective resistor
- Anti-static, conductive plastic bags must be used for storage and transport of PC boards in transit.

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# Safety Summary

## Before replacing Units

All procedures for replacing units can be located by referring to the relevant documentation.

Removing or replacing units with system power connected can cause injury to personnel and damage to equipment. It is, therefore, of the utmost importance that the power supply be fully disconnected, on the process side, before removal or insertion of units takes place.

See [Online Replacement of Unit](#) on page 198 and I/O documentation.

## Maintenance

It is recommended that a stock of suitable spare components be maintained to avoid system downtime.

Ensure that back-up copies of the current application program are made at regular, predetermined intervals to avoid system downtime.

---

# Safety Summary (continued)

## Operating Environment

Before the AC 800M Controller system is brought online, investigate which environmental conditions are applicable. Take note in particular of the following:

- The controller must not be exposed to conditions that exceed the values given in the relevant technical specifications.
- The controller must not be used in an environment exposed to strong electrical interference. Electrical machines can produce interference that exceeds levels permitted for the equipment, for example during repair work.
- All products must be handled with appropriate precautions with regard to electrostatic damage.
- The controller must not be exposed to direct sunlight.

### Important Software Check

- Use the system's fault-monitoring facilities to prevent accidents or mishaps.
- When in doubt, **ALWAYS CHECK** before executing changes.

### Important Hardware Notice

- **DO NOT**, under any circumstances, disconnect the power supply to a normally functioning system. Always use the correct system shut-down procedure prior to disconnecting the power supply.

### Signal Noise Due to Cables

Cables which may cause electrical interference (for example, power supply cables) must not be installed adjacent to bus cables carrying fast digital signals. Ensure that a minimum distance of 10 cm (4 in.) is provided between cables installed inside cabinets.

### Hazardous Electrical Supplies

Operational and maintenance procedures, during which personnel may come into contact with high voltage, should only be carried out by personnel fully trained in the maintenance of electrical equipment within those environments, and who are fully aware of all risks involved.

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# Safety Summary



## **Electrostatic Sensitive Device**

Devices labeled with this symbol require special handling precautions as described in the installation section.

## **GENERAL WARNINGS**

### **Equipment Environment**

All components, whether in transportation, operation or storage, must be in a noncorrosive environment.

### **Electrical Shock Hazard During Maintenance**

Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

## **SPECIFIC WARNINGS**

Page 67: The AC 800M Controller and associated units must be unpowered and disconnected when being mounted onto a DIN-rail!

Page 68: It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

Page 72: AC 800M units must be disconnected from the power source before removing them from a DIN-rail!

Page 72: It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

Page 78: For PM861/PM864/PM865/PM866 insert the RCU Link Termination plug TB852, at the RCU Link connector. The termination plug must always be used for PM861/PM864/PM865/PM866 when running in single configuration. When a redundant processor is running in a single configuration use the RCU Link Cable TK851, if the RCU Link Termination plug TB852 is not available.

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## Safety Summary (continued)

### **SPECIFIC WARNINGS (continued)**

Page 124: The CI862 baseplate has no locking device. Insert only the CI862 unit into this baseplate. Insertion of other unit types may cause damage to the equipment.

Page 191: Before attempting maintenance or troubleshooting, read the Safety Summary on page 13. Failure to do so could lead to personal injury or damage to equipment.

Page 198: It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

Page 429: Explosion hazard - Substitution of components may impair suitability for Class I, Zone 2.

Page 429: Explosion hazard - Do not replace batteries unless the power has been switched off or the area is known to be non-hazardous.

Page 430: Explosion hazard - Do not disconnect equipment unless the power has been switched off or the area is known to be non-hazardous.

### **SPECIFIC CAUTIONS**

Page 68: To prevent damage to the pins, be sure the baseplate plugs and sockets are fully aligned as the units interconnect. Under no circumstances use excessive force!

Page 68: It is essential that the locking device be placed in the LOCKED position to avoid possible problems caused by vibration and/or intermittent grounding.

Page 73: In order to provide adequate access and removal space, note that the SLIDE sequence must be carried out on the unit baseplates adjacent to the unit that is to be removed.

Page 73: The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see Figure 23 on page 74).

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## Safety Summary

### **SPECIFIC CAUTIONS (continued)**

Page 76: Do not manipulate the locking device. ABB will take no responsibility for errors caused by manipulating locking devices.

-79 and Page 92: Do not place the internal back-up battery in the battery holder until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the processor unit with the battery in place, then the CPU memory will immediately start to consume battery power.

Page 90: Note that in redundant CPU configuration, COM3 and the electrical ModuleBus on the baseplate can not be used.

Page 91: Note that the RCU Link Cable TK851 must be used and can not be replaced by a similar cable. Using another cable will disable the identification of the CPUs in the CB and Operator Station. When running in single configuration the RCU Link Cable TK851 might temporarily be used to perform the function of a termination plug.

Page 98: Do not connect the two CEX-Bus segments, separated with BC810, to each other with CEX-Bus extension cable TK850.

Page 98: In AC 800M High Integrity Controllers it is required that the external supply input of BC810 is connected and that the power supply is strictly configured either according to Figure 33 or according to Figure 34 and nor is it allowed to change the configuration by way of for instance individual circuit breakers between modules.

Page 99: Hot swap of the BC810 located next to a primary or single controller CPU, otherwise called "direct BC810", might jeopardize the whole controller and should not be performed unless every module on the CEX-Bus are in a non-operating state. Note: In an AC 800M HI controller this is unconditionally and intentionally leading to a shutdown of the controller.

Page 112: It is not possible to change the CI851 unit via hot swap and it is not allowed to perform an online upgrade of firmware in a system containing CI851.

---

## Safety Summary (continued)

### **SPECIFIC CAUTIONS (continued)**

Page 114: It is not possible to change the CI852 unit via hot swap and it is not allowed to perform an online upgrade of firmware in a system containing CI852.

Page 118: Hot swap is supported for CI854A (not CI854).

Page 133: – 115 V for 110–120 V AC – 230 V for 220–240 V AC (default position on delivery).

Page 141: To avoid error indications from SA/SB when single power supply is used, it is recommended to connect the input terminals SA/SB on the CPU to +24 V, see Figure 47.

Page 143: Do not connect the TK821V020 cable until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the PM8xx processor unit, the CPU memory will immediately start to consume battery power when the cable is connected.

Page 157: When setting the IP address of the primary CPU in Control Builder, the backup CPU must be turned off (powered down). Otherwise the backup CPU will take over and you get disconnected.

Page 159: Note that the electrical ModuleBus can only be used for connection of S800 I/O when AC 800M is running in single CPU configuration.

Page 184: Note that a Backup CPU with severe communication errors on the ModuleBus will be rejected (if ModuleBus is part of the HW configuration) and synchronized state will never be reached as long as error remains.

Page 189: The RCU Link Cable must NEVER be removed from the primary Processor Unit during redundant operation. Removal of the cable may cause the unit to stop.

Page 192: Due to the batteries being connected in parallel, it is necessary, when using the SB821 external battery, to remove the internal battery from the PM8xx in order to avoid reducing available memory back-up time.

---

## Safety Summary

### **SPECIFIC CAUTIONS (continued)**

Page 195: Due to the batteries being connected in parallel, it is necessary, when using the SB821 external battery, to remove the internal battery from the processor unit in order to avoid reducing available memory back-up time.

-200 and Page 201: Reuse of CPU modules replaced from redundant configurations within the same control network, might cause control network problems due to the MAC and IP address handling. See MAC and IP Address Handling in Redundant Configuration on page 49. Such reuse should not be fulfilled unless both the replaced module and the module previously acting together with it in redundant configuration are known to be restored from the previous mutual address swap. It is recommended to set up an IP-config session and use the “Restore factory settings” option subsequently followed by reassignment of the IP address or assignment of a new IP address.

Page 200: Do not, under any circumstances, remove the RCU Link Cable from the primary CPU now running in a single state. Removing the cable might cause the CPU to stop.

Page 201: The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see Figure 23 on page 74).

Page 202: Do not replace the RCU link cable online in a previous version than 5.0. The support for online replacement also depends on hardware Product Revision levels. Please consult Release Notes (3BSE021377\*) for detailed information.

Page 428: If you use other power supplies, except SD82X and SD83X, to provide the 24V d.c. for AC 800M it is required that they also are CE marked, Underwriters Laboratories (UL ) listed and fulfill the LVD (SEL-VandPELV) criteria.

Page 428: The AC 800M modules are IP20 semi-protected equipment and must be mounted in non-public localities.

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# About This User Manual

## General



Any security measures described in this User Manual, for example, for user access, password security, network security, firewalls, virus protection, etc., represent possible steps that a user of an 800xA System may want to consider based on a risk assessment for a particular application and installation. This risk assessment, as well as the proper implementation, configuration, installation, operation, administration, and maintenance of all relevant security related equipment, software, and procedures, are the responsibility of the user of the 800xA System.

This book describes the hardware platform AC 800M. It also describes in detail how to install, configure, operate and perform the necessary maintenance on all equipment making up the AC 800M or AC 800M HI controllers.

Control Builder is used to configure and program the AC 800M controller, and is referred to in this manual as Control Builder. For information on the controller software, see controller software documentation.

For important information about late changes and work-arounds for known problems, refer to the Release Notes (see [Released User Manuals and Release Notes](#) on page 28).

## User Manual Conventions

Microsoft Windows conventions are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, etc.

## 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, **fully comply** with all **Warning** and **Caution** notices.

## Terminology

A complete and comprehensive list of terms is included in *System 800xA System Guide Functional Description (3BSE038018\*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions and definitions given in standard dictionaries such as Webster's Dictionary of Computer Terms.

Terms that uniquely apply to this User Manual are listed in the following table.

*Table 1. Terminology*

| <b>Term/Acronym</b>   | <b>Description</b>  |
|-----------------------|---|
| ABB Drives            | ABB Oy, Drives Group  |
| AC 800M               | A hardware platform, comprising Processor Units, communication interfaces and other supporting devices, that can be configured to provide a controller.   |
| AC 800M Controller    | A controller configured from the AC 800M hardware platform and Controller FW for AC 800M.   |
| AC 800M HI Controller | A controller configured from a relevant selection of the AC 800M hardware platform and Controller Firmware for AC 800M HI.  |
| Central I/O           | Input/Output units, mounted onto a DIN-rail, and directly connected to the AC 800M controller via ModuleBus.  |
| CEX-Bus               | Communication Expansion Bus, (for communication units).   |
| DDCS                  | Distributed Drives Communication System   |
| DIN-rail              | Industry standard 'Top Hat' type mounting rail.   |
| DriveBus              | Communication link dedicated for ABB drives.  |
| DriveDebug            | Diagnostic Tool   |
| DriveWindow           | Commissioning and Maintenance Tool  |
| EMC                   | Electro-Magnetic Compatibility.   |
| Ethernet              | Network cabling system according to IEEE802.3.  |
| Ethernet Address      | The term Ethernet address is often used in extended meaning to refer to the hardware addresses of not only Ethernet (IEEE 802.3) hardware, but also Wireless (IEEE 802.11) hardware, and FDDI (ISO 9314), see also MAC-address. |
| FCI                   | Fieldbus Communication Interface.   |

Table 1. Terminology (Continued)

| Term/Acronym | Description  |
|--------------|--|
| FF           | FOUNDATION Fieldbus - Standard based on IEC 1158-2.  |
| FF HSE       | FOUNDATION Fieldbus - High Speed Ethernet, a fieldbus system based on Ethernet and FOUNDATION Fieldbus specification.  |
| Hot removal  | Units with hot removal support can be removed online, without any disturbance to other units connected to the CEX-Bus. This includes that the unit can be removed online if it becomes faulty.   |
| Hot swap     | Units with hot swap (includes hot removal) support, can be replaced online, without any disturbance to other units connected to the CEX-Bus. In a redundant system, the backup unit can be replaced without any disturbances to the primary unit. This includes that the unit can be replaced online if it becomes faulty. |
| IEC          | International Electrotechnical Commission.   |
| IEEE         | Institute of Electrical and Electronic Engineers.  |
| INSUM        | INtegrated System for User optimized Motor control.  |
| LVD          | Low Voltage Directive.   |
| MAC address  | The generic term for all hardware addresses of Ethernet (IEEE802.3) hardware, Wireless (IEEE802.11) hardware and FDDI (ISO 9314) is MAC address; MAC stands for Media Access Control.  |
| PELV         | Protected Extra Low Voltage (power supply).  |
| PROFIBUS DP  | Open, vendor-independent fieldbus for time-critical communication between controllers and distributed peripherals.   |
| RCU          | Redundancy Control Unit.   |

Table 1. Terminology (Continued)

| Term/Acronym | Description  |
|--------------|--|
| RCU Link     | RCU Link Cable transfers data between Primary and Back-up CPU. The two CPUs are connected to the RCU Link Cable. An RCU Link Terminator is used on the RCU Link Connector in single CPU configuration. |
| Remote I/O   | Input/Output units connected to a controller via a fieldbus.   |
| SELV         | Safety Extra Low Voltage (power supply).   |
| SIL          | Safety Integrity Level   |
| 10BaseT      | 10 Mbit Ethernet according to IEEE 802.3   |
| 100BaseTX    | 100 Mbit electrical Ethernet IEEE 802.3  |

## Applicable Specifications

### EUROPEAN UNION DIRECTIVE COMPLIANCE

Units mentioned in this document for which the product is marked with the  logo comply with the electromagnetic compatibility directive 89/336/EEC and the low-voltage directive 73/23/EEC. See [Appendix D, Directive Considerations](#).

### UL LISTING

Units mentioned in this document are UL listed if the product is marked with the UL logo.

 indicates UL approval for the USA, and  for both Canada and the USA. The logo  indicates UL approval for Canada only.

The applied standard is UL508, Industrial Control Equipment. Units approved for use at hazardous locations also comply with the standard UL60079-15. To fulfill the

UL requirements for hazardous locations, the instructions in [Appendix E, Standards](#) must be followed.

## TÜV Approval

Units mentioned in this document are TÜV qualified for IEC 61508 SIL2 or SIL3 if the

product is marked with the TÜV  logo.

## Released User Manuals and Release Notes

A complete list of all User Manuals and Release Notes applicable to System 800xA is provided in *System 800xA Released User Manuals and Release Notes (3BUA000263\*)*.

*System 800xA Released User Manuals and Release Notes (3BUA000263\*)* is updated each time a document is updated or a new document is released. It is in pdf format and is provided in the following ways:

- Included on the documentation media provided with the system and published to ABB SolutionsBank when released as part of a major or minor release, Service Pack, Feature Pack, or System Revision.
- Published to ABB SolutionsBank when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.



A product bulletin is published each time *System 800xA Released User Manuals and Release Notes (3BUA000263\*)* is updated and published to ABB SolutionsBank.

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# Section 1 Introduction

## Product Overview

### AC 800M – General

AC 800M is a hardware platform comprising individual hardware units, which can be configured and programmed to perform multiple functions.

Once configured and programmed, the AC 800M effectively becomes the AC 800M or AC 800M HI controller.

The hardware units that form the AC 800M and AC 800M HI Controllers are:

- Processor units (including baseplate)  
(PM851/PM851A/PM856/PM856A/PM860/PM860A/PM861/PM861A/  
PM864/PM864A/PM865/PM866/PM891)
- High Integrity Processor Unit  
(consists of PM865 and SM810/SM811 with corresponding baseplates)
- Communication interfaces for different protocols (including baseplates)  
(CI851/CI852/CI853/CI854/CI854A/CI855/CI856/CI857/CI858/CI860/  
CI862/CI865/CI867/CI868/CI869/CI871/CI872/CI873)
- CEX-Bus Interconnection Unit  
(BC810)
- Power supply units, providing various power output levels  
SD831/SD832/SD833/SD834/SS823/SS832)
- Battery back-up unit  
(SB821/SB822)  
The SB821 is not supported with PM891.



PM851 is equivalent with PM856 unless stated otherwise.

PM851A is equivalent with PM851 unless stated otherwise.

PM856A is equivalent with PM856 unless stated otherwise.

PM860A is equivalent with PM860 unless stated otherwise.

PM861A is equivalent to PM861 unless stated otherwise.

PM864A is equivalent to PM864 unless stated otherwise.

When equipped with the specified Control Software, the AC 800M Controller acts either as a stand-alone process controller, or as a controller performing local control tasks in a control network consisting of many interconnected controllers, operator stations and servers.

Various I/O systems can be connected to the AC 800M Controller, either directly (S800 I/O) or via PROFIBUS DP or FOUNDATION Fieldbus.

The AC 800M is delivered without Control Software. To provide the controller with Control Software, first load the firmware and then create the application separately using the Control Builder M engineering tool.

The AC 800M Controller consists of a selection of units mounted on horizontal DIN-rails, which can be housed within an enclosure. The majority of units consist of a base mounting plate and removable cover attached with screws.

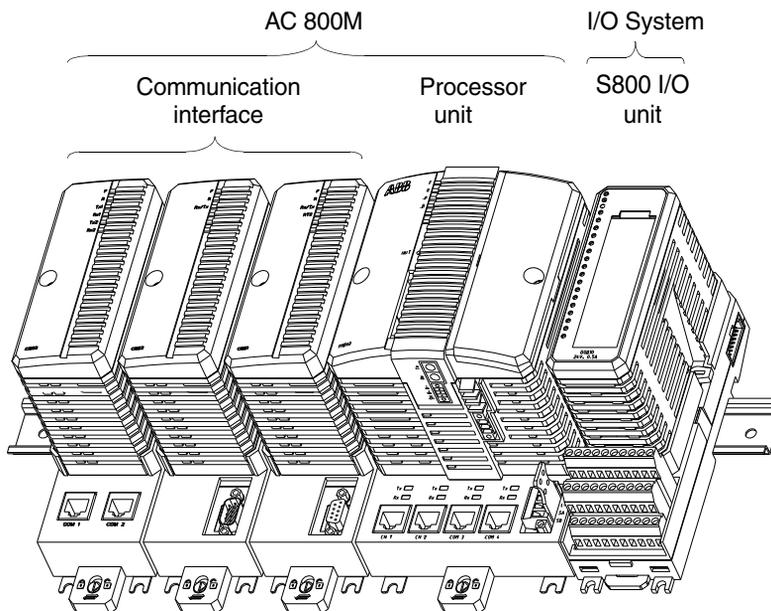
The baseplate, which is always mounted onto the DIN-rail, carries the majority of the connections to processor, power supplies and communication interfaces, as well as the connections to the external buses and systems.

The AC 800M Controller provides a cost-effective, low-maintenance solution for applications ranging from small Programmable Logic Controller (PLC) to advanced Distributed Control Systems (DCS) control applications and combined DCS, and High Integrity systems control applications.

In the AC 800M High Integrity Controller, it is possible to run both non-SIL and SIL classified applications. The AC 800M HI consist of PM865, SM810/SM811 and a High Integrity version of Control Software, and is also available in redundant configuration. AC 800M HI requires the use of SIL certified S800 I/O units in SIL

classified applications. If the application is not SIL classified, standard S800 I/O units can be used with AC 800M HI controller.

**Figure 1** shows the physical appearance of an AC 800M Controller with an S800 I/O Unit. This physical appearance does not apply to PM891.



*Figure 1. Example of an AC 800M Controller (except PM891) with an S800 I/O Unit*

**Figure 2** shows the PM861 processor unit that is part of the AC 800M controller. This processor unit is different from PM891.

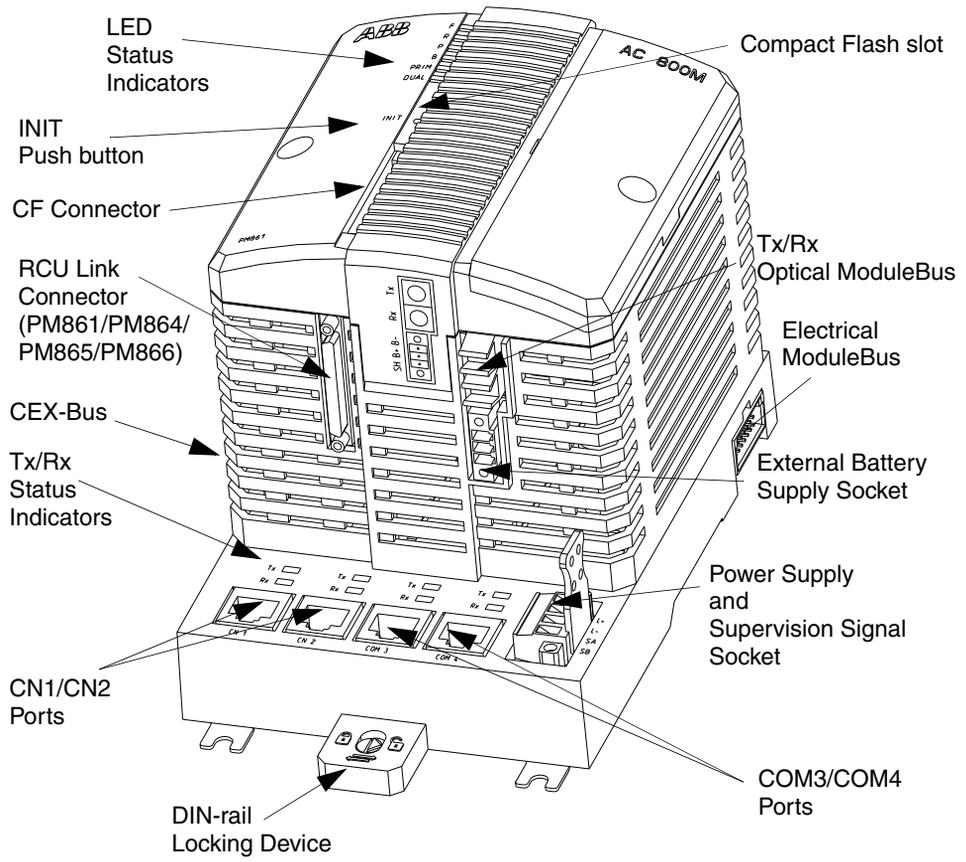


Figure 2. Processor Unit – General View (here shown with PM861)

## PM8xx/TP830 Processor Unit – General



The topic does not apply to PM891. See [PM891 Processor Unit – General](#) on page 40.

Physically the PM8xx/TP830 Processor Unit consists of two basic parts:

- Processor Unit  
(PM851/PM851A/PM856/PM856A/PM860/PM860A/PM861/PM861A/PM864/PM864A/PM865/PM866) with processor and Power Supply boards.
- Baseplate (TP830), housing the unit termination board.

For the Functional Block Diagram, see [Figure 4](#) on page 35 and [Figure 5](#) on page 36. The CPU board contains the microprocessor and the RAM-memory, controllers for all built-in communication interfaces, real-time clock, LED indicators, INIT push button and a Compact Flash interface.

The main function of the power supply board is to generate isolated, circuit-proof +5 V and +3.3 V supplies to the CPU and I/O units. The board also contains opto-isolated RS-232C drivers/receivers for the service port, together with a back-up battery holder for memory/real time clock, (RTC).

The termination board, housed in the TP830 Baseplate, is where the majority of the external connections terminates. The board is grounded to the DIN-rail through of the metallic components of the housing. The termination board is provided with screw terminals for power supply and redundant power supply monitoring, with RJ45 connectors for the control network and serial port, a connector for the service port, the electrical ModuleBus and the CEX-Bus.

The 24 V DC supply, connected to the TP830 Baseplate, powers all the units on the CEX-Bus and the electrical ModuleBus.

In single CPU configuration, it is possible to connect an S800 I/O cluster directly to the built-in electrical ModuleBus plug located on the right hand side of the TP830 Baseplate.

The processor unit has a communication expansion bus connector located on the left-hand side of the TP830 Baseplate. This CEX-Bus provides for extending the on-board communication ports with additional communication interfaces.

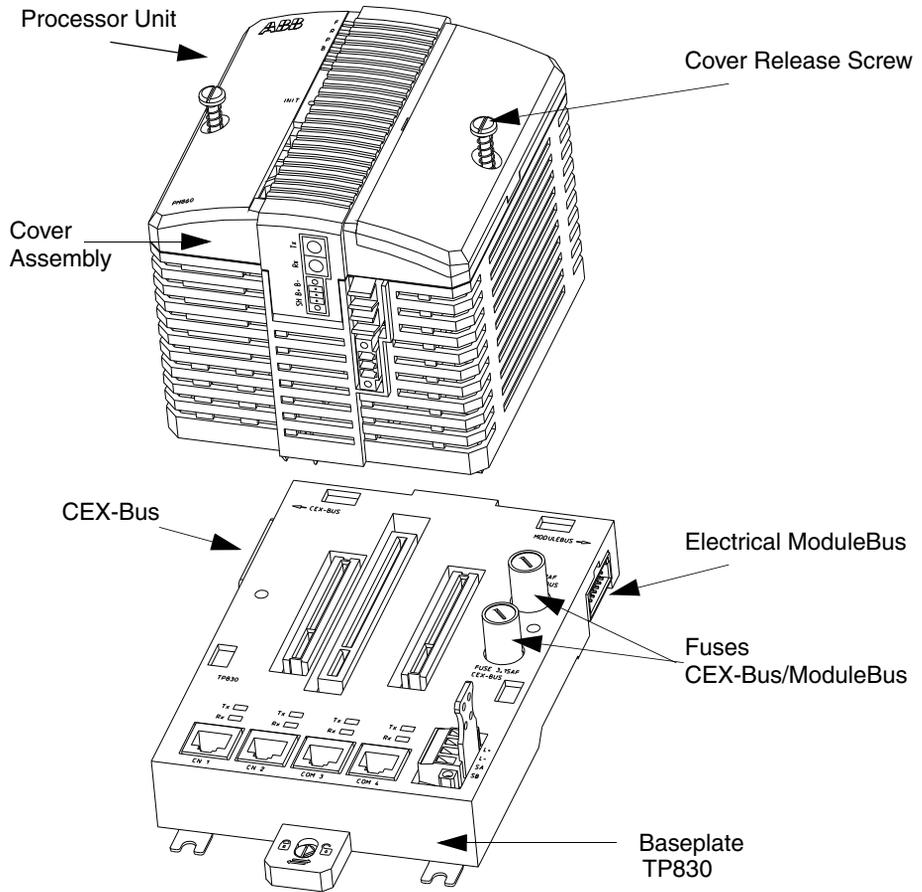


Figure 3. Processor Unit Assembly – General View  
(here shown with PM860/TP830)

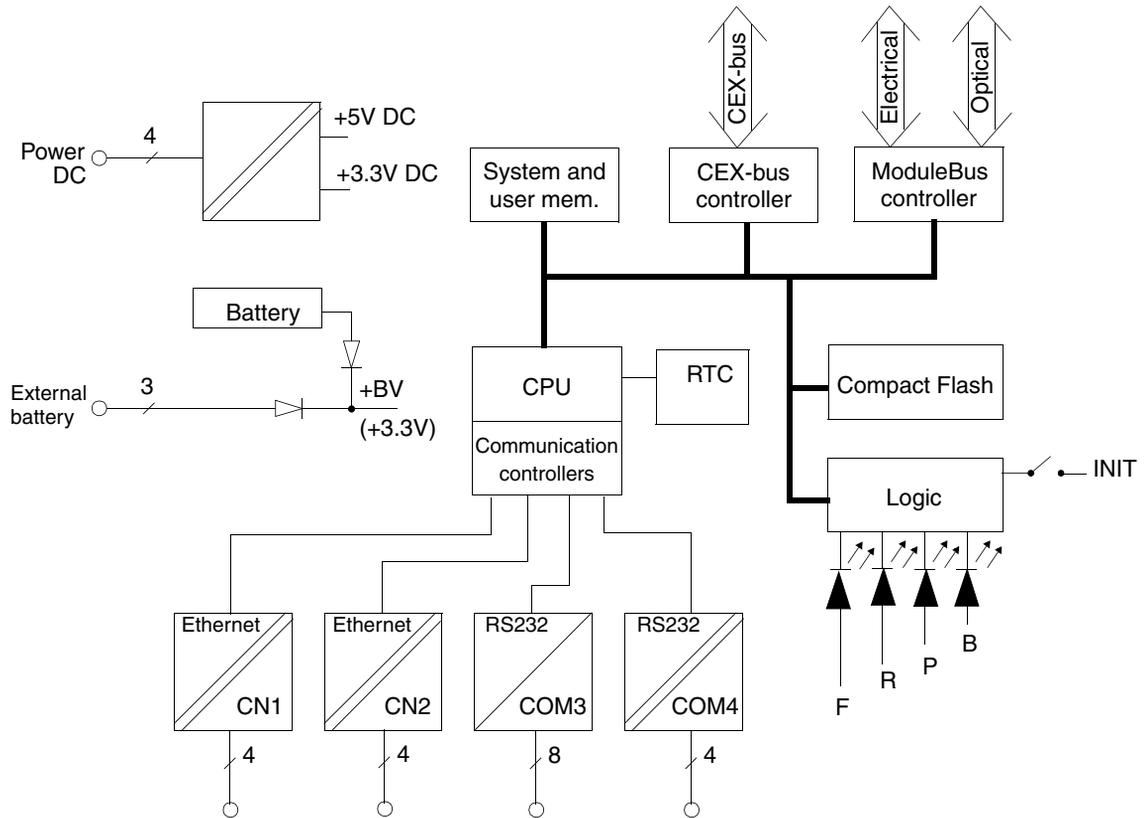


Figure 4. PM851/PM856/PM860 – Functional Block Diagram



PM851/PM851A is restricted to one Ethernet (CN1) port.

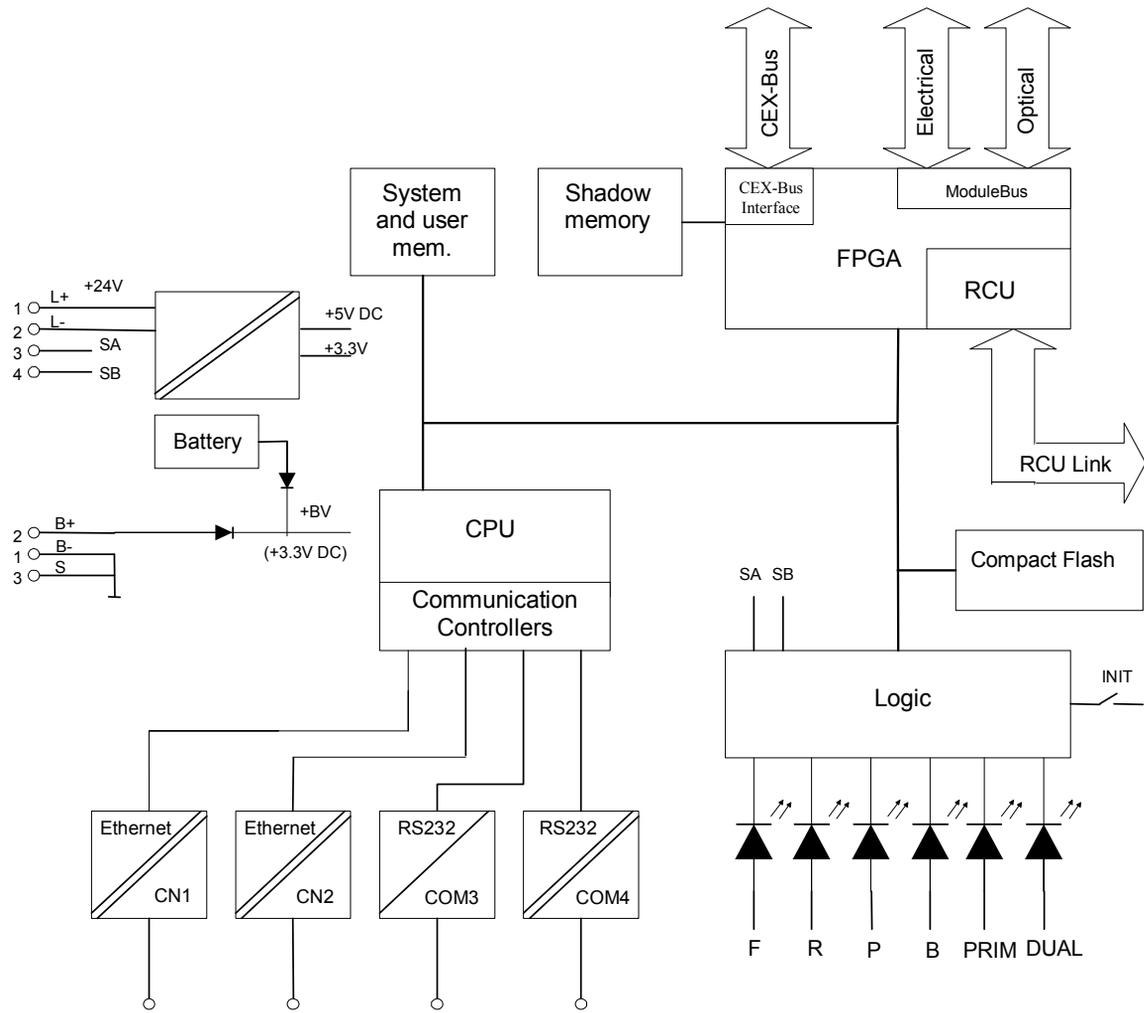


Figure 5. PM861/PM864/PM865/PM866 – Functional Block Diagram

PROFIBUS DP, FOUNDATION Fieldbus H1, FOUNDATION Fieldbus High Speed Ethernet and dual RS-232C ports are some examples of unit types available for connection to the CEX-Bus. It is possible to use redundant communication interfaces, for example PROFIBUS DP.

Figure 6 on page 38 provides examples of various ways to connect the S800 I/O units. It can be seen, at the top right-hand area of Figure 6 on page 38, that one cluster (or group) of units (maximum number of units per cluster is 12) is connected to the electrical ModuleBus of an AC 800M Controller. However, a further seven clusters (each comprising up to 12 units) can be added to the optical ModuleBus, thus achieving a total count of 96 units per AC 800M Controller when using only the ModuleBus.



Connecting S800 I/O units (using the ModuleBus) to an AC 800M Controller mounted with a **PM851/PM851A** processor unit is restricted to, one electrical ModuleBus cluster and one optical ModuleBus cluster.

To the left on Figure 6 on page 38, there is a PROFIBUS DP segment. This allows for a large increase in the numbers of units connected to each AC 800M Controller. Here the segment is shown as having an FCI unit (type CI801), connected to the PROFIBUS DP network. The use of FCI units allows the selection of units from several I/O families.

Figure 7 on page 39 shows another example for I/O units based on a FOUNDATION Fieldbus High Speed Ethernet (FF HSE).

For further examples refer to the relevant documentation for the I/O system in question.

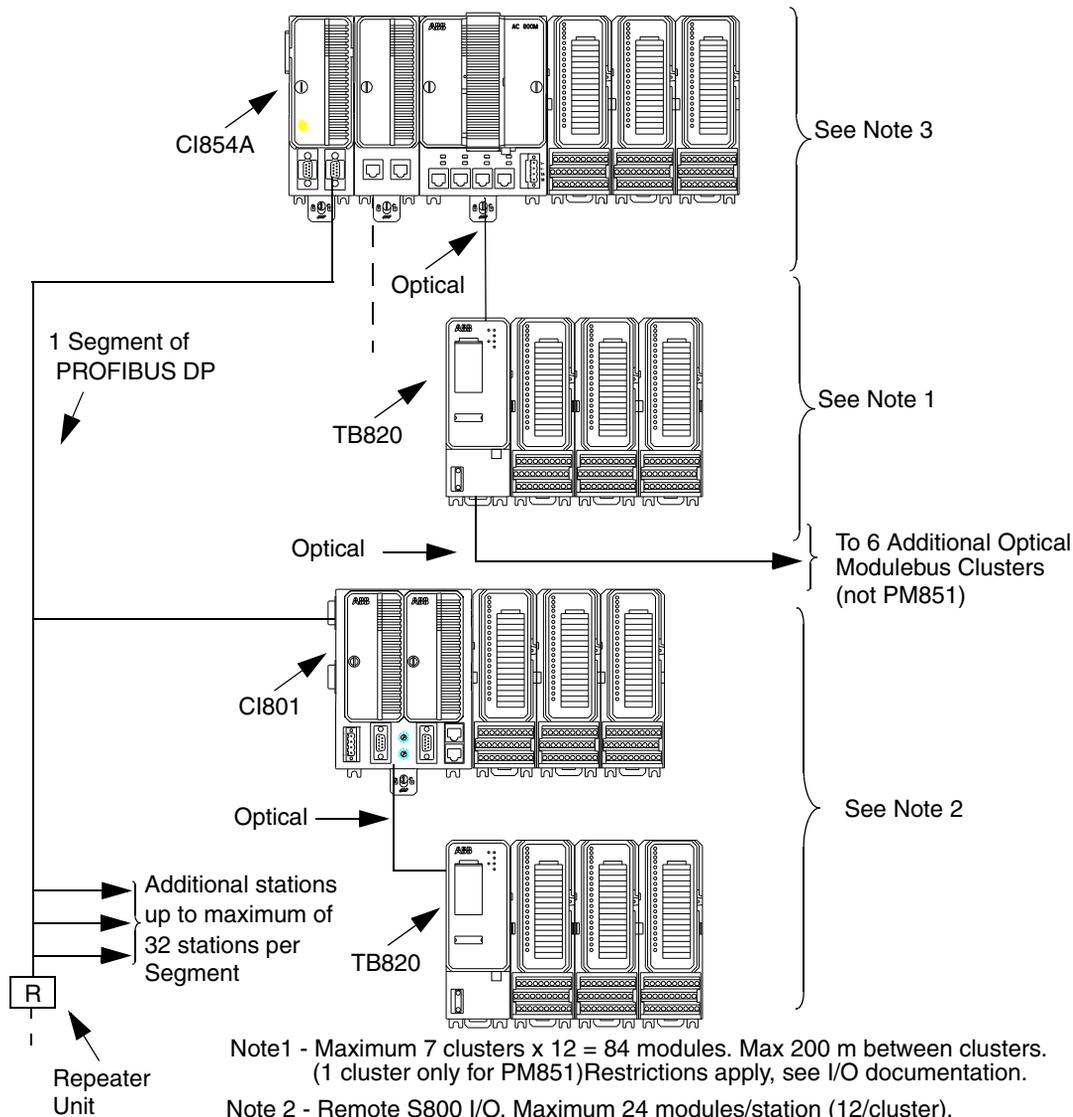


Figure 6. Example of AC 800M/S800 I/O Interconnection in Single CPU Configuration

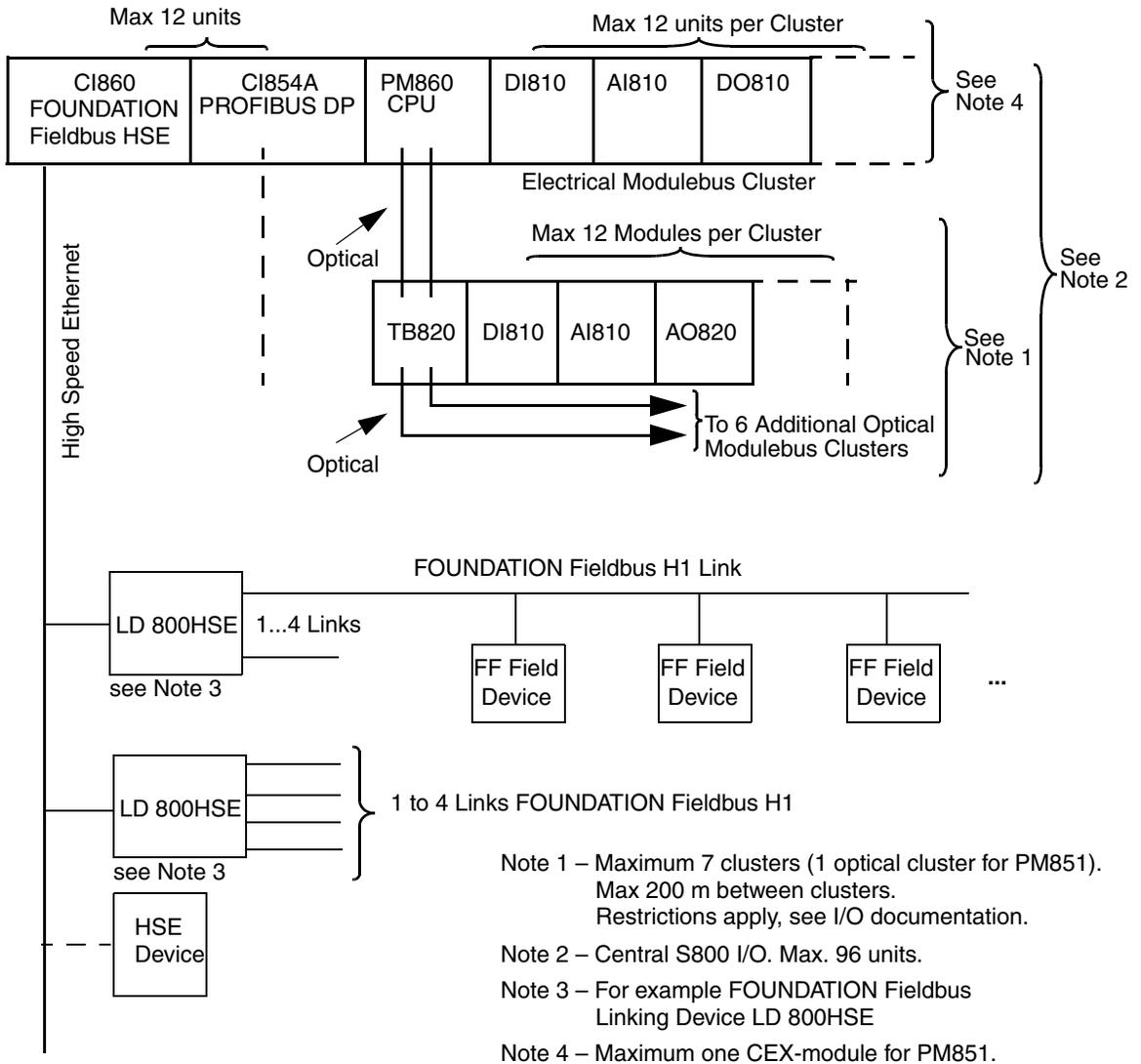


Figure 7. Example of AC 800M/S800 I/O and FOUNDATION Fieldbus High Speed Ethernet Interconnection in Single CPU Configuration

## PM891 Processor Unit – General

PM891 is a high performance controller, which is capable of handling applications with high requirements.

PM891 connects to the S800 I/O system through the optical Modulebus. It can act as a stand-alone Process Controller, or as a controller performing local control tasks in a control network.

Two PM891 controllers can function together as a redundant pair, with one PM891 acting as the primary controller and the other acting as the backup. The backup controller takes over the process controller tasks if any hardware error occurs in the primary controller.

The control network connectivity is obtained by two built in IEEE802.3 Ethernet channels on PM891.

PM891 also provides a communication expansion bus (CEX-Bus) to which a number of expansion modules can be connected. These modules offers connectivity to a wide range of field bus and I/O systems. In case of a redundant pair, both PM891s are connected to the same CEX-Bus and one of them can control the modules.

Physically, the PM891 Processor Unit consists of:

- Connector for power supply and status signals (L+, L-, SA, SB).
- DB25 connector for Electrical CEX-Bus.
- External battery connector.
- RJ45 connectors for the two Ethernet channels.
- One Com port.
- Optical Modulebus connector for connection to a maximum of seven clusters, with 12 non-redundant or six redundant modules (that is,  $7 \times 12 = 84$  modules).
- Connectors for Redundancy Link.
- SD (Secure Digital) memory connector.
- LEDs.
- Pushbutton reset switch.

Figure 8 shows the front view, Figure 9 shows the top view, and Figure 10 shows the bottom view of PM891.

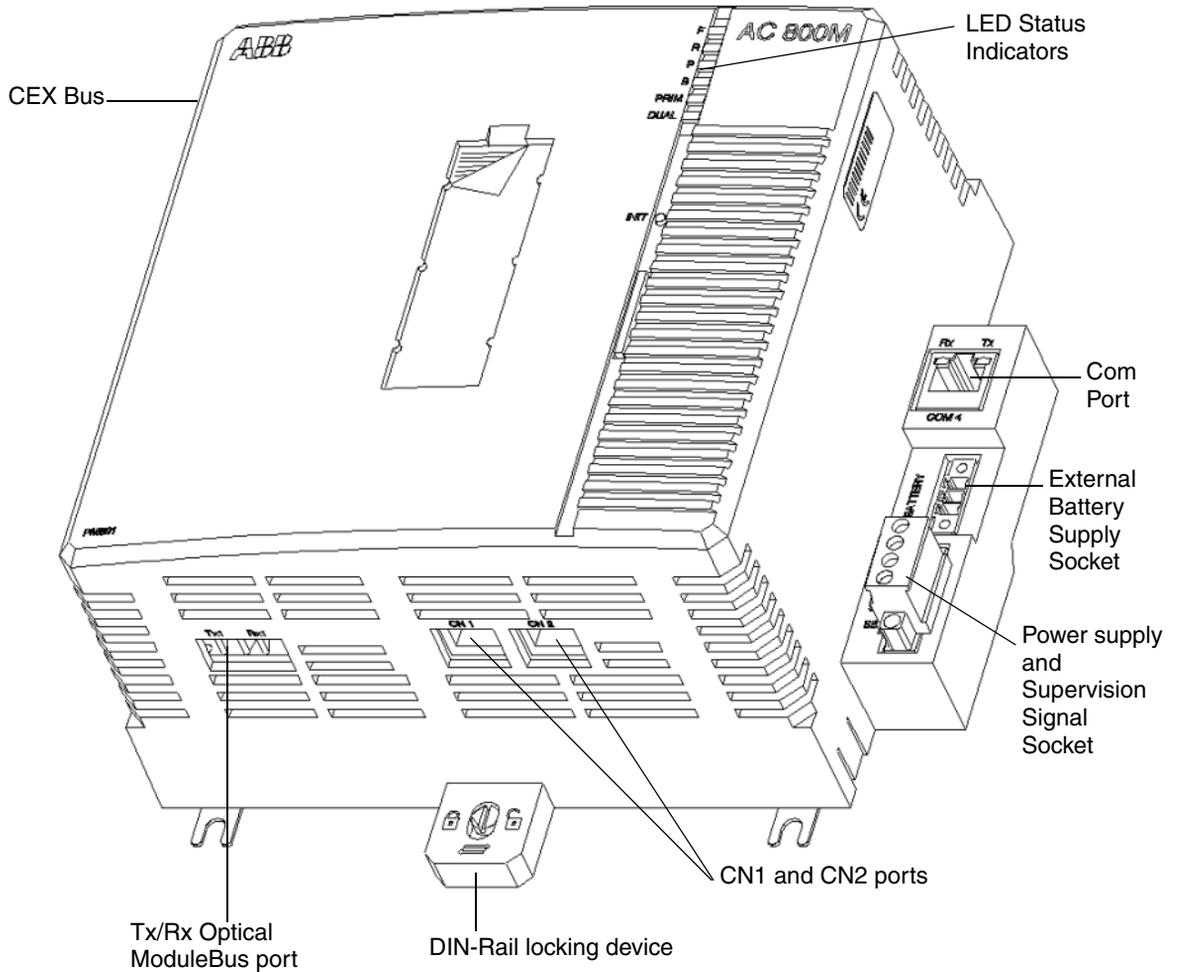


Figure 8. PM891-Front view

Screw terminals are provided for connections to the power supply and the external battery.

The 24 V DC power supply powers all the units on the CEX-Bus. The optical module clusters are powered independently.

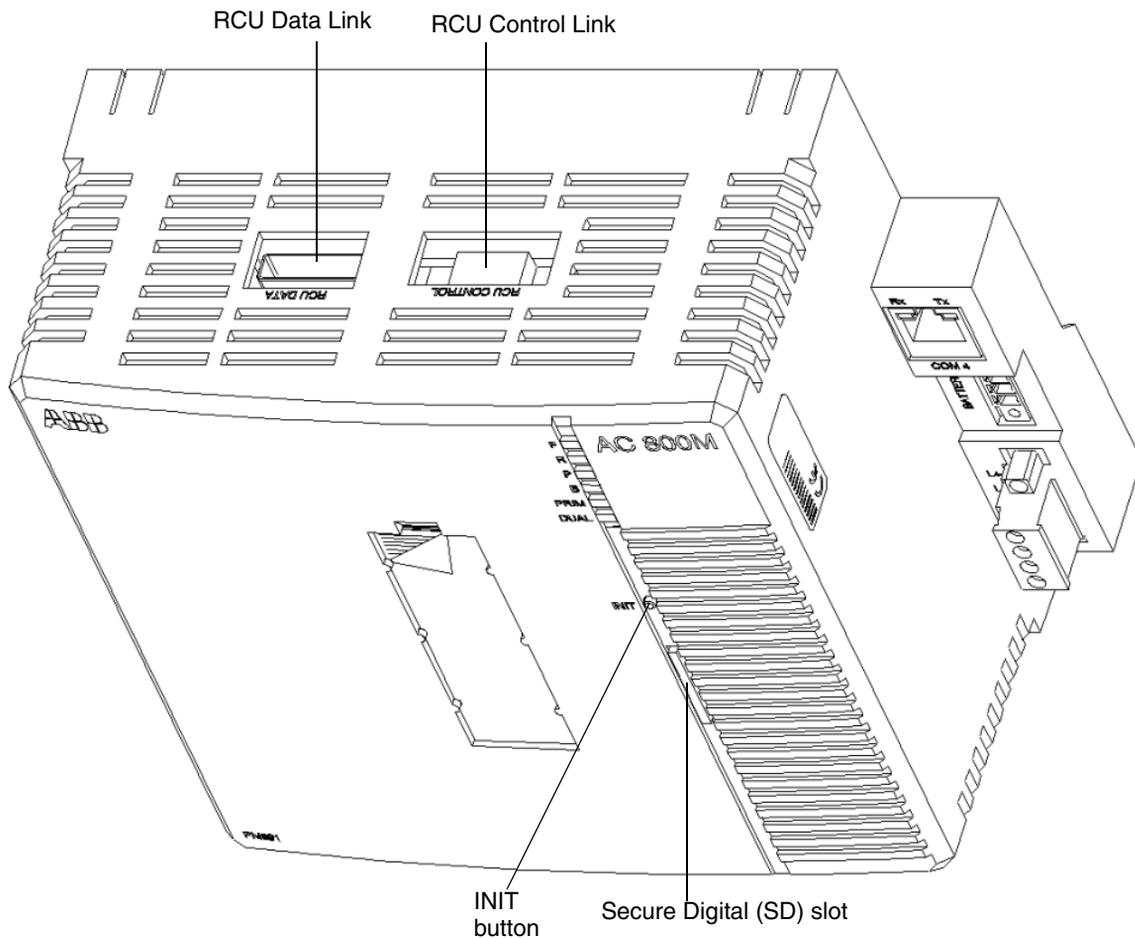
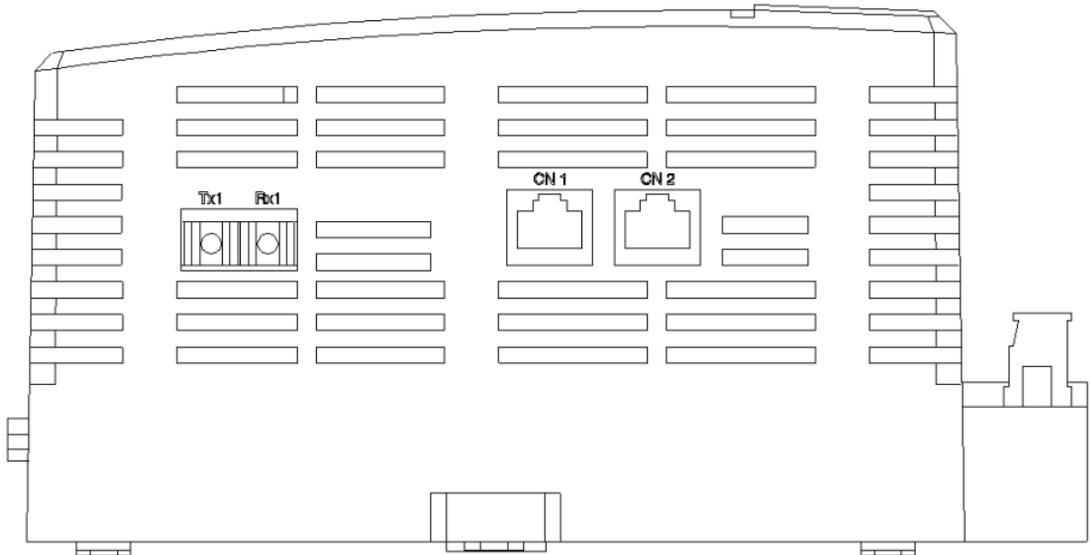


Figure 9. PM891-Top view



*Figure 10. PM891 - Bottom view with Tx1/Rx1 and CN1/CN2 ports.*

The Redundancy Link consists of two cables; RCU Data Link Cable and RCU Control Link Cable (see [Figure 9](#)).

[Figure 11](#) shows the block diagram of PM891.



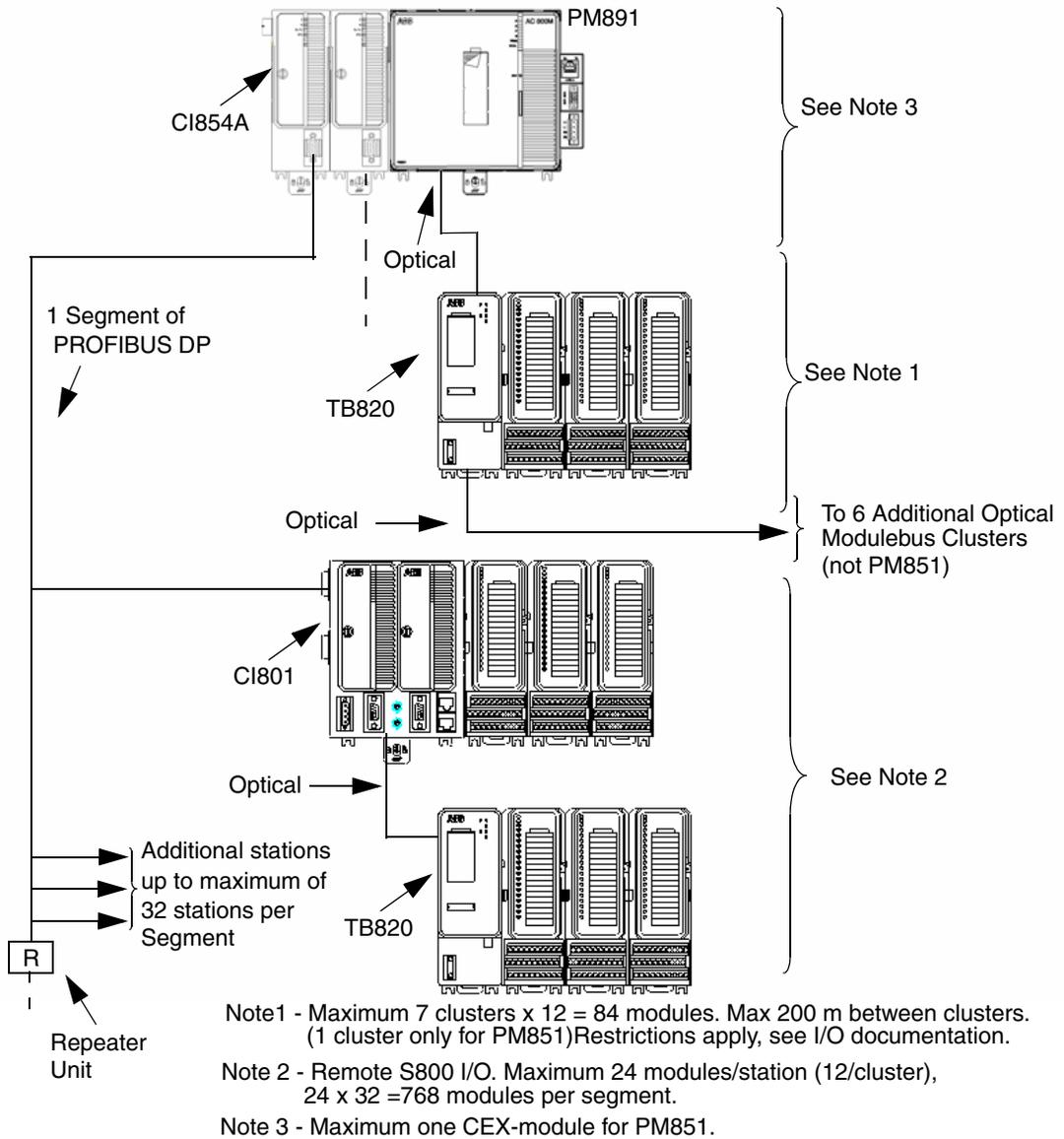


Figure 12. AC 800M/S800 I/O Interconnection Configuration with single PM891

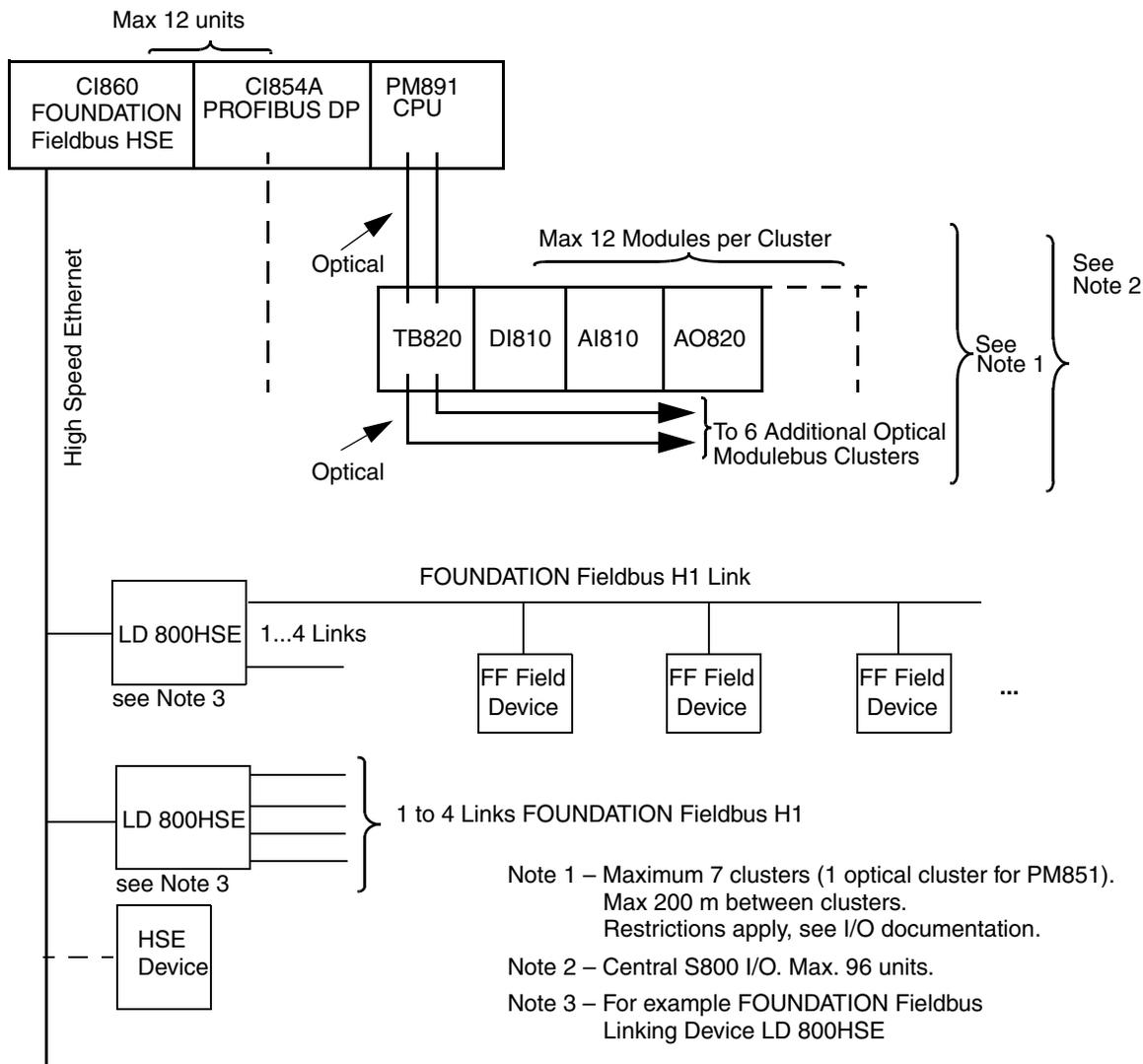


Figure 13. Example of AC 800M/S800 I/O and FOUNDATION Fieldbus High Speed Ethernet Interconnection in Single PM891 Configuration

## PM891/PM86x/TP830 Processor Unit – Redundancy

Processor unit redundancy is available for PM861, PM864, PM865, PM866, and PM891. In this case, the controller contains two processor units, each including memory for system and application software. One unit is acting as primary, the other is backup (hot stand-by). The primary processor unit controls the process. The backup stands by, ready to take over in case of a fault in the primary. The changeover is done bumplessly and in less than 10 ms. During the changeover, the process outputs are frozen.

Following a changeover, the system operates as a system without redundancy with only one processor unit in operation. You can replace the malfunctioning processor unit while the system is running. After the replacement is carried out, the system once again has a redundant processor unit.

If an error arises in the backup unit, you can also replace the backup unit while the system is running.

Errors which occur in the backup unit can never affect the primary unit's operation. The primary unit and the backup unit are logically separated from one another. Hardware errors in the primary processor unit cause the system to perform a correct changeover. These hardware errors are single errors.

The application programming and the communication are totally unaffected by the redundancy.

### PM86x/TP830 Redundancy



The serial port, COM3 on the baseplate TP830, cannot be used in redundant CPU configuration.

The PM861/PM864/PM865/PM866 has an RCU Link Connector for connecting the RCU Link Cable (see [Figure 2](#) on page 32). In a redundant system the two processor units are linked together with the RCU Link Cable (max 1 m). Both processor units are also connected to the same CEX-Bus and either of the two can control the expansion units (see [Figure 29](#) on page 93).

S800 I/O units are connected to the two CPUs via the optical ModuleBus and two TB840 cluster modems on each S800 I/O cluster (see [Figure 55](#) on page 161). The built-in electrical ModuleBus on the TP830 baseplate cannot be used for connecting S800 I/O in a redundant system.

**PM891 Redundancy**

The Redundancy Link in PM891 consists of two physical links. These are the RCU Data Link and the RCU Control Link.

The RCU Data Link is a fast communication channel used to transfer the data required to keep the backup CPU synchronized with the primary CPU. TK855 RCU Data Link Cable is used for the data link.

The RCU Control Link is used for role selection and CPU identity assignment (UPPER/LOWER). TK856 RCU Control Link Cable is used for the control link.

**Fault Tolerance Principle**

The principle of fault tolerance in the redundant processor units is based on continuous updating of the backup unit to the same status as the primary unit. This enables the backup unit to assume control without affecting surrounding systems in a bumpless manner.

This principle involves dynamic division of the program execution into execution units and the creation of rollback points at which the processor unit's status is completely defined.

In this context, the processor unit's total status is defined as the processor unit's internal status, that is, the contents of the processor registers, plus the contents of the data memory.

The backup unit's status is updated each time the primary unit passes a rollback point, enabling the backup unit to resume program execution from the last rollback point passed, should the primary unit fail due to error.

In order to minimize the amount of information involved in the update, the backup unit is updated only with the changes taking place since the latest rollback point.

Between rollback points, these changes that writes in the data memory, are stored in a log buffer in the backup unit. At a rollback point, the processor's total register contents are also written into the data memory, so that this information is also logged. Once the rollback point is established, the logged write operations are transferred to the backup unit's data memory.

If the primary unit fails because of an error, the backup unit resumes execution from the last rollback point, which means the last execution unit is partially re-executed by the backup unit. In order to re-execute a portion of the execution unit without affecting the peripheral units (communication units on the CEX-Bus), the peripheral units' references are also logged between rollback points. During re-execution, the results of the peripheral units' references, which have already been executed, are used, rather than re-executing them. The results of read operations are retrieved from the log, and write operations pass without execution, since they have already been executed. The peripheral units' statuses, then, are not affected by the re-execution in any way, except for the time delay which occurs.

The RAM included in the processor unit provides an automatic double inverted memory function for detection of arbitrary bit errors in the memory.

- All memory updates are written to both the primary memory and to the inverted memory in parallel.
- At every memory read cycle, the data from the two memories is compared.
- If there is a mismatch in the data a changeover is forced.

The double inverted memory handling is done in hardware and without any delay to the memory cycle time.

### **MAC and IP Address Handling in Redundant Configuration**

In order to provide for a bumpless changeover with respect to the control network, both the MAC and IP addresses are swapped between the initial primary and backup CPUs. The addresses of the initial primary CPU are stored and kept as the addresses used by the acting primary CPU. Similarly the addresses of the initial backup CPU are stored to be used by the acting backup CPU. This means that a redundant controller will be always identified and recognized by the same addresses regardless of which CPU module actually acting as primary.

The following characteristics of the MAC and IP address handling should be considered in order to avoid network problems while reusing previously used CPU modules within the same plant:

- The stored swap addresses will be remembered until erased by an IP-config session (Restore factory settings) or until started up as a backup CPU in new context (in this case a new swap will take place).
- A CPU running in standalone mode (with RCU terminator fitted) will always use its own native addresses.

## AC 800M High Integrity

AC 800M can easily be configured for usage in safety critical applications. The main components of such a system are PM865, SM810/SM811, SS823 and the S800 I/O High Integrity, running a High Integrity version of Control Software. The PM865 processor unit has increased internal diagnostics, compared to PM864. The added functionality on PM865 includes:

- Double over voltage protection on internal voltages
- A additional watchdog timer updated with data from SM810/SM811
- Increased oscillator supervision
- Support for S800 I/O High Integrity
- Support for SM810/SM811
- Increased system diagnostic and online self tests.



The following CEX modules cannot be used in a High Integrity controller: CI851, CI852, CI858, CI860, CI862 and CI865.

The main function of the SM810 is to act as a monitor for the HW and SW execution of PM865 and these two modules together are a SIL2 compliant system according to IEC61508, certified by TÜV. The SM810 is running a SIL3 certified operating system and have a high degree of self-diagnostic including, for example:

- Double and inverted memory
- Double over voltage protection on internal voltages
- Two independent watchdog timers

- Oscillator supervision
- CRC on firmware and data storage

An SM811 operates like an SM810 for SIL2 but can also together with the PM865 form a controller compliant with SIL3 according to IEC61508, certified by TÜV.

The ModuleBus telegrams used in a High Integrity system with the S800 High Integrity modules use the concept of long frames. Long frames are ModuleBus telegrams that are extended with a safety header, comprising additional diagnostics data and CRC32. S800 ModuleBus telegrams sent to the S800 I/O High Integrity modules uses data from the PM865 and an inverted CRC32 from the SM810/SM811. The I/O module checks that the safety header is correct. Data received from the S800 I/O High Integrity modules over the ModuleBus have the safety header independently verified by both SM810/SM811 and PM865. Any CRC32 or other faults in the safety header will result in a retry transmission and, if repeated, a shutdown of the faulty S800 I/O High Integrity module.

## Control Software

The software used by the AC 800M Controller is named Control Software. This name does not stand for a specific software package; is merely a generic name for the scope of functions used in a controller. These functions are provided by:

- Hardware functions (supervision, communication buses, I/O buses)
- Firmware functions loaded into the controller (real time executive system, real time clock, redundant communication)
- Application programs loaded into the controller (library functions, communication protocols).

To produce an application, it is necessary to use the Control Builder M tool. This tool is extremely versatile, having many useful functions in addition to system configuration.

## Ethernet Address for PM8xx (Except PM891)

Each TP830 Baseplate is provided with a unique Ethernet address that provides every CPU with a hardware identity.

This functionality takes the form of two identification addresses residing in the non-volatile memory of the TP830 Baseplate. The lowest address (a 12 character Hex code) is located on an adhesive label attached to the TP830 Baseplate. The remaining address is the lowest +1. See [Figure 14](#) on page 53 for label location details. See software documentation for details on loading the software and using Ethernet address.

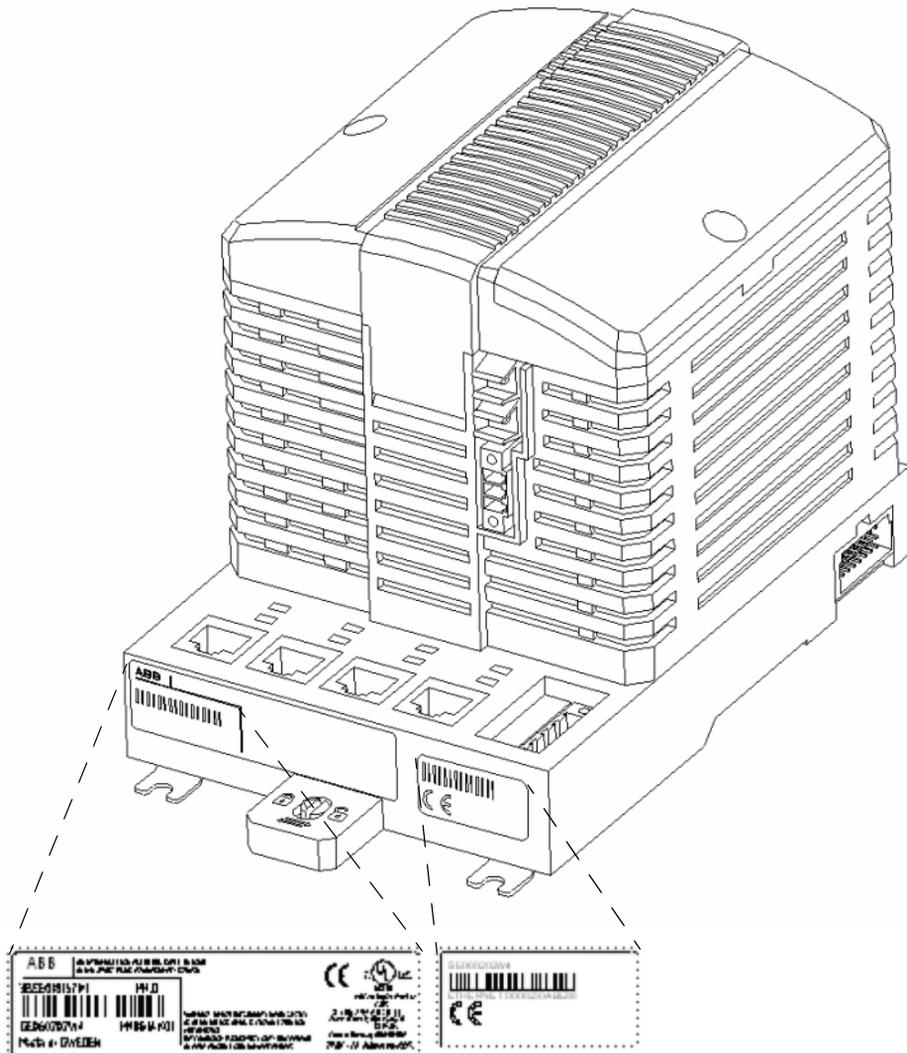


Figure 14. Identification Labels and their position on PM8xx (except PM891)

## Ethernet Address for PM891

Each PM891 unit is provided with a unique Ethernet address that provides hardware identity to the unit.

This functionality takes the form of two identification addresses residing in the non-volatile memory of PM891. The lowest address (a 12 character Hex code) is located on an adhesive label attached to the cover of PM891 unit. The remaining address is the lowest +1. See [Figure 15](#) on page 55 for label location details of PM891. See software documentation for details on loading the software and using Ethernet address.



## AC 800M Controller – Key Features

- Modularity, allowing for step-by-step expansion.
- Simple DIN-rail attachment/detachment procedures, using a unique slide and lock mechanism.
- Fast, simple troubleshooting procedures available via unit/channel LEDs.
- IP20 Class protection with no requirement for enclosures.
- Allows for the use of low-cost, sealed enclosures due to extremely low unit heat dissipation, even at an ambient temperature of 40 °C (104 °F) outside the enclosure.
- All units are fully EMC certified.
- Connection of up to 192 I/O signals, via Electrical ModuleBus, is available.
- Connection of up to 1344 I/O signals, via Optical ModuleBus, is available.
- Connection of S100 I/O is available.
- Connection of Satt I/O is available.
- Allows connecting a large number of I/Os, via PROFIBUS DP.
- Connection to FOUNDATION Fieldbus High Speed Ethernet (FF HSE).
- Connection to Modbus TCP.
- Connection to IEC 61850.
- Connection to Advant Fieldbus 100.
- Connection to MOD5-to-MOD5.
- Connection to PROFINET IO.
- Connection to EtherNet/IP.
- Allows connecting custom protocols of a large amount of Serial communication RS-232C ports.
- Connection to MasterBus 300 Networks.
- Connection to INSUM via Gateway (Ethernet/LON).
- Connection to ABB Drives is available, over DriveBus and ModuleBus.

- Built-in battery backup of memory (except for PM891 that uses external battery backup only).
- External battery backup.
- CPU Redundancy (PM861/PM864/PM865/PM866/PM891).
- Redundant/sectioned CEX-Bus using a pair of BC810.
- Safety Integrity Level 2 certified controller using PM865/SM810/SM811.
- Safety Integrity Level 3 certified controller using PM865/SM811
- Support for hot swap of CEX-Bus units.

## Product Release History

The AC 800M hardware platform has been allocated the initial version number 1.0. This number is required to keep the configuration of all units and components on the AC 800M platform together, and to act as a reference in the future between different documents. As the AC 800M hardware platform configuration grows in future releases, so the version number will increase accordingly.

See [Table 2](#) on page 57 for the product version release history of AC 800M.

*Table 2. AC 800M Release History*

| Version | Description   | User Doc         |
|---------|---|------------------|
| 5.1.1   | PM851A, PM856A, and PM860A are added.<br>Redundancy for CI873 is added. | 3BSE036351-510 A |
| 5.1     | PM891, CI869, CI871, CI872, CI873 are added                             | 3BSE036351-510   |
| 5.0 SP2 | CI868, PM866, SM811 are added.  | 3BSE036351R5021  |
| 5.0 SP1 | SB822 and CI867 are added.  | 3BSE036351R5011  |
| 5.0     | CI865 is added.   | 3BSE036351R5001  |

Table 2. AC 800M Release History

| <b>Version</b> | <b>Description</b>   | <b>User Doc</b>   |
|----------------|--|-------------------|
| 4.1            | New information about SS823 is added. SM810 and Compact Flash have been added. | 3BSE036351R4101   |
| 4.0            | CI862 is added.  | 3BSE036351R4001   |
| 3.1            | PM851 is added   | 3BSE 036 351 R101 |
| 3.0            | PM865, PM861A, PM864A, BC810, SM810, CI854A, CI858, CI860 and SS823 are added. | 3BSE 030 827 R201 |
| 2.1            | PM864 is added.  | 3BSE 027 941 R301 |
| 2.1            | CI855 and CI856 are added.   | 3BSE 027 941 R101 |
| 2.0            | PM861 and CI854/CI857 are added.   | 3BSE 026 020 R101 |
| 1.1            | PM856 and CI852 are added.   | 3BSE 019 193 R201 |
| 1.0            | Initial AC 800M release.   | 3BSE 019 193 R101 |

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## Section 2 Installation

This section contains guidelines for planning the installation of an AC 800M controller system (see [Site Selection and Building Requirements](#) on page 59). A complete list of measures to be taken with respect to the environment and other on-site conditions is not given here.

The equipment should be adapted to the actual application by means of a thorough and correctly scoped system definition, ordering procedures and design requirements. This section also describes practical on-site installation procedures specific to AC 800M units (see [Mounting AC 800M Units onto DIN-Rail](#) on page 65).

### Site Planning

#### Site Selection and Building Requirements

The AC 800M system is designed for use within demanding industrial environments. This section provides information on standard requirements regarding the location at which or the building(s) in which the AC 800M Controller system is to be stored or installed.

Most applications require no special arrangements regarding the environment, and installation according to standard regulations will suffice. In certain situations however, consideration must be given to specific protective measures.

When planning a control system installation, the following points must be considered:

- Temperature:
  - It is important to note the ambient air temperature as well as that within enclosures. Lower temperatures increase system reliability and availability.
  - If maximum permitted temperatures are exceeded, the anticipated lifetime of wet, electrolytic capacitors and most semiconductors will be greatly reduced.
- Vibration:
  - Regarding routine vibration it is recommended that floor enclosures/cabinets stand on a sound, level surface, and that wall enclosures/cabinets are mounted on sound, vertical walls.
  - Should the AC 800M system be installed in a control room, adjacent to large machinery such as shakers or large presses where frequent major vibration is expected, then shock absorbers or an isolation pad may be required to protect system equipment. Shock absorbers will normally protect the equipment from sustained low-level vibrations that are perceivable, but not unduly excessive.
  - It is recommended that additional fastening screws be used to prevent vibration-generated noise.
  - If vibrations or shock are a major factor, further consideration must be given to more extreme measures to reduce the problem.
- Cooling:
  - Cooling the electronics is achieved by self-convection. The AC 800M units are designed for wall mounting and must be mounted horizontally onto a DIN-rail to avoid generating high temperatures within the units.
  - ABB cabinets (RM550 or RE820) may be used up to an ambient temperature of 40°C (104°F), with no requirement for additional cooling equipment, such as fans.

- Grounding:
  - Grounding, cable selection and cable routing must be considered for electromagnetic interference-free operation. Planning considerations are discussed in the subsequent sections.
- Other requirements:
  - Room lighting independent of the equipment power source. A battery-powered emergency lighting system is recommended.
  - A well-developed process connection, with or without marshalling facilities.
  - Effective grounding through a net of copper bars
  - Cable routing observing standard installation regulations.
  - Availability of power and other necessary utilities.
  - Observation of standards and legal regulations.
  - Sufficient free space in front of the cabinet in order to fully open the doors. For safety reasons there must always be adequate space available, even with the doors in the fully open position.

For additional information regarding design considerations, see [Appendix B, Power Consumption](#).

### **Electro-Magnetic Compatibility**

The AC 800M units are intrinsically EMC compatible according to CE marking rules. For additional information regarding Electro-Magnetic Compatibility, see [Appendix D, Directive Considerations](#).

## Cables

### Laying Field Cables

There are no special requirements for laying field and communication cables connected to AC 800M. However:

- Cables for short-distance communication without modems should always be routed at a distance of 10 cm (4 in) from other cables.
- All cables connected to AC 800M should be routed at a distance of 30cm (12 in) from all power cables and 10 cm (4 in) from cables belonging to the relevant international immunity standard, class 4.

### Type of Field Cable

Always use shielded cables for the following applications:

- Communications
- High-frequency pulse transmission
- Low level analog signals, for example Pt100 and thermocouples

Unshielded cables may be used for other applications. The signal and return conductor should be located in the same cable.

### Lightning Protection

Industrial installations and power plants are normally provided with well-integrated grounding networks, installed as part of the power distribution system. Such installations do not require additional lightning protection unless using overhead wiring or suspended cables in an outdoor environment.

However, large dispersed plants such as water supply installations and oil refineries will have an inadequate grounding system where signal cables may be routed above ground. In such cases lightning protection equipment must be installed.

Should cables be discovered outside the grounding system (even at a short distance such as 10 m [9.1 yds]) lightning protection equipment must be installed.

## Power Supply

Under normal circumstances, the power supply required by AC 800M Controller and associated field equipment can be obtained from the plant's standard 120/230 V AC mains supply.

### Mains Net Filter

It is not necessary to use mains net filters when using the SD831/832/833/834 power supply units.

### Mains Breaker

A mains breaker must be installed in the immediate vicinity of a controller installation to allow for immediate **total** power supply disconnection to the equipment, should the need arise. However, the prime function of the mains breaker is to provide a means of isolating the power supply completely during maintenance.

The mains breaker must be installed in a location where it is both easily accessible and clearly visible, that is, outside any enclosure or cabinet.

### Protective Earth (PE)

Always install a protective earth connection on equipment connected to a 115/230 V AC supply.

For electrical safety reasons all conductive parts, such as the DIN-rail or the conductive parts to which the rail is fastened, are required to be connected to PE. The safety aspect that requires such a PE-connection is due to e.g. in-cabinet wiring providing basic insulation only or accidental touch/connection (e.g. loose wires) of hazardous voltages to conductive metal parts.

The connection shall fulfill the requirements in IEC61131-2 for PE connections, that is: A conductor which, having a static current of 30 A flowing through, measures a voltage drop which corresponds to  $<0.1$  ohm.

ABB strongly recommends that the equipment PE-conductor should be of 35 mm<sup>2</sup> (2 AWG) cross section if copper lead.

### Fusing the External Mains Supply Cable

The recommended fuse rating for the external mains supply of a standard AC 800M Controller configuration, housed within a floor or wall-mounted cabinet, is given in [Table 3](#) on page 64.

*Table 3. External Mains Supply – Fuse Rating*

| Fuse Rating | Fuse Type           |
|-------------|---------------------|
| 10 A        | Delayed action fuse |

Should the configuration be other than that stated, instructions for calculating current consumptions can be found in the relevant I/O manual. For the AC 800M Controller, see [Appendix B, Power Consumption](#).

### Uninterruptable Power Supply

The SD83X series of power supply units comfortably handle the short power interruptions (<20 milli seconds) that may occur normally within an industrial environment. Despite this, it is sometimes necessary to protect certain applications against brief voltage failures by the installation of an Uninterruptable Power Supply (UPS) device.

The AC 800M controller will shut down safely in the event of a power failure. During down-time, the application memory and the system clock will be backed up by the internal battery. In systems subject to long non-operational periods, it is recommended that an external battery back-up unit be installed. When the power supply is reconnected, the AC 800M Controller will re-start and run the application as normal.

If the effects of unexpected shutdowns are not acceptable, it is highly recommended that the AC 800M Controller be fully protected by connection to an Uninterruptable Power Supply (UPS) source.

## Enclosures

The AC 800M and S800 I/O units hold protection class IP20, with each unit being individually CE-marked. If a higher IP class is required, an additional enclosure is needed.

Normally the use of an additional enclosure will not influence the EMC characteristics of the controller.

### **Enclosure Mounting**

When mounting the controller enclosure, it is important to provide certain minimum distances between the enclosure, the walls and the ceiling, in order to provide satisfactory ventilation.

If the enclosure is provided with removable wall cladding, it is important to ensure that this is not removed from any enclosure adjacent to other enclosures containing equipment not belonging to the AC 800M Controller and its connected S800 I/O.

### **ABB Cabinets**

As a suitable enclosure, ABB recommends the following two cabinets, both specially adapted for mounting the AC 800M Controller and S800 I/O. Both are sealed to protection class IP54 and can support the Controller and S800 I/O units with no requirement for additional cooling equipment:

- RM550 – Floor-mounted cabinet
- RE820 – Wall-mounted cabinet.

For further information on ABB cabinets, see [Appendix C, Recommended Components](#).

## **Mounting AC 800M Units onto DIN-Rail**

Since the AC 800M units (CPU and communication interfaces) are cooled by self-convection, it is important that they only be mounted onto a horizontal DIN- rail.

Each baseplate has a locking mechanism that contacts the metal backplate to the DIN-rail, providing an effective ground connection. The DIN-rail functions as a very effective ground for the system.

The additional screw lugs, located in the lower part of the baseplate, serve no electrical function. They are provided for use should extra fastening be required within environments subject to excessive vibration.

There are two ways of mounting the product in cabinets, open rack or other types of installations; aluminum profile with mounted DIN-rail or DIN-rail mounted on a metal sheet of proper size. The aluminum profile or metal sheet shall be properly connected to protective earth.

DIN-rail type with height 7.5 mm shall be used. Refer to type NS 35/7.5 according to standard EN50022.

The interference suppression for external signals, are normally directly grounded to chassis and/or plant ground. The plant ground potential must be stable and well defined, even in the event of a low ground fault caused by high voltage equipment or a lightning strike.

Each module's conductive back plane connects to the metallic DIN-rail which serves as the module electronics ground conductor between the interconnected devices. This is to ensure a good ground connection both for the internal logic and for the EMI immunity and RF emission of the modules. The DIN mounting rail must have a good bond to the PE of the cabinet.

If AC 800M modules are configured as two or more groups interconnected with extension cables, special care should be taken to ensure that the DIN-rails of all groups have a good connection to ground. Also ensure to fix the figure numbers.

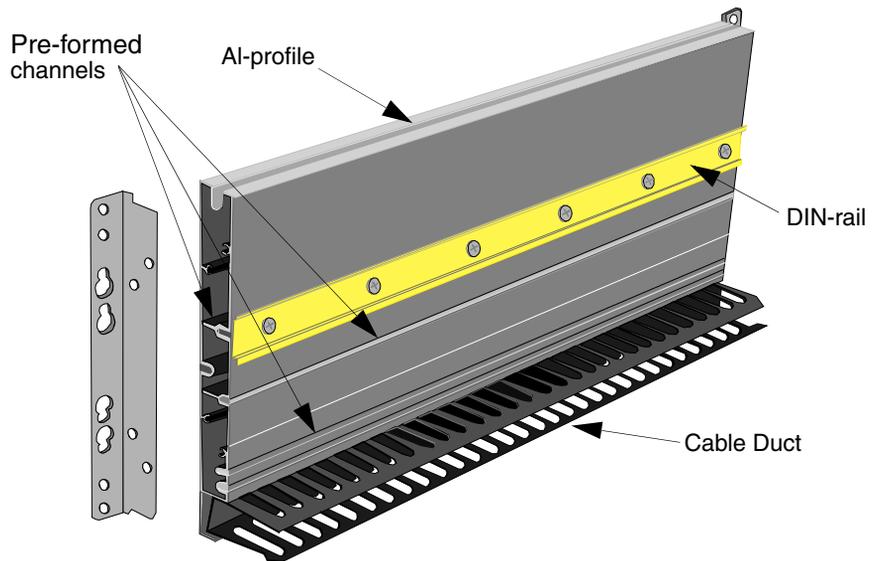
## **Mounting on metal sheet**

The DIN-rail shall be firmly attached to an unpainted metal sheet with fastening screws every 100 mm (4 in) to ensure good mechanical stability and a good chassis ground connection in the cabinet or an open rack.

The metal sheet shall at least be 2.5 mm thick and at least 180 mm high. The metal sheet shall be mechanical fastened at least every 500 mm to the cabinet or rack with a minimum of four screws. The fastening to the cabinet frame shall be performed with self-tapping screws to get a good grounding connection.

## Prefabricated aluminum profile

There are aluminum profiles for horizontal mounting. The aluminum profile gives an excellent grounding and rigid mounting of products concerned. The aluminum profile shall be fastened to the cabinet with at least 4 self-tapping screws.



*Figure 16. Al-profile for DIN-rail support*

The profile has grooves for screws that can be used for fastening the modules in an environment with high vibrations.



The AC 800M Controller and associated units must be unpowered and disconnected when being mounted onto a DIN-rail!

### Mounting Procedure for PM8xx and C18xx Units, Complete with Baseplates



This topic does not apply to PM891. See [Mounting Procedure for PM891 Unit](#) on page 70.

Before mounting any processor unit or communication interface onto the DIN-rail, read carefully the installation instructions provided with the equipment. Since the electronic unit and baseplate are supplied as a single unit, there is no requirement to separate them during the mounting procedure.

Mounting the units onto the DIN-rail only requires a blade screwdriver that fits securely into the baseplate locking screw (1 mm slot). For further details on mounting procedure, see [Figure 17](#) on page 69.



It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

Use the following procedure to mount the baseplates, complete with units:

1. Rotate the locking device to the **OPEN** position (1), hook the upper hook at the rear of the unit baseplate securely over the upper edge of the DIN-rail and gently snap the baseplate fully into the mounting position.
2. Rotate the locking device to the **SLIDE** position (2), slide the unit along the DIN-rail to the desired mounting position and using the connector plugs and sockets gently attach it to the adjacent unit baseplate.



To prevent damage to the pins, be sure the baseplate plugs and sockets are fully aligned as the units interconnect. Under no circumstances use excessive force!

3. When interconnection is complete, rotate the locking device clockwise to the **LOCKED** position (3). The baseplate is now fully locked into position and has a good ground connection to the DIN-rail.



It is essential that the locking device be placed in the **LOCKED** position to avoid possible problems caused by vibration and/or intermittent grounding.

For further visual information on mounting AC 800M Controller units, see [Figure 18](#) on page 69.



Figure 17. Baseplate Locking Device

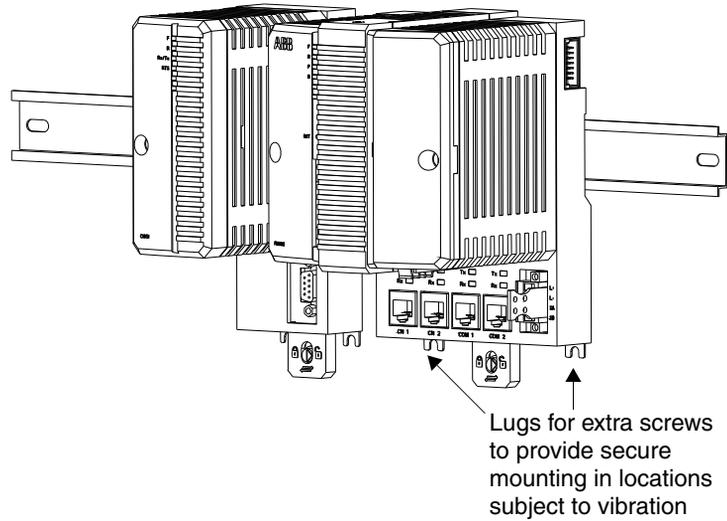


Figure 18. DIN-rail Mounting of AC 800M Units

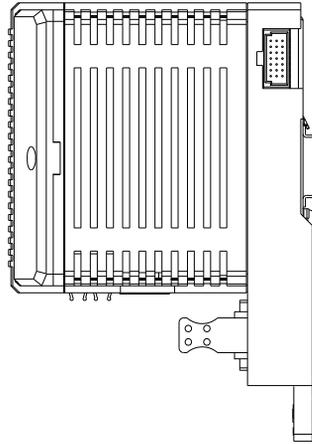


Figure 19. AC 800M Controller (except PM891) – Side View

### Mounting Procedure for PM891 Unit

Before mounting any processor unit or communication interface on the DIN-rail, read carefully the installation instructions provided with the equipment.

To mount the PM891 unit on the DIN-rail, a blade screwdriver that fits securely into the unit locking screw (1 mm slot) is required. For details about the unit locking screw, see [Figure 20](#) on page 71.

To mount the PM891 unit on the DIN-rail:

1. Rotate the locking device to the **OPEN** position (1), hook the upper lip at the rear of the unit securely over the upper edge of the DIN-rail, and gently snap the unit fully into the mounting position.
2. Rotate the locking device to the **SLIDE** position (2), slide the unit along the DIN-rail to the desired mounting position, and using the connector plugs and sockets gently attach it to the adjacent unit baseplate.



To prevent damage to the pins, ensure that the baseplate plugs and sockets are fully aligned as the units interconnect. Do not apply excessive force.

- When the interconnection is complete, rotate the locking device clockwise to the **LOCKED** position (3). The PM891 unit is now fully locked into the position and has a good ground connection to the DIN-rail.



It is essential that the locking device be placed in the **LOCKED** position to avoid possible problems caused by vibration and/or intermittent grounding.

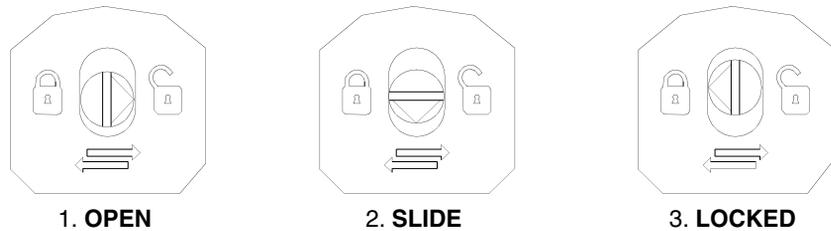


Figure 20. Unit locking for PM891

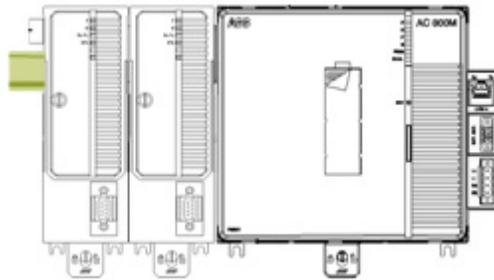


Figure 21. PM891 with other units mounted on DIN-rail

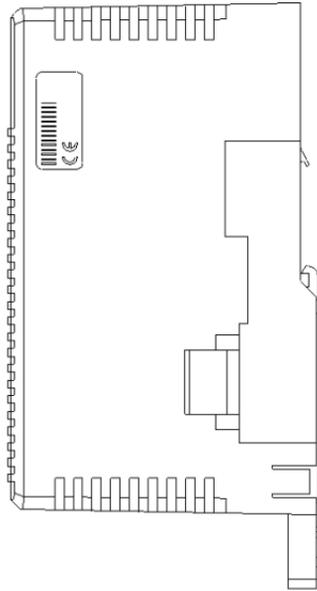


Figure 22. PM891 - Side view

### Removing Processor Units Complete with Baseplates



AC 800M units must be disconnected from the power source before removing them from a DIN-rail!



It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

Use the following procedure to remove a unit, complete with baseplate:

1. Switch off or disconnect the power supply to the controller units.
2. Remove any detachable cables from the appropriate unit baseplate.

3. Rotate the locking device to the **SLIDE** position (2) on the unit baseplate, see [Figure 17](#) on page 69.



In order to provide adequate access and removal space, note that the **SLIDE** sequence must be carried out on the unit baseplates adjacent to the unit that is to be removed.

4. Gently ease the unit/baseplates sideways in order to release the contacts of the unit baseplate being removed.
5. Turn the locking device anti-clockwise to the **OPEN** position (1) and ease the unit baseplate outward and upward at the base. Lift the unit to remove it from the DIN-rail. The AC 800M units must be disconnected from the power source before removing them from the DIN-rail.



The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see [Figure 23](#) on page 74).

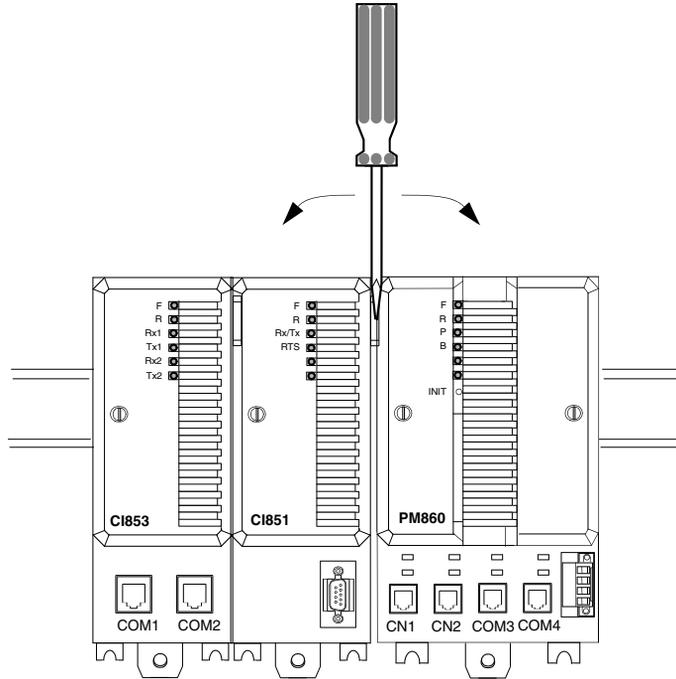


Figure 23. Separating the Baseplates

### Unit to Baseplate Alpha Code Lock

Baseplates have a pre-set Alpha code locking device. This locking device prevents the installation of an incompatible type of unit onto the base plate if the Alpha codes do not match. All identical unit types have the same factory pre-set, two-letter Alpha code installed prior to delivery.

The following unit types have two-part, pre-set Alpha code locking devices installed (see [Table 4](#) on page 75).

*Table 4. Factory Pre-set Alpha Codes*

| Unit  | Key Position 1   | Key Position 2   |
|---|------------------|------------------|
| CI851 PROFIBUS DP Interface                                       | A                | A                |
| CI852 FOUNDATION Fieldbus H1 Interface                            | A                | B                |
| CI853 RS-232C Interface   | A                | C                |
| CI854/CI854A PROFIBUS DP Interface                                | A                | D                |
| CI855 Ethernet interface for MasterBus 300                        | A                | E                |
| CI856 S100 interface  | B                | A                |
| CI857 INSUM Interface   | B                | B                |
| CI858 DriveBus Interface  | B                | C                |
| CI860 FOUNDATION Fieldbus High Speed Ethernet (FF HSE) Interface. | B                | E                |
| CI862 TRIO/Genius Interface                                       | (no Alpha lock)  | (no Alpha lock)  |
| CI865 Satt I/O  | C                | F                |
| CI867 Modbus TCP Interface  | D <sup>(1)</sup> | B <sup>(1)</sup> |
| CI868 IEC 61850 Interface   | D <sup>(1)</sup> | B <sup>(1)</sup> |

Table 4. Factory Pre-set Alpha Codes (Continued)

| Unit                                  | Key Position 1                              | Key Position 2                              |
|---------------------------------------|---|---|
| CI869 AF 100 Interface                | D   | C   |
| CI872 MOD5 Interface                  | D   | E   |
| CI871 PROFINET IO Interface           | D <sup>(1)</sup>                            | B <sup>(1)</sup>                            |
| CI873 EtherNet/IP DeviceNet Interface | D <sup>(1)</sup>                            | B <sup>(1)</sup>                            |
| BC810 CEX-Bus Interconnection Unit    | C   | A   |
| SM810                                 | C   | B   |
| SM811                                 | D   | D   |
| S800 I/O Units                        | Various – see S800 I/O Product/User's Guide | Various – see S800 I/O Product/User's Guide |

(1) The key positions are common to CI867, CI868, CI871 and CI873. Hence caution must be exercised in field replacement. Ensure that correct CI is inserted, especially in hot insert.

For further details on pre-set Alpha codes, refer to the relevant unit documentation.



Ensure that the baseplate and the unit to be mounted have compatible Alpha codes. Otherwise it may result in equipment damage. Any difficulty in installing a unit on a particular baseplate indicates a difference in Alpha Code lock.

See [Figure 24](#) on page 77 for further details of the Alpha code lock arrangement.

The mechanical keys are delivered pre-set and must not be altered. This prevents the removable interface being placed on the wrong type of baseplate.



Do not manipulate the locking device. ABB will take no responsibility for errors caused by manipulating locking devices.

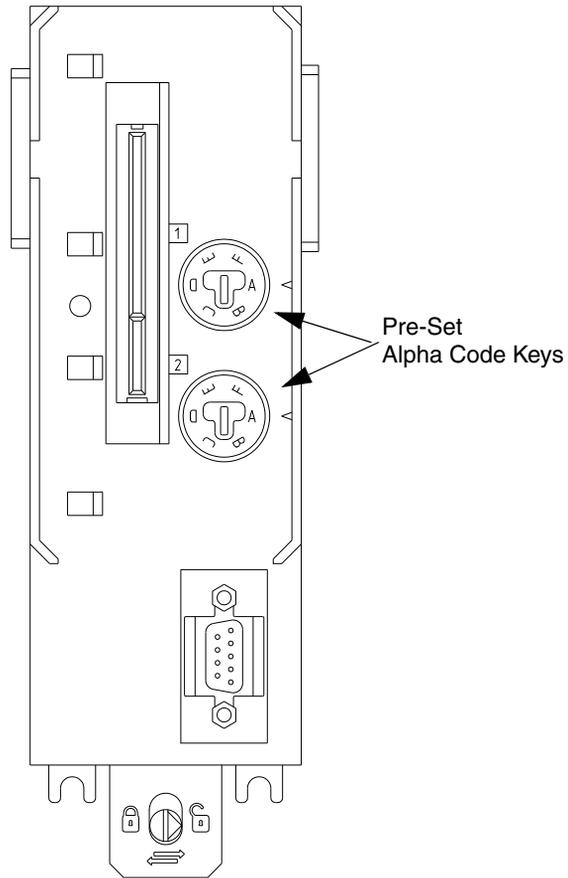


Figure 24. Unit Baseplate – Alpha Code Lock Arrangement

## Installing the PM86x/TP830 Processor Unit in Single Configuration



This topic does not apply to the PM891 processor unit. See [Installing PM891 in Single Configuration](#) on page 87.

Use the procedure below to install the processor unit along the DIN-rail:

1. If already mounted, remove the CEX-Bus and ModuleBus terminations from the sides of the processor unit.



For PM861/PM864/PM865/PM866 insert the RCU Link Termination plug TB852, at the RCU Link connector. The termination plug must always be used for PM861/PM864/PM865/PM866 when running in single configuration.

When a redundant processor is running in a single configuration use the RCU Link Cable TK851, if the RCU Link Termination plug TB852 is not available.

2. Mount the processor unit, the communication interfaces, and the S800 I/O units.  
The communication interfaces for all PM8xx is on the CEX-Bus to the left of the processor unit. The S800 I/O units for PM8xx is on the electrical ModuleBus to the right of the processor unit.
3. Press them gently together and make sure that the ModuleBus and the CEX-Bus are correctly connected, via baseplate connectors.
4. Reinsert the bus terminations into the communication units at farthest away from the processor unit.
  - a. For CEX-Bus TB850 (TB851 if cable TK850 is used), see [Figure 25](#) on page 80 and [Figure 26](#) on page 81. When using BC810, see [Figure 27](#) on page 82. If no units are used on the CEX-Bus, no bus termination is required.
  - b. For ModuleBus TB807, refer to the S800 I/O documentation. If no units are used on the ModuleBus, no bus termination is required.

5. Baseplate cable connections:
  - a. Connect the power leads and, if applicable, power supervision signals from SS82x to screw terminals SA and SB (see [Figure 28](#) on page 83).
  - b. Connect the Control Network cables to CN1 (single connection) or CN1 + CN2 (redundant connection).
  - c. Connect the serial protocol to COM3.
  - d. Connect the Control Builder to COM4 with cable TK212 (if required for changing an IP address etc). Otherwise connect the Control Builder to the Control Network.
6. Connect the optical ModuleBus to the optical contacts on the processor unit (see [Figure 2](#) on page 32 and [Figure 40](#) on page 131). Information regarding optical cable selection and cable length is provided in the S800 I/O documentation.



Note that connection to the optical ModuleBus is identical to that for the processor unit and for the FCI in S800 I/O (see [Figure 54](#) on page 160.)

7. The PM8xx is supplied with an internal back-up battery. When the battery is to be used, place it in the Internal Battery Holder (see [Figure 63](#) on page 193). When the external SB821/SB822 battery unit is to be used, install it according to the instructions in [Installing the SB821 External Battery Unit](#) on page 143/[Installing the SB822 Rechargeable External Battery Unit](#) on page 144.



Do not place the internal back-up battery in the battery holder until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the processor unit with the battery in place, then the CPU memory will immediately start to consume battery power.



Always install a fresh internal or external battery at the end of the installation phase. The original battery is heavily utilized due to frequent blackouts during system installation.

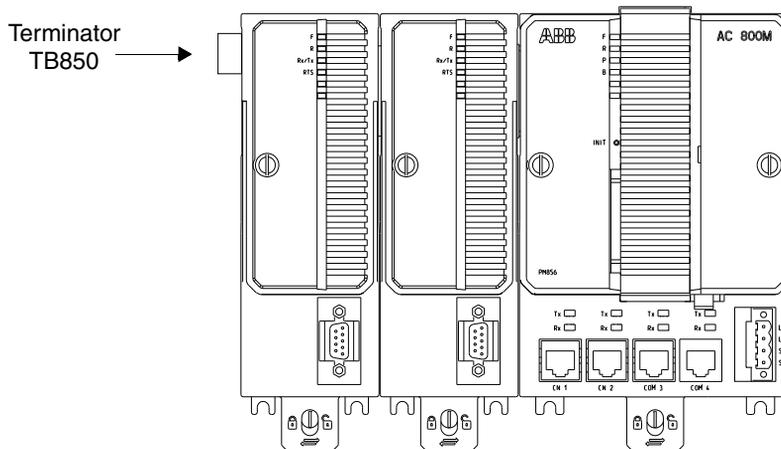


Figure 25. TB850 Terminator for CEX-Bus (male)



A TB850 male CEX-Bus termination unit is supplied with each package (PM851K01, PM851AK01, PM856K01, PM856AK01, PM860K01, PM860AK01, PM861K01, PM861AK01, PM864K01, PM864AK01 and PM865K01) of the PM8xx/TP830 processor unit.



PM851/PM851A is restricted to a maximum of one CEX module.

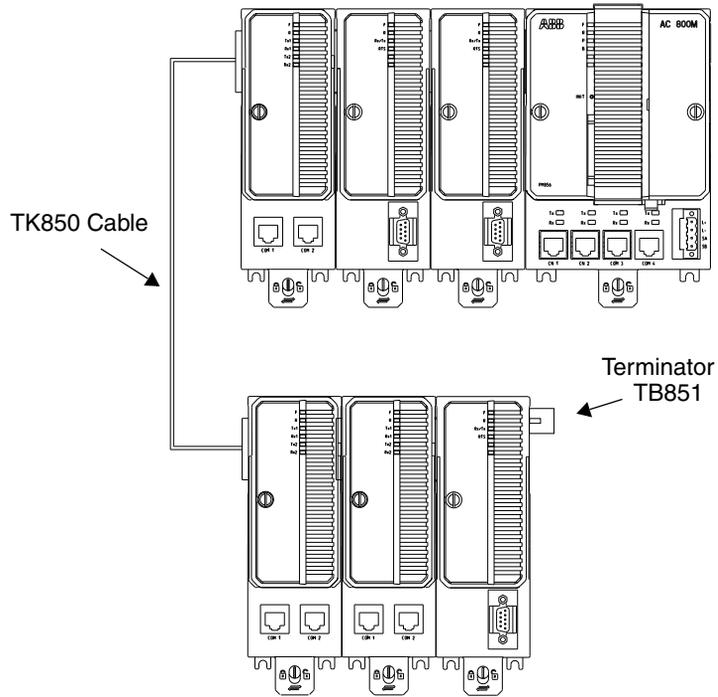


Figure 26. TB851 Terminator for CEX-Bus (female)

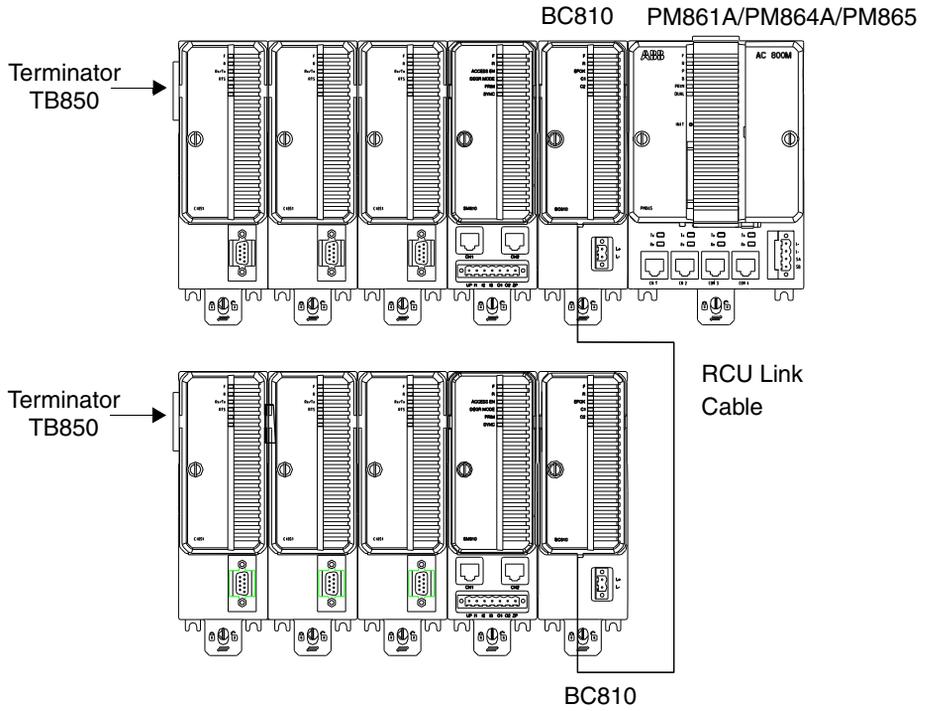


Figure 27. CEX-Bus Terminator when using BC810

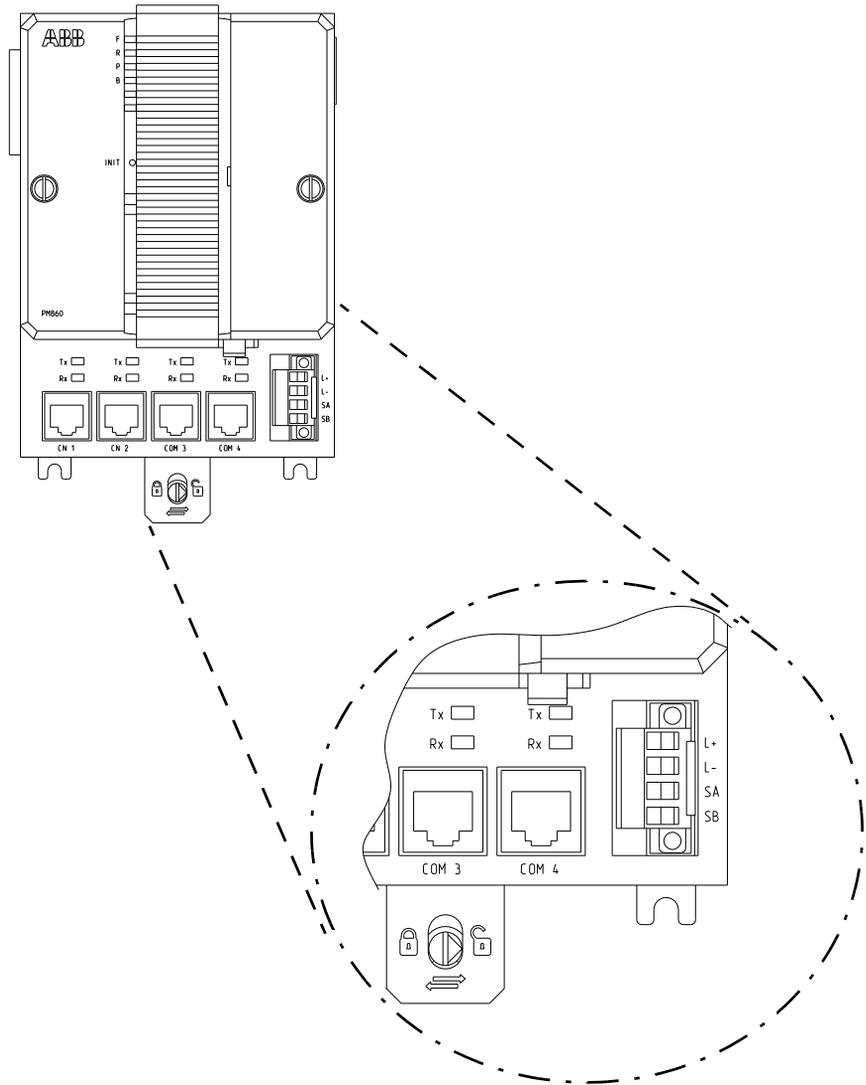


Figure 28. SA/SB Connectors for Supervision Signals

## Communication Ports

### CN1 and CN2

The control network connects to one or two RJ45 connectors (CN1 and CN2) depending on network option (single or redundant).

Use an RJ45 connector for IEEE802.3 (Ethernet) for connecting to a category 5 Shielded Twisted Pair cable (STP class 5).



Class 5, or higher, cable 10/100BaseT/TX max 100 m (110 yd). ABB recommends the use of optical fiber in an industrial environment, for example 62.5/125 100BaseFX, max. distance 1500 m (1600 yd).

*Table 5. TP830 CN1 and CN2 Connections (RJ45 connectors)*

| Pin     | Designation | Direction | Description           |
|---------|-------------|-----------|-----------------------|
| 1       | TD+         | Out       | Transmit Data (plus)  |
| 2       | TD-         | Out       | Transmit Data (minus) |
| 3       | RD+         | In        | Receive Data (plus)   |
| 4–5     | –           | –         | Not used              |
| 6       | RD-         | In        | Receive Data (minus)  |
| 7–8     | –           | –         | Not used              |
| Housing | Shield      | –         | Shield                |



PM851/PM851A is restricted to one Ethernet (CN1) port, thus redundant Ethernet is not available.

**COM3 Port**

The COM3 is an RS-232C port with modem signals. This port is used for serial protocols such as Modbus, Siemens 3964R, COMLI or custom-design.

*Table 6. TP830 COM3 Connections (RJ45 connector)*

| <b>Pin</b> | <b>Designation</b> | <b>Direction</b> | <b>Description</b>  |
|------------|--------------------|------------------|---------------------|
| 1          | RTS                | Out              | Request To Send     |
| 2          | DTR                | Out              | Data Terminal Ready |
| 3          | TD                 | Out              | Transmit Data       |
| 4          | 0V                 | -                | Signal ground       |
| 5          | 0V                 | -                | Signal ground       |
| 6          | RD                 | In               | Receive Data        |
| 7          | DCD                | In               | Data Carrier Detect |
| 8          | CTS                | In               | Clear To Send       |
| Housing    | Shield             | -                | Shield              |

**COM4 Port**

The COM4 port is an RS-232C port, opto-isolated and without modem signals. Connect Control Builder to this port when connecting directly to the controller, or, when not required, without the need use the remote tool connection via the Control Network.

*Table 7. TP830 COM4 Connections (RJ45 connector)*

| Pin     | Designation | Direction | Description   |
|---------|-------------|-----------|---------------|
| 1       | –           | –         | Not used      |
| 2       | –           | –         | Not used      |
| 3       | TD          | Out       | Transmit Data |
| 4       | 0 V         | –         | Signal ground |
| 5       | 0 V         | –         | Signal ground |
| 6       | RD          | In        | Receive Data  |
| 7       | –           | –         | Not used      |
| 8       | –           | –         | Not used      |
| Housing | Shield      | –         | Shield        |

## Installing PM891 in Single Configuration

Use the procedure below to install the PM891 processor unit in single configuration:

1. If already connected, remove the CEX-Bus termination from the side of the PM891 processor unit.
2. Mount the PM891 processor unit, the communication interfaces, and the S800 I/O units on the DIN-rail.  
The communication interfaces for PM891 is connected to the CEX-Bus to the left of the processor unit. The S800 I/O units for PM891 is connected through the optical ModuleBus at the bottom of the processor unit.
3. Re-insert the bus terminations into the communication units farthest from the processor unit. For CEX-Bus, use the TB850 termination plug (TB851, if CEX-Bus Extension cable TK850 is used. If no units are used on the CEX-Bus, no bus termination is required.
4. Provide termination for redundancy, by using the termination plug TB853 RCU Control Link Terminator, at the RCU Control Link connector at the top of the processor unit.
5. Provide cable connections:
  - a. Connect the power leads to screw terminals L+ and L-. If applicable, connect the power supervision signals from SS82x to the screw terminals SA and SB.
  - b. Connect the Control Network cables to CN1 (single connection) or CN1 + CN2 (redundant connection).
  - c. Connect the Control Builder to COM4 with cable TK212 (if required, for changing an IP address). Otherwise connect the Control Builder to the Control Network.

6. Connect the optical ModuleBus to the optical contacts (Tx1/Rx1) at the bottom of the processor unit (see [Figure 10](#) on page 43). For information regarding optical cable selection and cable length, refer to the S800 I/O documentation.



The connection to the optical ModuleBus is identical to that for the processor unit and for the FCI in S800 I/O (see [Figure 54](#) on page 160.)

7. Provide battery backup by connecting the PM891 unit to the external SB822 battery unit. Install it according to the instructions in [Installing the SB822 Rechargeable External Battery Unit](#) on page 144.

### Communication Ports - CN1 and CN2

The control network connects to one or two RJ45 connectors (CN1 and CN2) depending on network option (single or redundant).

Use an RJ45 connector for IEEE802.3 (Ethernet) for connecting to a category 5 Shielded Twisted Pair cable (STP class 5).



Class 5, or higher, cable 10/100BaseT/TX max 100 m (110 yd). ABB recommends the use of optical fiber in an industrial environment, for example 62.5/125 100BaseFX, max. distance 1500 m (1600 yd).

*Table 8. TP830 CN1 and CN2 Connections (RJ45 connectors)*

| Pin     | Designation | Direction | Description           |
|---------|-------------|-----------|-----------------------|
| 1       | TD+         | Out       | Transmit Data (plus)  |
| 2       | TD-         | Out       | Transmit Data (minus) |
| 3       | RD+         | In        | Receive Data (plus)   |
| 4–5     | –           | –         | Not used              |
| 6       | RD-         | In        | Receive Data (minus)  |
| 7–8     | –           | –         | Not used              |
| Housing | Shield      | –         | Shield                |

**COM4 Port**

The COM4 port is an RS-232C port, opto-isolated and without modem signals. Connect the Control Builder to this port when connecting directly to the controller, or, when not required, without the need use the remote tool connection through the Control Network.

*Table 9. PM891 COM4 Connections (RJ45 connector)*

| <b>Pin</b> | <b>Designation</b> | <b>Direction</b> | <b>Description</b> |
|------------|--------------------|------------------|--------------------|
| 1          | –                  | –                | Not used           |
| 2          | –                  | –                | Not used           |
| 3          | TD                 | Out              | Transmit Data      |
| 4          | 0 V                | –                | Signal ground      |
| 5          | 0 V                | –                | Signal ground      |
| 6          | RD                 | In               | Receive Data       |
| 7          | –                  | –                | Not used           |
| 8          | –                  | –                | Not used           |
| Housing    | Shield             | –                | Shield             |

## Installing the PM86x/TP830 Processor Unit in Redundant Configuration



This topic does not apply to the installation of PM891 unit in redundant configuration. See [Installing the PM891 Processor Unit in Redundant Configuration](#) on page 94.

In redundant configuration two PM861/PM864/PM865/PM866 units are mounted onto two separate DIN-rails. If sufficient space is available, the units can be mounted onto the same DIN-rail



Note that in redundant CPU configuration, COM3 and the electrical ModuleBus on the baseplate can not be used.

Use the following procedure to install the processor units along the DIN-rail:

1. Mount the processor units.
2. Mount the communication interfaces on the CEX-Bus to the left of the processor unit. If BC810s are used, the configuration of the segments should be considered. If no BC810s are used, the interfaces can be divided between the two CPUs in any preferred way.
3. Press the units gently together and make sure that the CEX-Bus is correctly connected, via the connectors on the baseplates.
4. If BC810s are used, connect the TK851 cable to the two BC810s ([Figure 31](#) on page 100). If no BC810s are used, mount the CEX-Bus extension cable TK850 to the units at farthest away from the processor units or, if no units are mounted, directly to the CEX-Bus on the processor unit. The CEX-Bus extension cable must be connected to both CPUs whether or not there are any other CEX-Bus units ([Figure 29](#) on page 93).

5. Connect the RCU Link Cable TK851 to both CPUs. Note that in redundant CPU configuration, COM3 and the electrical ModuleBus on the baseplate can not be used.



Note that the RCU Link Cable TK851 must be used and can not be replaced by a similar cable. Using another cable will disable the identification of the CPUs in the CB and Operator Station. When running in single configuration the RCU Link Cable TK851 might temporarily be used to perform the function of a termination plug.



The CPU connected to the RCU Link Cable connector marked “UPPER” will be defined as “UPPER” in the Control Builder and Operator Station. The marking has no relevance to the physical placement of the CPUs. Any CPU can become the Primary CPU.

6. Baseplates cable connections:
  - a. Connect the power leads to both CPUs and the power supervision signals from SS8xx to screw terminals SA and SB (see [Figure 28](#) on page 83).



Both CPUs should be powered from the same supply (single or redundant). For redundant power supply, see [Figure 46](#) on page 140.

- b. Connect the Control Network cables to CN1 (single bus connection) or CN1 + CN2 (redundant bus connection). The Control Network is connected to both CPUs.
  - c. Connect the Control Builder to COM4 with cable TK212 of the Primary CPU (if required for changing an IP address etc.). Otherwise connect the Control Builder to the Control Network.
7. Connect the optical ModuleBus to the optical contacts on the processor units (see [Figure 2](#) on page 32 and [Figure 40](#) on page 131). Information regarding optical cable selection and cable length is provided in the S800 I/O documentation.



Connection to the optical ModuleBus is identical to that for the processor unit and for the FCI in S800 I/O ([Figure 55](#) on page 161).

8. The CPUs are supplied with internal back-up batteries. When the batteries are to be used, place them in the Internal Battery Holder ([Figure 63](#) on page 193). When the external SB821/SB822 battery units are to be used, install them according to the instructions in [Installing the SB821 External Battery Unit](#) on page 143/[Installing the SB822 Rechargeable External Battery Unit](#) on page 144.



Do not place the internal back-up battery in the battery holder until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the processor unit with the battery in place, then the CPU memory will immediately start to consume battery power.



Always install a fresh internal or external battery at the end of the installation phase. The original battery is heavily utilized due to frequent blackouts during system installation.

### Communication Ports

Same as for single configuration (see [Table 5](#) on page 84, [Table 6](#) on page 85 and [Table 7](#) on page 86).

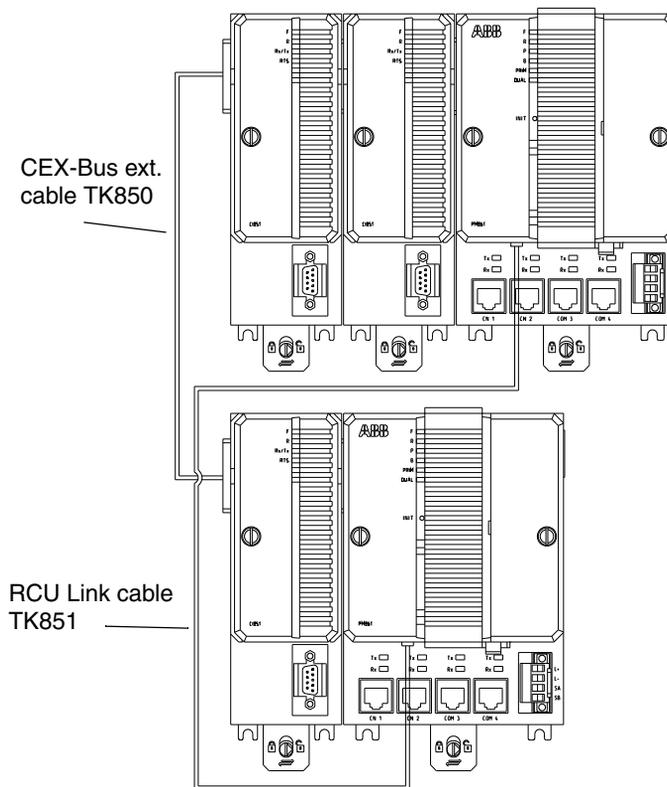


Figure 29. Connection of CPU redundancy

## Installing the PM891 Processor Unit in Redundant Configuration

In redundant configuration, two PM891 units are mounted on two separate DIN-rails. If sufficient space is available, the units can be mounted on the same DIN-rail.

Use the following procedure to install the processor units along the DIN-rail:

1. Mount the processor units.
2. Mount the communication interfaces on the CEX-Bus to the left of the processor unit. If BC810s are used, the configuration of the segments should be considered. If no BC810s are used, the interfaces can be divided between the two CPUs in any preferred way.
3. Press the units gently together and ensure that the CEX-Bus is correctly connected, through the connector on the unit.
4. If BC810s are used, connect the TK851 cable to the two BC810s. If no BC810s are used, mount the CEX-Bus extension cable TK850 to the units at farthest away from the processor units or, if no units are mounted, directly to the CEX-Bus on the processor unit. The CEX-Bus extension cable must be connected to both CPUs whether or not there are any other CEX-Bus units ([Figure 29](#) on page 93).
5. Connect the RCU Data Link Cable (TK855) and the RCU Control Link Cable (TK856) to both CPUs.



The RCU Data Link Cable (TK855) and the RCU Control Link Cable (TK856) must not be replaced by similar cables. Using another cable will disable the identification of the CPUs in the Control Builder and Operator Station.



The CPU connected to the RCU Control Link Cable (TK856) connector marked “UPPER” will be defined as “UPPER” in the Control Builder and Operator Station. The marking has no relevance to the physical placement of the CPUs. Any CPU can become the Primary CPU.

6. Provide connections for power supply and network:
  - a. Connect the power leads to screw terminals L+ and L- of both CPUs, and the power supervision signals from SS8xx to screw terminals SA and SB.



Both CPUs should be powered from the same supply (single or redundant). For redundant power supply, see [Figure 46](#) on page 140.

- b. Connect the Control Network cables to CN1 (single bus connection) or CN1 + CN2 (redundant bus connection). The Control Network is connected to both CPUs.
  - c. Connect the Control Builder to COM4 with cable TK212 of the Primary CPU (if required for changing an IP address etc.). Otherwise connect the Control Builder to the Control Network.
7. Connect the optical ModuleBus to the optical contacts on the processor units (see [Figure 2](#) on page 32 and [Figure 40](#) on page 131). Information regarding optical cable selection and cable length is provided in the S800 I/O documentation.



Connection to the optical ModuleBus is identical to that for the processor unit and for the FCI in S800 I/O ([Figure 55](#) on page 161).

8. Provide battery backup by connecting the CPUs to the external SB822 battery units. Install them according to the instructions in [Installing the SB822 Rechargeable External Battery Unit](#) on page 144.

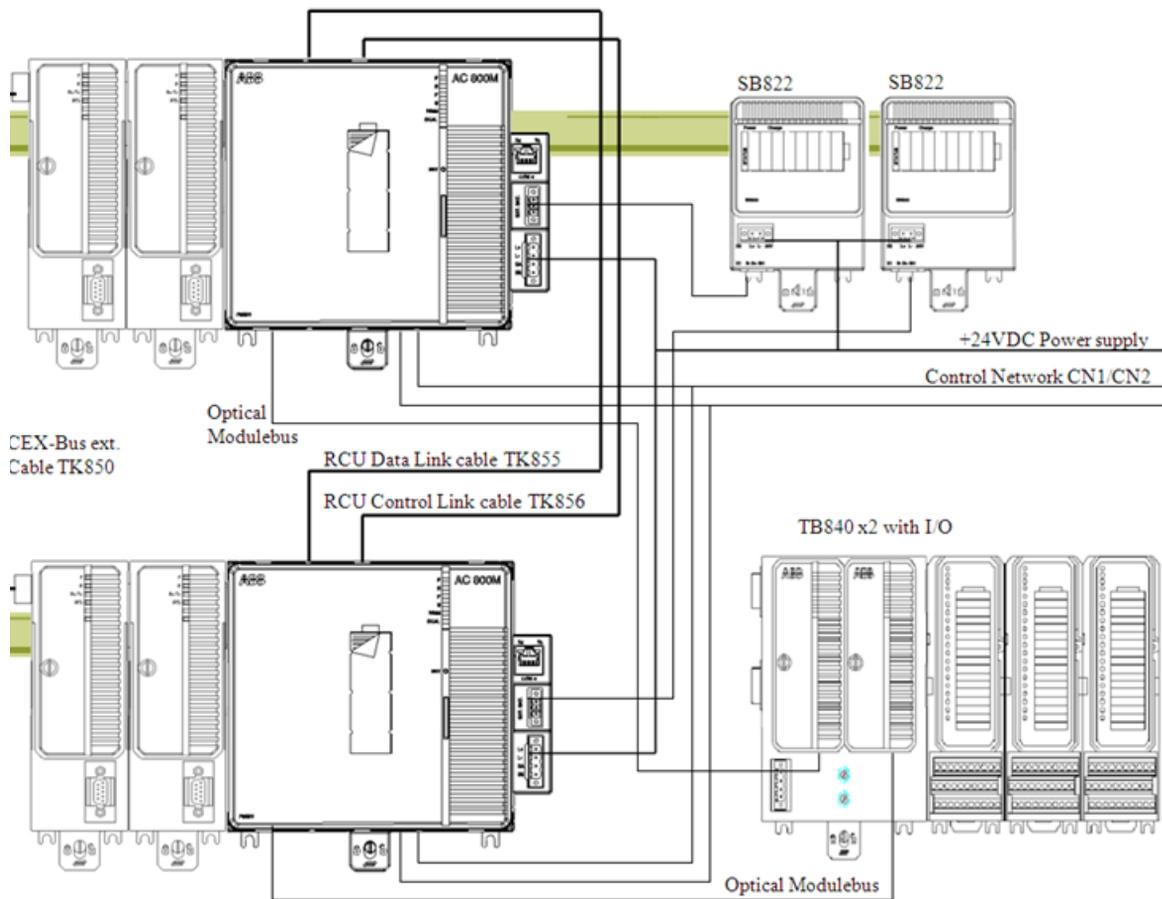


Figure 30. Example of PM891-Redundant configuration

**Communication Ports**

Same as for single configuration (see [Table 8](#) on page 88 and [Table 9](#) on page 89).

## Installing the CEX-Bus without BC810

The CEX-Bus, used for connection of communication interfaces to the processor unit, is located on the left-hand side of the processor unit baseplate (TP830).

A bus termination unit must always be fitted to the last unit on the CEX-Bus, as shown in [Figure 25](#) on page 80. A TB850 male CEX-Bus termination unit is supplied with each PM8xx/TP830 processor unit.

However, should the configuration require the use of a TK850 extension cable, as shown in [Figure 26](#) on page 81, then a TB851 female CEX-Bus termination unit is required and must be fitted to the last baseplate in the sequence. A TB851 female CEX-Bus termination unit is supplied with each TK850 extension cable.

### TK850 CEX-Bus Extension Cable

Only one TK850 CEX-Bus extension cable may be used in any one CEX-Bus. Cable length: 0.7 m (2.3 ft).

## Installing the CEX-Bus Interconnection Unit BC810/TP857

The BC810 units must be mounted directly to the CEX-Bus on the processor unit base plate. The SM810, if used, and communication interfaces are then mounted to the CEX-Bus on the BC810, and terminated in each end with TB850 male CEX-Bus termination unit. The two BC810 are connected with the interconnection cable TK851.



The maximum number of CEX-Bus units connected to a BC810 is six. The primary function of BC810 is to divide the CEX-Bus into two physically separate segments for increased system availability, a faulty CEX-Bus unit on one segment will not affect the processor unit or the other CEX-Bus segment. It is also important to note that when using the BC810 together with redundant CEX-Bus units these units shall be mounted on different BC810 CEX-Bus segments.

See [Figure 31](#) on page 100 and [Figure 32](#) on page 101 for configuration examples. Use the configuration which coincides with the requirements for availability, redundancy and safety of your AC 800M controller system.



Do not connect the two CEX-Bus segments, separated with BC810, to each other with CEX-Bus extension cable TK850.

The BC810 is powered either from the processor unit via the CEX-Bus or through its external connector for power supply. This external connector can also support the CEX-Bus with redundant power.

If the external connector is used in a redundant configuration of BC810, there are two valid connection possibilities:

- Single power source (SD8xx or SS8xx) for the processor units and the BC810s on both the segments (say, segments A and B). See [Figure 33](#) on page 102.
- One power source (SD8xx or SS8xx) for the processor unit on segment A and the BC810 on segment B, and another power source (SD8xx or SS8xx) for the processor unit on segment B and the BC810 on segment A. See [Figure 34](#) on page 103.



For obtaining redundant power supply, connect the external connector to the SS82x voting device. For details of SS82x connections, see [Installing the SS823/SS832 Voting Unit](#) on page 136. See also [Powering from an External Source](#) on page 176.



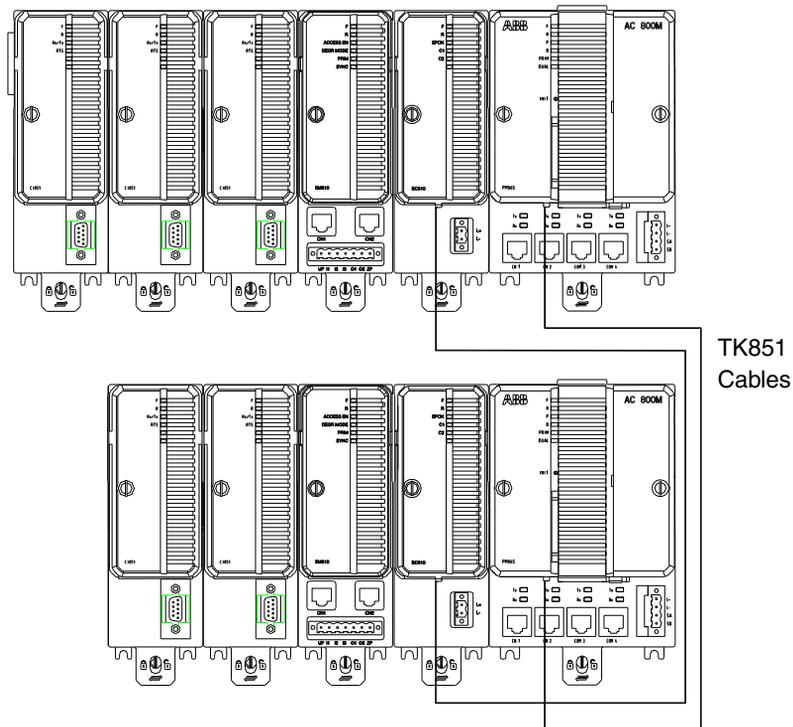
In AC 800M High Integrity Controllers it is required that the external supply input of BC810 is connected and that the power supply is strictly configured either according to [Figure 33](#) or according to [Figure 34](#) and nor is it allowed to change the configuration by way of for instance individual circuit breakers between modules.



Hot swap of the BC810 located next to a primary or single controller CPU, otherwise called “direct BC810”, might jeopardize the whole controller and should not be performed unless every module on the CEX-Bus are in a non-operating state. Note: In an AC 800M HI controller this is unconditionally and intentionally leading to a shutdown of the controller.

Hot swap of the BC810 not located next to a primary or single controller CPU, otherwise called “indirect BC810”, will shut down any non-redundant interface located on that CEX-Bus segment and should not be performed unless such interfaces already are in a non-operating state or their function is dispensable for the controller.

SM810/SM811<sup>(1)</sup> BC810 PM861A/PM864A/PM865/PM866



SM810/SM811<sup>(1)</sup> BC810 PM861A/PM864A/PM865/PM866

(1) Only for High Integrity Systems and only together with PM865

Figure 31. Redundant Communication Interface Units and Controllers

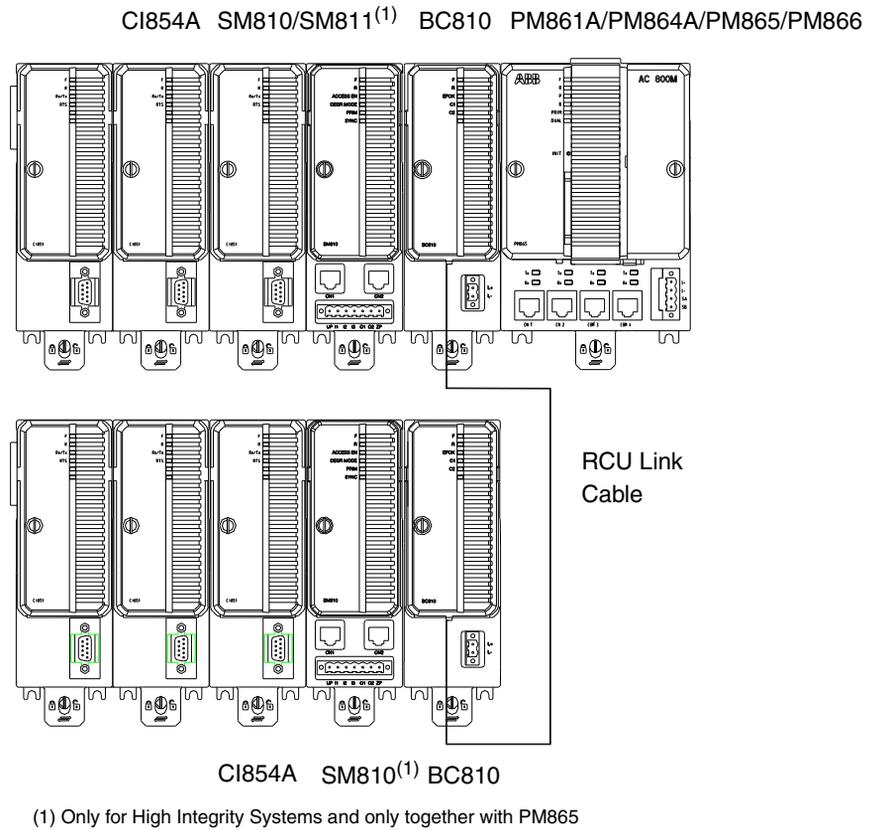


Figure 32. Redundant Communication Interface Units and Single Controller

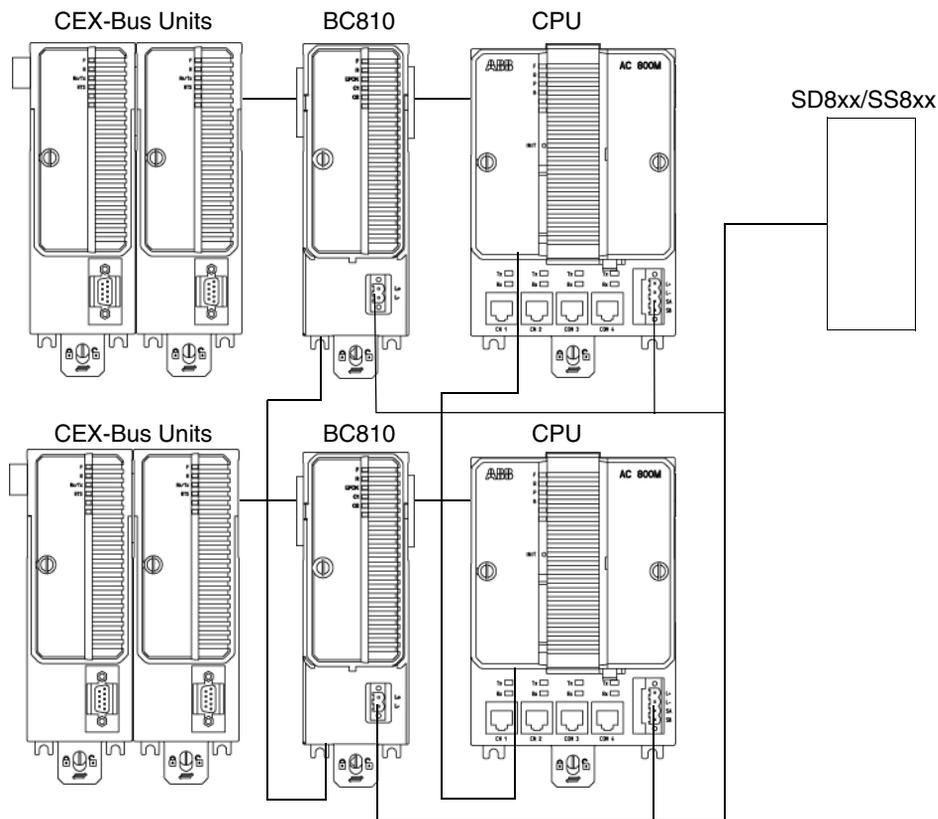


Figure 33. The Power Source Connected to the Same PM864/BC810 Segment, see [Installing the CEX-Bus Interconnection Unit BC810/TP857 on page 97](#) and [Power Supply System on page 173](#).

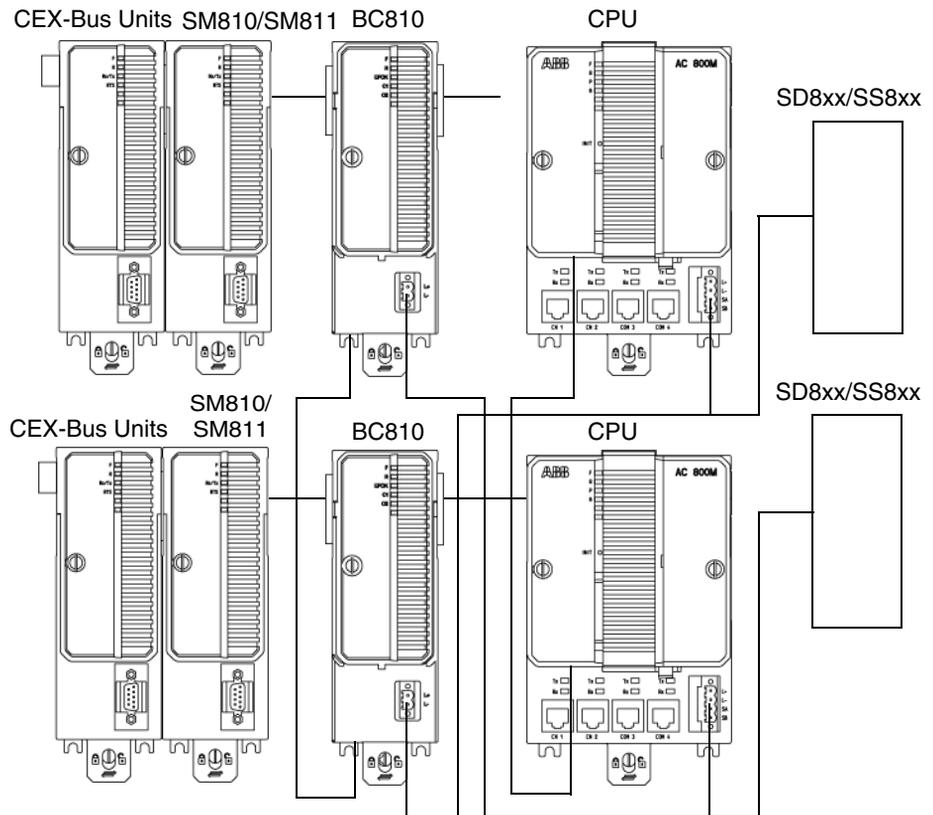


Figure 34. The Power Source Connected to a Different PM865/BC810 Segment, see [Installing the CEX-Bus Interconnection Unit BC810/TP857](#) on page 97 and [Power Supply System](#) on page 173.

## Installing SM810/TP855

The SM810 is mounted directly to the CEX-Bus on the processor unit base plate or to the CEX-Bus interconnection unit BC810. The communication interfaces are then mounted to the CEX-Bus on the SM810. See [Figure 31](#) on page 100 and [Figure 32](#) on page 101 for configuration examples.

### Digital I/O Connection

The SM810 has a connector with two digital inputs and three digital outputs that can be used for High Integrity related digital I/O (not process I/O). See [Table 10](#).



In a redundant configuration, the corresponding digital inputs to both the SM810's must be connected to common digital input switches.

For example, the I2's of both SM810's must be connected to a common switch. If separate sources are used, connect the sources to a common switch, and then derive connections from the switch to both the SM810's.

The input signals are used for system function, see AC 800M High Integrity documentation.

*Table 10. SM810 Digital I/O Connector*

| PIN | Designation | Description                         |
|-----|-------------|-------------------------------------|
| 1   | UP          | Common I/O power                    |
| 2   | I1          | Digital input 1 (Reset all forces)  |
| 3   | I2          | Digital input 2 (Access enable)     |
| 4   | I3          | Digital input 3                     |
| 5   | O1          | Digital output 1 (Any force active) |
| 6   | O2          | Digital output 2 (System alarm)     |
| 7   | ZP          | Common I/O return                   |

Connection of Input Signals to SM810

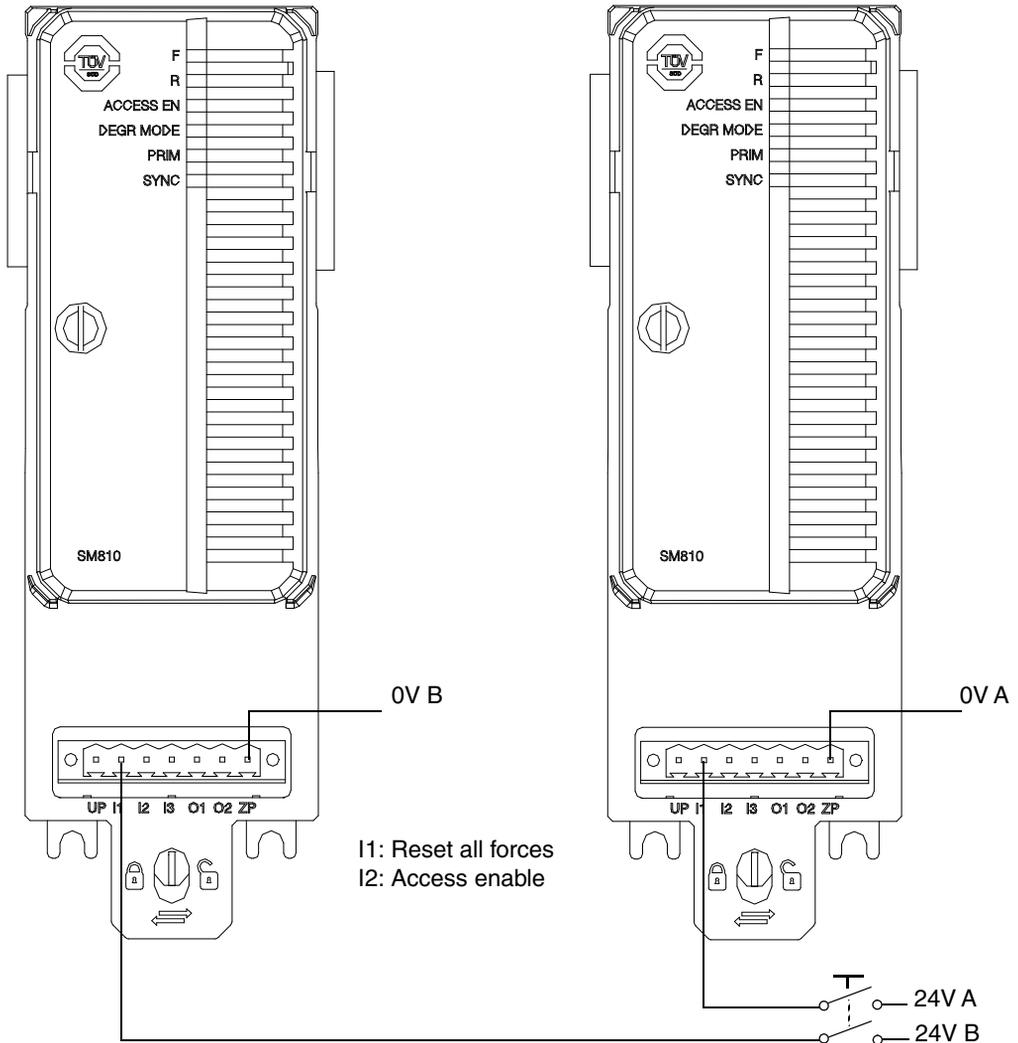


Figure 35. Connection of input signals to redundant SM810.

**Connection of Output Signals to SM810**

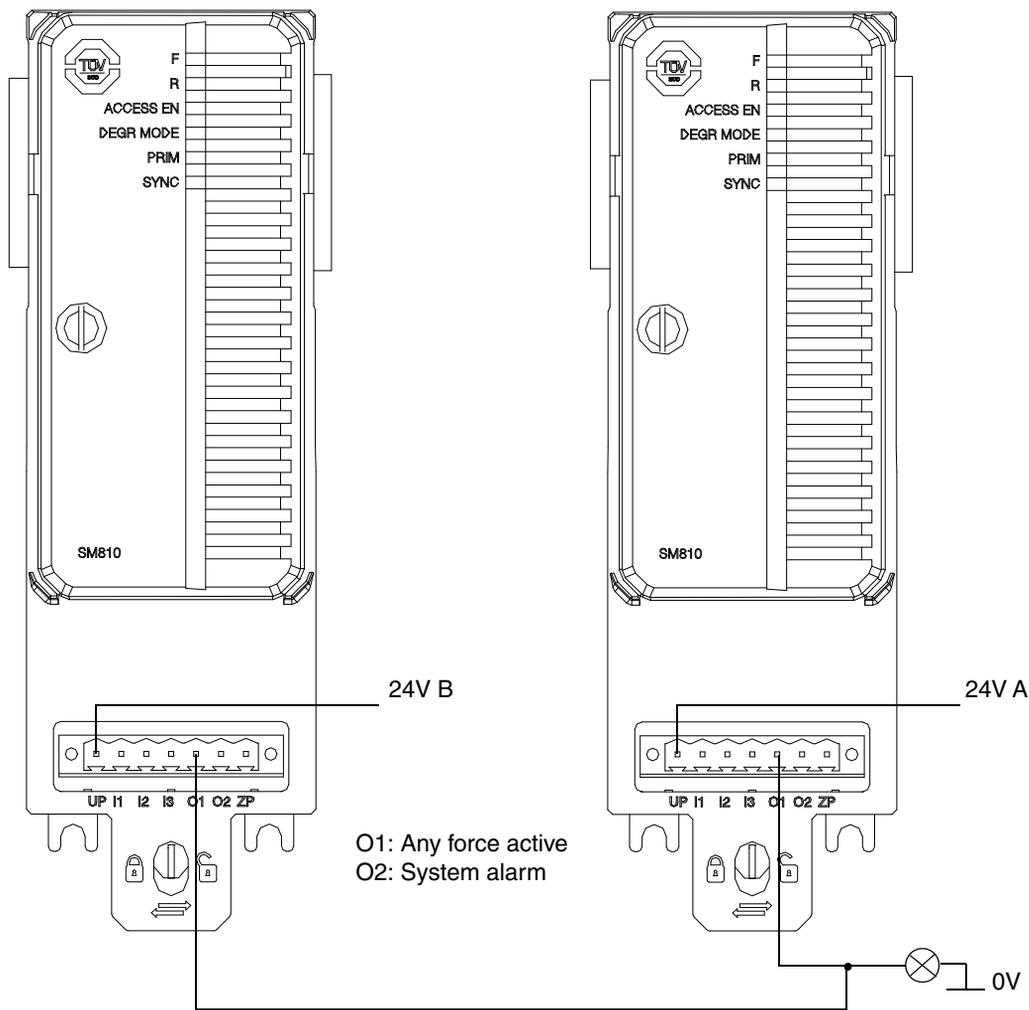


Figure 36. Connection of output signals from redundant SM810.

## Installing SM811/TP868

The SM811 is mounted directly to the CEX-Bus on the processor unit base plate or to the CEX-Bus interconnection unit BC810. The communication interfaces are then mounted to the CEX-Bus on the SM811. See [Figure 31](#) on page 100 and [Figure 32](#) on page 101 for configuration examples. Use the enclosed cable TK852V010 to connect the SM Link of the two SM811s in case of redundant configuration.

### Digital I/O Connection

The SM811 has a connector with three digital inputs and two digital outputs that can be used for High Integrity related digital I/O (not process I/O). See [Table 11](#).

The Access Enable input (I2) must be connected to a key switch in the operator's panel. The Reset all Forces input (I1) and Hot-insert input (I3) must be connected to impulse type panel if they are used.



In a redundant configuration, the corresponding digital inputs to both the SM811's must be connected to common digital input switches.

For example, the I3's of both SM811's must be connected to a common switch. If separate sources are used, connect the sources to a common switch, and then derive connections from the switch to both the SM811's.

The input signals are used for system function, see AC 800M High Integrity documentation.

*Table 11. SM811 Digital I/O Connector*

| PIN | Designation | Description                         |
|-----|-------------|-------------------------------------|
| 1   | UP          | Common I/O power                    |
| 2   | I1          | Digital input 1 (Reset all forces)  |
| 3   | I2          | Digital input 2 (Access enable)     |
| 4   | I3          | Digital input 3 (Hot-insert of SM)  |
| 5   | O1          | Digital output 1 (Any force active) |

*Table 11. SM811 Digital I/O Connector*

| <b>PIN</b> | <b>Designation</b> | <b>Description</b>              |
|------------|--------------------|---------------------------------|
| 6          | O2                 | Digital output 2 (System alarm) |
| 7          | ZP                 | Common I/O return               |

Connection of Input Signals to SM811

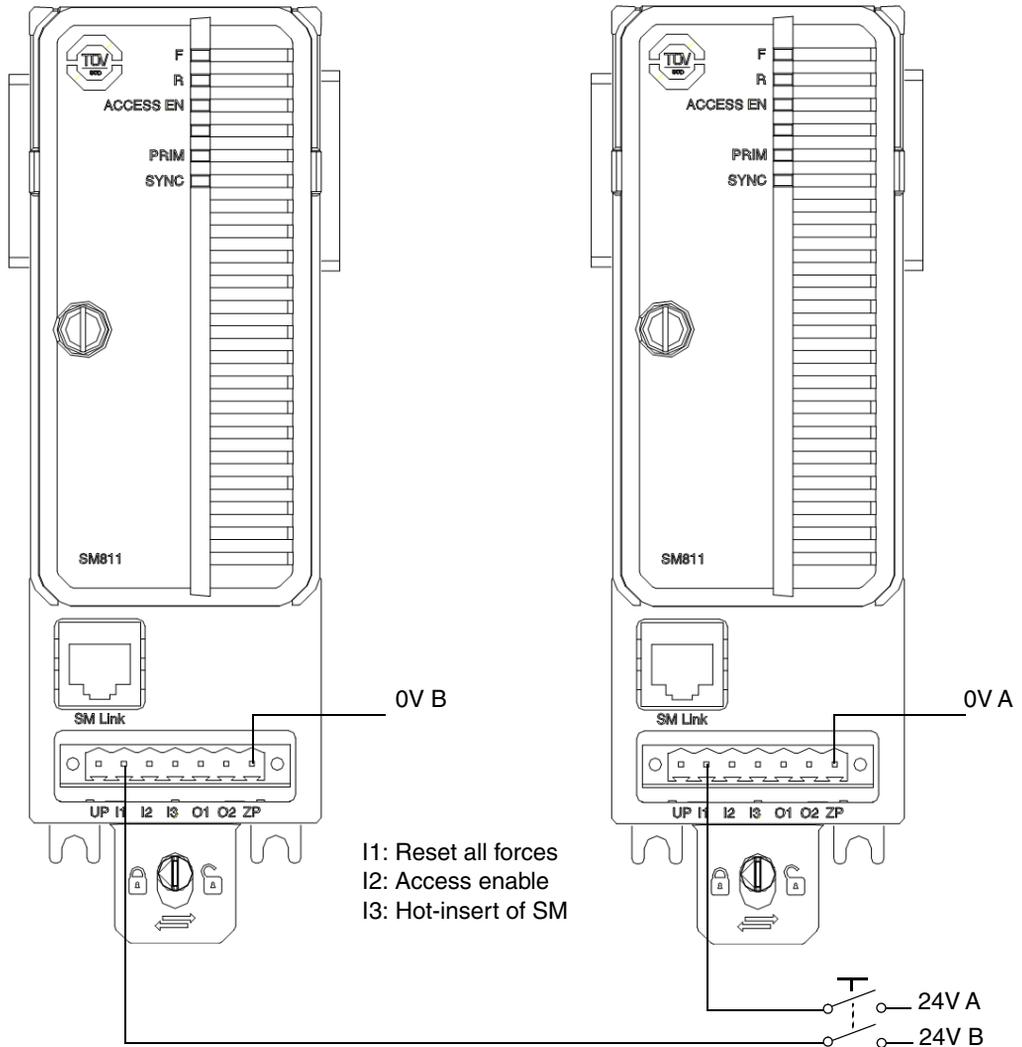


Figure 37. Connection of input signals to redundant SM811

Connection of Output Signals to SM811

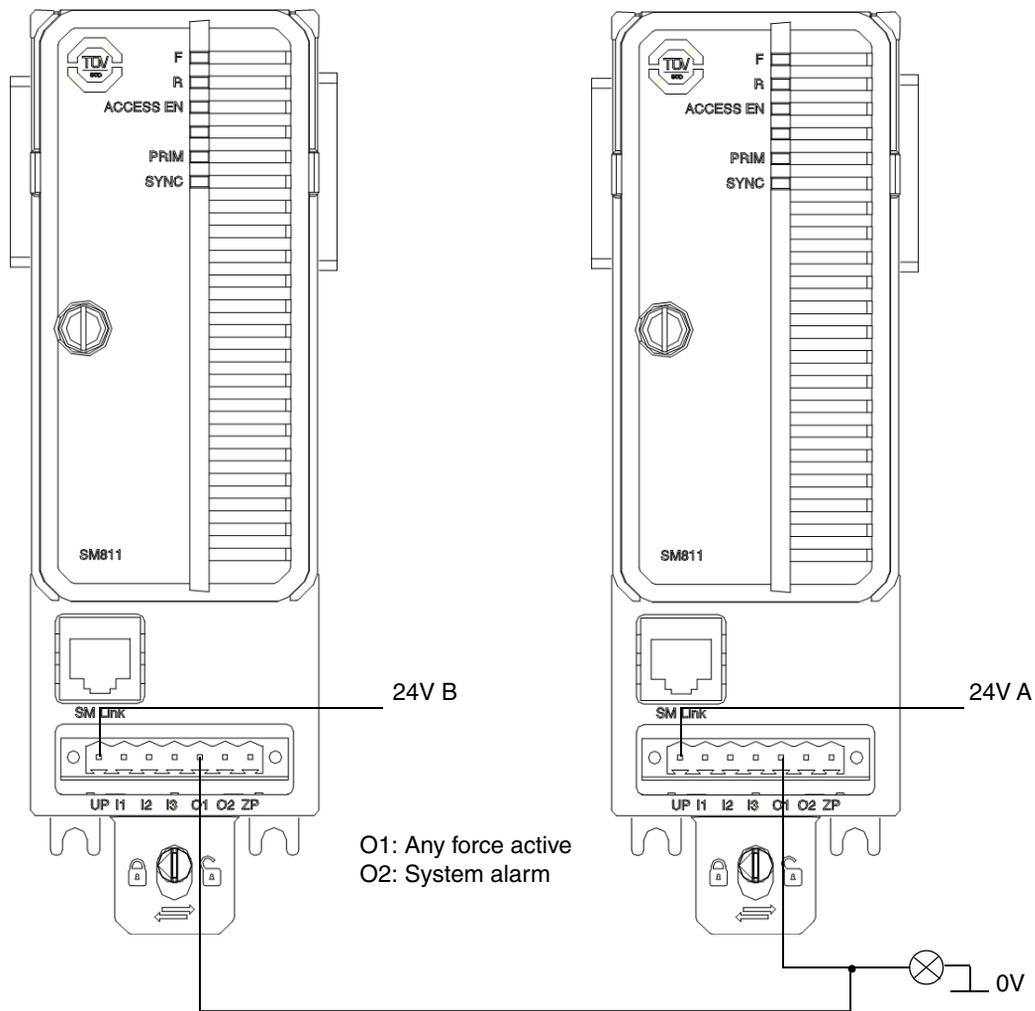


Figure 38. Connection of output signals from redundant SM811

## Installing the PROFIBUS DP Interface, CI851/TP851

The CI851 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

Use the following procedure to install the CI851/TP851:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Install a connector on the PROFIBUS DP cable. Connect the cable screen to the ground terminal within the connector to ground the screen via CI581. A connector with a switchable built-in bus termination is recommended.
3. Connect the PROFIBUS DP cable to the contact on the baseplate.
4. If this is at the end of the PROFIBUS DP cable, switch the bus termination ON. Otherwise leave the bus termination switched OFF.

### **PROFIBUS DP Connection**

The PROFIBUS DP cable is connected via the 9-pin female D-type connector located on TP851.

**Installation of PROFIBUS DP***Table 12. CI851 - PROFIBUS DP Connector*

| PIN | Designation                  | Description                  |
|-----|------------------------------|------------------------------|
| 1   | Shield                       | Shield/protective ground     |
| 2   | –                            | Not Used                     |
| 3   | B-line                       | Receive/Transmit Data B-line |
| 4   | RTS(TTL) Indicates direction | RTS(TTL) Indicates direction |
| 5   | GND Bus                      | GND Bus                      |
| 6   | +5 V Bus                     | For terminating resistors    |
| 7   | –                            | Not used                     |
| 8   | A-line                       | Receive/Transmit Data A-line |
| 9   | –                            | Not used                     |

For installation of the fieldbus and recommended certified fieldbus devices and components, see fieldbus documentation and [Appendix C, Recommended Components](#). The PROFIBUS DP must be connected with shielded twisted pair cables.



For additional information on PROFIBUS DP and other suitable components, visit the PROFIBUS User Organization web site.



Note that there is no unit redundancy for the CI851 unit.



Cannot be used in High Integrity Controller.



CI851 has been replaced by the CI854 communication interface. CI851 is only described for legacy reasons.



It is not possible to change the CI851 unit via hot swap and it is not allowed to perform an online upgrade of firmware in a system containing CI851.

## Installing the FOUNDATION Fieldbus H1 Interface, CI852/TP852

CI852 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source. No field device on the FF H1 bus is powered from the CI852.

An AC 800M Controller connected to a CI852 constitutes a FOUNDATION Fieldbus linking device.

Use the following procedure to install the CI852/TP852:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Install a connector on the FOUNDATION Fieldbus H1 cable. Connect the cable screen to the ground terminal within the connector to ground the screen via CI582.
3. Connect the FOUNDATION Fieldbus H1 cable to the contact on the baseplate.

### FOUNDATION Fieldbus H1 Connection

Connect the FF H1 bus to the male DB9 connector located on the TP852 Baseplate.

*Table 13. CI852 and TP852 FOUNDATION Fieldbus H1 Connector*

| Pin | Designation | Description                                   |
|-----|-------------|---|
| 1–5 | –           | Not used                                      |
| 6   | FB-P        | Receive/transmit data line, positive polarity |
| 7   | FB-N        | Receive/transmit data line, negative polarity |
| 8–9 | –           | Not used                                      |

The use of shielded twisted pair cables for FOUNDATION Fieldbus is recommended (see [Appendix C, Recommended Components](#)).

For additional information on designing a fieldbus (connectors, cables and devices), see fieldbus documentation.

A catalog referencing suppliers, devices, services and other fieldbus-related items, is available for FIELDBUS ONLINE via the Internet web site.

### Powering Field Devices

Field devices requiring power from the fieldbus need special power supplies connected to the data wires (in the same way as a field device). To avoid short-circuiting of fieldbus signals, use only power supplies with impedance characteristics specifically designed for FOUNDATION Fieldbus.

Do not use SD82x power supply units for this purpose.



Note that there is no unit redundancy for the CI852 unit.



Cannot be used in High Integrity Controller.



CI852 has been replaced by the CI860 communication interface. CI852 is only described for legacy reasons.



It is not possible to change the CI852 unit via hot swap and it is not allowed to perform an online upgrade of firmware in a system containing CI852.

## Installing the RS-232C Interface, CI853/TP853

CI853 is powered from the processor unit via the CEX bus and requires therefore no additional external power source.

Use the following procedure to install the CI853/TP853:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the cable (maximum 15 m (16.4 yd)) to one of the contacts on the baseplate. Connect the cable screen to the ground terminal within the connector to ground the screen via CI583.
3. If cables longer than 15 m (16.4 yd.) are required, then a short distance modem TC562 must be used. In this case mount the modem onto a DIN-rail in a suitable position, connect a 24 V DC power supply to the modem and connect cable TK853 from CI853 to the TC562 modem input terminals
4. Connect the TC562 modem output terminals to the outgoing cable.

The TC562 modem can be used for the following distances/speeds:

- Up to 1000 m (1100 yd) with transmission speed 19200 bit/s
- Up to 12000 m (13100 yd) with transmission speed 1200 bit/s

### Connectors

Connect the RS-232C channels to the RJ45 connectors marked COM1 and COM2 on the TP853 Baseplate.

*Table 14. CI853 RS23-C Interface – COM1 and COM2 Connectors*

| Pin | Designation | Direction | Description  |
|-----|-------------|-----------|--|
| 1–9 | –           | –         | See COM3 on TP830, <a href="#">Table 6</a> on page 85. |



Note that there is no unit redundancy for the CI853 unit.

## Installing the PROFIBUS DP Interface, CI854/CI854A/TP854

The CI854/CI854A is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

Use the following procedure to install the CI854/CI854A/TP854:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Install a connector on the PROFIBUS DP cable. A connector with a switchable built-in bus termination is recommended. Connect the cable screen to the metal case of the connector to ground the screen via CI854/CI854A. Connect the data cable wire A to the terminal PIN8 (RxD/TxD-N) and the data cable wire B to the terminal PIN3 (RxD/TxD-P). If the data transfer cable has data wires with red and green insulation, then the following assignment should be used:  
Data cable wire A: green  
Data cable wire B: red
3. Connect the cable shield for both lines to functional ground, for example by using a grounding clamp.
4. Connect the PROFIBUS DP cable to one of the connectors PROFIBUS A or PROFIBUS B on the baseplate. For support of Line Redundancy connect a second PROFIBUS DP cable to the other contact.
5. If the CI854/CI854A is at the end of the PROFIBUS DP cable, switch the bus termination ON. Otherwise leave the bus termination switched OFF.

The following applies for CI854A:

6. If the CI854A is installed in a redundant configuration connect the PROFIBUS DP cable to primary and backup module. Do it like described in [Figure 39](#) on page 117. Switch the termination ON for the interface on primary or backup module that is at the end of the line.

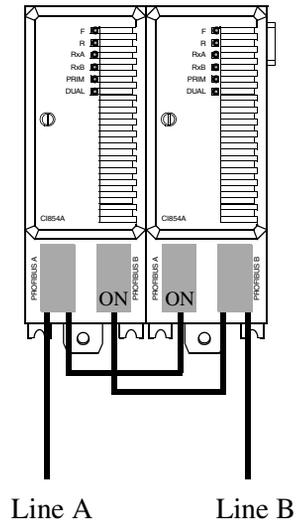


Figure 39. Connection of Redundant PROFIBUS DP (CI854A)

### PROFIBUS DP Connection

The PROFIBUS DP cable is connected via the 9-pin female D-type connector located on TP854.

**Installation of PROFIBUS DP***Table 15. CI854/CI854A – PROFIBUS DP Connector*

| PIN | Designation | Description                           |
|-----|-------------|---------------------------------------|
| 1   | Shield      | Shield/protective ground              |
| 2   | –           | Not Used                              |
| 3   | RxD/TxD-P   | Receive/Transmit Data P-line (B-line) |
| 4   | CNTR-P      | Indicates Direction to Repeater (TTL) |
| 5   | DGND        | Digital Ground                        |
| 6   | VP          | +5 V, for terminating resistors       |
| 7   | –           | –                                     |
| 8   | RxD/TxD-N   | Receive/Transmit Data N-line (A-line) |
| 9   | DGND        | Digital Ground                        |

For installation of the fieldbus and recommended certified fieldbus devices and components, see fieldbus documentation and [Appendix C, Recommended Components](#). The PROFIBUS DP must be connected with shielded twisted pair cables.



Note that there is no unit redundancy for the CI854 unit. Only for CI854A.



Hot swap is supported for CI854A (not CI854).

## Installing the MasterBus 300 Interface, CI855/TP853

The CI855 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

The baseplate, TP853, provides two Ethernet ports for connection of redundant Ethernet network for MasterBus 300.

Use the following procedure to install the CI855/TP853:

1. Mount the unit on the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the Ethernet twisted pair cable to the contact on the baseplate.
3. Connect the other end of the Ethernet cable to an Ethernet Switch.



If an interface to an AUI is required, a converter from 10BaseT to AUI is needed. The communication unit, CI855, can not provide power to the transceiver, therefore a separate power source must be used.

### **Ethernet twisted pair Connection**

The Ethernet twisted pair is connected via the 10BaseT RJ45 connector located on TP853. For a description of the connector, see [Table 5](#) on page 84.



Note that there is no unit redundancy for the CI855 unit.

## Installing the S100 I/O Interface, CI856/TP856

The CI856 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

Use the following procedure to install the CI856/TP856:

1. Mount the unit on the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the S100 I/O cable, TK575/TK580, to the contact on the baseplate. A bus extender, DSBC174/DSBC176/DSBC173A, must be used.

### S100 I/O Connection and Installation

Connect the S100 I/O rack cable TK575/TK580 to the “I/O-labeled” 36-pin centerline miniature ribbon connector located on TP856.

### Installation of S100 I/O

For installation of the S100 I/O-related components, see S100 I/O documentation.



Note that there is no unit redundancy for the CI856 unit.

## Installing the INSUM Interface, CI857/TP853

The CI857 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

Use the following procedure to install the CI857/TP853:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the Ethernet twisted pair cable to the COM1 connector on the baseplate (COM2 is not used for connection to INSUM).
3. Connect the other end of the Ethernet cable to the INSUM equipment via Ethernet/LON Gateway.

### Ethernet Twisted Pair Connection

The Ethernet twisted pair is connected via the 10BaseT RJ45 connector located on TP853. For a description of the connector see [Table 5](#) on page 84.



Note that there is no unit redundancy for the CI857 unit.

## Installing the DriveBus Interface, CI858/TP858

The CI858 is powered from the processor unit via the CEX bus and requires therefore no additional external power source. The unit is mounted onto a horizontal DIN rail.

Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65, [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78 and [CI858 and TP858 – DriveBus Interface](#) on page 313.

### Optical Connectors

The CI858 board connects to the drive system via three optical receiver/transmitter pairs. HP/Agilent Technologies Versatile Link Series (HFBR family) optical transmitter/receivers are used. Transmission speed of the optical fibres is 4 Mbit/s.

*Table 16. Optical Connectors*

| Connector | Designation | Description   |
|-----------|-------------|---------------|
| DriveBus  | TxD         | Transmit data |
| DriveBus  | RxD         | Receive data  |
| I/O Bus   | TxD         | Transmit data |
| I/O Bus   | RxD         | Receive data  |
| PC Tools  | TxD         | Transmit data |
| PC Tools  | RxD         | Receive data  |



Note that there is no unit redundancy for the CI858 unit.

## Installing the FOUNDATION Fieldbus High Speed Ethernet Interface, CI860/TP860

The CI860 is powered from the processor unit via the CEX-Bus and requires therefore no additional external power source.

Use the following procedure to install the CI860/TP860:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the Ethernet twisted pair cable to the COM connector on the baseplate.
3. Connect the other end of the Ethernet cable to Ethernet network via standard Ethernet components.
4. Please make sure to meet the FOUNDATION Fieldbus High Speed Ethernet specification of the network and the network devices.

### **Ethernet Twisted Pair Connection**

The Ethernet twisted pair is connected via the RJ45 connector located on TP860. For a description of the connector see [Table 5](#) on page 84.

## Installing the TRIO Fieldbus Interface CI862

The CI862 is powered from the processor unit via the CEX-Bus and requires no additional external power source. No field device is powered from the CI862.

Use the following procedure to install the CI862:

1. Mount the unit onto the DIN-rail.
2. Connect the field bus cable to the LAN connector (right most connector). See the CI862 Installation book for TRIO field bus guidelines, cable types and length.

The Hand-Held Monitor, if used, is connected to the HHM connector.

### Unit to Baseplate Alpha Code Lock

The CI862 unit and baseplate have the locking device removed because of the placement of the electronics inside the unit. The electronics will not allow the CI862 unit to be installed in any baseplate with a locking device. However, other units could be inserted into the CI862 baseplate.



The CI862 baseplate has no locking device. Insert only the CI862 unit into this baseplate. Insertion of other unit types may cause damage to the equipment.

### Bus Termination

The appropriate terminating resistor must be attached to both the beginning and end of the bus. The characteristic impedance for each type of cable is listed in [Table 142](#). If the CI862 is at either end of the bus, the characteristic resistance is set by a switch on the Field Bus Interface Module, [Table 17](#). If a TRIO module is at the beginning or end of the bus, the bus can be terminated with a resistor or a terminating resistance plug, 6202FP00150 for 150 W or 6202FP00075 for 75 W. BSM stubs should not be terminated.

*Table 17. Field Bus Termination Switch Settings of the CI862*

| Dip Switch <sup>(1)</sup> | Setting                 |
|---------------------------|-------------------------|
| 1                         | 75 ohms                 |
| 2                         | 110 ohms <sup>(2)</sup> |

*Table 17. Field Bus Termination Switch Settings of the CI862 (Continued)*

| <b>Dip Switch<sup>(1)</sup></b> | <b>Setting</b> |
|---------------------------------|----------------|
| 3                               | 150 ohms       |
| 4                               | Not Used       |

- (1) The dip switch must be closed to make the termination connection. The default is open, (no internal termination).
- (2) The 110 ohm option may be used to terminate cables with an impedance in the range of 100 to 120 ohms.

As shown in [Figure 78](#), the dip switch is located on the bottom of the housing when looking from the front. Switch 1 is towards the top of the housing.

## Installing the Satt I/O Units and CI865 Module

The CI865 is powered from the processor unit via the CEX-Bus and requires no additional external power source. No field device is powered from the CI865.

Use the following procedure to connect the ControlNet to the BNC connector of the I/O systems and the CI865 module. For more information see Satt I/O Interface for AC 800M (3BSE042821\*).

The BNC connector is located:

- Rack I/O - at the rear of the 200-RACN module.
  - Series 200 I/O - at the front of the 200-ACN module.
  - CI865 - at the front of the CI865 module.
1. Select a suitable location for the tap within one meter from the ControlNet BNC connector. When selecting the tap location, keep in mind the routing of the drop and trunk cables. They should not be routed close to high-voltage cables. Avoid bending the trunk cable too much.
  2. The tap can be mounted in various ways, for example using a DIN rail or screwed into a suitable structure. Even if the tap is not mounted on a DIN rail, the universal mounting bracket should be used to avoid galvanic connection to a conducting structure.
  3. Connect the tap drop cable to the BNC connector. Before starting up the system, all ControlNet cable connections should be tested. Check the pulling strength of applied connectors.
  4. Define the network node address:
    - Rack I/O - by turning the two switches (x10 and x1) on front of the 200-RACN module to the correct position. A node address in the range 02-99 should be selected for the 200-RACNs.
    - Series 200 I/O - by clicking the push button switches on the front of the 200-ACN module. A node address in the range 02-99 should be selected for the 200-ACNs.
    - CI865 - The node address is fixed to 01.

## Installing the Modbus TCP Interface CI867/TP867

The CI867 is powered from the processor unit via the CEX-Bus and no additional external power source is required.

Use the following procedure to install the CI867/TP867:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65 and [Installing the PM86x/TP830 Processor Unit in Single Configuration](#) on page 78.
2. Connect the 10/100Mbps Ethernet twisted pair cable to the CH1 connector on the baseplate.
3. Connect the other end of the Ethernet cable to a Fast Ethernet network via standard Ethernet components.
4. Connect the 10Mbps Ethernet twisted pair cable to the CH2 connector on the baseplate.
5. Connect the other end of the Ethernet cable to a Ethernet network via standard Ethernet components.

### Ethernet Twisted Pair Connection

The Fast 10/100 Mbps Ethernet twisted pair is connected via the RJ45 connector (CH1) located on TP867. The slower 10 Mbps Ethernet twisted pair is connected via the RJ45 connector (CH2) located on TP867.

For a description of the connectors see [Table 5](#) on page 84.

## Installing the IEC 61850 Interface CI868

The CI868 is powered from the processor unit via the CEX-Bus with no additional external power source required.

To install CI868:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 65.
2. Connect the 100Mbps Ethernet twisted pair cable to the CH1 connector on the baseplate.
3. Connect the other end of the Ethernet cable to a Fast Ethernet network via standard Ethernet components. Refer to PTUST04-3211- Switch Management for IEC 61850 for switches that are certified for IEC 61850.

## Installing the AF 100 Interface CI869

The CI869 unit is powered from the processor unit via the CEX-Bus with no additional external power source required.

To install CI869:

1. Mount the CI869 unit onto the DIN-rail. See [Mounting AC 800M Units onto DIN-Rail](#) on page 65.
2. Connect the AF 100 twisted pair to the 4-pin contact of CI869.  
In case of redundant media, connect the other AF 100 twisted pair to the other 4-pin contact.
3. Connect the other end of the twisted pair to the AF 100 bus.

For details on AF 100 connections, refer to the *Advant Fieldbus 100 User Manual (3BSE000506\*)*.

## Installing the PROFINET IO Interface CI871

The CI871 unit is powered from the processor unit through the CEX-Bus, which requires no additional external power source.

To install CI871:

1. Mount the CI871 unit on the DIN-rail.
2. Connect the 100 Mbps Ethernet cable to the CH1 connector on the baseplate.
3. Connect the other end of the Ethernet cable to the PROFINET IO network.

## Installing the MOD5 Interface CI872

The CI872 unit is powered from the processor unit through the CEX-bus, and does not require any additional external power source.

To install CI872:

1. Mount the unit onto the DIN-rail.
2. Connect the fiber optic cables to the CH1, CH2, and CH3 connectors on the CI872. Leave the protective plugs mounted on unused ports.
3. Connect the other end of the fiber optic cable to a MOD5 controller.

### Fiber Optics Specifications

The following data applies for the fiber optics connections between the AC 800M controller and MOD5 controllers:

- Wavelength: 820 nm.
- Fiber size: 62.5/125  $\mu$  m multimode glass fiber.
- Connector type: ST.
- Max nominal fiber damping including connectors: 11 dB.

## Installing the EtherNet/IP Interface CI873

The CI873 is powered from the processor unit through the CEX-Bus, which requires no additional external power source.

Follow the steps below to install CI873:

1. Mount the unit onto the DIN-rail.
2. Connect the 100 Mbps Ethernet twisted pair cable to the CH1 connector on the baseplate.
3. Connect the other end of the Ethernet cable to the Fast Ethernet network through the standard Ethernet components.

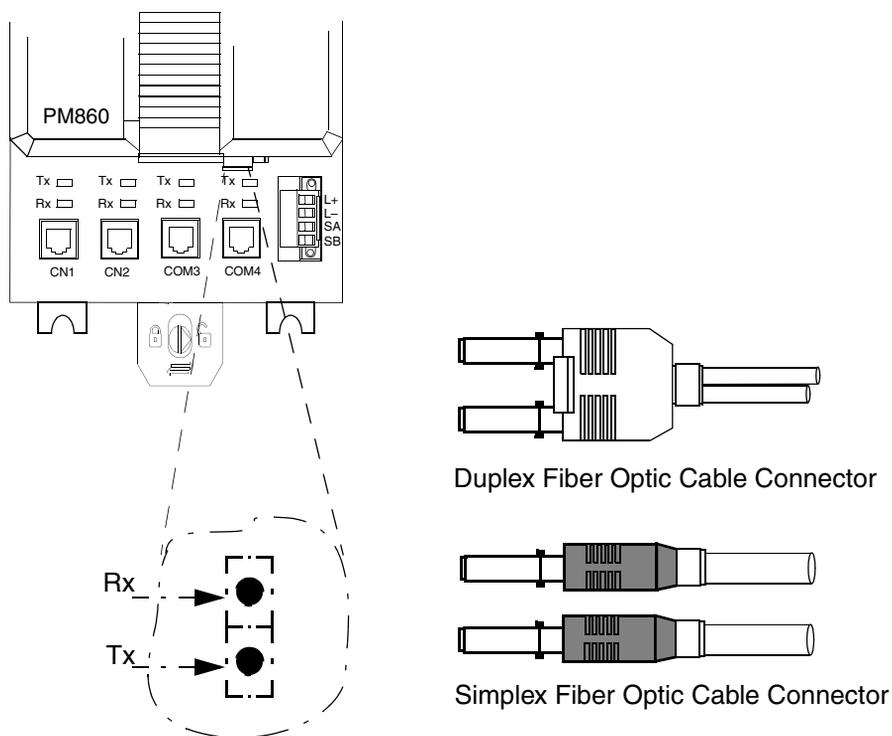
## Installing the ModuleBus for PM8xx



This topic does not apply to PM891. See [Installing the ModuleBus for PM891](#) on page 132.

The ModuleBus has an electrical and a fiber optical interface that are logically the same buses. A maximum of 12 I/O units can be connected to the Electrical ModuleBus and up to seven clusters to the fiber optical ModuleBus. The fiber optical interface is intended for local distribution of I/O clusters and for connection of engineered and standard drives.

[Figure 40](#) on page 131 provides details of the fiber optic connectors, together with the PM8xx optical ModuleBus ports.



*Figure 40. PM8xx Connectors for Optical ModuleBus*

## Installing the ModuleBus for PM891

The ModuleBus for PM891 has a fiber optical interface. The interface is designed for a maximum of seven clusters, of twelve non-redundant or six redundant modules (that is,  $7 \times 12 = 84$  modules). Redundant and non-redundant modules can be mixed. The fiber-optical interface is intended for local distribution of I/O clusters. .

Figure 41 on page 132 provides details of the fiber optic connectors, together with the PM891 optical ModuleBus ports.

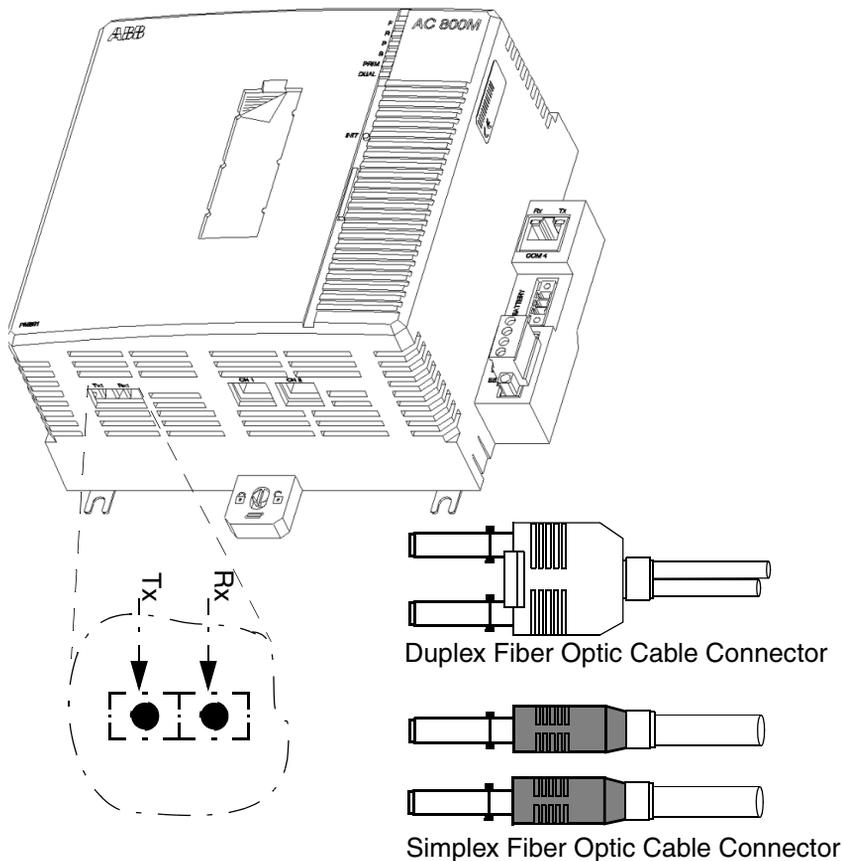


Figure 41. PM891 connectors for Optical ModuleBus

## Installing the SD83x Power Supply

The SD83x power supply units (SD831 / SD832 / SD833 / SD834) should be mounted horizontally at a DIN rail. The units have to be used in non-hazardous locations only.

The four PSUs have data as follows:

- SD831 = Input a.c. 100-240 V or d.c. 110-300 V.  
Output d.c. 24 Volts regulated @ 3 A.
- SD832 = Input a.c. 100-120 or 200-240 V.  
Output d.c. 24 Volts regulated @ 5 A
- SD833 = Input a.c. 100-120 or 200-240 V.  
Output d.c. 24 Volts regulated @ 10 A
- SD834 = Input a.c. 100-240 V or d.c. 110-300 V.  
Output d.c. 24 Volts regulated @ 20 A

Internal primary main fuses are arranged to meet the requirements of electrical safety publications for connection to the Phase - Neutral terminals of primary main network; TN network, 1 (one) fuse. When SD831 and SD834 are used with d.c. input, connect + terminal to L and - terminal to N.

Recommended mounting space and weight:

*Table 18. PSU's SD831, 832, 833, 834 - Mounting space and weight.*

| Parameter                              | SD831 Converter | SD832 Converter | SD833 Converter | SD834 Converter |
|--|-----------------|-----------------|-----------------|-----------------|
| Mounting spacing top <sup>(1)</sup>    | 40 mm           | 40 mm           | 40 mm           | 40 mm           |
| Mounting spacing bottom <sup>(2)</sup> | 20 mm           | 20 mm           | 20 mm           | 20 mm           |
| Mounting spacing side                  | 15 mm           | 15 mm           | 15 mm           | 15 mm           |
| Weight                                 | 430 g           | 500 g           | 700 g           | 1200 g          |

(1) Do not place temperature sensitive units above the PSU.

(2) Do not place units with high power dissipation below the PSU.

## Installing the Mains Breaker Unit

The mains breaker unit is supplied in separate components that must be mounted onto a DIN-rail in order to form a complete assembly. Different distribution options are available, see [Figure 61](#) on page 177 and [Figure 62](#) on page 178. For the sake of simplicity, the installation described covers the redundant power supplies/independent power supplies option.

Use the following procedure to correctly install the mains breaker unit:

1. Mount the mains breaker unit components onto the DIN-rail, from left to right, close to the incoming power supply, in the order given below (see [Figure 42](#) on page 135).

- a. A DIN-rail end-stop (1).
- b. The terminal for the incoming protective ground (2).



The protective ground terminal (2) is fitted with a knife-like device to provide automatic grounding to the DIN-rail.

- c. The two terminals for the incoming Live and Neutral mains power (3). These terminals are equipped with built-in jumpers which, if necessary, can be opened to provide complete mains input power isolation.
  - d. The miniature mains breaker unit (4).
  - e. The protective ground distribution terminal (5).
  - f. The mains distribution terminal block (6), depending on the required configuration.
  - g. A DIN-rail end-stop (1).
2. Connect the incoming mains, the protective ground terminals, the mains breaker and the distribution terminals as shown in [Figure 42](#) on page 135.
  3. Install the two required links (7), fuse holders (8) and jumpers (9) onto the distribution terminals. Fit the required fuses into the fuse holders, (glass tube type, 5 x 20 mm (0.2 x 0.8 in)).

Removing the fuse holders or the jumper connections provides visual indication if the power supply has been disconnected. The fuse holders have built-in red LEDs to indicate a ruptured (defective) fuse.

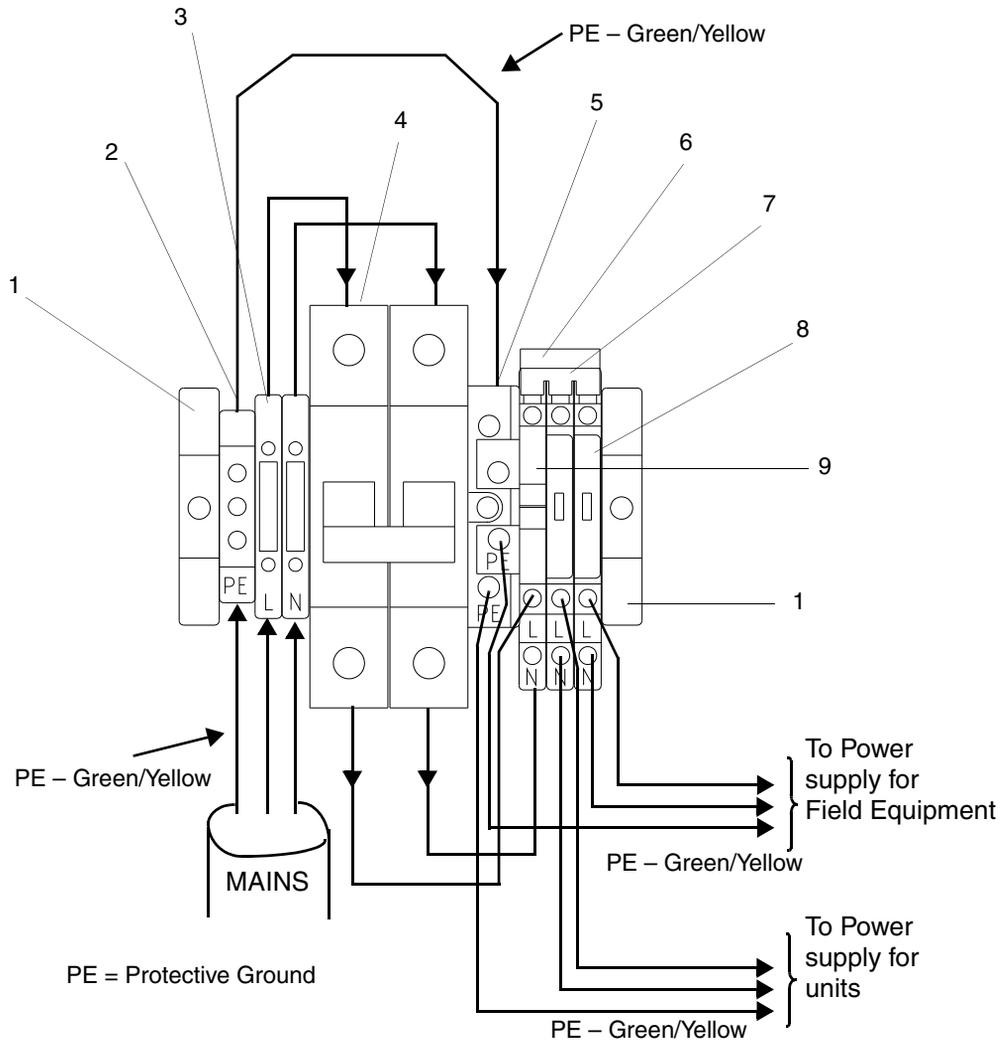


Figure 42. Installation of Mains Breaker Assembly

## Installing the SS823/SS832 Voting Unit

The SS8xx voting unit is used to connect two redundant power supplies to a common load. Depending on the system configuration requirements, the two redundant power supplies may be connected to completely separate mains supplies or to the same mains supply, as shown in [Figure 43](#) on page 137 for SS823, [Figure 44](#) on page 138, and [Figure 45](#) on page 139 for SS832.

Use the following procedure to install the voting unit SS8xx:

1. Mount the voting unit SS8xx onto the DIN-rail, adjacent to the power supplies.
2. Connect the voting unit to the selected SD83x power supply units, in required configuration. See [Figure 44](#) on page 138 and [Figure 45](#) on page 139 for SS832.

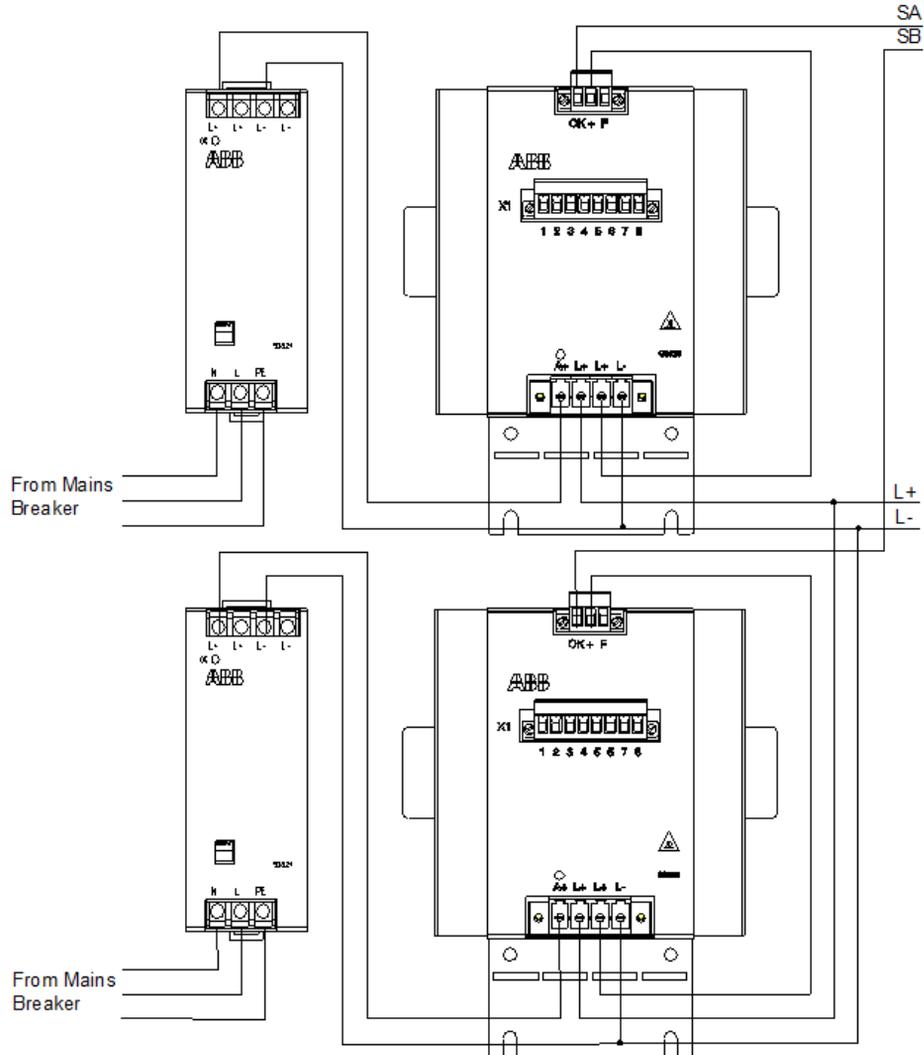


Figure 43. Redundant Power Supply for SS823

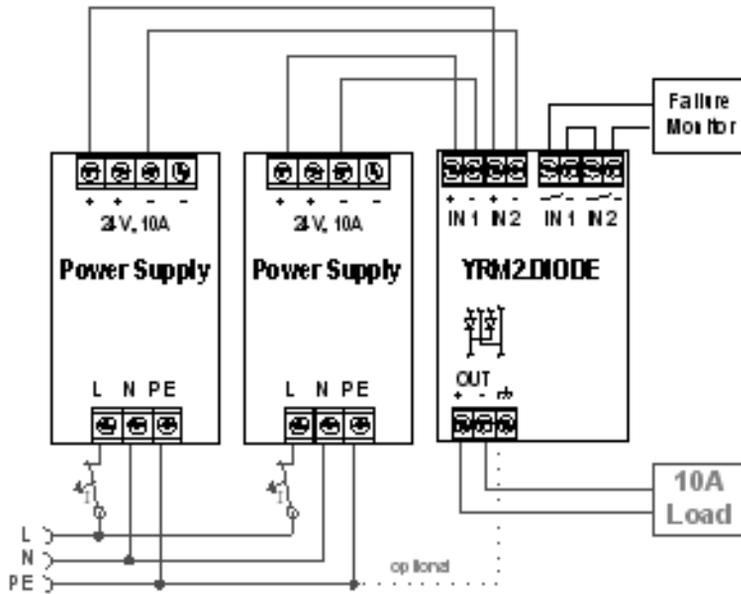


Figure 44. SS832 Redundant Configuration up to 10 A

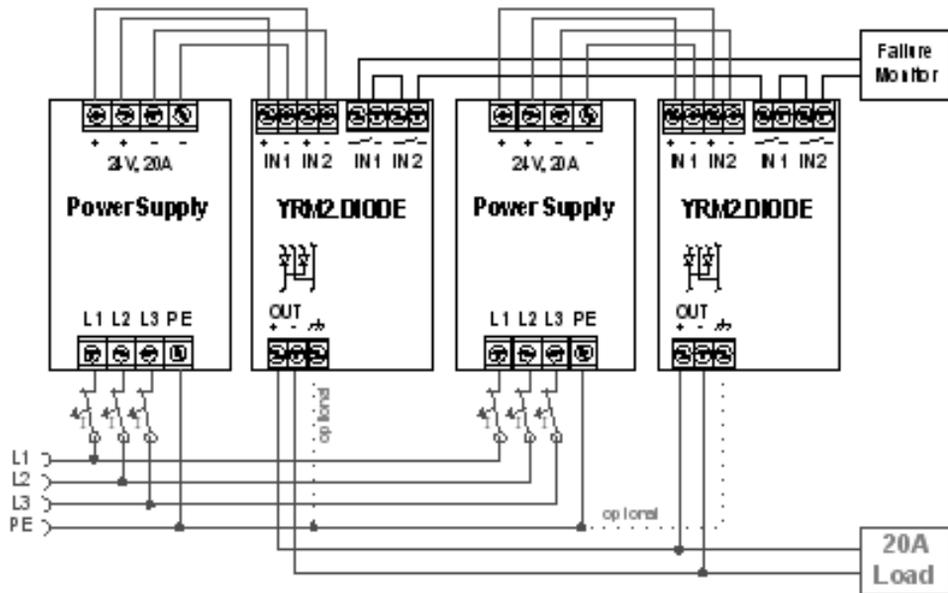


Figure 45. SS832 Redundant Configuration up to 20 A

3. Connect the SS82x voting unit to the processor unit. [Figure 46](#) on page 140 shows the connection to PM861/PM864/PM865 in redundant configuration.

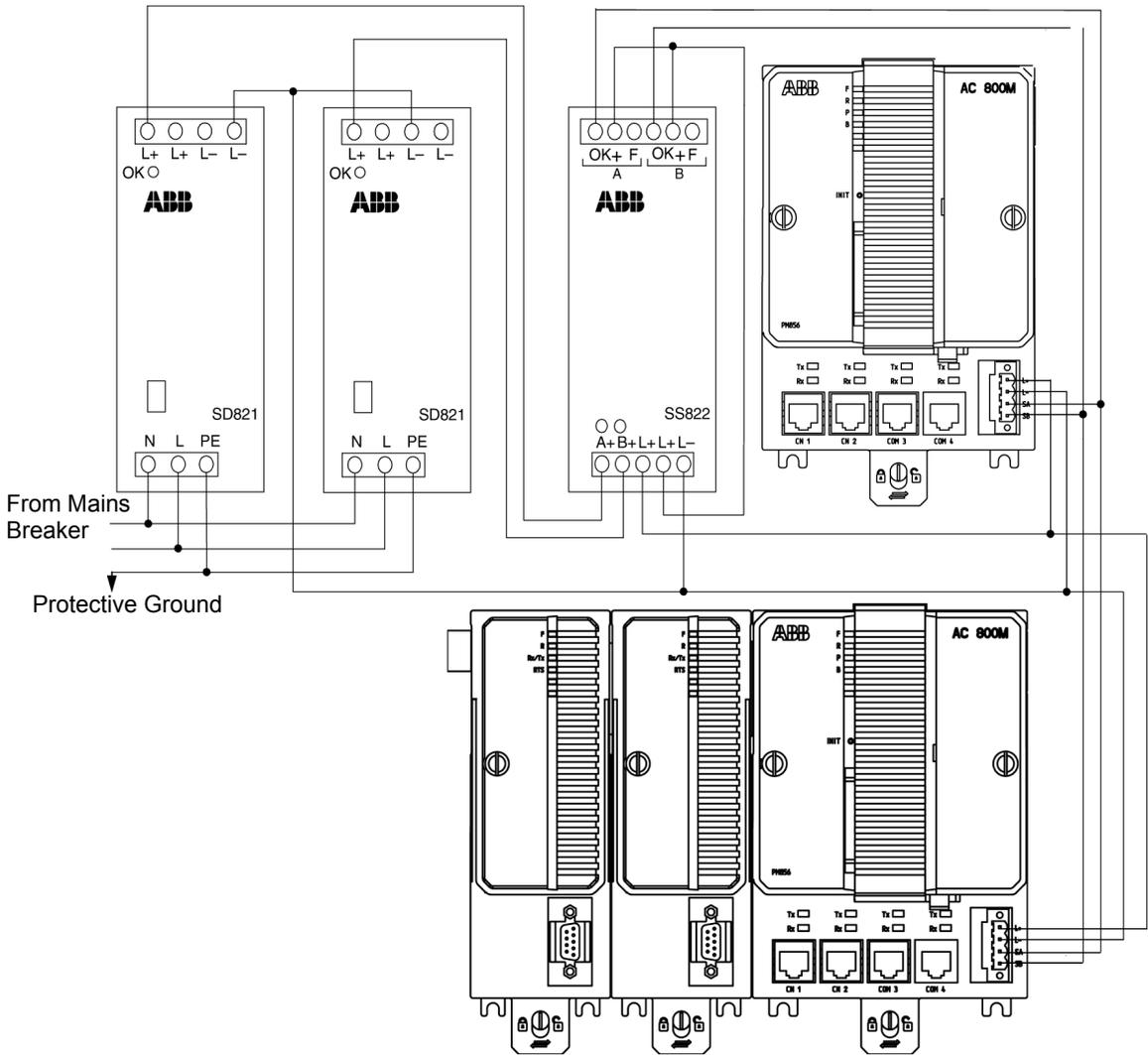


Figure 46. Redundant Power Supply Powering Redundant CPUs

### Power Supply Supervision

The status of power supplies in redundant configuration can be supervised via the SS8xx voting unit. The supervision signals SA and SB from the SS8xx are connected to the corresponding terminals of the CPU.

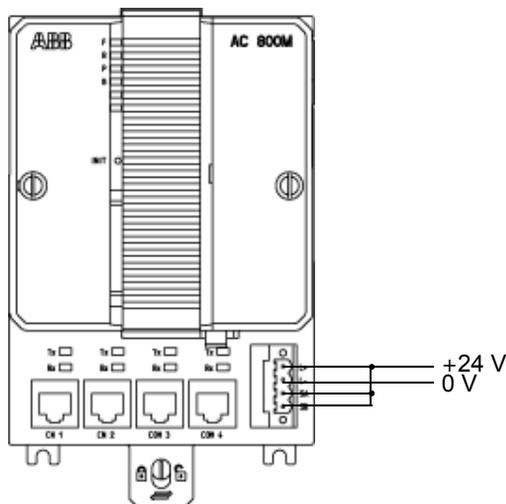
+24 V on the SA/SB indicates working power supplies. 0 V on SA/SB indicates an error in the corresponding power supply and lack of redundancy. SA/SB signal connection is shown in [Figure 46](#) on page 140, [Figure 47](#) on page 141 and [Figure 48](#) on page 142.

[Figure 46](#) on page 140 show redundant power supplies powering AC 800M units. Here the SA/SB signals also indicate physical power supplies.

[Figure 48](#) on page 142 shows one redundant power supply powering the AC 800M units and one for powering field equipment. An SA/SB error indication can not indicate which physical power supply that has failed, only that there is a failure.



To avoid error indications from SA/SB when single power supply is used, it is recommended to connect the input terminals SA/SB on the CPU to +24 V, see [Figure 47](#).



*Figure 47. Connection of SA/SB using Single Power Supply*

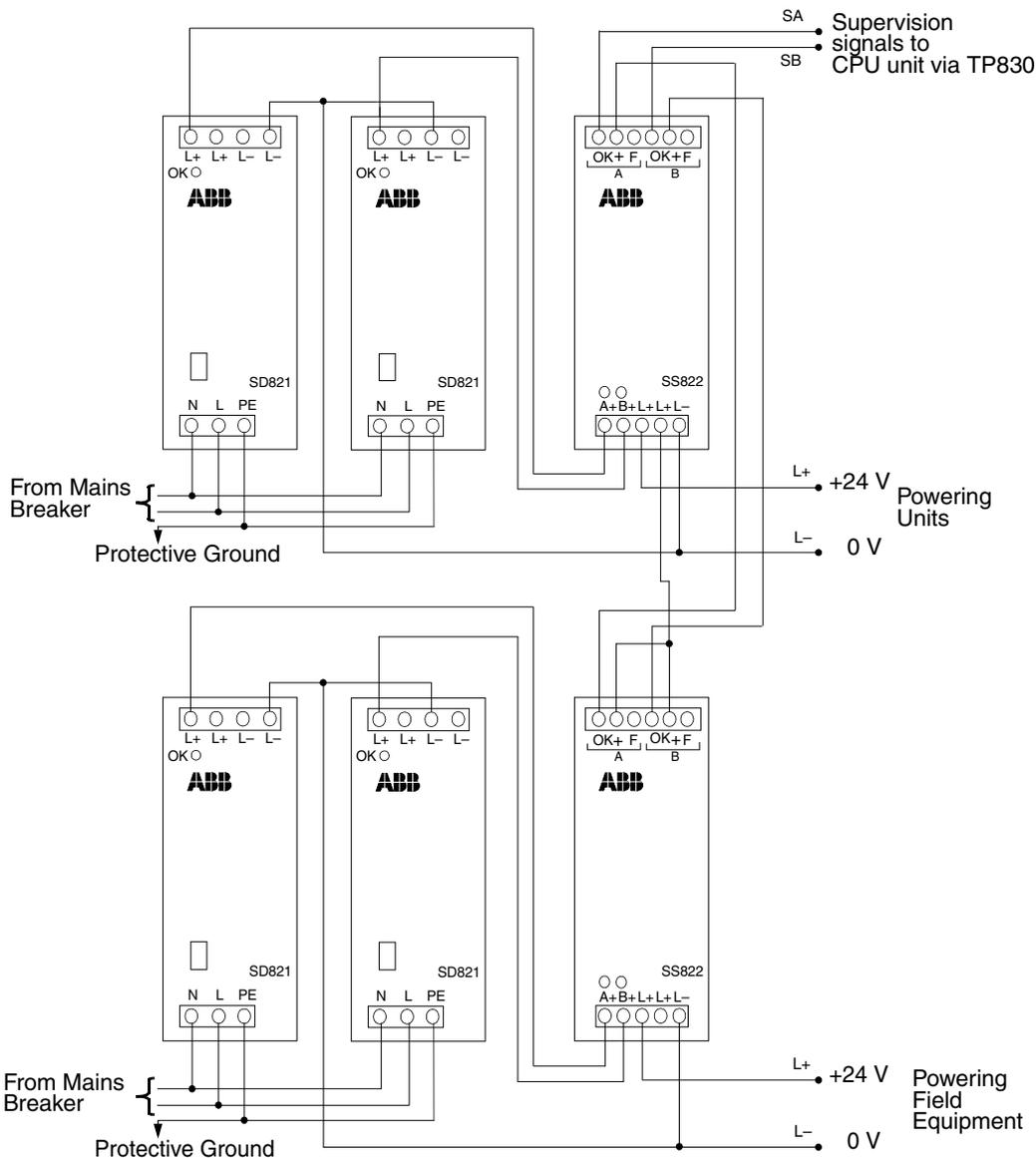


Figure 48. Redundant Power Supply Powering Units and Field Equipment

## Installing the SB821 External Battery Unit

Use the following procedure to connect the external battery unit:

1. Mount the SB821 external battery unit at a suitable position on the DIN-rail.
2. For connecting the SB821 external battery unit, use the 2 m (2.2 yd) cable TK821V020. Plug one end into the battery unit and the other into the external battery supply socket of the PM8xx processor unit (see [Figure 2](#) on page 32).
3. In redundant CPU configuration containing two PM861/PM864/PM865 processor units, use also two SB821 battery units, one for each processor unit.
4. Due to the batteries being connected in parallel, it is necessary, when using the external battery, to remove the internal battery from the PM8xx in order to avoid reducing available memory back-up time.



Do not connect the TK821V020 cable until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the PM8xx processor unit, the CPU memory will immediately start to consume battery power when the cable is connected.



Always install a fresh internal or external battery at the end of the installation phase. The original battery is heavily utilized due to frequent blackouts during system installation.

## Installing the SB822 Rechargeable External Battery Unit

Use the following procedure to connect the rechargeable external battery unit:

1. At delivery the Li-Ion battery package is not connected internally. Follow the steps in the Data and installation sheet, which is enclosed in the packing box, to connect the battery package properly.
2. Mount the SB822 rechargeable external battery unit at a suitable position on the DIN-rail.
3. Connect the 24V supply to the connector enclosed in the packing box.
4. Connect the 24V supply to the battery unit (X3)
5. Make sure that the AC 800M controller is powered and that the battery LED in the front of PM8xx is flashing
6. Connect the SB822 rechargeable external battery unit, use the 2 m (2.2 yd) cable TK821V020. Plug one end into the battery unit and the other into the external battery supply socket of the PM8xx processor unit (see [Figure 2](#) on page 32).
7. Make sure that the green Power LED and the yellow Charge LED on SB822 are turned on.
8. In redundant CPU configuration containing two PM861/PM864/PM865/PM891 processor units, use also two SB822 battery units, one for each processor unit.
9. Due to the batteries being connected in parallel, it is necessary, when using the external battery, to remove the internal battery from the PM8xx in order to avoid reducing available memory back-up time.

Do not connect the TK821V020 cable until the AC 800M Controller has been powered-up normally and the memory back-up function has been activated, that is, the B(attery) LED flashes. If no normal power supply is connected to the PM8xx processor unit, the CPU memory will immediately start to consume battery power when the cable is connected

## Installation of I/O Units

For further information regarding mounting, removing and releasing procedures for I/O Units, refer to the appropriate I/O system documentation.

## Installation in Cabinets

The figures listed below are examples of how the AC 800M Controllers, Power Supply units, Voting units and S800 I/O units can be configured and mounted within cabinets:

- [Figure 49](#) on page 146: Wall Cabinet – Single Power Supply Arrangement
- [Figure 50](#) on page 147: Wall Cabinet – Dual Power Supply (Local/Field) Arrangement
- [Figure 51](#) on page 148: Floor Mounted Cabinet – Unit Arrangement (Redundant PSU)

The DIN-rails are using the supporting Al-profile to ensure rigidity. See [Figure 118](#) on page 403.

The cabinets shown in the figures are ABB manufactured cabinets:

- RE820: Wall Cabinet
- RM550: Floor Cabinet

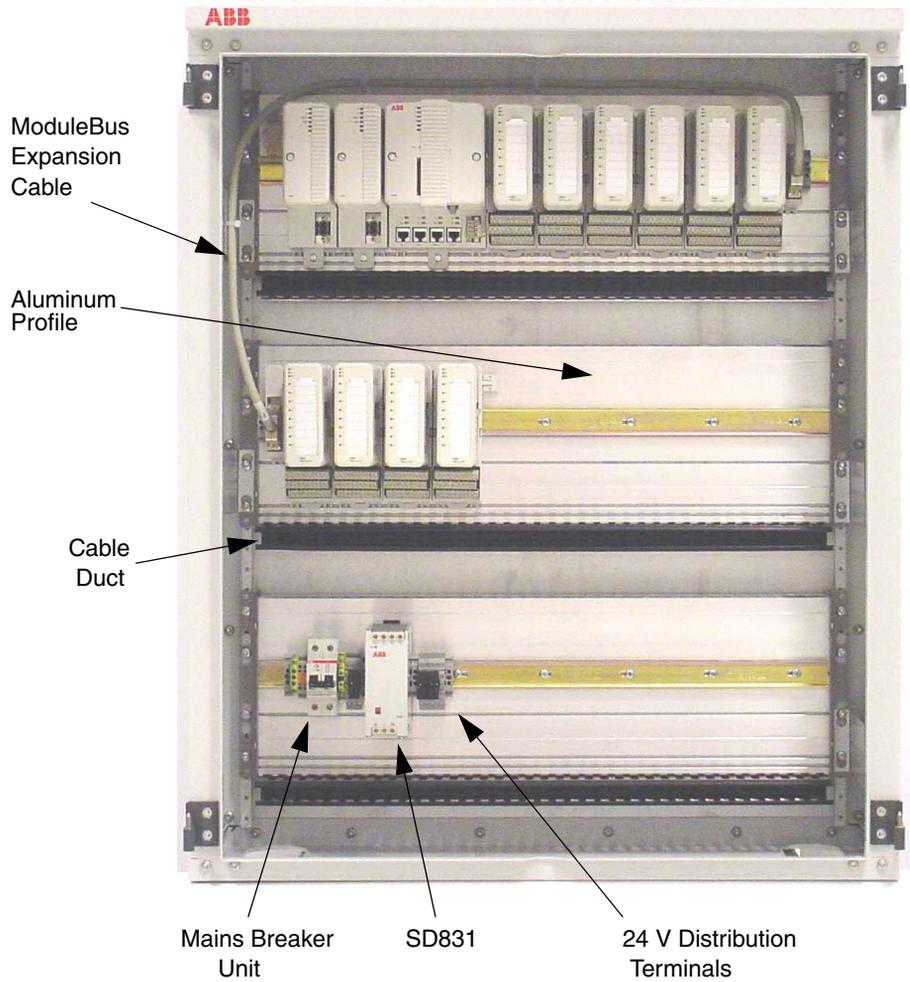


Figure 49. Wall Cabinet – Single Power Supply Arrangement

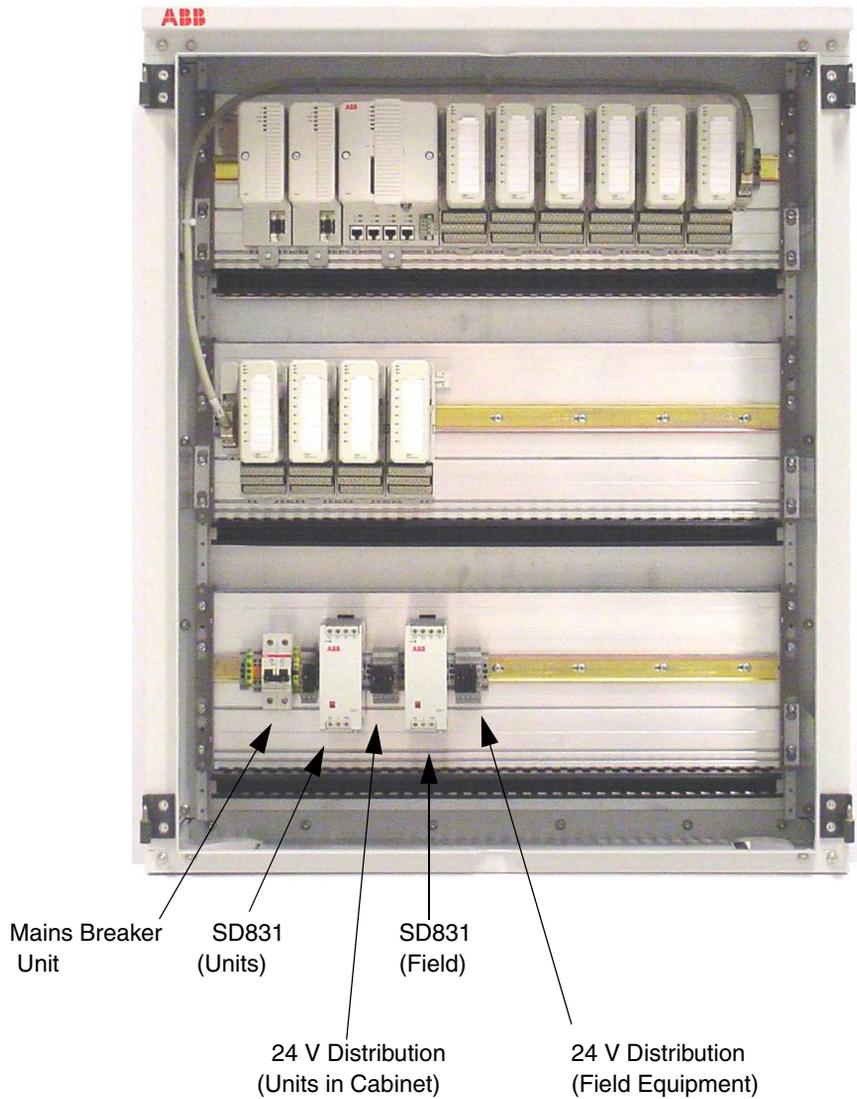


Figure 50. Wall Cabinet – Dual Power Supply (Local/Field) Arrangement

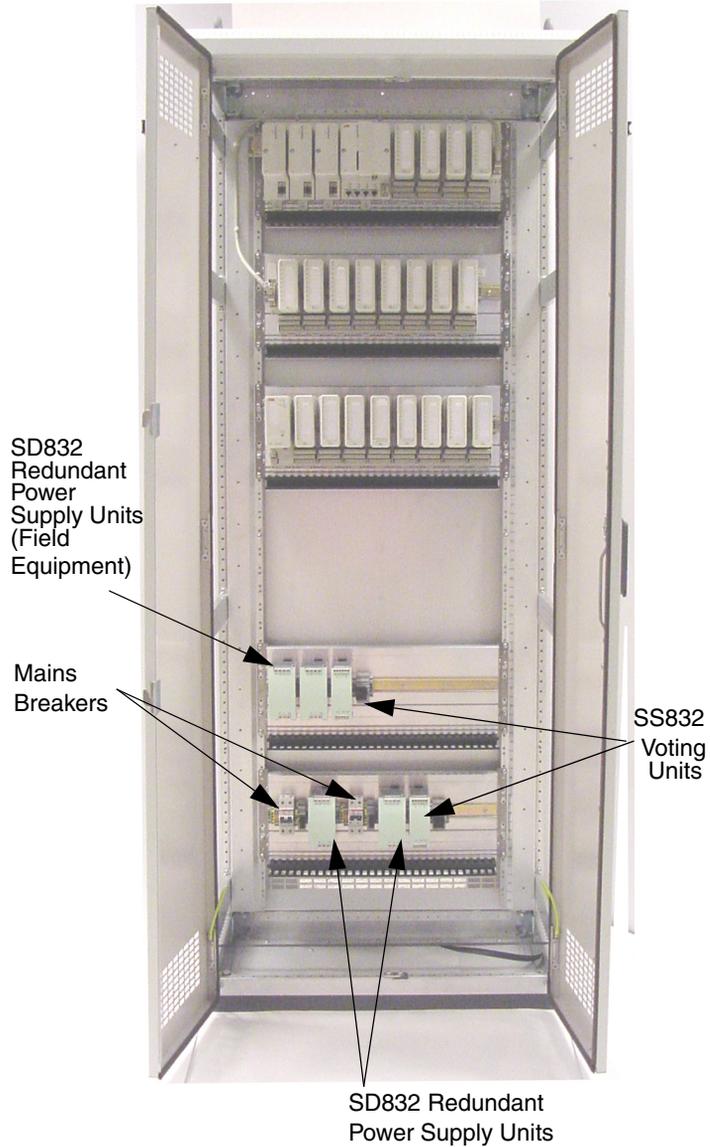


Figure 51. Floor Mounted Cabinet (Horizontal Unit Arrangement)

## Mounting Dimensions for Proper Ventilation

To maintain adequate cooling airflow through the AC 800M Controller units, there must be no obstruction within 50 mm (2 in) above and 25 mm (1 in) below the units, as shown in [Figure 52](#) on page 149. **Note** that the CPU and Communication Interfaces must be mounted on a **horizontal** DIN-rail.

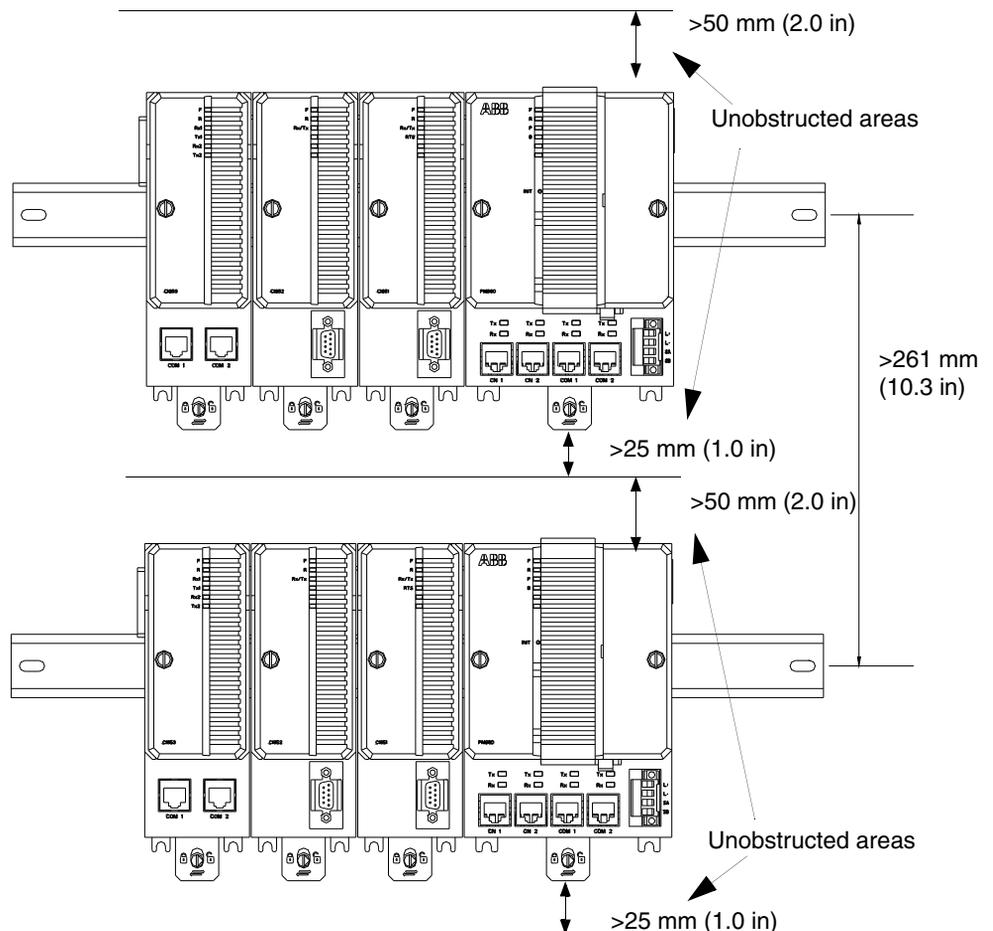


Figure 52. Ventilation Requirements – Minimum Mounting Dimensions



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## Section 3 Configuration

### General Information

Using the engineering tool Control Builder, it is possible to configure hardware (I/O and communication units) and make application programs with control languages according to IEC 61131-3. Programs can be compiled and run off-line as an aid to process simulation before finally downloading an application to the controller. The Control Builder offers a set of options, each with its own set of properties. Simply select the option that is closest to system requirements.

- Control Builder documentation – for configuration information
- Control Software documentation – for available functionality.

Control Builder Online Help provides detailed step-by-step information when creating an application for the AC 800M Controller.

## Connecting Control Builder

The Control Builder is installed in a PC that is normally connected to the AC 800M Controller via the Control Network and the CN1 or CN2 ports on the controller (see [Figure 53](#) on page 153).

Alternatively, the Control Builder may be connected via the COM4 port (RS-232C) on the AC 800M Controller. Use the tool cable TK212 and a serial port on the PC.



In redundant configuration, the Control Builder is connected to the Primary CPU COM4 port. The Backup CPU cannot communicate with Control Builder.



PM851/PM851A is restricted to one Ethernet (CN1) port, thus redundant Ethernet is not available.



Control Builder as standard does not support CI862. If CI862 is to be used suitable system extension must be installed.



To use the FF HI functionality, upgrade the firmware of CI852 unit by using Serial Firmware Upgrade Tool. The Serial Firmware Upgrade Tool loads the special firmware with FF HI functionality to the Controller. Manually browse the folder, ..\FirmwareFiles\SC860rFFHI in the Serial Firmware Upgrade Tool and select firmware.ext.

## Connection to a Control Network

Control Network is a private IP network domain for both real time data and general system communication between industrial computers. It is scalable, from a very small network with a few nodes, to a large network containing a number of “Network Areas” and many hundreds of nodes.

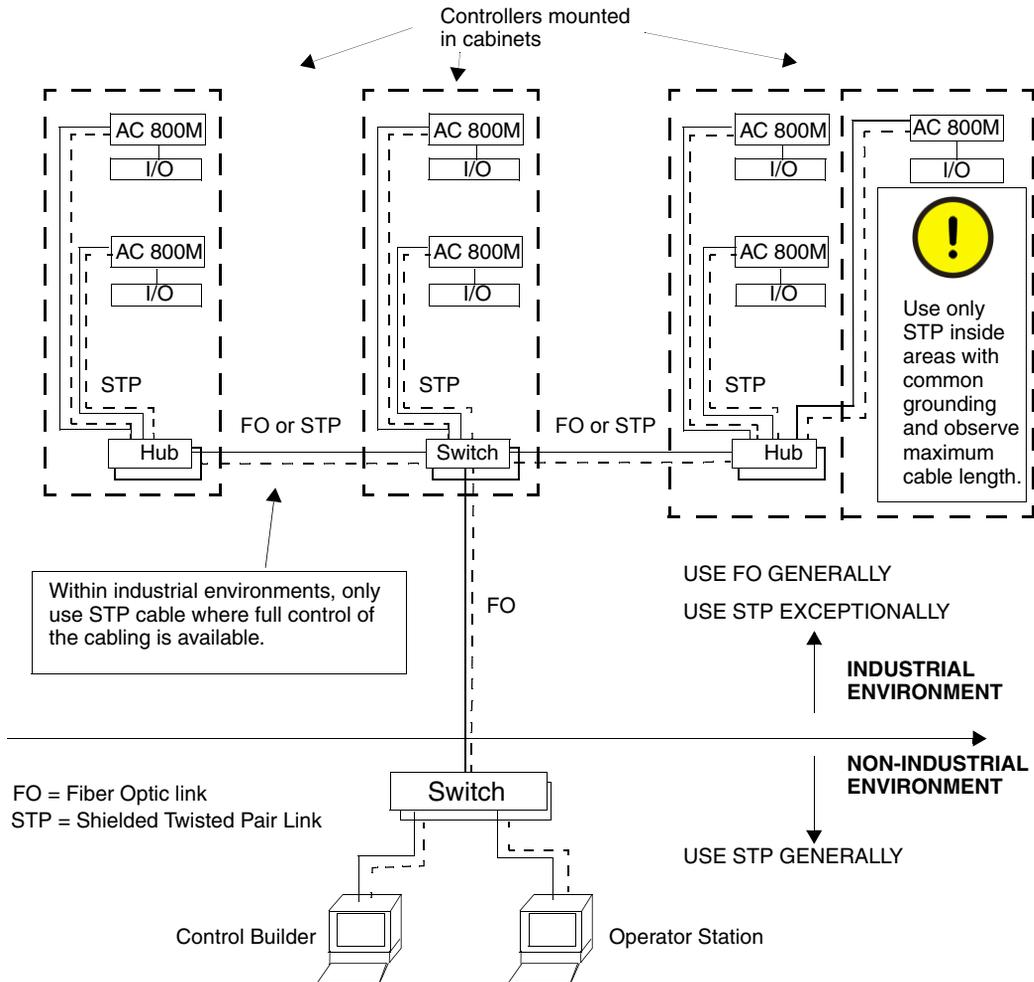


Figure 53. Example of AC 800M Controllers Connected to a Control Network

The network can utilize different and mixed link implementations such as Fast Ethernet and PPP. It provides for full redundancy, in order to achieve high network availability.

The AC 800M controller is always connected to the Control Network via an STP (Shielded Twisted Pair) cable. Should the local environment be of an industrial nature, the AC 800M / Control Network connection must be converted over to a Fiber Optic (FO) cable. This is achieved by installing an Ethernet Switch having both optical and electrical ports. See [Figure 53](#) on page 153.

For more information on Control Network, see Control Network documentation.

## Communication Possibilities

The processor unit (PM8XX/TP830 or PM891) contains the following communication ports, offering the following functions:

- CN1 and CN2 are used for connection to the Control Network. Both are RJ45 ports for Ethernet (IEEE802.3) and connection is normally achieved using category 5 shielded twisted pair cable (STP class 5). However, as mentioned previously, within industrial environments it is recommended that all STP cables are converted to optical fiber.
  - For single or redundant CPUs and **single** networks: All CN1 ports are connected to the network (CN2 can be used, but requires reconfiguration of the communication set-up for the concerned CPU).
  - For single or redundant CPUs and **redundant** networks: All CN1 ports are connected to the primary network and all CN2 ports to the secondary network.



PM851/PM851A is restricted to one Ethernet (CN1) port, thus redundant Ethernet is not available.

Details on cable selection, switches and so forth, are provided in [Appendix C, Recommended Components](#).

- COM3 is an RJ45 port for RS-232C with modem signals. Examples of protocols are Modbus, Siemens 3964R, COMLI or custom-design. For more details, see protocol-specific documentation.



COM3 port is not available for PM891.

- COM4 is an RJ45 port for connection of service tools (see [Connecting Control Builder](#) on page 152). The port has no modem signals.

By adding communication interfaces to the CEX-Bus, the number of protocols and processor unit ports can be expanded. The available CEX-Bus interface quantities are shown in [Table 19](#) on page 156.

Table 19. Interfaces Available on the CEX-Bus

| Interface                          | Number of Interfaces on CEX-Bus |  | Number of ports per Interface |
|------------------------------------|---------------------------------|--|-------------------------------|
|                                    | Maximum of each interface       | Maximum total on CEX-Bus <sup>(1)(2)</sup> |                               |
| CI851 (PROFIBUS DP)                | 12                              | 12   | 1                             |
| CI852 (FOUNDATION Fieldbus H1)     | 12                              |  | 1                             |
| CI853 (RS-232C)                    | 12                              |  | 2                             |
| CI854/CI854A (PROFIBUS DP)         | 12                              |  | 2                             |
| CI855 (Ethernet for MasterBus 300) | 12                              |  | 2                             |
| CI856 (S100)                       | 12                              |  | 1                             |
| CI857 (INSUM)                      | 6                               |  | 1                             |
| CI858 (DriveBus)                   | 2                               |  | 3                             |
| CI860 (FOUNDATION Fieldbus HSE)    | 12                              |  | 1                             |
| CI862 (TRIO)                       | 4                               |  | 1                             |
| CI865 (Satt I/O)                   | 4                               |  | 1                             |
| CI867 (Modbus TCP)                 | 12                              |  | 2                             |
| CI868 (IEC 61850)                  | 4                               |  | 1 <sup>(3)</sup>              |
| CI869 (AF100)                      | 12                              |  | 2                             |
| CI871 (PROFINET IO)                | 12                              |  | 2 <sup>(3)</sup>              |
| CI872 (MOD5)                       | 4                               | 8  | 3                             |
| CI873 (EtherNet/IP)                | 4                               | 12   | 2 <sup>(3)</sup>              |

(1) PM851/PM851A is restricted to a maximum of one CEX module.

- (2) The maximum total limit on CEX-Bus is the electrical one, there might be further limitations due to performance for a particular unit.
- (3) Only one port (CH1) is used in the interfaces CI868, CI871 and CI873.

For information on available serial protocols for the CI853 interface, see COM3 above.



If redundant controllers (PM8XX) are used along with redundant communication interfaces, it ensures full redundancy and supports the online upgrade of firmware.

## Controller IP Addresses



It is recommended to make a practice of always starting an IPConfig session with a “Restore factory settings” command before assigning the intended IP addresses. This will erase previously stored alternative MAC and IP addresses if any. See [MAC and IP Address Handling in Redundant Configuration](#) on page 49.

### Single CPU Configurations

The IP address of the CN1 port on the controller is set using the IPConfig tool (this tool is installed together with the 800xA system). See IPConfig online help.

If network redundancy is used, make sure that the CN1 port is connected to the primary network, and the CN2 port is connected to the secondary network. In this case, you also have to set the IP address for the CN2 port. See IPConfig online help.

### Redundant CPU Configurations

In configurations with redundant CPU, the IP address must be set as follows:

1. Switch off the backup CPU (power down).



When setting the IP address of the primary CPU in Control Builder, the **backup CPU must be turned off** (powered down). Otherwise the backup CPU will take over and you get disconnected.

2. Connect the IPConfig tool to the primary CPU and set the IP address of the CN1 port on the primary CPU. See IPConfig online help.



At the first power-up, the primary processor is always the one connected to the RCU Link connector marked “UPPER”.



If network redundancy is used, the IP address of the **CN2 port of the primary processor cannot be set using IPConfig**. This address must be set in Control Builder

3. Set the IP address of the CN1 port on the backup CPU. Use default settings (0.0.2.0 is added to the address of the primary CPU), unless your network administrator requires otherwise. See IPConfig online help.



If network redundancy is used, you also have to set the IP address of the CN2 port of the backup processor using IPConfig. See IPConfig online help.

4. Start your 800xA Workplace.
5. Create a representation of the controller in the Project Explorer hardware tree. Make sure the PM861/PM864/PM865/PM891 processor unit is defined as redundant. See Control Builder online help.
6. In Project Explorer, set the IP address of the controller to the IP address of the primary CPU. See Control Builder online help.
7. Switch on the secondary CPU. Check that you have communication with the controller.



There is no need to set IP address(es) for the backup CPU in Control Builder. The IP address of the backup CPU, CN1 and CN2 ports will only be used for internal communication between the primary and backup CPUs. When the backup CPU takes over, it also takes over the primary IP address that is defined in Control Builder. Other units on the control network will never notice the switchover.

## I/O Systems

There are several methods of connecting I/O systems to the AC 800M Controller:

- S100 I/O via CI856.
- S800 I/O units via the ModuleBus. Support for hot configuration during run, redundancy on all levels, HART routing, and Sequence-of-Events (SOE).
- S800 I/O units via CI854/CI854A and CI840/CI840A, PROFIBUS DP. Support for HART routing, redundancy on all levels, and hot configuration during run.

- S800 I/O units via CI854/CI854A and CI801, PROFIBUS DP. Support for HART routing, and hot configuration during run.
- S900 I/O units can be connected to PROFIBUS DP.
- ABB Drives can be connected to the ModuleBus, via CI801 and also via Modulebus on the PM8xx. Some Drives equipment can be connected directly to PROFIBUS or PROFINET IO. Please refer to Drives-specific documentation for more information.
- Genius remote I/O (TRIO) via the CI862 Interface
- Satt I/O on ControlNet (19" Satt rack I/O, S200 I/O and S200L I/O) via the CI865
- PROFINET IO via CI871

For more information on supported I/O systems and units, see I/O documentation.

### ModuleBus

The ModuleBus in the AC 800M controller, except PM891, consists of one electrical and one optical unit. The PM891 consists of optical ModuleBus only.

The following are the details of the ModuleBus:

- Electrical ModuleBus, (see [Figure 54](#) on page 160) – 1 cluster (group), with a maximum of 12 S800 I/O units connected.



Note that the electrical ModuleBus can only be used for connection of S800 I/O when AC 800M is running in single CPU configuration.

- Optical ModuleBus (see [Figure 54](#) on page 160) – 7 clusters (groups), with maximum  $7 \times 12 = 84$  S800 I/O units connected.



PM851/PM851A is restricted to one optical ModuleBus cluster.



Use of redundancy will reduce the maximum number of S800 channels. Each cluster may contain up to 12 single S800 I/O units *or* up to 6 redundant S800 I/O units.

This provides a total of eight clusters (groups), with a maximum  $8 \times 12 = 96$  S800 I/O units connected to an AC 800M Controller with single CPU configuration.

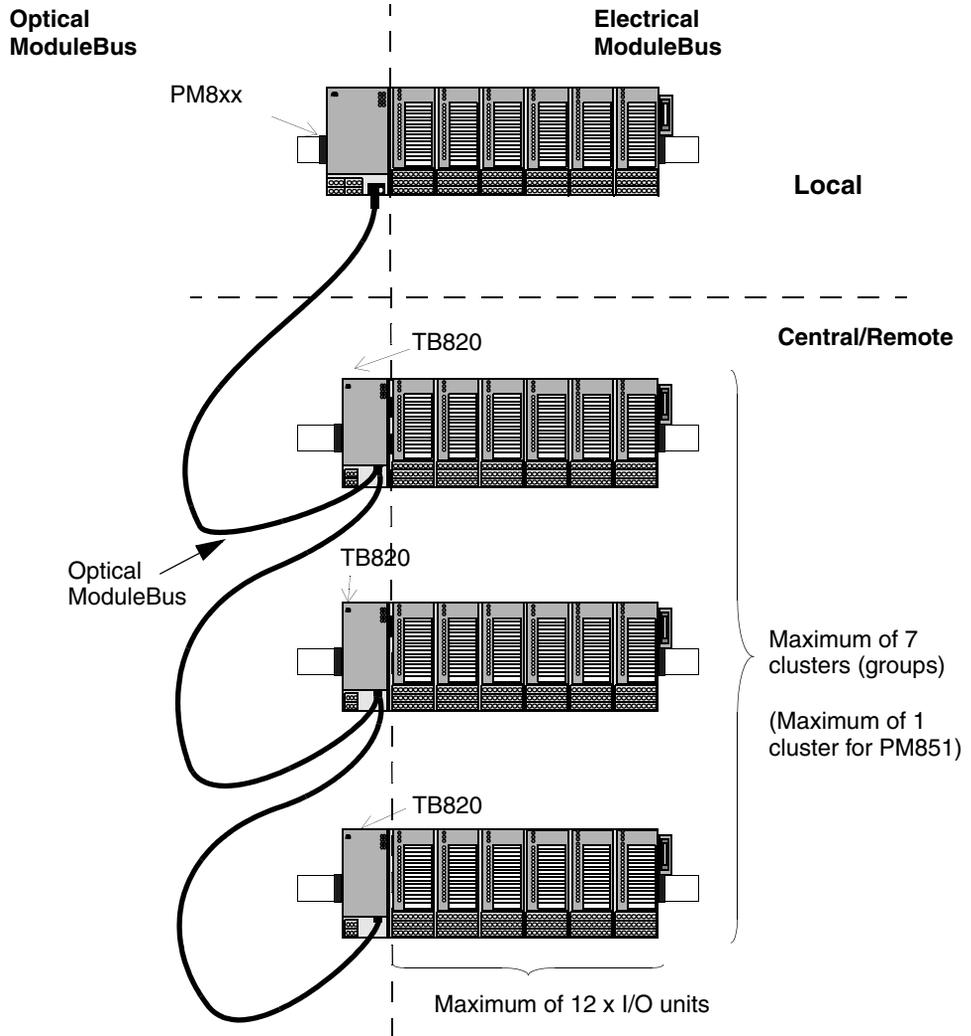


Figure 54. Electrical and Optical ModuleBus Configuration

In redundant CPU configuration, S800 I/O is connected through the optical ModuleBus. Each CPU is connected to one TB840 on each cluster (see [Figure 55](#) on page 161).

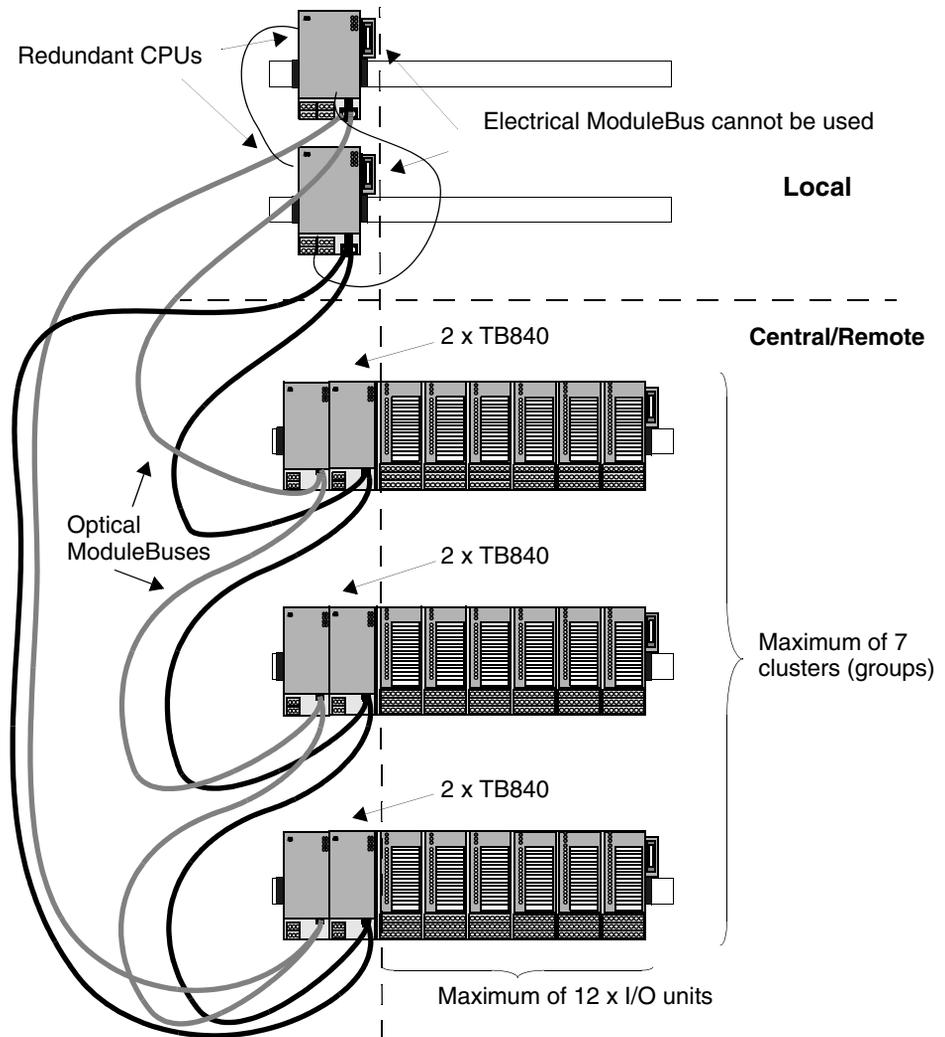


Figure 55. Optical ModuleBus connection in redundant CPU configuration

## PROFIBUS DP

A PROFIBUS DP segment, capable of providing up to 32 nodes, can be directly connected to a PROFIBUS DP Interface unit type CI854A/TP854. This segment can be further extended using repeater units.

PROFIBUS PA can be connected to PROFIBUS DP via the PROFIBUS linking device LD 800P, see [Appendix C, Recommended Components](#). For further details refer to PROFIBUS documentation, available at the PROFIBUS Internet site.

It is possible to connect the following I/O systems to the PROFIBUS DP:

- S800 I/O and/or S800L I/O via FCI – refer to S800 I/O documentation.
- S900 I/O via FCI CI920 - refer to S900 I/O documentation.
- S200 I/O and/or S200L I/O via Fieldbus Adapter 200-APB12 – refer to S200 I/O documentation. Restrictions apply for PROFIBUS DP.
- Other I/O systems can also be connected to PROFIBUS DP. Refer to the relevant manufacturer's documentation.



Note that the total number of I/O units to be configured within a controller may be restricted, depending on the unit range parameter of your license.

For further information on the various I/O systems, see specific I/O documentation.

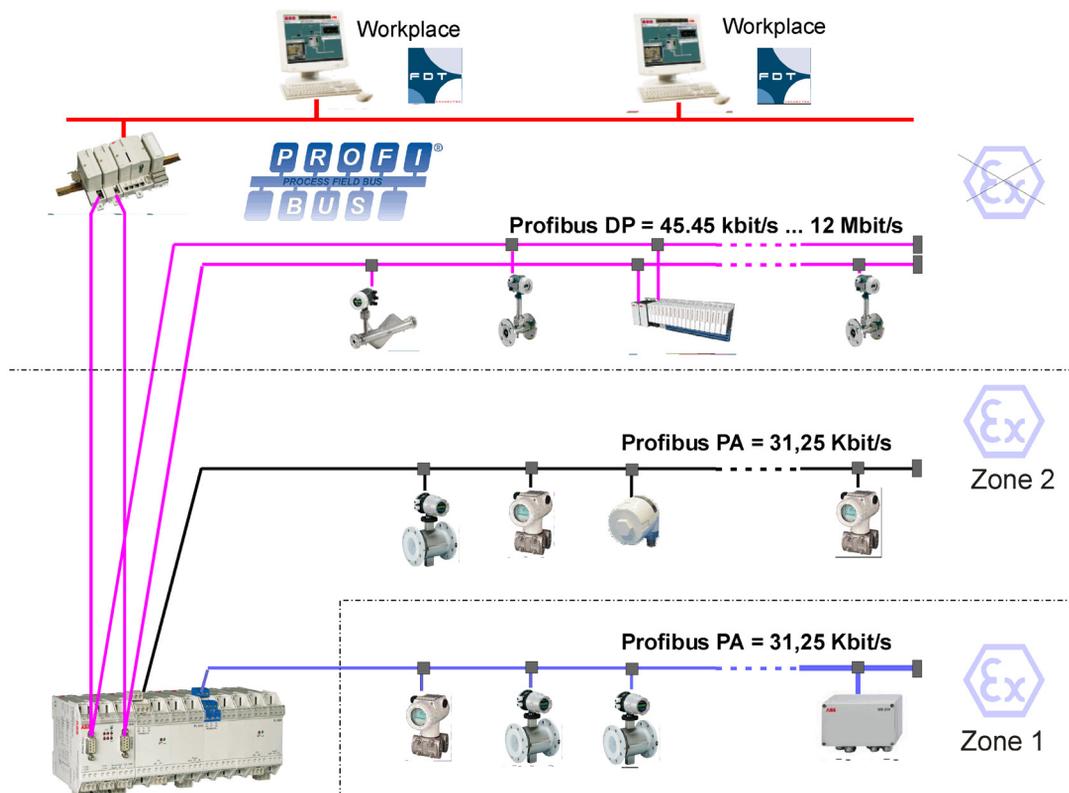


Figure 56. Example of System Structure for PROFIBUS

### PROFINET IO

PROFINET IO describes a device model oriented to the PROFIBUS framework. It consists of places of insertion (slots) and groups of I/O channels (subslots). The PROFINET IO engineering is performed in a way familiar to PROFIBUS. The distributed field devices are assigned to the controllers during configuration.

The PROFINET IO is interfaced to the AC 800M controller , using the PROFINET IO communication interface, CI871.

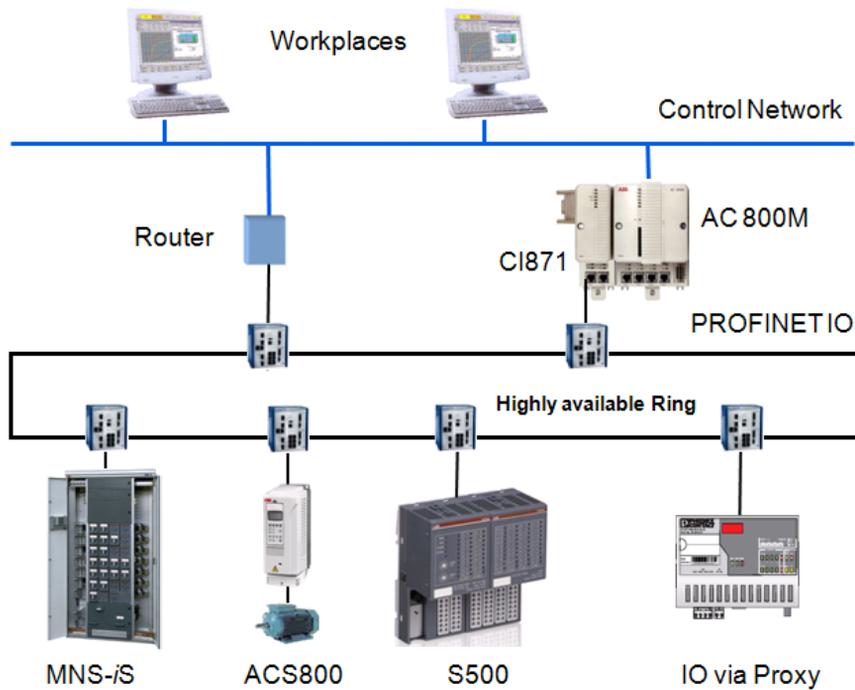


Figure 57. PROFINET IO with AC 800M

### **FOUNDATION Fieldbus High Speed Ethernet (FF HSE)**

FOUNDATION Fieldbus (FF) is a fieldbus protocol based on international standards and designed for applications in the manufacturing industry, process automation and buildings automation. The guidelines for this fieldbus standard are published by the Fieldbus Foundation.

FF defines two communication profiles, H1 and HSE. The H1 profile allows a transmission rate of 31.25 kbit/s. It is preferably used for direct communication between field devices in one link (H1 link). The HSE profile is based on standard ethernet serves first and foremost as a powerful backbone for the link between H1 segments. Typically transmission rates are: 10 Mbit/s or 100 Mbit/s. The first devices that are already available on the market and support the HSE profile are FF linking devices (for example LD 800HSE). They serve as a gateway between the field devices on the H1 segments and the HSE backbone.

The FOUNDATION Fieldbus is linked to the AC 800M via the high-performance HSE bus using FF linking devices.

More detailed information on the HSE profile can be found in the FF specifications. The fundamental concepts behind HSE are explained in the FF specifications System Architecture (FF-581) and HSE Profiles (FF-941).

The FF subsystem consists of FF linking devices (for example LD 800HSE, see [Appendix C, Recommended Components](#)) which communicate with one another using the HSE protocol. An FF linking device usually provides more than one FOUNDATION Fieldbus H1 segments (H1 link). FF linking devices with a device class of 42c allow process data that have been published cyclically on the subsidiary H1 segments to be “republished” on the HSE segment. By using HSE republishing, it is possible to configure cyclical communication between field devices on different H1 segments and devices on the HSE segment. The FOUNDATION Fieldbus HSE and H1 network and the devices are configured with the Fieldbus Builder FOUNDATION Fieldbus.

The FF subsystem is interfaced to the IEC 61131 controller (AC 800M) using a FF HSE unit CI860 in the AC 800M, see [Figure 7](#) on page 39. From the perspective of FF the FF HSE unit is an HSE device which participates in the HSE communication.

FF linking devices operate as gateways between the AC 800M and the field devices on the H1 segments both for the configuration data of the field devices and for the process data which is exchanged cyclically between AC 800M and the field devices.

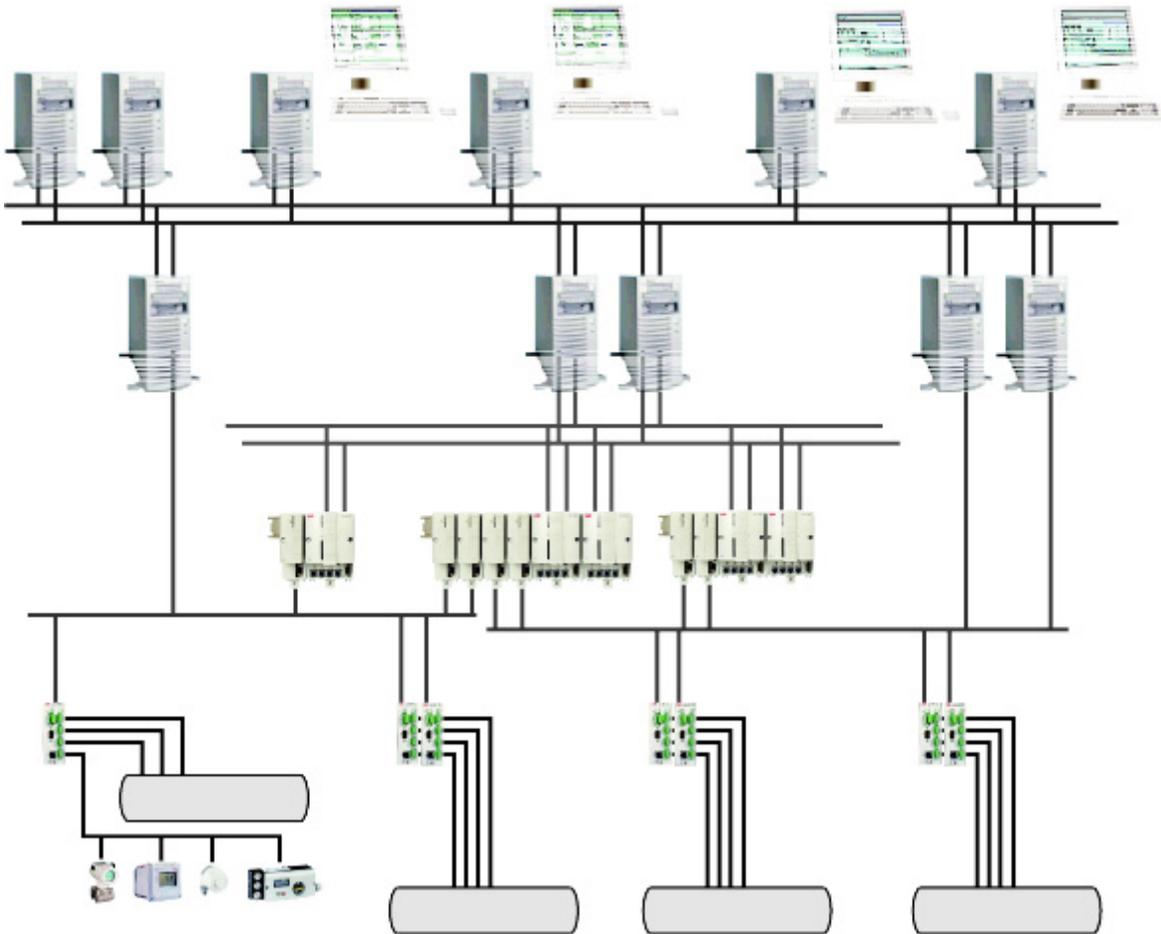


Figure 58. Example of system structure for FOUNDATION Fieldbus HSE

### **TRIO/Genius Remote I/O**

TRIO is a Genius remote I/O product that provides discrete, analog and high-speed counter blocks for connection to the AC 800M. Configuration of the I/O block units and the CI862 is done using Control Builder M.

## Drive System

ABB Standard (Std) and Engineered (Eng) Drives can be connected to AC 800M through any of the following:

- The optical ModuleBus
- CI801 and PROFIBUS DP
- NPBA-12, RPBA-01, or FPBA-01 PROFIBUS DP Adaptor modules along with CI854
- RETA-02 or FENA-01/-11 Ethernet Adapter modules along with CI871 (PROFINET IO)
- CI858 DriveBus Interface.

### ModuleBus

In single CPU configuration, ABB Drives can be connected to the processor unit via the optical ModuleBus. See [Figure 59](#) on page 171. The number of ABB Drives which can be connected to the optical ModuleBus, can be described by the following equation:

$$(\text{No. of ABB Drives}) \leq 84 - (12 \times (\text{No. of TB820s}))$$

that is, each Drive uses one ModuleBus cluster.

### PROFIBUS DP and CI801

In single and redundant CPU configuration, ABB Drives can be connected via PROFIBUS DP and CI801. See [Figure 59](#) on page 171. Only Standard Drives can be connected to CI801. Fourteen (14) Standard Drives can be connected to each CI801 if there are no I/O units connected. For the number of Drives that can be connected to the same CI801, when both I/O units (TB820) and Standard Drives are connected, refer to documentation about FCI for PROFIBUS DP.

For more information about ABB Drives and its types (Std and Eng) refer to S800 I/O documentation.

For information about Branching Unit ([Figure 59](#) on page 171) see ABB Drive System documentation.

ABB drives can also be connected via PROFIBUS DP (CI854/CI854A), with direct connection to PROFIBUS DP slave modules NPBA-12, RPBA-01, and FPBA-01.

**PROFINET IO and CI871**

The RETA-02 Ethernet Adapter module and FENA-01/-11 Ethernet Adapter module are optional devices for ABB drives, which enables the connection of the drive to a PROFINET IO (PNIO) network. The drive is considered as a PNIO device on the PROFINET IO network, and it is compatible with all PNIO controller stations that support PROFINET IO and sub-slots.

**DriveBus Interface CI858**

ABB drives can be connected to the AC 800M via the CI858 unit, see [Figure 59](#) on page 171 and [Figure 60](#) on page 172. The drive interface can be used for controlling up to 24 drives or inverter units.

Main communication functions of the drive connection are:

- Dataset communication
- Broadcast system time
- Supervision and diagnostics functions

The data exchange between the AC 800M and the CI858 consists of eight datasets. The drive connection is able to transfer at the maximum 8 datasets / 1 ms.

Connection of multiple drives requires the use of a branching unit, which enables the construction of a logical bus with physical star topology, see [Figure 60](#) on page 172. The branching units can be chained.

The following drives are supported by the drive connection:

- ACS 600 single drive
- ACS 600 multi drive
- ACS 600 thyristor supply units
- ACS 600 IGBT supply units
- ACS 800 product family
- ACS 140-AC S400
- DCS 600 and DCS 400
- ACS 6000 product family/large drives

- ACS 1000 product family

See also [CI858 and TP858 – DriveBus Interface](#) on page 313

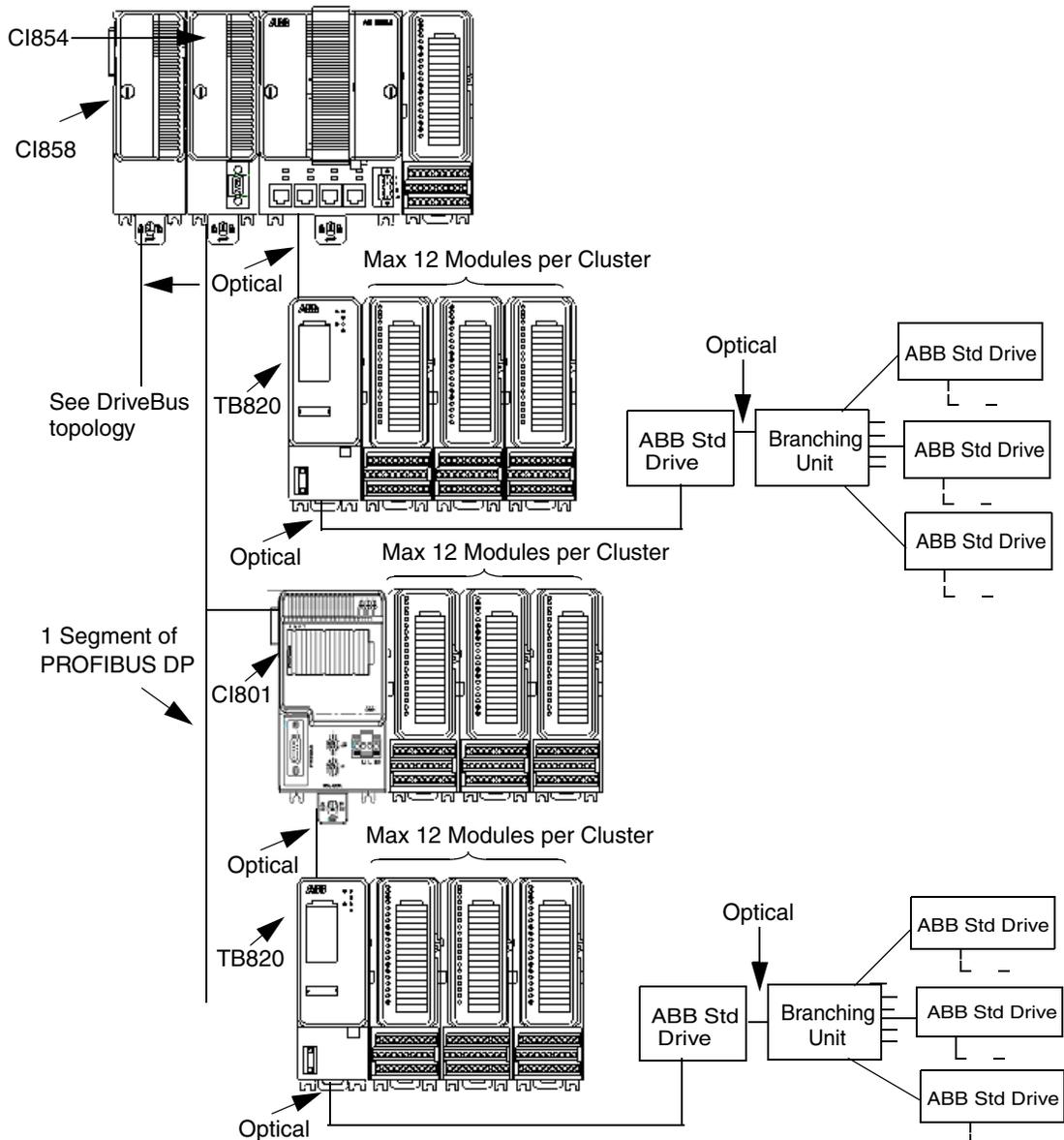


Figure 59. Example of Connection of ABB Drives in Single CPU Configuration

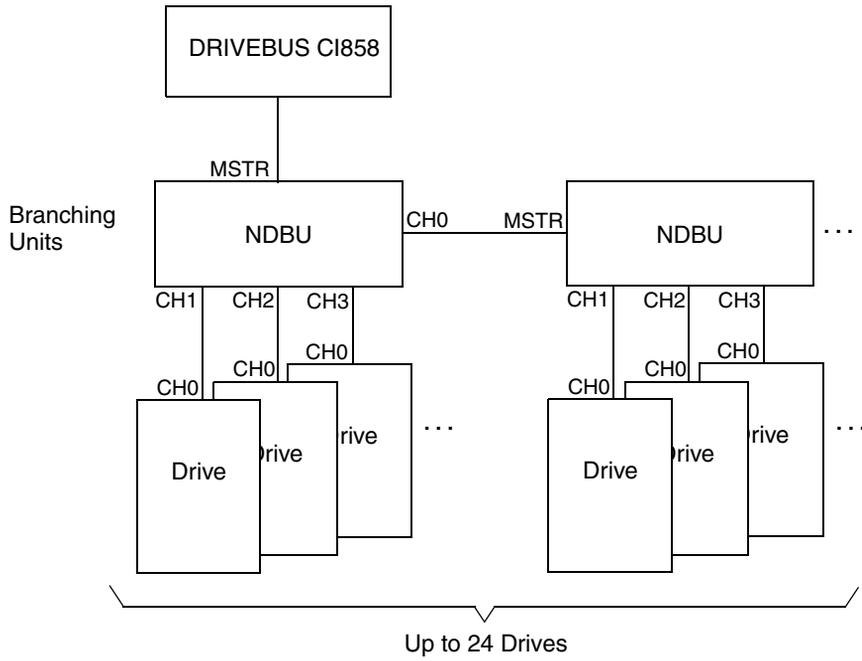


Figure 60. DriveBus Topology

## Power Supply System

The configuration of a power supply system for an AC 800M controller is very straightforward.

### Configurations

[Figure 61](#) on page 177 and [Figure 62](#) on page 178 gives a series of simple circuit diagrams showing various possibilities for connecting the incoming mains power – via the mains breaker, the power supply units and the SS83X voting devices – to the 24 V DC distribution terminals.

The AC 800M Controller and its I/O system are normally located in one or several enclosures or cabinets. The cabinet housing the AC 800M Controller can also contain I/O units connected to the controller via the electrical ModuleBus, the optical ModuleBus or the communication interfaces for PROFIBUS DP.

### Cabinet Containing AC 800M Controller

From this cabinet power may be required for:

- Powering Units: power to the electronic circuitry for each unit in the cabinet.
- Powering Field Equipment: power to equipment, relay contacts etc. located outside the cabinet, but connected to the inputs/outputs of the I/O units in the cabinet.



It is strongly recommended to:

- use a power supply in each cabinet for Powering Units (only when cabinets are mounted side by side, and the maximum cable length is less than 10 m, can power to the units be taken from another cabinet)
- use separate power supplies for Powering Units (including S800 cluster modems) and Powering Field Equipment

### Cabinet Containing I/O System

Use the recommendations given above if no other information is given in the I/O system documentation.

## Powering Units in the Cabinet

This power supply is only connected to units within the cabinet such as:

- PM8XX, which also powers all communication interfaces (via the CEX-Bus) and all S800 I/O units connected to its electrical ModuleBus.
- BC810 powers all communication interfaces connected to its own segment.
- TB820V2/TB840 (optical modem for S800 I/O) which also powers all S800 I/O units connected to its electrical ModuleBus.
- CI840 and CI801 (PROFIBUS DP interface for S800 I/O) which also powers all S800 I/O units connected to its electrical ModuleBus.
- PROFIBUS DP adapters for other I/O systems (depending on the supply arrangement for the I/O units, it may be necessary to connect power to each I/O unit).
- Communication modems located in the cabinet.

The main configuration rule for this power supply is to retain the 24 V cables within the cabinet.

## Powering Field Equipment outside the Cabinet

This is intended for supplying power to process signals and equipment located outside the cabinet.

### Interference

Powering field equipment from a power supply located in the AC 800M Controller cabinet often requires the use of long 24 V DC cables that can easily pick up local interference and direct it straight back to the power supply units. When installing the cables, follow the instructions for Field Cables, given under [Cables](#) on page 62.

### Short-Circuit at Power Supply Output

The SD83X series power supply has no extra energy reservoir at its outputs. In the event of a short circuit the power supply output voltage will fall rapidly.

Short circuits (even with fuses installed in the 24 V DC distribution system) or large load changes can produce unwanted voltage dips in supply.

To avoid the AC 800M Controller being influenced by field equipment, it is strongly recommended that separate power supplies be installed (see [Figure 50](#) on page 147 and [Figure 51](#) on page 148).

### **Sectioning Field Equipment**

If field equipment connected to an AC 800M Controller is to be sectioned into groups – thus avoiding a power failure in one group from influencing the power to other groups – then it is recommended to use separate power supplies for each field equipment group.

The use of fuses in the 24 V DC distribution system is not a fail-safe measure. If a short circuit occurs in one group, then voltage will most likely drop before a fuse blows; consequently all groups will experience a drop in voltage.

### **Cable Protection**

24 V DC distribution system cables must be fuse-protected. In order to allow for overload/short circuit situations, the power supply output current is limited. Allow the power supply an extra capacity of at least 3-4 times the rated current value of the largest connected fuse and remember to include long cable resistance in the calculation.

### **Connection Alternatives**

The field equipment power supply can be connected in the same manner as that used for connecting and powering the AC 800M units (see [Figure 61](#) on page 177 and [Figure 62](#) on page 178). However, it should be noted that the same Mains Breaker Unit can be used to control and isolate both power supplies. Alternatively, independent Mains Breakers can be used on each spur (see [Figure 62](#) on page 178).

## Powering from an External Source

The AC 800M Controller can be powered from an external +24 V DC source. This source is often common for many different types of plant equipment, resulting in long power cables to the AC 800M Controller. Furthermore, heavy load changes can cause variations in controller supply voltage making it necessary to take precautions against low voltage in order to prevent controller malfunction.



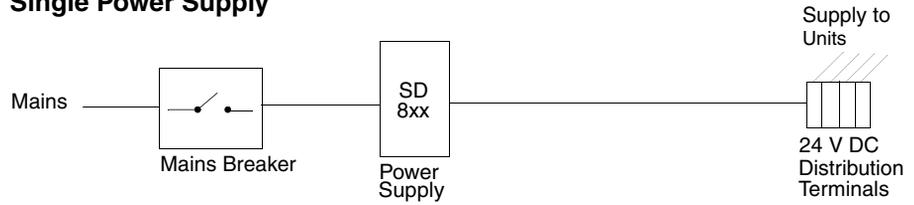
Should there be a risk that the +24 V at the PM8XX power terminals could drop below 19.2 V for more than 1 ms, then an energy reservoir must be used for Powering Units.

ABB requires the use of DC/DC converter and extra energy reservoir in case external DC-supply with longer cables than 10 m is used.

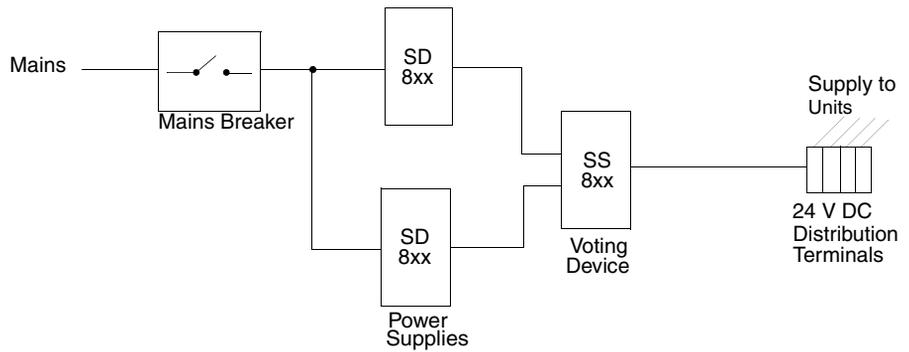


For redundant power supplies to the AC 800M controller and associated units, always derive connections from the SS8xx voting device. See [Figure 61](#) on page 177.

**Single Power Supply**



**Redundant Power Supplies**



**Redundant Mains Power Supplies**

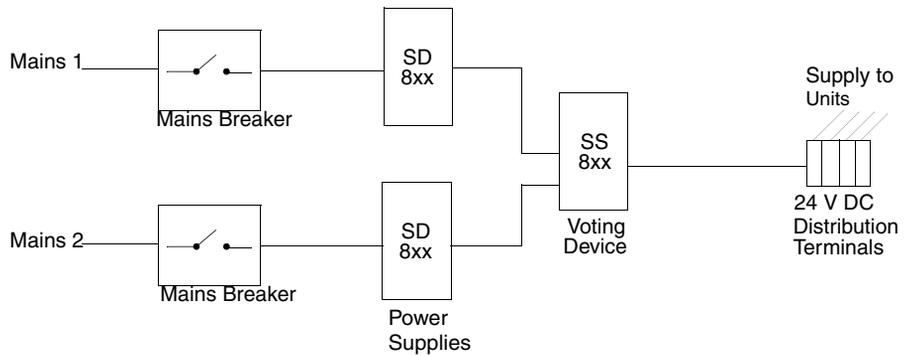


Figure 61. Power Supply Options for AC 800M Units

### Powering Field Equipment

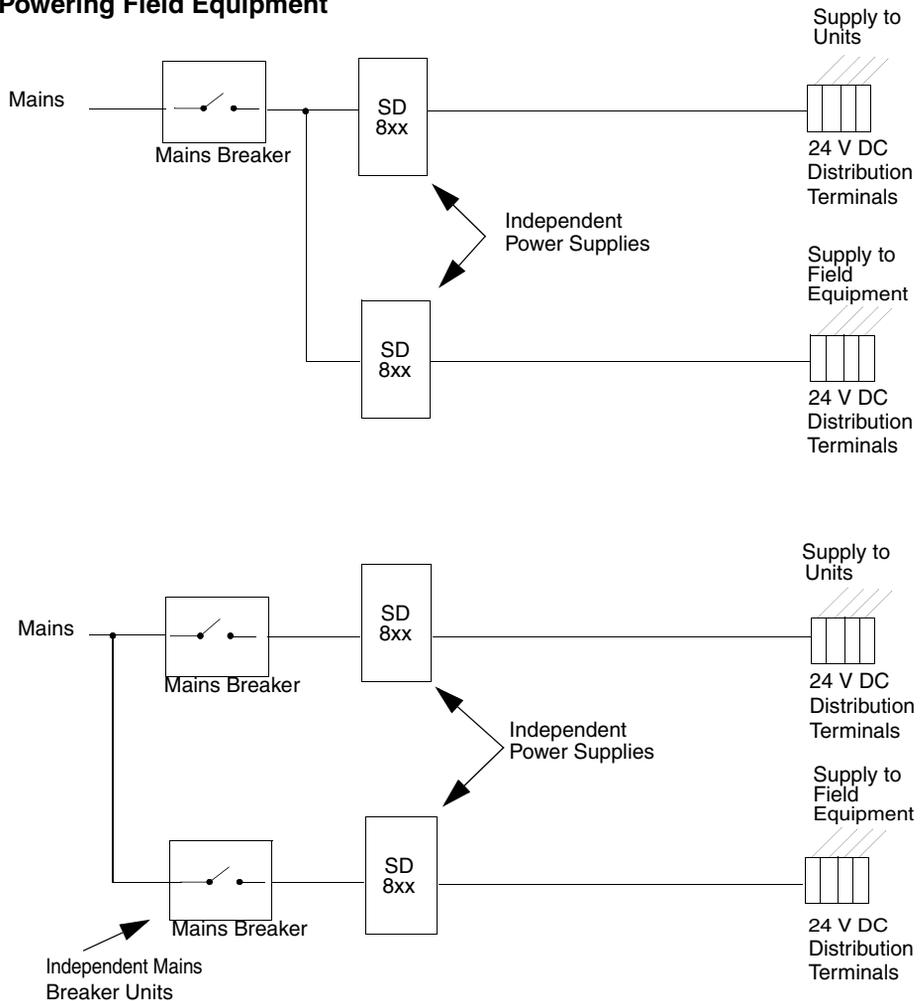


Figure 62. Powering Field Equipment

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## Section 4 Operation

This section describes the operation of the AC 800M Controller, comprising a PM8xx (single or redundant configuration) processor unit, together with various optional units. For additional technical information on optional units, see [Appendix A, Hardware Units](#).

### AC 800M Controller (PM8xx)

Equipped with Control Software, the basic PM8xx/TP830 or PM891 hardware units mounted on the AC 800M hardware platform constitute an AC 800M Controller.

#### LED Indicators

See [Figure 2](#) on page 32, for description of placement.

*Table 20. PM8xx – LED Indicators*

| Marking | Color | Function  |
|---------|-------|---|
| F(ault) | Red   | Normal state – OFF<br>Re-start (INIT) temporarily lit F(ault).<br>May also be operated by software program.   |
| R(un)   | Green | Normal state – ON<br>Re-start (INIT) temporarily extinguishes R(un). At restart press the (INIT) push button (3 sec. or more) until R(un) flashes.<br>May also be operated by software program. |

Table 20. PM8xx – LED Indicators (Continued)

| Marking  | Color                          | Function   |
|--|--------------------------------|--|
| P(ower)  | Green                          | Normal state – ON<br>When lit, indicates that the CPU DC/DC converter is generating valid +5 V and +3.3 V DC supply voltages.<br>No software control.        |
| B(attery)                                      | Green                          | Normal state – ON<br>Lit when internal or external battery voltage is above 3.1 V. The LED is controlled by a software battery voltage test <sup>(1)</sup> . |
| Tx   | Yellow<br>Green <sup>(2)</sup> | Data Transmission <sup>(4)</sup> ,<br>CN1 + CN2 and COM3 <sup>(3)</sup> + COM4<br>Flashes in synchronization with Tx traffic                                 |
| Rx   | Yellow<br>Green <sup>(2)</sup> | Data Reception <sup>(4)</sup> ,<br>CN1 + CN2 and COM3 <sup>(3)</sup> + COM4<br>Flashes in synchronization with Rx traffic                                    |
| <b>Valid for PM861/PM864/PM865/PM866/PM891</b> |                                |  |
| PRIM(ary)                                      | Yellow                         | Lit in single and redundant configuration.<br>Indicates Primary CPU in redundant configuration. Controlled by software.                                      |
| DUAL   | Yellow                         | Lit when the CPU is running in redundant configuration and synchronized state.   |

- (1) The software performs cyclic battery voltage level tests via a dedicated LED control input. The battery provides back-up power for both the application memory and the real time clock during power down. The battery is either accessible via the PM8xx cover panel or externally connected to the external battery connector. Battery voltage is checked by the software. Voltage is common for both the internal and external battery. For this reason the internal battery should be removed when using the external battery, since having two batteries connected in parallel will result in greatly reduced capacity.
- (2) Only for PM891
- (3) Not valid for PM891
- (4) Only CN1 for PM851/PM851A. Do not connect to CN2.

## Switches and Push buttons

Table 21. PM8xx – Switches and Push buttons

| Marking | Type               | Function   |
|---------|--------------------|--|
| INIT    | Manual Push button | <p>Initiates</p> <ol style="list-style-type: none"> <li>1. <u>Cold Restart</u> if INIT is held less than 2.5 seconds.</li> <li>2. <u>Controller Reset</u> if INIT is held more than 3 seconds.</li> </ol> <p>If INIT is pushed on the Primary CPU in redundant configuration a switchover to the backup CPU will be initiated.</p> |

## Connectors

Table 22. PM8xx/TP830 and PM891 – Connectors

| Marking                  | Function   |
|--------------------------|--|
| L+                       | External Power Supply Connection<br>+24 V DC supply      |
| L–                       |  |
| SA                       |  |
| SB                       |  |
| SH                       | External Battery Connection                              |
| B+                       | Shield (Screw Connector)                                 |
| B–                       | Battery Positive (Screw Connector)                       |
|                          | Battery Negative (Screw Connector)                       |
| Tx                       | ModuleBus Connection<br>Data Transmission Port (Optical) |
| Rx                       |  |
|                          | Note – Duplex or Simplex optical cables may be used.     |
| MODULEBUS <sup>(1)</sup> | Provides expansion of I/O unit capability.               |

Table 22. PM8xx/TP830 and PM891 – Connectors (Continued)

| Marking                            | Function  |
|------------------------------------|---|
| CEX-BUS                            | Provides extension of on-board communication ports.   |
| <b>Valid for PM861/PM864/PM865</b> |   |
| RCU Link Connector                 | Provides information and data transfer between Primary and Backup CPU in redundant configuration. |
| <b>Valid for PM891</b>             |   |
| RCU Data Link Connector            | Provides transfer of data required to keep the backup CPU synchronized with the primary CPU.      |
| RCU Control Link Connector         | Provides role selection and CPU identity assignment.  |

(1) Electrical ModuleBus not valid for PM891.

## Start-up

Refer to relevant document for information on:

- Firmware download
- Controller IP address
- Downloading application
- Updating firmware

### Start-up in Redundant Configuration (CEX Bus Considerations)

The redundant configuration using CEX bus and CEX modules is supported along with the processor modules PM861, PM864, PM865, PM866 and PM891.

At start-up, some things regarding the CEX bus and CEX modules have to be considered when starting up a redundant AC 800M system:

- Without using BC810 units:
  - At least one CEX module must be inserted, if there are base plates without inserted modules in other positions.

- After having rebuilt the hardware on the CEX bus, that is, after removing or adding a number of base plates (equipped with CEX modules or not) the upper CPU (the CPU connected to the part of the RCU Link cable that is marked “UPPER”) must be started as the primary CPU the first time.

## Start Modes

### Warm Start

Application-controlling tasks are initiated. Variable values are initialized unless marked **Retain** or **Cold retain**.

To initiate a warm restart, disconnect the power supply for a few seconds.

Following a power failure, the warm restart function will be automatically initiated on power restoration.



After a power fail, instead of doing a warm restart of the application SIL3 applications are restarted using cold retain marked values saved in the controller periodically with a cycle time set by the user.

### Cold Restart

The application program restarts. Variable values are initialized unless marked **Cold retain**.

To initiate a cold restart, the Controller must be restarted by briefly pressing the INIT push button (less than 2.5 seconds).

### Cold Restart in Redundant Configuration

To restart CPUs running in redundant configuration:

1. Perform a Controller Reset of the backup CPU (see below). The system will go into single CPU state.
2. Wait a few seconds and then restart the Primary CPU by pressing the INIT push button less than 2.5 seconds.
3. The system will be upgraded to synchronized CPU state once again.

### Controller Reset

The system stops. The application program and variables are erased.

To initiate Controller Reset, press and hold the Controller INIT push button (more than three seconds) until the Run LED begins to flash. A Controller Reset must be performed if the system is in an undefined position and consequently unavailable to the user.

### Controller Reset in Redundant Configuration

Follow the steps below to perform a Controller Reset in redundant configuration:

1. Perform a Controller Reset of the backup CPU. The system will go single CPU state.
2. Wait a few seconds and then perform a Controller Reset on the Primary CPU.

## Automatic Switch-Over to Backup CPU

In a redundant configuration an automatic switch-over from the Primary CPU to the Backup CPU occurs in the following situations, provided they are in synchronized state (DUAL LED is lit):

- Memory error in the Primary CPU.
- Other HW-error in the Primary CPU, which causes CPU crash.
- Severe communication errors on the Control network, that is, loss of both network ports in the Primary CPU.
- Severe communication errors on the ModuleBus (if ModuleBus is part of the HW configuration) that is, loss of clusters in the Primary CPU.



Note that a Backup CPU with severe communication errors on the ModuleBus will be rejected (if ModuleBus is part of the HW configuration) and synchronized state will never be reached as long as error remains.

## Verification of Satisfactory AC 800M Operation

To affirm, following start-up, that the AC 800M Controller and all associated units are operating correctly, see [Table 23](#) on page 185.

### Verification of Single CPU

Check the status of each LED indicator and compare it against the criteria listed in the table. If the status is other than that listed, see [Fault-Finding Procedures](#) on page 204.

*Table 23. AC 800M Controller – Verification of Satisfactory System Operation*

| LED Indicator Status  | AC 800M Controller Status |
|---|---------------------------|
| <b>PM8xx Processor Unit</b>                                 |                           |
| F(ault) Red LED must be OFF                                 | OK                        |
| R(un) Green LED must be ON (steady)                         | OK                        |
| P(owok) Green LED must be ON (steady)                       | OK                        |
| B(attery) Green LED must be ON (steady)                     | OK                        |
| <b>BC810 CEX-Bus Interconnection Unit</b>                   |                           |
| F(ault) Red LED must be OFF                                 | OK                        |
| R(un) Green LED must be ON (steady)                         | OK                        |
| EPOK Yellow LED must be ON (if external power is connected) | OK                        |
| <b>SM810/SM811</b>  |                           |
| F(ault) Red LED must be OFF                                 | OK                        |
| R(un) Green LED must be ON (steady)                         | OK                        |
| <b>CI851 PROFIBUS DP Unit</b>                               |                           |
| F(ault) Red LED must be OFF                                 | OK                        |
| R(un) Green LED must be ON (steady)                         | OK                        |

Table 23. AC 800M Controller – Verification of Satisfactory System Operation

| LED Indicator Status                                   | AC 800M<br>Controller<br>Status |
|--|---------------------------------|
| <b>CI852 FOUNDATION Fieldbus H1 Unit</b>               |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| <b>CI853 RS-232C Interface Unit</b>                    |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| <b>CI854/CI854A PROFIBUS DP Unit</b>                   |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| <b>CI855 Ethernet Interface Unit for MasterBus 300</b> |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| <b>CI856 S100 I/O Interface Unit</b>                   |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| C(omm. fail) Red LED must be OFF                       | OK                              |
| <b>CI857 INSUM Unit</b>                                |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |
| <b>CI858 DriveBus Unit</b>                             |                                 |
| F(ault) Red LED must be OFF                            | OK                              |
| R(un) Green LED must be ON (steady)                    | OK                              |

Table 23. AC 800M Controller – Verification of Satisfactory System Operation

| LED Indicator Status                                      | AC 800M Controller Status |
|---|---------------------------|
| <b>CI860 FOUNDATION Fieldbus High Speed Ethernet Unit</b> |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI862 TRIO I/O Interface Unit</b>                      |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI865 Satt I/O Interface Unit</b>                      |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI867 Modbus TCP Interface Unit</b>                    |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI868</b>  |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI869</b>  |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |
| <b>CI871</b>  |                           |
| F(ault) Red LED must be OFF                               | OK                        |
| R(un) Green LED must be ON (steady)                       | OK                        |

*Table 23. AC 800M Controller – Verification of Satisfactory System Operation*

| LED Indicator Status                |  | AC 800M Controller Status |
|-------------------------------------|--|---------------------------|
| <b>CI872</b>                        |  |                           |
| F(ault) Red LED must be OFF         |  | OK                        |
| R(un) Green LED must be ON (steady) |  | OK                        |
| <b>CI873</b>                        |  |                           |
| F(ault) Red LED must be OFF         |  | OK                        |
| R(un) Green LED must be ON (steady) |  | OK                        |

### Verification of Redundant CPU

Check, in redundant configuration, the following LED indicators on PM861/PM864/PM865/PM866/PM891 and, if used, SM810/SM811 (see [Table 24](#) on page 188).

*Table 24. AC 800M Controller (PM861/PM864/PM865/PM866/PM891/SM810/SM811) – Verification of Satisfactory System Operation in Redundant configuration*

| LED Indicator Status       |                            | AC 800M Controller Status |
|----------------------------|----------------------------|---------------------------|
| Primary CPU                | Back-up CPU                |                           |
| PRIM(ary) yellow ON        | PRIM(ary) yellow OFF       | OK                        |
| DUAL yellow ON             | DUAL yellow ON             | OK                        |
| <b>Primary SM810/SM811</b> | <b>Back-up SM810/SM811</b> |                           |
| PRIM(ary) yellow ON        | PRIM(ary) yellow OFF       | OK                        |
| SYNC yellow ON             | SYNC yellow ON             | OK                        |



To check that the redundancy, is working correctly, perform a manual switch-over from the Primary CPU to the Backup CPU. This should be performed with caution, and consideration to possible impact on the process.

A manual switch-over is initiated by:

- Resetting the Primary CPU
- Powering off the Primary CPU



The RCU Link Cable must NEVER be removed from the primary Processor Unit during redundant operation. Removal of the cable may cause the unit to stop.

Check that the yellow DUAL LED subsequently lights up on both CPUs, and that the PRIM LED lights up on the former Backup CPU now acting as Primary CPU. For other units see [Table 23](#) on page 185.



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## Section 5 Maintenance

This section describes preventive and corrective maintenance measures for the AC 800M Controller together with troubleshooting procedures for both the system and individual units.



Before attempting maintenance or troubleshooting, read the Safety Summary on page 13. Failure to do so could lead to personal injury or damage to equipment.

### Preventive Maintenance Frequency Schedule

*Table 25. Preventive Maintenance Frequency Schedule*

| Frequency                          | Equipment                                | Procedure  |
|------------------------------------|--|--|
| At regular, user-defined intervals | Complete system                          | Carry out a visual inspection of all system hardware, connectors and wiring. Check for the: <ul style="list-style-type: none"><li>• Physical damage and deterioration</li><li>• Secure attachment</li><li>• Condition of connectors and wiring</li><li>• LED function</li></ul> Correct any defects. |
| 2 Years                            | PM8xx<br>Internal Battery<br>(if fitted) | Change battery<br>See <a href="#">Internal Battery</a> on page 192   |

Table 25. Preventive Maintenance Frequency Schedule (Continued)

| Frequency                       | Equipment  | Procedure  |
|---------------------------------|--|--|
| 5 Years                         | SB821<br>External Battery<br>(if fitted)                 | Change battery<br>See <a href="#">SB821 External Battery Unit</a> on page 195              |
| 3 years or 400 discharge cycles | SB822<br>Rechargeable<br>External Battery<br>(if fitted) | Change battery<br>See <a href="#">SB822 Rechargeable External Battery Unit</a> on page 197 |

## Replacing the Battery

### Internal Battery



This topic does not apply to PM891, which does not contain internal battery.

The internal battery is mounted inside the PM8xx processor unit (except PM891). Since the battery is not rechargeable, it is important to exchange it on a regular basis (refer to the Maintenance Frequency Schedule for further details). For details of correct battery polarity, remove the right-hand cover from the battery housing (see [Figure 63](#) on page 193 and [Figure 64](#) on page 194).

Specifications for the internal battery:

- Type: Low-rate lithium battery, 3.6 V, 950 mAh.
- Size: ANSI Size ½ AA / IEC size ½ R6
- Lithium contents: 0.3 g



Due to the batteries being connected in parallel, it is necessary, when using the SB821 external battery, to remove the internal battery from the PM8xx in order to avoid reducing available memory back-up time.

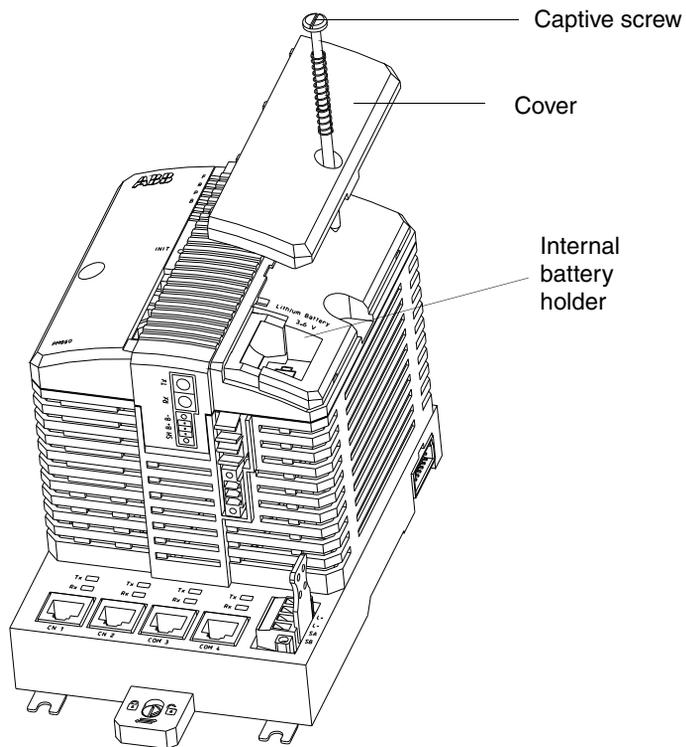


It is possible to replace the internal battery with the AC 800M Controller online. However, be sure to observe standard safe working practices at all times.

The battery must be exchanged whenever:

- The PM8xx B(attery) LED flashes or is extinguished.
- Multiple or extended power cuts have occurred.
- Extended periods of system downtime have occurred for maintenance or malfunctions.

For reasons of safety, exchange the battery only when the AC 800M is powered up.



*Figure 63. Right-hand Cover Removal – here shown with PM860*

To exchange the internal battery:

1. Using a blade screwdriver, release the captive screw from the PM8xx and remove the right-hand cover.
2. Identify and remove the internal battery.



Insert a serviceable battery and check that battery polarity and orientation are correct, according to the marking on the housing.

3. When power is re-established, ensure that the B(attery) LED is illuminated
4. Replace the PM8xx right-hand cover and tighten the screw.
5. Dispose of the run-down Lithium battery in an approved manner.

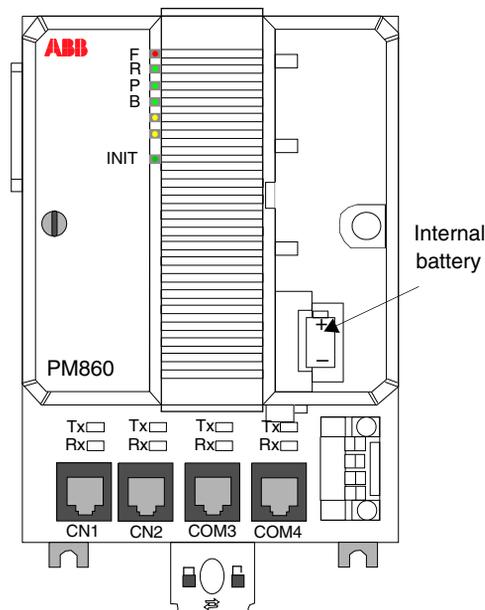


Figure 64. Internal Battery Location – here shown with PM860

## SB821 External Battery Unit

The external battery is mounted inside the SB821 External Battery unit. Since the battery is not rechargeable, it is important to exchange it on a regular basis (refer to the Maintenance Frequency Schedule for further details). For access to the battery and housing, remove the cover (see [Figure 65](#) on page 196). When replacing the battery, be sure to check that polarity and orientation are correct.

Specifications for the external battery:

- Type: Low-rate lithium battery, 3.6 V, 16 Ah
- Size: ANSI Size D / IEC R20
- Lithium contents: 5.6 g



Due to the batteries being connected in parallel, it is necessary, when using the SB821 external battery, to remove the internal battery from the processor unit in order to avoid reducing available memory back-up time.

The battery must be exchanged whenever:

- The PM8xx B(attery) LED flashes or is extinguished.
- Multiple or extended power cuts have occurred.
- Extended periods of system downtime have occurred for maintenance or malfunctions.

### Replacing the Battery in an SB821 External Battery Unit

To replace an external battery:

1. Disconnect the SB821 unit cable connector.
2. Release the SB821 unit from the DIN-rail.
3. Carefully remove the SB821 unit cover and identify the external battery.
4. Read and comply with the Warning label/text on the external battery.
5. Carefully remove the battery.
6. Insert a serviceable battery and check that battery polarity and orientation are correct. For further battery details see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392.

7. Replace the cover, mount the unit onto the DIN rail, and reconnect the cable.
8. When power is re-established, check that the B(attery) LED lights up.
9. Dispose of the run-down Lithium battery in an approved manner.

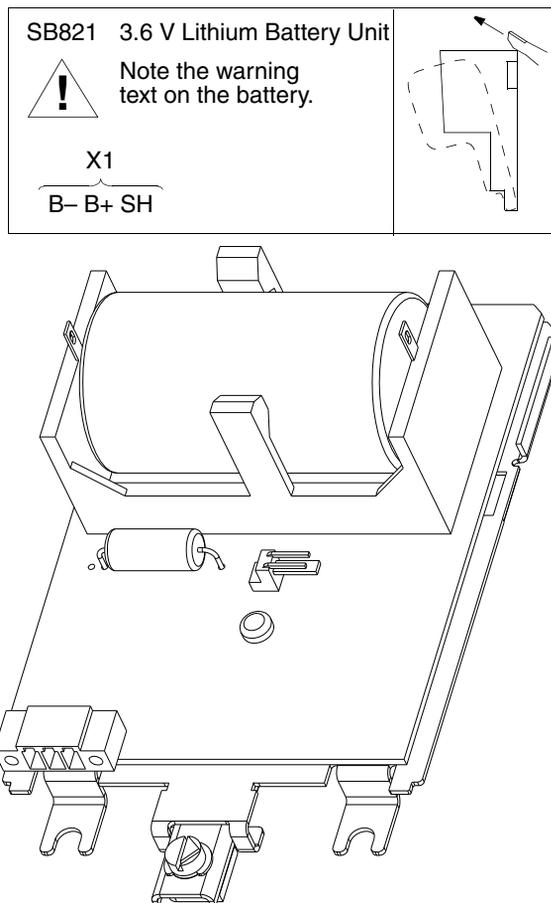


Figure 65. SB821 External Battery Unit – Cover Removed

## SB822 Rechargeable External Battery Unit

The Li-Ion battery package is mounted inside the SB822 unit. To prevent problems you need to charge it on a regular basis.

Specification for the battery package:

- Type: Rechargeable Lithium-Ion, 3.75V 2.3 Ah
- Size: Prismatic 14.5x43x50 mm
- Lithium equivalent content: 0.8 g

### Replacing the Battery in an SB822 Rechargeable External Battery Unit

To replace the Li-Ion battery:

1. Disconnect the TK821V020 cable connector.
2. Disconnect the 24V supply cable connector
3. Release the SB822 unit from the DIN-rail.
4. Attach a properly grounded ESD wrist strap to your wrist before you proceed.
5. Carefully remove the SB822 unit cover and identify the battery package.
6. Carefully disconnect the battery connector from the PCB.
7. Carefully remove the battery package.
8. Insert the new battery and connect. Reassemble is reverse from disassemble.
9. Install the unit.
10. Dispose of the worn battery package in an approved manner.

## Online Replacement of Unit

Replacement online entails adding or removing units in a controller without disturbing the execution of the running application program. Units are connected to the CEX-Bus and the electrical ModuleBus (S800 I/O).

|  |  |
|--|--|
| <b>CEX-Bus</b><br>Communication interfaces (CI8xx) | Can be removed or replaced online. Restrictions apply, refer to the installation section for each interface and to <a href="#">Appendix A, Hardware Units</a> .  |
| Baseplates for CI8xx (TP8xx)                       | Must not be replaced online.   |
| <b>ModuleBus</b><br>S800 I/O units                 | Can be removed or replaced online.   |
| Module Terminal Units (MTUs)                       | Must not be replaced online  |
| <b>Redundant CPUs</b><br>Processor unit            | Can be removed or replaced online (see the next following pages)   |
| <b>RCU Link Cables</b>                             | Can be removed or replaced online. However, the following restriction applies; you cannot replace the RCU link cable online in a previous than 4.1 software version. For more information, see the instructions given in <a href="#">Exchanging a Defect RCU Link Cables Online</a> on page 202. |



It is not allowed to manipulate CEX bus baseplates in a powered and running system. Before changing or removing a baseplate, all CEX modules on that segment must be removed.

## Exchange of CPU in Redundant Configuration without BC810



For PM86x, only the CPU unit can be exchanged during operation, and not the associated baseplate. Removing the baseplate jeopardizes the functioning of CEX-bus interfaces, if any.



For PM891, the entire unit cannot be exchanged during operation, without jeopardizing the functioning of CEX-bus interfaces, if any



Before replacing, the new CPU must be loaded with the correct firmware as in the existing CPU.

Follow the steps below to exchange a halted processor unit:

1. Disconnect the Power Supply Socket from the processor unit.
2. Disconnect the RCU link cables and optical ModuleBus cable from the processor unit to be exchanged.



You do not have to disconnect the RCU link cables completely in order to exchange a halted processor unit. Disconnect only the backup CPU, thus keeping the RCU link cables connected to the primary CPU (now running in a single state). However, if you must replace the RCU link cables, see [Exchanging a Defect RCU Link Cables Online](#) on page 202.

3. If PM86x is used, use a blade screwdriver to release the two spring-loaded captive screws on the processor unit cover, and then carefully remove the processor unit. If PM891 is used, carefully remove the unit.
4. Fit the new processor unit (which already has the correct firmware installed) and tighten the screws.
5. Reconnect the Power Supply Socket to the new processor unit.



The F(ault) LED of the new processor unit is temporarily lit when the power supply is connected. This is not an indication of fault.

6. Reconnect the optical ModuleBus and RCU Link Cable.
7. Press the INIT push button on the replaced processor unit.



Pressing the INIT button initiates the restart that is required to keep the new processor unit in redundant mode.

8. Observe the startup procedure and make sure that Dual mode is reached, that is, the Dual LED is lit on both processor units.



During synchronization, the new processor unit inherits the IP address from the running processor unit.



Reuse of CPU modules replaced from redundant configurations within the same control network, might cause control network problems due to the MAC and IP address handling. See [MAC and IP Address Handling in Redundant Configuration](#) on page 49. Such reuse should not be fulfilled unless both the replaced module and the module previously acting together with it in redundant configuration are known to be restored from the previous mutual address swap. It is recommended to set up an IP-config session and use the “Restore factory settings” option subsequently followed by reassignment of the IP address or assignment of a new IP address.

## Exchange of CPU in Redundant Configuration with BC810



Before replacing, the new CPU must be loaded with the correct firmware as in the existing CPU.

If the BC810 is powered from an external power source, the entire CPU, with baseplate, can be replaced during operation.

Follow the steps below to exchange a halted processor unit

1. Disconnect the Power Supply Socket from the processor unit.
2. Disconnect the RCU Link Cable and optical ModuleBus cable from the processor unit to be exchanged.



Do not, under any circumstances, remove the RCU Link Cable from the primary CPU now running in a single state. Removing the cable might cause the CPU to stop.

3. Disconnect the Control Network cables.
4. Rotate the locking device to the **SLIDE** position (2) on the unit baseplate, see [Figure 17](#) on page 69.

5. Gently ease the unit/baseplate sideways in order to release the contacts of the unit.
6. Turn the locking device anti-clockwise to the **OPEN** position (1) and ease the unit baseplate outward and upward at the base. Lift the unit to remove it from the DIN-rail.



The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see [Figure 23](#) on page 74).

7. Mount the new unit (which already has the correct firmware installed). See [Mounting AC 800M Units onto DIN-Rail](#) on page 65. Fit the unit to BC810 CEX-Bus.
8. Reconnect the Power Supply Socket to the new processor unit.



The F(ault) LED of the new processor unit is temporarily lit when the power supply is connected. This is not an indication of fault.

9. Reconnect the optical ModuleBus and the RCU Link Cable.
10. Reconnect the Control Network cables.
11. Press the INIT push button on the replaced processor unit.



Pressing the INIT button initiates the restart that is required to keep the new processor unit in redundant mode.

12. Observe the startup procedure and make sure that Dual mode is reached, that is, the Dual LED is lit on both processor units.



During synchronization, the new processor unit inherits the IP address from the running processor unit.



Reuse of CPU modules replaced from redundant configurations within the same control network, might cause control network problems due to the MAC and IP address handling. See [MAC and IP Address Handling in Redundant Configuration](#) on page 49. Such reuse should not be fulfilled unless both the replaced module and the module previously acting together with it in redundant configuration are known to be restored from the previous mutual address swap. It is recommended to set up an IP-config session and use the “Restore factory settings” option subsequently followed by reassignment of the IP address or assignment of a new IP address.

## Exchanging a Defect RCU Link Cables Online

### In Configuration with BC810



Do not replace the RCU link cable online in a previous version than 5.0. The support for online replacement also depends on hardware Product Revision levels. Please consult Release Notes (3BSE021377\*) for detailed information.

If online change proves to be supported, after the caution above has been considered, and the BC810s are externally supplied with 24V the same steps as in configuration without BC810 can be followed.

### In Configuration without BC810

To exchange a RCU link cable in a redundant CPU configuration, perform the following steps:

1. Switch OFF the Power for the backup CPU. (Power on the primary CPU must still be On.)
2. Disconnect the RCU link cable from the backup CPU.
3. Disconnect the RCU link cable from the primary CPU.



Do not leave the primary CPU with the RCU link cable disconnected for a prolonged time. If a power fail occurs while the cable is disconnected, the primary CPU cannot perform a startup when the power come back.

4. Attach the new RCU link cable to the primary CPU, note the UPPER orientation on the cable.



The new cable-ends must be connected to the redundant CPUs (exactly) in the same way as the replaced cable was. Thus, the UPPER mark on the cable-end must be located to the same CPU as before the exchange.

5. Attach the other end of RCU link cable to the backup CPU.
6. Switch ON the Power to the backup CPU.

## Corrective Maintenance Procedures

### Changing Fuses – ModuleBus and CEX-Bus



This topic does not apply to PM891, which does not contain internal fuses.

To change the TP830 internal ModuleBus and CEX-Bus fuses:

1. Using a blade screwdriver, release the two spring-loaded captive screws on the PM8xx cover.
2. Carefully remove the processor unit.
3. Identify both the ModuleBus and CEX-Bus fuse-holders to the right on the TP830 Baseplate.



- Upper Fuse-holder – ModuleBus – fuse 2 AF
  - Lower Fuse-holder – CEX-Bus – fuse 3.15 AF
4. Using a blade screwdriver, carefully unscrew the fuse-holder containing the defective fuse. Remove the fuse.
  5. Insert a new fuse and replace the fuse holder.



- Upper Fuse-holder – ModuleBus – fuse 2 AF
  - Lower Fuse-holder – CEX-Bus – fuse 3.15 AF
6. Replace the processor unit and tighten the cover screws.
  7. Check that the relevant LED lights up.

## Fault-Finding Procedures

The following sections describe elementary fault-finding procedures. For complete instructions contact ABB Support.

### PM8xx Processor Unit in Single CPU Configuration

Table 26. PM8xx – Fault-Finding Procedure

| Fault                   | Possible Cause and Corrective Action   |
|-------------------------|--|
| F(ault) LED is ON       | Controller Re-start, (INIT), in progress. <ul style="list-style-type: none"> <li>• Wait for Controller restart to finalize.</li> </ul> Missing firmware. <ul style="list-style-type: none"> <li>• Upgrade firmware.</li> </ul> Firmware upgrade in progress. <ul style="list-style-type: none"> <li>• Wait for FW upgrade to finalize.</li> </ul> Firmware upgrade failure. <ul style="list-style-type: none"> <li>• Use serial FW upgrade.</li> </ul> Missing TB852 <ul style="list-style-type: none"> <li>• Check TB852 connection (PM861, PM864, PM865).</li> </ul> Other <ul style="list-style-type: none"> <li>• Check controller log.</li> </ul> |
| F(ault) LED is flashing | Firmware upgrade in progress: <ul style="list-style-type: none"> <li>• Wait for FW upgrade to finalize.</li> </ul> Other <ul style="list-style-type: none"> <li>• Check controller log.</li> </ul>   |
| R(un) LED is OFF        | No application loaded in the Controller. <ul style="list-style-type: none"> <li>• Download application.</li> </ul> Controller application failed. <ul style="list-style-type: none"> <li>• Restart Controller (INIT push button).</li> <li>• Download application.</li> </ul>  |

Table 26. PM8xx – Fault-Finding Procedure (Continued)

| Fault                     | Possible Cause and Corrective Action   |
|---------------------------|--|
| B(attery) LED is flashing | Battery voltage (Internal or External) is below 3.1 V or non-existent. <ul style="list-style-type: none"> <li>• Install new battery.</li> </ul> External battery cable disconnected. <ul style="list-style-type: none"> <li>• Connect external battery cable.</li> </ul> See Fault-Finding <a href="#">Table 30</a> on page 208. |

### PM861/PM864/PM865/PM866/PM891 Unit in Redundant Configuration

Table 27. PM861/PM864/PM865/PM866/PM891 Redundant Configuration – Fault-Finding Procedure

| Fault                        | Possible Cause and Corrective Action   |
|------------------------------|--|
| DUAL LED is OFF on both CPUs | The CPUs are in the process of being re-started or configured. Allow time for this to finalize.<br>RCU Link Cable disconnected. <ul style="list-style-type: none"> <li>• Connect the RCU Link Cable.</li> </ul> Different Control Software in the two CPUs. <ul style="list-style-type: none"> <li>• Upgrade the CPUs with the same control software.</li> </ul> |
| Fault LED is ON              | Check controller log.  |

## CEX-Bus Interconnection Unit - BC810

Table 28. BC810 – Fault-Finding Procedure

| Fault  | Possible Cause and Corrective Action  |
|--|---|
| Fault LED is ON                                  | No 3.3 V caused by internal short circuit or overvoltage from power supply <ul style="list-style-type: none"> <li>• Check external 24 V voltage with voltmeter.</li> <li>• Send unit for repair.</li> </ul> |
| Run LED is OFF                                   | Hardware error. <ul style="list-style-type: none"> <li>• Send unit for repair.</li> </ul> Internal fuse blown (BC810)<br>External fuse blown (TP857)  |
| EPOK LED is OFF when external power is connected | Hardware error.<br>External fuse blown (TP857) <ul style="list-style-type: none"> <li>• Send unit for repair.</li> </ul>  |
| C1 or C2 LED OFF despite accessing CEX-units     | CEX-Bus units using no interrupt (for example CI851), no action is needed.  |

## SM810/SM811

Table 29. SM810/SM811 – Fault-Finding

| Fault                                    | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LEDs are ON    | <p>The SM810/SM811 board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check the Log File</li> <li>• Check the CEX-Bus fuse inside the CPU unit.</li> <li>• Initiate a reset signal (INIT) from the CPU unit.</li> <li>• Replace the SM810/SM811 unit.</li> </ul> |
| F(ault) LED is ON                        | Unit error. Replace the SM810/SM811 unit.  |
| PRIM LED is flashing                     | Unit error. Replace the SM810/SM811 unit.  |
| PRIM LED is OFF in single configuration. | Unit error. Replace the SM810/SM811 unit.  |
| SYNC LED is flashing                     | <p>Upgrade in progress. When the LED is blinking with a symmetric pattern, allow time for this to finalize. If the LED is blinking with a 3 blinks and a pause sequence, the SM811 is ready for acknowledgment of SIL3 hot insert, see <a href="#">SM811 and TP868</a> on page 278. If the condition persists for a longer time, replace the SM810/SM811 unit.</p>   |

## Internal Battery / SB821 External Battery/SB822 Rechargeable External Battery



The PM891 unit does not contain internal battery.

Table 30. Internal / SB821/SB822 External Battery/– Fault-Finding

| Fault   | Possible Cause and Corrective Action  |
|---|---|
| B(attery) LED indicator on PM8xx processor unit is flashing | <p><b>Internal battery</b></p> <ul style="list-style-type: none"> <li>Renew the PM8xx internal battery</li> </ul> <p><b>SB821:</b></p> <ul style="list-style-type: none"> <li>Check external battery connections.</li> </ul> <p>If condition persists:</p> <ul style="list-style-type: none"> <li>Renew the External battery, see <a href="#">SB821 External Battery Unit</a> on page 195.</li> </ul> <p><b>SB822:</b></p> <ul style="list-style-type: none"> <li>Check external battery connections.</li> </ul> <p>If Charge LED and or Power LED on SB822 are turned off:</p> <ul style="list-style-type: none"> <li>Check 24V supply connections.</li> </ul> <p>If condition persists:</p> <ul style="list-style-type: none"> <li>Renew the Li-Ion battery package, see <a href="#">SB822 Rechargeable External Battery Unit</a> on page 197.</li> </ul> |
| The system time is incorrect following a power failure      | Renew the External Battery.   |

## PROFIBUS DP – CI851

Table 31. PROFIBUS DP CI851 – Fault-Finding

| Fault                                 | Possible Cause and Corrective Action   |
|---------------------------------------|--|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI851 board is in the process of being re-started or configured. Allow time for this to finalize.</p> <p>If the condition persists, and all other units on the CEX-Bus have non-illuminated LEDs:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI851 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI851 unit.</li> </ul> |
| F(ault) LED is ON                     | <p>Check all cables and connectors for damage, loose or incorrect terminations.</p> <ul style="list-style-type: none"> <li>• Repair as necessary.</li> </ul>   |
| R(un) LED is flashing                 | <p>Check that the relevant units are sending data.</p> <p>Check if the CI851 board is in the process of being restarted or configured. If so, allow time for this finalize.</p> <p>If the condition persists:</p> <ul style="list-style-type: none"> <li>• Halt the application program and initiate a restart.</li> <li>• Replace the CI851 board.</li> </ul>   |

## FOUNDATION Fieldbus H1 – CI852

Table 32. FOUNDATION Fieldbus H1 CI852 – Fault-Finding

| Fault                             | Possible Cause and Corrective Action  |
|-----------------------------------|---|
| R(un) and F(ault) LEDs are not ON | <p>The CI852 board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and all units on the CEX-Bus have non-illuminated LEDs:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI852 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI852 unit.</li> </ul> |
| F(ault) LED is ON                 | <p>Use the Control Builder software to demand status information from the CI852 unit and proceed accordingly:</p> <ul style="list-style-type: none"> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI852 unit.</li> </ul>  |

Table 32. FOUNDATION Fieldbus H1 CI852 – Fault-Finding (Continued)

| Fault   | Possible Cause and Corrective Action  |
|---|---|
| One or more field devices appear to be slow to respond or completely dead | <p>1. A device may be:</p> <ul style="list-style-type: none"> <li>• Incorrectly addressed.</li> <li>• Connected with incorrect polarity.</li> <li>• Faulty and causing breakdown or heavy loading of the network.</li> </ul> <p>2. The fieldbus cable may:</p> <ul style="list-style-type: none"> <li>• Be damaged causing a short-circuit, breaks or grounding of the data wires, (possibly intermittent).</li> <li>• Be incorrectly terminated.</li> <li>• Contain sections having reversed polarity due to incorrect connections.</li> <li>• Cause supply voltage drops due to damage or bad connections.</li> </ul> <p>3. The <b>network</b> power supply may be faulty.</p> <ul style="list-style-type: none"> <li>• Rectify the <b>network</b> power supply.</li> </ul> |
| The <b>network</b> problem is proving very difficult to solve             | <p>Give consideration to possible activities within the plant, such as maintenance or repair work, which may be causing the problem. Having totally ruled this out, then proceed as follows:</p> <p>Check the DC supply voltage in powered networks by means of a digital voltmeter having an input capacitance of less than 1000 pF.</p>   |

Table 32. FOUNDATION Fieldbus H1 CI852 – Fault-Finding (Continued)

| Fault   | Possible Cause and Corrective Action  |
|---|---|
| <p>The <b>network</b> problem is proving very difficult to solve (continued).</p> | <p>Use an oscilloscope to check the communication signals for abnormalities.</p> <ul style="list-style-type: none"> <li>• The oscilloscope must be of differential or battery operated type.</li> <li>• Probes must have a minimum of 1 MOhm input resistance, and less than 1000 pF input capacitance.</li> </ul> <p>Disconnect sections of the network, including the Ethernet port via the PM8xx processor unit, until it is reduced to a size that functions correctly.</p> <ul style="list-style-type: none"> <li>• A hand-held fieldbus master unit should be used to make connections at different points in the network.</li> <li>• Locate the unserviceable section by reconnecting the sections one at a time. In the worst possible case, it may be necessary to remove devices one by one to identify the faulty item.</li> <li>• Cables can be checked using the ohmmeter (resistance) function of a digital voltmeter. Isolate the power supply and disconnect all other devices before making the check.</li> <li>• For large networks, a network analyzer should be employed. The analyzer must be suitable for use on FOUNDATION Fieldbus networks.</li> </ul> |

## On-board RS-232C Channels – CI853

Table 33. On-board RS-232C Channels CI853 – Fault-Finding

| Fault   | Possible Cause and Corrective Action   |
|---|--|
| <p>The PM8xx is transmitting and the Tx1/Tx2 LEDs are flashing, but the connected device is not receiving data.</p> <p>OR</p> <p>The connected device is transmitting, but the Rx1/Rx2 LEDs are not flashing.</p> | <ul style="list-style-type: none"> <li>• Check that the communication interface cable is connected.</li> <li>• Check the hand-shake signals.</li> </ul>  |
| <p>The Tx/Rx signals are flashing concurrently with transmission, but the messages are not being received correctly by the connected device.</p>  | <ul style="list-style-type: none"> <li>• Check that the baud rate, parity, and number of data and stop bits are as specified for the connected device.</li> <li>• Check that the handshake procedures are as specified at both ends.</li> <li>• Check that the driver routines are adequate, both in the controller and the connected device.</li> <li>• Disconnect power to the controller, wait a moment and then power-up again.</li> <li>• Halt the program and initiate a reset signal (INIT) from the PM8xx processor unit.</li> </ul> |



CI853 supports hot swap.

**PROFIBUS DP – CI854/CI854A**

*Table 34. PROFIBUS DP CI854/CI854A – Fault-Finding*

| Indication                             | Possible Cause and Corrective Action  |
|--|---|
| Neither R(un) nor F(ault) LED's are ON | <p>The CI854/CI854A board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and all other units on the CEX-bus have non-illuminated LEDs:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI854 is downloaded to the controller.</li> <li>• Check the CEX-bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI854/CI854A unit.</li> </ul> |
| F(ault) LED is ON                      | <p>Check that the CI854 board is in the process of being restarted. Allow time for this to finalize.</p> <p>Check that there is no configuration fault reported from CI854/CI854A in CBM.</p> <p>If the status remains initiate a reset signal (INIT) from the PM8xx processor unit. If the status still remains after the reset replace the CI854/CI854A unit.</p>   |
| RxA LED is OFF                         | <p>No communication on Line A.</p> <ul style="list-style-type: none"> <li>• Check that slaves are configured and connected to this line.</li> <li>• If redundant slaves are used check that the redundancy is working properly. The backup slave has to answer to the life list requests sent by the master.</li> <li>• Check all cables and connectors for damage and loose or poor connections.</li> </ul>  |

Table 34. PROFIBUS DP CI854/CI854A – Fault-Finding (Continued)

| Indication                                    | Possible Cause and Corrective Action   |
|---|--|
| RxB LED is OFF                                | <p>No communication on Line B.</p> <ul style="list-style-type: none"> <li>• Check that slaves are configured and connected to this line.</li> <li>• If redundant slaves are used check that the redundancy is working properly. The backup slave has to answer to the life list requests sent by the master.</li> <li>• Check all cables and connectors for damage and loose or poor connections.</li> </ul> |
| DUAL LED is OFF on both modules (CI854A only) | <p>The CI854A board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>Check that the redundancy for this module is set within CBM and the configuration is downloaded.</p>   |



CI854A supports hot swap.

## MasterBus 300 Interface – CI855

Table 35. MasterBus 300 CI855 – Fault Finding

| Fault                                 | Possible Cause and Corrective Action   |
|---------------------------------------|--|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI855 board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <p>Check that a valid HW configuration including the CI855 is downloaded to the controller.</p> <p>Check the CEX-Bus fuse inside the processor unit</p> <p>Initiate a reset signal (INIT) from the processor unit</p> <p>Replace the CI855 unit</p> |
| F(ault) LED is ON                     | <p>Check all cables and connectors for damage and loose or poor connections.</p> <p>Repair as necessary</p>  |
| R(un) LED is flashing                 | <p>Check that the relevant units are sending data. Check if the CI855 board is in the process of being restarted or configured. If so, allow time for this to finalize.</p> <p>If the condition persists:</p> <p>Halt the application program and initiate a restart.</p> <p>Replace the CI855 board.</p>  |
| Tx1 LED is ON (not flashing)          | <p>The unit is not transmitting data.</p> <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> </ul>  |
| Rx1 LED is ON (not flashing)          | <p>The unit is not receiving data.</p> <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> </ul>   |



CI855 supports hot swap.

## S100 I/O Interface – CI856

Table 36. S100 I/O CI856 – Fault Finding

| Fault                                  | Possible Cause and Corrective Action  |
|--|---|
| Neither R(un) nor F(ault) LED's are ON | <p>The CI856 unit is in the process of being configured. Allow time for this to finalize.</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI856 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit</li> <li>• Replace the CI856 unit</li> </ul> |
| F(ault) LED is ON                      | <p>The CI856 unit is in the process of being restarted. Allow time for this to finalize.</p> <p>Replace unit if the condition persists.</p>   |



CI856 supports hot swap.

## INSUM Interface – CI857

Table 37. INSUM CI857 – Fault-Finding

| Fault                                 | Possible Cause and Corrective Action  |
|---------------------------------------|---|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI857 board is in the process of being restarted or configured. Allow time for this to finalize</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI857 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the processor unit.</li> <li>• Initiate a reset signal (INIT) from the processor unit.</li> <li>• Replace the CI857 unit.</li> </ul> |
| F(ault) LED is ON                     | Check all cables and connectors for damage and loose or poor connections. Repair as necessary.  |
| R(un) LED is flashing                 | <p>Check that the relevant units are sending data.</p> <p>Check if the CI857 board is in the process of being restarted or configured. If so, allow time for this to finalize.</p> <p>If the condition persists:</p> <ul style="list-style-type: none"> <li>• Halt the application program and initiate a restart.</li> <li>• Replace the CI857 board.</li> </ul>   |
| Tx1 LED is ON (not flashing)          | <p>The unit is not transmitting data.</p> <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> </ul>   |
| Rx1 LED is ON (not flashing)          | <p>The unit is not receiving data.</p> <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> </ul>  |



CI857 supports hot swap.

## DriveBus Interface - CI858

Table 38. DriveBus CI858 – Fault-Finding

| Fault                                 | Possible Cause and Corrective Action  |
|---------------------------------------|---|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI858 board is in the process of being restarted or configured. Allow time for this to finalize</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI858 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the processor unit.</li> <li>• Initiate a reset signal (INIT) from the processor unit.</li> <li>• Replace the CI858 unit.</li> </ul> |
| F(ault) LED is ON                     | <p>Unit error or initializing.</p> <p>Check all cables and connectors for damage and loose or poor connections.</p> <ul style="list-style-type: none"> <li>• Repair as necessary.</li> </ul>  |
| Dbus;Rx1 LED is ON (not flashing)     | <p>The unit is not receiving data.</p> <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> <li>• Replace the CI858 unit.</li> </ul>   |
| Dbus;Rx1 LED is OFF                   | <p>No signals are sent to the unit or unit error.</p> <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> <li>• Replace the CI858 unit.</li> </ul>  |
| Dbus;Tx1 LED is ON (not flashing)     | <p>The unit is not transmitting data.</p> <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> <li>• If there is no failure message in the CB replace the CI858 unit.</li> </ul>   |

Table 38. DriveBus CI858 – Fault-Finding (Continued)

| Fault                            | Possible Cause and Corrective Action   |
|----------------------------------|--|
| Dbus;Tx1 LED is OFF              | The unit is not properly configured or unit error. <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> <li>• If there is no failure message replace the CI858 unit.</li> </ul> |
| I/O;Rx1 LED is ON (not flashing) | The unit is not receiving data. <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> <li>• If there is no failure message replace the CI858 unit.</li> </ul>                      |
| I/O;Rx1 LED is OFF               | No signals are sent to the unit or unit error. <ul style="list-style-type: none"> <li>• Check all cables and connections.</li> <li>• Replace the CI858 unit.</li> </ul>                                      |
| I/O;Tx1 LED is ON (not flashing) | The unit is not transmitting data. <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> <li>• If there is no failure message in the CB replace the CI858 unit.</li> </ul>       |
| I/O;Tx1 LED is OFF               | The unit is not properly configured or unit error. <ul style="list-style-type: none"> <li>• Check the CB for a failure message.</li> <li>• If there is no failure message replace the CI858 unit.</li> </ul> |



CI858 supports hot swap.

## FOUNDATION Fieldbus High Speed Ethernet - CI860

Table 39. FOUNDATION Fieldbus High Speed Ethernet CI860 – Fault-Finding

| Fault                                 | Possible Cause and Corrective Action   |
|---------------------------------------|--|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI860 board is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI860 is downloaded to the controller.</li> <li>• Check the Log File</li> <li>• Check the CEX-Bus fuse inside the CPU unit.</li> <li>• Initiate a reset signal (INIT) from the CPU unit.</li> <li>• Replace the CI860 unit.</li> </ul> |
| F(ault) LED is ON                     | <p>Check all cables and connectors for damage and loose or poor connections.</p> <p>Repair as necessary.</p>   |
| R(un) LED is flashing                 | <p>Check that the relevant units are sending data.</p> <p>Check if the CI860 board is in the process of being restarted or configured. If so, allow time for this to finalize.</p> <p>If the condition persists:</p> <ul style="list-style-type: none"> <li>• Stop the application program and initiate a restart.</li> <li>• Check the Log File</li> <li>• Replace the CI860 board.</li> </ul>  |
| 100Mbit/s is ON                       | <p>If RxTx LED is flashing:<br/>A valid connection with 100 MBit/s is established.</p>   |

Table 39. FOUNDATION Fieldbus High Speed Ethernet CI860 – Fault-Finding  
(Continued)

| Fault                | Possible Cause and Corrective Action   |
|----------------------|--|
| 100Mbit/s is OFF     | If RxTx LED is flashing:<br>A valid connection with 10 MBit/s is established.  |
| RxTx LED is ON       | A link to the corresponding ethernet device is established. No Ethernet packages are sent/received.  |
| RxTx LED is flashing | A link to the corresponding ethernet device is established. Ethernet packages are sent/received  |
| RxTx LED is OFF      | A link with the corresponding ethernet unit is not established <ul style="list-style-type: none"> <li>• Check the Log File</li> <li>• Check the ethernet cable to the corresponding ethernet device.</li> <li>• Check the corresponding ethernet device.</li> <li>• Check CI860 unit.</li> </ul> |
| PRIM                 | A yellow LED for indicating the primary unit in redundant configuration.   |
| DUAL                 | The yellow LED indicates the redundant configuration.  |



CI860 supports hot swap.

## TRIO Interface - CI862

Table 40. TRIO Interface CI862 - Fault Finding

| Indication                             | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LED's are ON | <p>The CI862 is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>If the condition persists, and all other units on the CEX-bus have non-illuminated LEDs:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI862 is downloaded to the controller.</li> <li>• Check the CEX-bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI862.</li> </ul> |
| F(ault) LED is ON                      | <p>Check that the CI862 is in the process of being restarted. Allow time for this to finalize.</p> <p>Check that there is no configuration fault reported from CI862 in CBM. If the status remains, initiate a reset signal (INIT) from the PM8xx processor unit. If the status still remains after the reset replace the CI862.</p>   |
| COMM ERROR LED is ON                   | Field Bus Communication Error from the $\mu$ Genie slave module.   |
| PRIM LED is OFF                        | <p>The CI862 is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>Check that there is no configuration fault reported from CI862 in CBM.</p>  |
| DUAL LED is OFF on both CI862's        | <p>The CI862 is in the process of being restarted or configured. Allow time for this to finalize.</p> <p>Check that the redundancy for this module is set within CBM and the configuration is downloaded.</p>  |



CI862 supports hot swap.

## Satt I/O Interface – CI865

Table 41. Satt I/O CI865 – Fault Finding

| Fault                                  | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LED's are ON | <p>The CI865 unit is in the process of being configured. Allow time for this to finalize. If the condition persists, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI865 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit</li> <li>• Replace the CI865 unit</li> </ul> |
| F(ault) LED is ON                      | The CI865 unit is in the process of being restarted. Allow time for this to finalize. Replace unit if the condition persists.  |
| COM A/COM B LED is OFF                 | Power OFF or Reset Mode  |
| COM A/COM B LED is solid green         | Channel OK   |
| COM A/COM B LED is flashing green      | Temporary error or need initial setup  |
| COM A/COM B LED is solid red           | Module is broken, has to be replaced   |
| COM A/COM B LED is flashing red        | Bad channel cable  |
| COM A/COM B LED is railroad red        | The road is not configured right for the network   |
| COM A/COM B LED is flashing red/green  | Network has data flow problem  |
| COM A/COM B LED is railroad red/green  | Self test  |



CI865 supports hot swap.

## Modbus TCP Interface – CI867

Table 42. Modbus TCP Interface CI867 - Fault Finding

| Fault                                  | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LED's are ON | <p>The CI867 unit is in the process of being configured. Allow time for this to finalize. If the condition persist, and no other unit LED on the CEX-Bus is lit:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI867 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI867 unit.</li> </ul> |
| F(ault) LED is ON                      | <p>The CI867 unit is in the process of being restarted. Allow time for this to finalize.<br/>Replace unit if the condition persists.</p>   |
| RxTx1/RxTx2 LED is OFF                 | <p>No Receive or transmit activity for respective Ethernet channels.</p>   |
| RxTx1/RxTx2 LED is flashing            | <p>Receive or transmit activity for respective Ethernet channels is normal.</p>  |
| PRIM is OFF                            | <p>In non-redundant mode:</p> <ul style="list-style-type: none"> <li>• This module is not started by the application.</li> </ul> <p>In redundant mode:</p> <ul style="list-style-type: none"> <li>• This module is not started by the application or this module act as backup interface.</li> </ul>   |

Table 42. Modbus TCP Interface CI867 - Fault Finding

| Fault       | Possible Cause and Corrective Action   |
|-------------|--|
| PRIM is ON  | In non-redundant mode: <ul style="list-style-type: none"> <li>• This module is started by the application.</li> </ul> In redundant mode: <ul style="list-style-type: none"> <li>• This module is started by the application and this module act as the primary interface.</li> </ul>   |
| DUAL is OFF | In non-redundant mode: <ul style="list-style-type: none"> <li>• This is always OFF in non-redundant mode.</li> </ul> In redundant mode: <ul style="list-style-type: none"> <li>• This module is not synchronized or the other module in this redundant pair is not started.</li> </ul> |
| DUAL is ON  | In non-redundant mode: <ul style="list-style-type: none"> <li>• N/A</li> </ul> In redundant mode: <ul style="list-style-type: none"> <li>• This module is not synchronized or the other module in this redundant pair is not started.</li> </ul>                                       |



CI867 supports hot swap.

## IEC 61850 Interface – CI868

Table 43. IEC 61850 Interface CI868 - Fault Finding

| Fault                                      | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LED's are ON     | <p>The CI868 unit is in the process of being configured. Allow time for this to finalize. If the condition persist, and no other unit LED on the CEX-Bus is ON:</p> <ul style="list-style-type: none"> <li>• Check that a valid HW configuration including the CI868 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI868 unit.</li> <li>• None application is downloaded.</li> </ul> |
| F(ault) LED is ON                          | <p>The CI868 unit is in the process of being restarted. Allow time for this to finalize. Replace unit if the condition persists.</p>   |
| RxTx1/RxTx2 <sup>(1)</sup> LED is OFF      | <p>No Receive or transmit activity for respective Ethernet channels.</p>   |
| RxTx1/RxTx2 <sup>(1)</sup> LED is flashing | <p>Receive or transmit activity for respective Ethernet channels is normal.</p>  |

(1) LED will always be switched off due to disabling of channel CH2



Since CI868 does not support redundancy, the DUAL LED is not used. However, the PRIM LED is ON in a single configuration of CI868.



CI868 supports hot swap.

## AF 100 Interface - CI869

The *Mast* LED in the CI869 module is not used. [Table 44](#) lists the other indications.

Table 44. AF 100 Interface, CI869 - Indications and Fault Finding

| Indication                           | Possible Cause and Corrective Action (for faults)   |
|--------------------------------------|---|
| Both R(un) and F(ault) LED's are OFF | <p><b>Possible Cause 1:</b> The CI869 module is connected to the controller, but the configuration is not downloaded to the controller for that position.</p> <p><b>Corrective Action 1:</b> Ensure that the CI869 module is configured in the Hardware Tree (in the Control Builder) for that position, and that the configuration is downloaded to controller.</p>  |
|                                      | <p><b>Possible Cause 2:</b> The CI869 module is just powered up or it is being configured and downloaded.</p> <p><b>Corrective Action 2:</b> Allow time for the module to initialize.</p>   |
|                                      | <p><b>Corrective Action 3:</b> If the indication persists after performing the corrective actions 1 and 2, then one of the following corrective actions is recommended:</p> <ul style="list-style-type: none"> <li>• Remove and insert the CI869 module to the CEX-Bus and allow time for it to initialize.</li> <li>• If this CI869 is the only module on the CEX-Bus, or if the CEX-Bus already contains other communication modules and all the LED's on those modules are OFF, then one of the following corrective actions is recommended:                             <ul style="list-style-type: none"> <li>- Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>- Check the CEX-Bus fuse inside the PM8xx processor Unit</li> </ul> </li> </ul> |
|                                      | <p><b>Corrective Action 4:</b> If the indication still persists after performing the corrective actions 1 to 3, replace the CI869 module.</p>   |

Table 44. AF 100 Interface, CI869 - Indications and Fault Finding

| Indication  | Possible Cause and Corrective Action (for faults)   |
|---|---|
| F(ault) LED is ON   | <p><b>Possible Cause 1:</b> The CI869 module is in the process of upgrading the firmware (if the upgrade is in progress).</p> <p><b>Corrective Action 1:</b> Wait for the firmware to be upgraded.</p>  |
|   | <p><b>Possible Cause 2:</b> Fault in the CI869 module.</p> <p><b>Corrective Action 2:</b> Hot remove and hot insert the CI869 module.</p>   |
|   | <p><b>Corrective Action 3:</b> If the indication persists after performing the corrective actions 1 and 2, then replace the CI869 module.</p>   |
| Rx LED is ON (without flashing)   | The CI869 module is operational, and it is receiving and transmitting data.   |
| Rx LED is flashing with less frequency  | <p><b>Possible Cause 1:</b> The twisted wire pair (TWP) is not connected or it is not connected properly to the 4-pin contact.</p> <p><b>Corrective action 1:</b> Check the TWP connections.</p>  |
| Rx LED is flashing with 50% more frequency than when the TWP is not connected | <p><b>Possible Cause 1:</b> The configuration is not downloaded from the Hardware Tree (in the Control Builder) to the controller.</p> <p><b>Corrective Action 1:</b> Ensure that the CI869 module is configured in the Hardware Tree for the correct position and the configuration is downloaded to controller.</p> |
| Rx LED is flashing with 75% more frequency than when the TWP is not connected | <p><b>Possible Cause:</b> At least one of the configured DSPs does not respond when polled.</p> <p><b>Corrective Action:</b> Configure the DSPs correctly.</p>  |

Table 44. AF 100 Interface, CI869 - Indications and Fault Finding

| Indication          | Possible Cause and Corrective Action (for faults)   |
|---------------------|---|
| Dual LED is ON      | The CI869 module is run in redundant configuration.   |
| Prim(ary) LED is ON | <p>The CI869 module is run in redundant configuration, and it functions as the primary module.</p> <p><b>Note:</b> Even if the backup CI869 module runs with errors or fails in redundant configuration, the Prim LED is still ON in the primary CI869 module in redundant configuration.</p> |



If the corrective action is to replace the faulty CI869 module, replace it with another CI869 module which has the same version of hardware and firmware.



CI869 supports hot swap.

## PROFINET IO Interface - CI871

Table 45. PROFINET IO Interface, CI871 - Indications and Fault Finding

| Fault                                 | Possible Cause and Corrective Action   |
|---------------------------------------|--|
| Neither R(un) nor F(ault) LEDs are ON | <p>The CI871 unit is in the process of configuration. If the condition persists, and no other unit LED on the CEX-Bus is ON:</p> <ul style="list-style-type: none"> <li>• Check that a valid hardware configuration including the CI871 is downloaded to the controller.</li> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI871 unit.</li> </ul> |
| F(ault) LED is ON                     | <p>The CI871 unit is in the process of being restarted. Wait until the restart operation is complete.</p> <p>Replace unit if the condition persists.</p>   |
| RxTx1/RxTx2 LED is OFF                | <p>Reception and transmission of I/O data does not occur at the respective Ethernet channels.</p>  |
| RxTx1/RxTx2 LED is flashing           | <p>Reception and transmission of I/O data occurs normally at the respective Ethernet channels.</p>   |
| PRIM is OFF                           | <p>The CI871 is not started by the application.</p>  |
| PRIM is ON                            | <p>The CI871 is started by the application.</p>  |
| DUAL is OFF                           | <p>Default, as no redundancy is supported with PROFINET IO.</p>  |



CI871 supports hot swap.

## MOD5 Interface - CI872

Table 46 provides the indications and possible causes, and the corrective actions for the faults, appearing in the MOD5 communication interface, type - CI872.

Table 46. MOD5 Communication Interface, Type CI872 - Indications and Fault Finding

| Indication                           | Possible Causes, and Corrective Actions (for faults)   |
|--------------------------------------|--|
| Both R(un) and F(ault) LED's are OFF | <p><b>Possible Cause 1:</b> The CI872 module is connected to the controller and the configuration is not downloaded to the controller for that position.</p> <p><b>Corrective Action 1:</b> Ensure that the CI872 module is configured in the Hardware Tree (in the Control Builder) for that position, and that the configuration is downloaded to controller.</p>  |
|                                      | <p><b>Possible Cause 2:</b> The CI872 module is just powered up or it is being configured and downloaded.</p> <p><b>Corrective Action 2:</b> Allow time for the module to initialize.</p>  |
|                                      | <p><b>Corrective Action 3:</b> If the indication persists after performing the corrective actions 1 and 2, then one of the following corrective actions is recommended:</p> <ul style="list-style-type: none"> <li>• Remove and insert the CI872 module to the CEX-Bus and allow time for it to initialize.</li> <li>• If the CEX-Bus already contains other communication modules and all the LED's on those modules are OFF, or if this CI872 is the only module on the CEX-Bus, then check the CEX-Bus fuse inside the PM86x Processor Unit.</li> </ul> |
|                                      | <p><b>Corrective Action 4:</b> If the indication still persists after performing the corrective actions 1 to 3, replace the CI872 module.</p>  |

Table 46. MOD5 Communication Interface, Type CI872 - Indications and Fault Finding (Continued)

| Indication                                   | Possible Causes, and Corrective Actions (for faults)   |
|--|--|
| F(ault) LED is ON                            | <p><b>Possible Cause 1:</b> The CI872 module is in the process of upgrading the firmware (if the upgrade is in progress).</p> <p><b>Corrective Action 1:</b> Wait for the firmware to be upgraded.</p>   |
|  | <p><b>Possible Cause 2:</b> Fault in the CI872 module.</p> <p><b>Corrective Action 2:</b> Hot remove and hot insert the CI872 module.</p>  |
|  | <p><b>Corrective Action 3:</b> If the indication persists after performing the corrective actions 1 and 2, then replace the CI872 module.</p>  |
| R(un) LED is ON                              | The green R(un) LED indicates that CI872 is operational.   |
| Rx/Tx1, Rx/Tx2, and Rx/Tx3 LEDs are flashing | There is one LED corresponding to each port on the CI872 module. When the LED corresponding to a port flashes, it indicates that communication is happening on that particular port.   |
| Rx/Tx1, Rx/Tx2, Rx/Tx3 LED is OFF            | <p><b>Possible Cause 1:</b> The fiber optic cable is not connected or it is not connected properly to the port.</p> <p><b>Corrective action 1:</b> Do any of the following:</p> <ul style="list-style-type: none"> <li>• Check the corresponding optical cable connections, that is, the connections for reversed transmitter and receiver optical cables for that particular port, and the connections on the DOW MOD5 controller.</li> <li>• Check the Network Controller Board (NCB) on the MOD5 Controller connected to that particular port.</li> </ul> |
|  | <p><b>Possible Cause 2:</b> The configuration is not downloaded from the Hardware Tree (in the Control Builder) to the controller.</p> <p><b>Corrective Action 2:</b> Ensure that the module is configured in the Hardware Tree for the correct position and the configuration is downloaded to controller.</p>  |

Table 46. MOD5 Communication Interface, Type CI872 - Indications and Fault Finding (Continued)

| Indication        | Possible Causes, and Corrective Actions (for faults)  |
|-------------------|---|
| DUAL LED is ON    | <p>The yellow DUAL LED is illuminated when the CI872 module is run in redundant configuration. The module that has the DUAL LED illuminated is the primary [active] module in a redundant configuration.</p> <p><b>Note:</b> Even if the backup CI872 module runs with errors or fails in redundant configuration, the DUAL LED is still ON in primary CI872 module in redundant configuration.</p> |
| DUAL LED is OFF   | <p>The yellow DUAL LED is OFF when any of the following conditions are met:</p> <ul style="list-style-type: none"> <li>• CI872 is run in single configuration.</li> <li>• CI872 is run in redundant configuration, but it acts as a backup module.</li> </ul>   |
| All LED's are OFF | <p><b>Possible Cause 1:</b> Difference in the CI872 position in the Hardware Tree (in the Control Builder) as compared to the CI872 position on the CEX-Bus.</p> <p><b>Corrective Action 1:</b> Check and correct the position of CI872 module in the Hardware Tree in accordance with the position on CEX-Bus, or vice-versa.</p>  |
|                   | <p><b>Possible Cause 2:</b> The CI872 module is hot inserted and the configuration is not downloaded to the controller.</p> <p><b>Corrective Action 2:</b> Ensure that the module is configured in the Hardware Tree (in the Control Builder) for that position, and that the configuration is downloaded to controller.</p>  |
|                   | <p><b>Possible Cause 3:</b> The CI872 is just hot inserted and it is in the process of configuration.</p> <p><b>Corrective Action 3:</b> Allow time for the module to initialize.</p>   |

Table 46. MOD5 Communication Interface, Type CI872 - Indications and Fault Finding (Continued)

| Indication  | Possible Causes, and Corrective Actions (for faults)   |
|---|--|
| Rx/Tx LED's are flashing, but there is no communication | <p><b>Possible Cause 1:</b> MTMConnect and/or MTMReadCyc and/or MTMDefCyc are disabled.</p> <p><b>Corrective Action 1:</b> Enable MTMConnect, MTMReadCyc, and MTMDefCyc function blocks.</p>   |
|   | <p><b>Possible Cause 2:</b> MTMConnect and/or MTMReadCyc and/or MTMDefCyc function blocks show a bad status.</p> <p><b>Corrective Action 2:</b> Check the reason for the bad status (see the status codes for MTMCommLib in the Online Help), and take the appropriate corrective action for the bad status.</p>   |
|   | <p><b>Possible Cause 3:</b> The value for the Channel parameter in the MTMConnect function block is not in accordance with the position of the CI872 module in the Hardware Tree.</p> <p><b>Corrective Action 3:</b> Ensure that the value of the Channel parameter in the function block is in accordance with the position of the CI872 module in the Hardware Tree.</p> |
|   | <p><b>Corrective Action 4:</b> If the condition persists even after performing corrective actions 1 to 3, then hot remove and hot insert the CI872 module on the CEX-Bus and allow time for the module to initialize.</p>  |



If the corrective action is to replace the faulty CI872 module, replace it with another CI872 module which has the same version of hardware and firmware.



CI872 supports hot swap.

## EtherNet/IP Interface - CI873

Table 47. EtherNet/IP Communication Interface CI873 - Indications and Fault Finding

| Fault                                      | Possible Cause and Corrective Action   |
|--|--|
| Neither R(un) nor F(ault) LEDs are ON      | <p>The CI873 unit is in the process of being configured. Wait until the configuration is complete. If the condition persist, and no other unit LED on the CEX-Bus is ON:</p> <ul style="list-style-type: none"> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit.</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit.</li> <li>• Replace the CI873 unit.</li> </ul> |
| F(ault) LED is ON                          | <p>The CI873 unit is in the process of being restarted. Wait until the restart operation is complete.</p> <p>Replace unit if the condition persists.</p>   |
| RxTx1/RxTx2 <sup>(1)</sup> LED is OFF      | No Receive or transmit activity for respective Ethernet channels.  |
| RxTx1/RxTx2 <sup>(1)</sup> LED is flashing | Receive or transmit activity for respective Ethernet channels is normal.   |

*Table 47. EtherNet/IP Communication Interface CI873 - Indications and Fault Finding*

| <b>Fault</b>        | <b>Possible Cause and Corrective Action</b>   |
|---------------------|---|
| Dual LED is ON      | The CI873 module is run in redundant configuration.   |
| Prim(ary) LED is ON | <p>The CI873 module is run in redundant configuration, and it functions as the primary module.</p> <p><b>Note:</b> Even if the backup CI873 module runs with errors or fails in redundant configuration, the Prim LED is still ON in the primary CI873 module in redundant configuration.</p> |

(1) LED can be switched off by disabling CH2 channel.



CI873 supports hot swap.



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# Appendix A Hardware Units

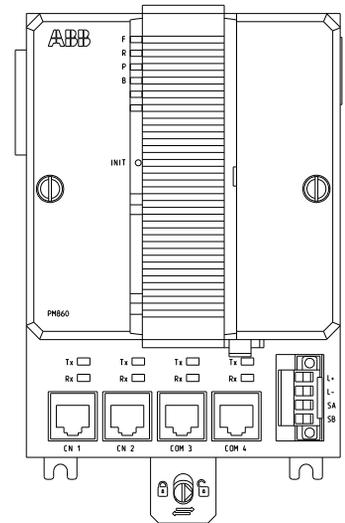
## PM851/PM856/PM860 and TP830 – Processor Unit



This section does not apply to the Feature Pack release of System 800xA 5.1. See [PM851A/PM856A/PM860A](#) and [TP830 – Processor Unit](#) on page 245.

### Key Features

- MPC860 Microprocessor running at 48 MHz.
- 8 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.



The data for **PM851** is the same as for PM856 except, no support for CN2.

The data for **PM856** is the same as for PM860 except for performance of application program execution, see [Performance Data](#) on page 244.

- Compact Flash interface which supports loading of application and cold retain data storage.

## Technical Data

Technical data for PM851/PM856/PM860 and TP830 is described in [Table 48](#) on page 240.

*Table 48. PM851/PM856/PM860 and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 2 MB flash PROM (firmware storage).</li> <li>• 8 MB of SDRAM.</li> </ul>   |
| Power Dissipation                    | 5 W typical<br>10 W typical (incl. full supply to ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).   |
| Current Consumption                  | 180 mA typical (300 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).  |
| Power Input Connector                | Four pin, screw connector L+, L–, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L– 24 V nominal, variation between 19.2V DC and 30V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical “0” or “1” input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 48. PM851/PM856/PM860 and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1100 g (2.4 lb) (package PM856K01 with PM856, TP830 and bus terminations).</li> <li>1100 g (2.4 lb) (package PM860K01 with PM860, TP830 and bus terminations).</li> </ul> |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in.)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.  |

### Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table 49](#) on page 241.

Table 49. PM851/PM856/PM860 and TP830 Interfaces – Technical data

| Item  | Value  |
|---|--|
| <b>CN1 and CN2 Ethernet Communication<sup>(1)</sup></b> |  |
| Communication speed                                     | 10 Mbit/s (half duplex)  |
| Signal levels   | IEEE802.3, 10Base-T  |
| Connector   | RJ45   |
| <b>COM3 Serial Communication</b>                        |  |
| Communication speed                                     | Selectable in steps from 75 to 19200 baud.<br>75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud.<br><b>Protocol specific restrictions apply.</b> |
| Signal levels   | RS-232C  |
| Connector   | RJ45   |
| Modem support   | Yes  |

Table 49. PM851/PM856/PM860 and TP830 Interfaces – Technical data

| Item                                   | Value  |
|--|--|
| <b>COM4 Serial Communication</b>       |  |
| Communication speed                    | 9600 baud  |
| Signal levels                          | RS-232C  |
| Connector                              | RJ45   |
| Modem support                          | No   |
| <b>Electrical ModuleBus</b>            |  |
| I/O capacity                           | 1 x S800 I/O base cluster with up to 12 x S800 I/O units.  |
| Supply current                         | <ul style="list-style-type: none"> <li>• Max 24 V – 1.0 A (short circuit proof, fuse 2 A fast)</li> <li>• Max 5 V – 1.5 A (short circuit proof)</li> </ul> |
| Supply voltage variation               | 24 V – follows the input power at L+   |
| <b>Optical ModuleBus<sup>(2)</sup></b> |  |
| I/O capacity                           | up to 7 x S800 I/O clusters each with 12 units   |
| Connector                              | <ul style="list-style-type: none"> <li>• Duplex Fiber Optic Cable</li> <li>• Simplex Fiber Optic Cable</li> </ul>  |
| <b>CEX-Bus<sup>(3)</sup></b>           |  |
| Capacity                               | up to 12 communication interfaces  |
| Supply current                         | Max 24 V – 2.4 A (fuse 3.15 A fast)  |

(1) Only (CN1) Ethernet Communication is supported for PM851.

(2) Maximum one S800 I/O cluster is possible on the optical ModuleBus with PM851.

(3) Maximum one communication interface on the CEX-bus is possible with PM851.

## Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 50](#) on page 243.



The figures given in [Table 50](#) on page 243 are valid if the batteries are installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

*Table 50. Back-up times for PM851/PM856/860*

| Source   | Back-up time                         |
|--|--------------------------------------|
| Internal battery   | Minimum 48 hours                     |
| External battery SB821   | Minimum 1 month                      |
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 100 hours when fully charged |

[Table 51](#) on page 243 shows Internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392 and [SB822 Rechargeable External Battery – AC 800M Memory Back-up](#) on page 394.

*Table 51. PM851/PM856/PM860 and TP830 – Internal battery data*

| Item                    | Value                             |
|-------------------------|-----------------------------------|
| <b>Internal battery</b> |                                   |
| Battery Type            | Low rate lithium, 3.6 V, 950 mAh  |
| Size                    | ANSI size 1/2 AA, IEC size 1/2 R6 |
| Lithium content         | 0.3 g                             |

## Electro-magnetic Compatibility and Electrical Safety

PM851/PM856/PM860/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding EMC and safety, see [Appendix D, Directive Considerations](#).

### LED Indicators

See [Table 20](#) on page 179.

## Performance Data

The PM851/PM856/PM860 differ in performance when executing an application program.

Using the same application program in PM851/PM856 and PM860, the difference in execution time can be expressed as:

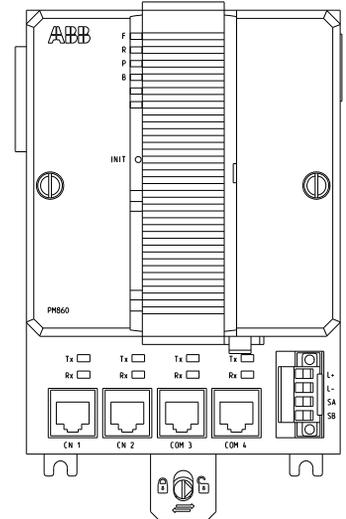
Execution time in PM851/PM856 = 2 \* Execution time in PM860

Example: If a certain application program has an execution time of **100 ms in PM860**, the same application program will have an execution time of **200 ms in PM851/PM856**.

## PM851A/PM856A/PM860A and TP830 – Processor Unit

### Key Features

- MPC860 Microprocessor running at 48 MHz.
- For PM851A, 12 MB RAM with internal or external battery back-up facility.
- For PM856A, 16 MB RAM with internal or external battery back-up facility.
- For PM860A, 16 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.



The data for **PM851A** is the same as for PM856A, except for the RAM and that there is no support for CN2 in PM851A.

The data for **PM856A** is the same as for PM860A except for performance of application program execution, see [Performance Data](#) on page 244.

- Compact Flash interface which supports loading of application and cold retain data storage.

## Technical Data

Technical data for PM851A/PM856A/PM860A and TP830 is described in [Table 52](#).

*Table 52. PM851A/PM856A/PM860A and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 2 MB flash PROM (firmware storage).</li> <li>• 12 MB of SDRAM for PM851A.</li> <li>• 16 MB of SDRAM for PM856A and PM860A.</li> </ul>  |
| Power Dissipation                    | 5 W typical<br>10 W typical (incl. full supply to ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).   |
| Current Consumption                  | 180 mA typical (300 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).  |
| Power Input Connector                | Four pin, screw connector L+, L-, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L- 24 V nominal, variation between 19.2V DC and 30V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical “0” or “1” input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 52. PM851A/PM856A/PM860A and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1100 g (2.4 lb) (package PM851AK01 with PM851A, TP830 and bus terminations).</li> <li>1100 g (2.4 lb) (package PM856AK01 with PM856A, TP830 and bus terminations).</li> <li>1100 g (2.4 lb) (package PM860AK01 with PM860A, TP830 and bus terminations).</li> </ul> |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in.)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.  |

### Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table 53](#).

Table 53. PM851A/PM856A/PM860A and TP830 Interfaces – Technical data

| Item  | Value  |
|---|--|
| <b>CN1 and CN2 Ethernet Communication<sup>(1)</sup></b> |  |
| Communication speed                                     | 10 Mbit/s (half duplex)  |
| Signal levels   | IEEE802.3, 10Base-T  |
| Connector   | RJ45   |
| <b>COM3 Serial Communication</b>                        |  |
| Communication speed                                     | Selectable in steps from 75 to 19200 baud.<br>75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud.<br><b>Protocol specific restrictions apply.</b> |
| Signal levels   | RS-232C  |
| Connector   | RJ45   |
| Modem support   | Yes  |

Table 53. PM851A/PM856A/PM860A and TP830 Interfaces – Technical data

| Item                                   | Value  |
|--|--|
| <b>COM4 Serial Communication</b>       |  |
| Communication speed                    | 9600 baud  |
| Signal levels                          | RS-232C  |
| Connector                              | RJ45   |
| Modem support                          | No   |
| <b>Electrical ModuleBus</b>            |  |
| I/O capacity                           | 1 x S800 I/O base cluster with up to 12 x S800 I/O units.  |
| Supply current                         | <ul style="list-style-type: none"> <li>• Max 24 V – 1.0 A (short circuit proof, fuse 2 A fast)</li> <li>• Max 5 V – 1.5 A (short circuit proof)</li> </ul> |
| Supply voltage variation               | 24 V – follows the input power at L+   |
| <b>Optical ModuleBus<sup>(2)</sup></b> |  |
| I/O capacity                           | up to 7 x S800 I/O clusters each with 12 units   |
| Connector                              | <ul style="list-style-type: none"> <li>• Duplex Fiber Optic Cable</li> <li>• Simplex Fiber Optic Cable</li> </ul>  |
| <b>CEX-Bus<sup>(3)</sup></b>           |  |
| Capacity                               | up to 12 communication interfaces  |
| Supply current                         | Max 24 V – 2.4 A (fuse 3.15 A fast)  |

(1) Only (CN1) Ethernet Communication is supported for PM851A.

(2) Maximum one S800 I/O cluster is possible on the optical ModuleBus with PM851A.

(3) Maximum one communication interface on the CEX-bus is possible with PM851A.

### Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 54](#).



The figures given in [Table 54](#) are valid if the batteries are installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table 54. Back-up times for PM851A/PM856A/PM860A

| Source   | Back-up time                       |
|--|------------------------------------|
| Internal battery   | Minimum 2 weeks                    |
| External battery SB821   | Minimum 8 months                   |
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 4 weeks when fully charged |

Table 55 shows Internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392 and [SB822 Rechargeable External Battery – AC 800M Memory Back-up](#) on page 394.

Table 55. PM851A/PM856A/PM860A and TP830 – Internal battery data

| Item                    | Value                             |
|-------------------------|-----------------------------------|
| <b>Internal battery</b> |                                   |
| Battery Type            | Low rate lithium, 3.6 V, 950 mAh  |
| Size                    | ANSI size 1/2 AA, IEC size 1/2 R6 |
| Lithium content         | 0.3 g                             |

### Electro-magnetic Compatibility and Electrical Safety

PM851A/PM856A/PM860A/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding EMC and safety, see [Appendix D, Directive Considerations](#).

### LED Indicators

See [Table 20](#) on page 179.

## Performance Data

The PM851A/PM856A/PM860A differ in performance when executing an application program.

Using the same application program in PM851A/PM856A and PM860A, the difference in execution time can be expressed as:

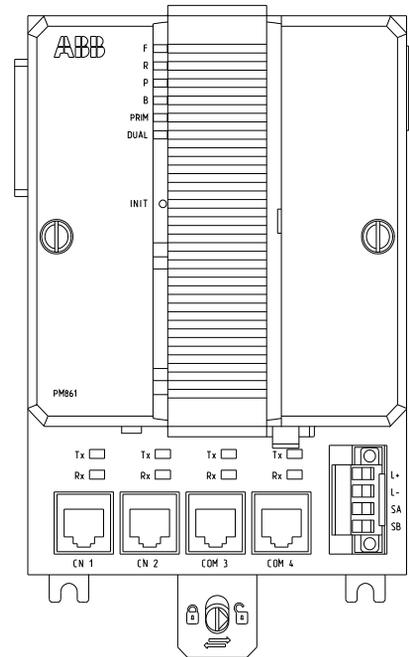
Execution time in PM851A/PM856A = 2 \*Execution time in PM860A

Example: If a certain application program has an execution time of **100 ms in PM860A**, the same application program will have an execution time of **200 ms in PM851A/PM856A**.

## PM861/PM861A and TP830 – Processor Unit

### Key Features

- MPC860 Microprocessor running at 48 MHz.
- 16 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundancy configuration.
- Compact Flash interface which supports loading of application and cold retain data storage.



## Technical Data

For technical data on PM861 and TP830, see [Table 56](#) on page 252.

*Table 56. PM861 and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 2 MB flash PROM (firmware storage).</li> <li>• 16 MB of SDRAM.</li> </ul>  |
| Power Dissipation                    | 6 W typical<br>11 W typical (incl. full supply to ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).   |
| Current Consumption                  | 250 mA typical (430 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).  |
| Power Input Connector                | Four pin, screw connector L+, L-, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L- 24 V nominal, variation between 19.2 V DC and 30 V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical “0” or “1” input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 56. PM861 and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1200 g (2.6 lb) (package PM861K01).</li> <li>2800 g (6.1 lb) (package PM861K02).</li> </ul>                           |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism. |

### Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table 49](#) on page 241.

### Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 57](#) on page 253.



The figures in [Table 57](#) on page 253 are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table 57. Back-up times for PM861 and PM861A

| Source                 | Back-up time                        |                                      |
|------------------------|-------------------------------------|--------------------------------------|
|                        | PM861                               | PM861A                               |
| Internal battery       | Minimum 36 hours                    | Minimum 118 hours                    |
| External battery SB821 | Minimum 3 weeks                     | Minimum 12 weeks                     |
| External battery SB822 | Minimum 85 hours when fully charged | Minimum 285 hours when fully charged |

[Table 51](#) on page 243 shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392 and [SB822 Rechargeable External Battery – AC 800M Memory Back-up](#) on page 394

### **Electro-magnetic Compatibility and Electrical Safety**

PM861/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

### **LED Indicators**

See [Table 20](#) on page 179.

## **Performance Data**

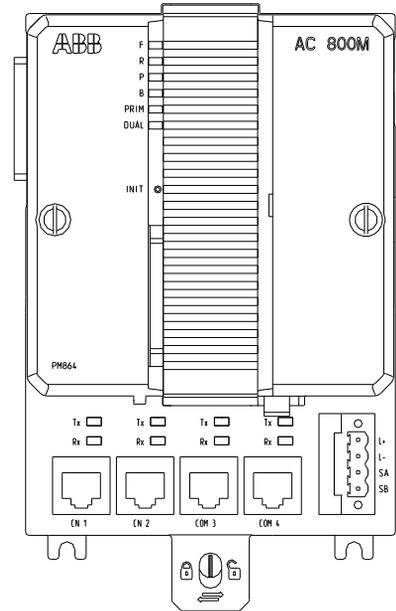
The PM861 processor unit, in single configuration, has the same performance data as the PM860. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant CPU configuration, is less than 10 ms.

## PM864/PM864A and TP830 – Processor Unit

### Key Features

- MPC862 Microprocessor running at 96 MHz.
- 32 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundancy configuration.
- Compact Flash interface which supports loading of application and cold retain data storage.



## Technical Data

For technical data on PM864 and TP830, see [Table 58](#) on page 256.

*Table 58. PM864 and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 2 MB flash PROM (firmware storage).</li> <li>• 32 MB of SDRAM.</li> </ul>  |
| Power Dissipation                    | 6.9 W typical<br>11.9 W typical (incl. full supply to ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).   |
| Current Consumption                  | 287 mA typical (487 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).  |
| Power Input Connector                | Four pin, screw connector L+, L-, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L- 24 V nominal, variation between 19.2 V DC and 30 V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 58. PM864 and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1200 g (2.6 lb) (package PM864K01).</li> <li>2800 g (6.1 lb) (package PM864K02).</li> </ul>                           |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism. |

### Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table 49](#) on page 241.

### Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 59](#) on page 257.



The figures in [Table 59](#) on page 257 are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table 59. Back-up times for PM864 and PM864A

| Source   | Back-up time                        |                                    |
|--|-------------------------------------|------------------------------------|
|  | PM864                               | PM864A                             |
| Internal battery   | Minimum 36 hours                    | Minimum 235 hours                  |
| External battery SB821   | Minimum 3 weeks                     | Minimum 24 weeks                   |
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 85 hours when fully charged | Minimum 3 weeks when fully charged |

[Table 51](#) on page 243 shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392 and [SB822 Rechargeable External Battery – AC 800M Memory Back-up](#) on page 394.

### **Electro-magnetic Compatibility and Electrical Safety**

PM864/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

### **LED Indicators**

See [Table 20](#) on page 179.

## **Performance Data**

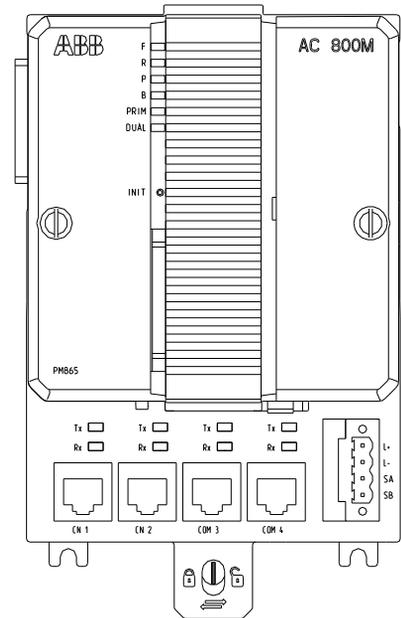
The PM864 processor unit, in single configuration, has performance data which theoretically peaks at twice the performance compared to the PM860. The useful sustained performance improvement is, however, a bit lower and somewhat dependent on the actual application program but can be expected to be 10 to 50% compared to PM860. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.

## PM865 and TP830 – Processor Unit

### Key Features

- MPC862P Microprocessor running at 96 MHz.
- 32 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundant configuration.
- High Integrity Controller (with SM810 and certified software)
  - Overvoltage protection
  - Internal voltage supervision
  - Runs application code in non-SIL and SIL1-2 applications
  - Supports S800 I/O High Integrity.



## Technical Data

For technical data on PM865 and TP830, see [Table 60](#) on page 260.

*Table 60. PM865 and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 4 MB flash PROM (firmware storage).</li> <li>• 32 MB of SDRAM.</li> </ul>  |
| Power Dissipation                    | 6.9 W typical<br>11.9 W typical (incl. full supply to ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).   |
| Current Consumption                  | 287 mA typical (487 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus, see <a href="#">Appendix B, Power Consumption</a> ).  |
| Power Input Connector                | Four pin, screw connector L+, L–, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L– 24 V nominal, variation between 19.2 V DC and 30 V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 60. PM865 and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1200 g (2.6 lb) (package PM865K01).</li> <li>2800 g (6.1 lb) (package PM865K02).</li> </ul>                           |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism. |

### Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table 49](#) on page 241.

### Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 61](#) on page 261.



The figures in [Table 61](#) on page 261 are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table 61. Back-up times for PM865

| Source   | Back-up time                       |
|--|------------------------------------|
| Internal battery   | Minimum 235 hours                  |
| External battery SB821   | Minimum 24 weeks                   |
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 3 weeks when fully charged |

[Table 51](#) on page 243 shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 392 and [SB822 Rechargeable External Battery – AC 800M Memory Back-up](#) on page 394.

### Electro-magnetic Compatibility and Electrical Safety

PM865/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

### LED Indicators

See [Table 20](#) on page 179.

## Performance Data

The PM865 processor unit, in single configuration, has performance data which theoretically peaks at twice the performance compared to the PM860. The useful sustained performance improvement is, however, a bit lower and somewhat dependent on the actual application program but can be expected to be 10 to 50% compared to PM860. In redundant configuration the execution performance is somewhat lower than in single configuration.



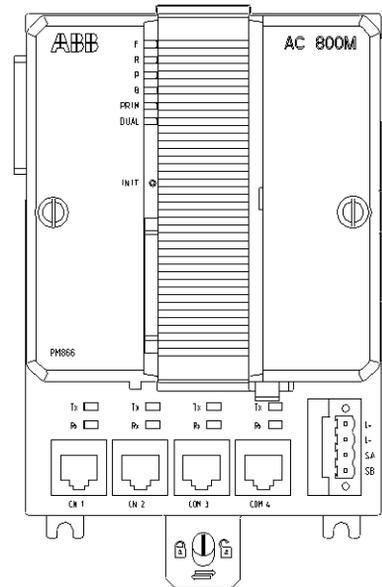
PM865 is designed for use in a High Integrity controller. If it is run as a non-SIL controller without any SIL applications, its performance will be the same as stated above, while performance will be lower when running SIL applications.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.

## PM866 and TP830 – Processor Unit

### Key Features

- MPC866 Microprocessor running at 133 MHz.
- 64 MB RAM with internal or external battery backup facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
  - CN1 + CN2, Ethernet ports (IEEE 802.3, 10BaseT)
  - COM3, serial port (RS-232C) with modem support
  - COM4, serial port (RS-232C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundancy configuration.
- Compact Flash interface which supports loading of application and cold retain data storage.



## Technical Data

For technical data on PM866 and TP830, see [Table 62](#) on page 264.

*Table 62. PM866 and TP830 – Technical data*

| Item                                 | Value   |
|--------------------------------------|---|
| Memory                               | <ul style="list-style-type: none"> <li>• 4 MB flash PROM (firmware storage).</li> <li>• 64 MB of SDRAM.</li> </ul>  |
| Power Dissipation                    | 5.1 W typical<br>8.6 W typical (incl. full supply to ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).  |
| Current Consumption                  | 210 mA typical (360 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).  |
| Power Input Connector                | Four pin, screw connector L+, L-, SA and SB.  |
| Power Supply Requirements            | Inputs designated L+ and L- 24 V nominal, variation between 19.2 V DC and 30 V DC.  |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits. |
| Power Reservoir                      | The processor unit has an internal 5ms power reservoir, sufficient for the CPU to make a controlled power down.   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.   |

Table 62. PM866 and TP830 – Technical data (Continued)

| Item       | Value  |
|------------|--|
| Weight     | <ul style="list-style-type: none"> <li>1200 g (2.6 lb) (package PM866K01).</li> <li>2800 g (6.1 lb) (package PM866K02).</li> </ul>                           |
| Dimensions | W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism. |

### Communication Ports and Interfaces

For details on Technical data for communication ports and interfaces, For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation.

### Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table 63](#) on page 265.



The figures in [Table 63](#) on page 265 are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table 63. Back-up time for PM866

| Source   | Back-up time for PM866             |
|--|------------------------------------|
| Internal battery   | Minimum 158 hours                  |
| External battery SB821   | Minimum 15 weeks                   |
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 16 days when fully charged |

For internal and external battery data, refer 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation.

**Electro-magnetic Compatibility and Electrical Safety**

PM866/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

**LED Indicators**

See [Table 20](#) on page 179.

**Performance Data**

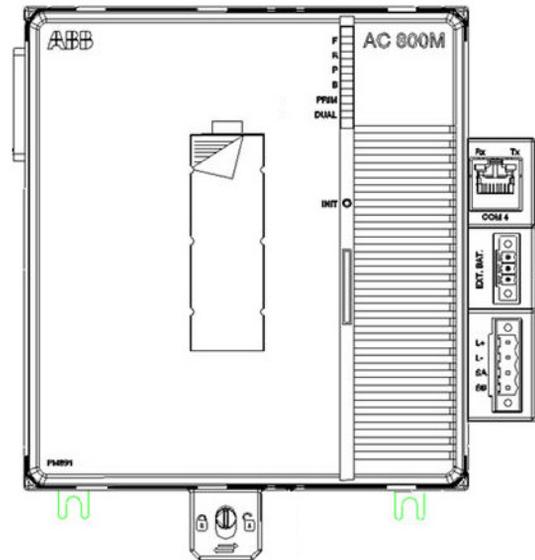
The PM866 processor unit has performance data which is approximately 1.4 times the performance of PM864. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.

## PM891– Processor Unit

### Key Features

- MPC8270 Microprocessor running at 450 MHz.
- 256 MB RAM with integrity check (shadow memory).
- Optical ModuleBus interface that is designed for a maximum of seven clusters, of twelve non-redundant or six redundant modules (that is,  $7 \times 12 = 84$  modules). Redundant and non-redundant modules can be combined.
- Three on-board communication ports:
  - CN1 + CN2 (built in, 10/100Mbit/s) Ethernet ports (IEEE 802.3u, 10 Base-T/100Base-Tx).
  - COM4 (built in) serial port (RS-232C) for service tool.
- Two Redundancy Control Links — RCU Control Link and RCU Data Link — for use in redundant configuration.
- Secure Digital (SD) card slot that supports the SD card for loading of application and for saving the cold retain values cyclically. The SD cards of various manufacturers are supported.



## Technical Data

For technical data on PM891, see [Table 64](#).

*Table 64. PM891 – Technical data*

| Item                                 | Value  |
|--------------------------------------|--|
| Memory                               | <ul style="list-style-type: none"> <li>• 16 MB flash PROM (firmware storage).</li> <li>• 256 MB of DDR2 SDRAM with integrity check.</li> </ul>   |
| Power Dissipation                    | 15.8 W typical<br>19.5 W typical (incl. full supply to ModuleBus and CEX-Bus).   |
| Current Consumption                  | 660 mA typical (750 mA max.)<br>(excl. supply of ModuleBus and CEX-Bus).   |
| Power Input Connector                | Four pin, screw connector L+, L–, SA and SB.   |
| Power Supply Requirements            | Inputs designated L+ and L– 24 V nominal, variation between 19.2 V DC and 30 V DC.   |
| Redundant Power Supply Status Inputs | Inputs designated SA, SB <ul style="list-style-type: none"> <li>• Max input voltage 30 V</li> <li>• Min. input voltage for high level 15 V</li> <li>• Max input voltage for low level 8 V</li> </ul> These are status inputs and the threshold levels are limits for logic "0" or "1" on the inputs, that is, not power fail limits. |
| Power Reservoir                      | 5 ms   |
| Protection Rating                    | IP20 according to EN60529, IEC 529.  |
| Weight                               | 1.6 kg (1.9 kg with package)   |
| Dimensions                           | W 200 x H 186 x D 102 mm (7.9 x 7.3 x 4.0 in)<br>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.   |

## Communication Ports and Interfaces

For details on communication ports and interfaces, see [Key Features](#) on page 267

## Battery

The memory content is backed up with an external battery unit (SB822). For backup time, see [Table 65](#).



The figures in [Table 65](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

*Table 65. Backup time for PM891*

| Source   | Back-up time for PM891              |
|--|-------------------------------------|
| External battery SB822<br>Note: Recharge time for an empty battery is approximately 7 hours. | Minimum 33 hours when fully charged |

## Electro-magnetic Compatibility and Electrical Safety

PM891 meets the requirements specified in EMC Directive 2004/108/EEC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

## LED Indicators

See [Table 20](#) on page 179.

## Performance Data

The PM891 processor unit's performance is approximately three times the performance of PM864. In redundant configuration too, the execution performance is approximately three times the performance of PM864.

## BC810 and TP857 - CEX-Bus Interconnection Unit

### Key Features

- Supports redundant communication interface units.
- Supports on-line replacement of the CPU.
- External power supply.
- Supports hot swap.

### Description

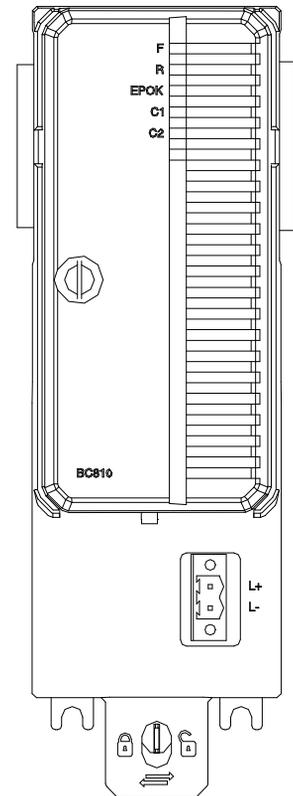
The BC810 unit consists of two basic parts: baseplate (TP857) and power supply/logic board.

The baseplate is where the connectors to CEX-Bus and the external power reside. It is grounded to the DIN-rail through metal parts of the housing. The board also carries the external power voting diode and fuse.

The power supply and logic board contains the +3.3 V converter, logic, drivers for CEX-Bus interconnection and the connector for interconnection cable.

In a fully redundant system with two interlinked BC810 and primary/backup CPU pair, the BC810 support online replacement of the CPU baseplate without disturbing the CEX traffic.

If the BC810 has to be replaced, all traffic to the connected CEX segment are stopped.



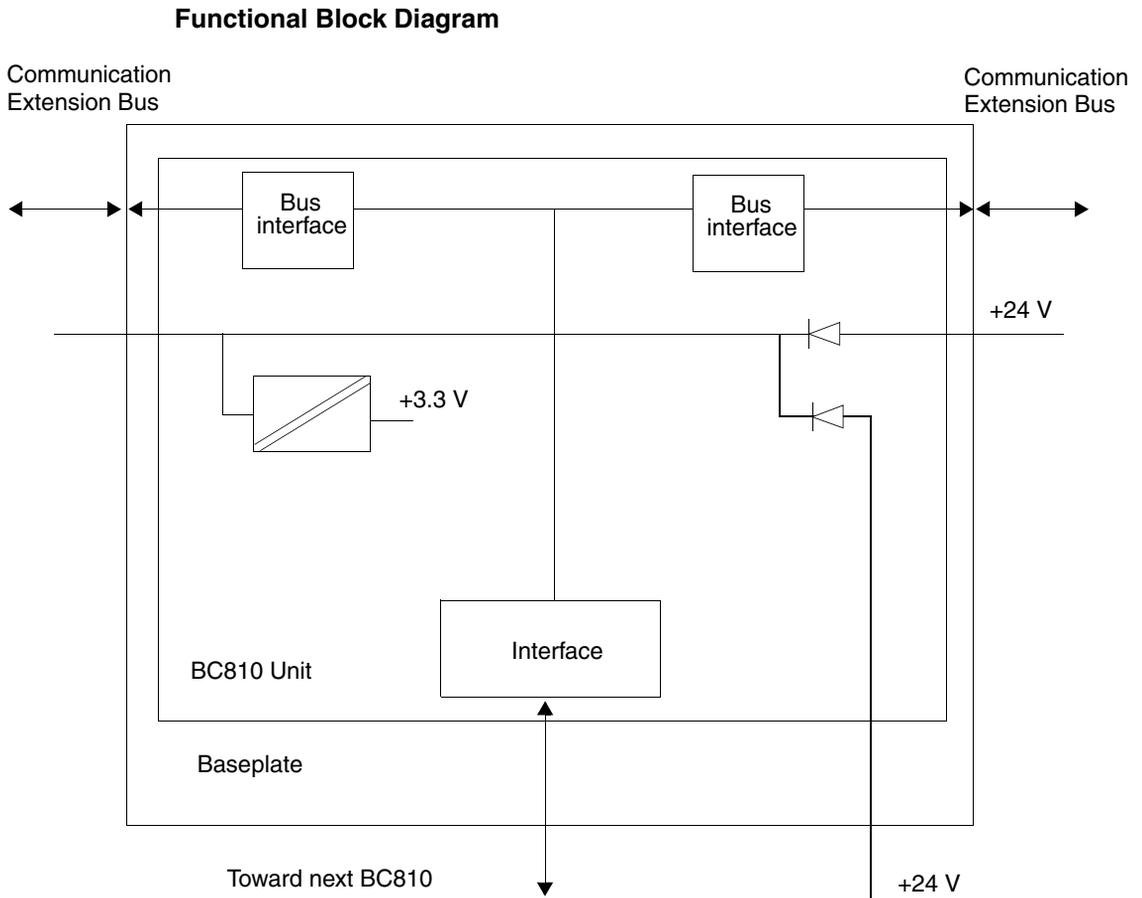


Figure 66. Block Diagram – BC810

**Indicators***Table 66. BC810 – CEX-Bus Interconnection Unit LED Indicators*

| <b>Designation/Color</b>       | <b>Function</b>   |
|--------------------------------|---|
| F(ault) /Red                   | Power supply error detected. Controlled by hardware. Set and cleared by the Hardware during power up. |
| R(un) /Green                   | Operating. Controlled by the Hardware.  |
| EPOK(external power OK) /Green | Indicates that the external power is connected and powered up.  |
| C1 /Yellow                     | Indicates traffic on the directly connected CEX-segment.  |
| C2 /Yellow                     | Indicates traffic on the interconnected CEX-segment.  |

**Technical Data***Table 67. BC810 – CEX-Bus Interconnection Unit Specifications*

| <b>Item</b>               | <b>Value</b>   |
|---------------------------|--|
| Power Input Connector     | Two pin, screw connector L+, L-.   |
| Power Supply Requirements | Inputs designated L+ and L- 24 V nominal, variation between 19.2 V DC and 30 V DC. |
| Current consumption       | 50 mA typical (70 mA max)  |
| Power dissipation         | 1.2 W typical  |
| Protection Rating         | IP20 according to EN60529, IEC 529   |
| Weight                    | 700 g (1.5 lb) (package BC810K01)  |
| Dimensions                | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)                            |

## SM810 and TP855

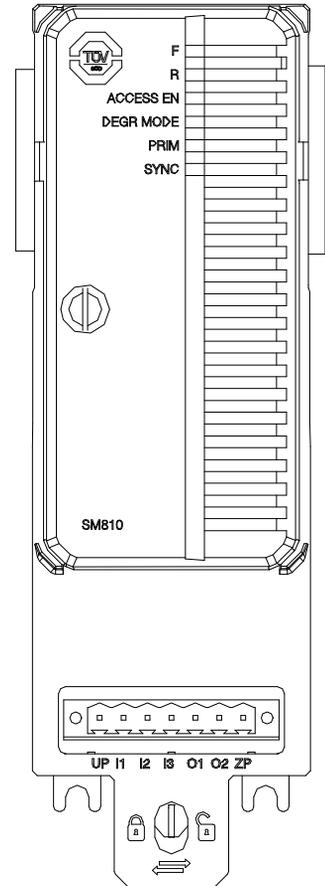
### Key Features

- MPC862P Microprocessor running at 96 MHz.
- 32 MB RAM
- Provides supervision of the PM865 controller during SIL1-2 operations.
- Over voltage protection.
- Internal voltage monitoring.
- Supports hot swap.
- Supports redundancy.

### Description

Physically SM810 Unit consists of two parts: Termination Plate (TP855) and SM810.

The SM810 contains two pc-boards. The main board contains the MPC862, SDRAM, Flash PROM, and CEX-Bus slave interface. A daughter board contains digital I/O, +3.3V supply with over-voltage protection and voltage monitoring. The termination plate contains CEX-Bus connectors and connectors for the digital I/O.



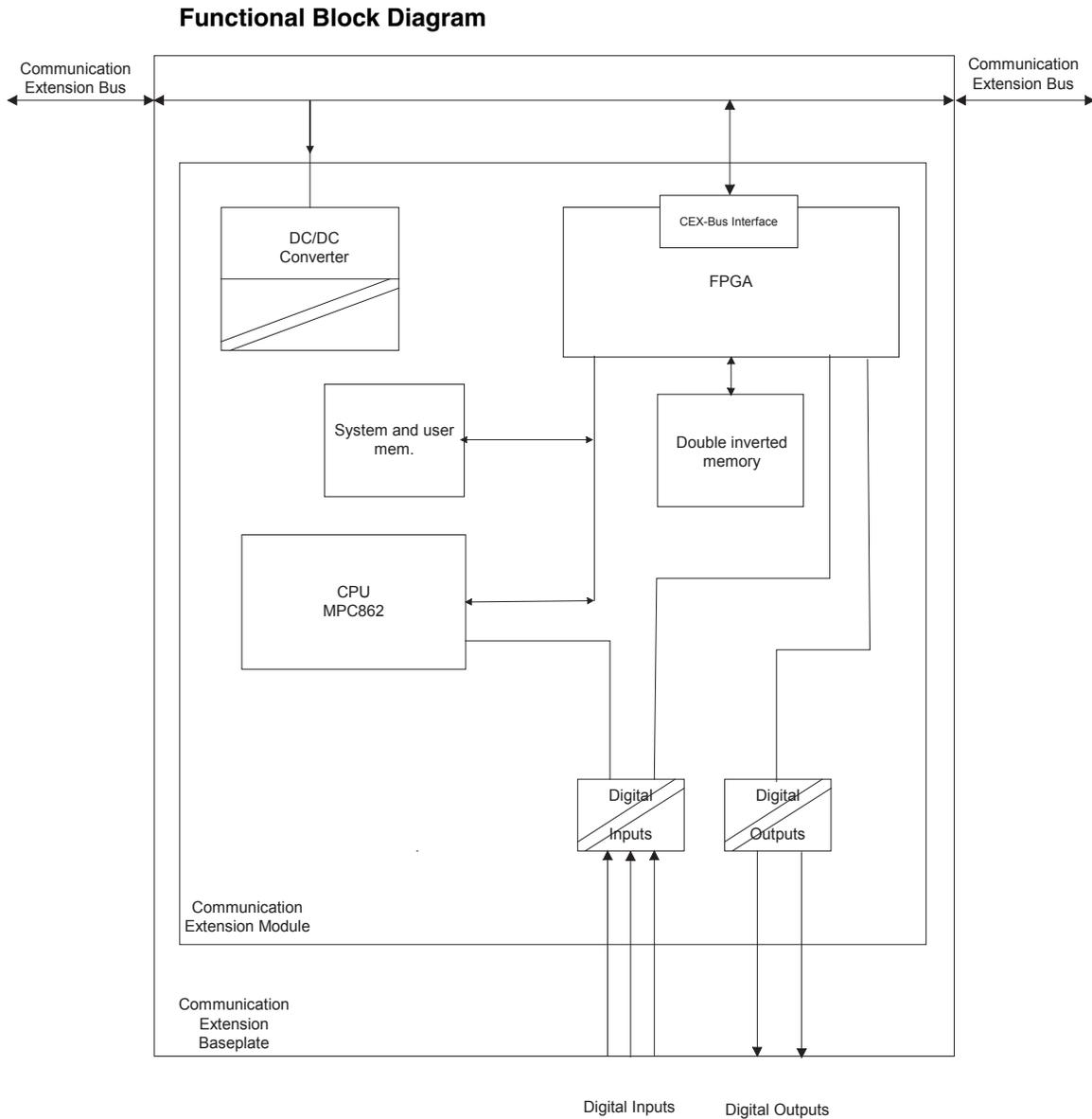


Figure 67. Block Diagram – SM810

## Indicators

Table 68. SM810 – LED Indicators

| Designation/Color        | Function  |
|--------------------------|---|
| F(ault) /Red             | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green             | Operational. Controlled by the Control Software. Cleared by the Hardware during controller Reset.             |
| ACCESS EN(abled) /Yellow | Access Enable switch active.  |
| DEGR(aded) MODE /Yellow  | Reserved for future use.  |
| PRIM /Yellow             | Indicates that the unit is used as the primary SM810.   |
| SYNC(hronized) /Yellow   | Indicates that the SM810 is synchronized. Flashes during SM810 synchronization.                               |

## Technical Data

Table 69. SM810 Specifications

| Item  | Value  |
|---|--|
| Memory  | <ul style="list-style-type: none"> <li>• 4 MB flash PROM (firmware storage).</li> <li>• 32 MB of SDRAM.</li> </ul> |
| Galvanic isolation                            | Yes  |
| Connector                                     | One 7 pin screw connector  |
| Current consumption<br>(from CEX-Bus 24 V DC) | 160 mA typical (250 mA max)  |
| Power dissipation                             | 3.8 W typical  |

Table 69. SM810 Specifications (Continued)

| Item       | Value   |
|------------|---|
| Weight     | 700 g (1.5 lb) (package SM810K01 with SM810 and TP855). |
| Dimensions | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

Table 70. SM810 - Digital Input Specifications

| Item  | Value  |
|---|--|
| Electric isolation                                    | Yes  |
| Overvoltage category                                  | II   |
| Rated insulation voltage                              | 50 V   |
| Insulation test voltage                               | 500 V a.c. 1 min                               |
| Nominal voltage                                       | 24 V   |
| Voltage limits<br>( $U_L$ = logic 0, $U_H$ = logic 1) | - 30 V < $U_L$ < 5 V<br>15 V < $U_H$ < 30 V    |
| Nominal current                                       | 12 mA  |
| Current limits  | - 22 mA < $I_L$ < 2 mA<br>6 mA < $I_H$ < 18 mA |
| Input impedance                                       | 1.8 kOhm                                       |

Table 71. SM810 - Digital Output Specifications

| Item                             | Value                             |
|----------------------------------|-----------------------------------|
| Electric isolation               | Yes                               |
| Overtoltage category             | II                                |
| Rated insulation voltage         | 50 V                              |
| Insulation test voltage          | 500 V a.c. 1 min                  |
| Nominal voltage                  | 24 V                              |
| Process voltage range (UP)       | 12... 32 V                        |
| On-state output voltage (UA)     | $UP - 0.5 \text{ V} < UA \leq UP$ |
| Maximum continuous load current  | 0.5 A                             |
| Off-state output leakage current | < 10 mA                           |
| Maximum short circuit current    | < 2.4 mA                          |
| Output impedance                 | < 0.4 ohm                         |

## SM811 and TP868

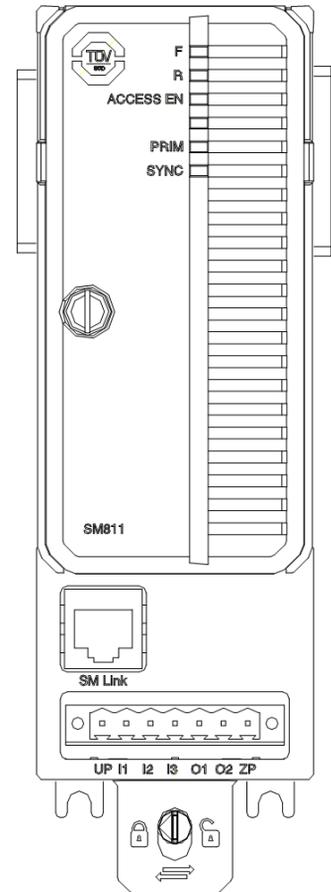
### Key Features

- MPC862P Microprocessor running at 96 MHz.
- 32 MB RAM
- Provides supervision of the PM865 controller during SIL1-2 operations and together with the PM865 forms a 1oo2 diverse architecture for SIL3 applications.
- Over voltage protection.
- Internal voltage monitoring.
- Supports hot swap.
- Supports redundancy.
- SM Link for synchronization of redundant pair.

### Description

Physically SM811 Unit consists of two parts: Termination Plate (TP868) and SM811.

The SM811 contains two pc-boards. The main board contains the MPC862, SDRAM, Flash PROM, and CEX-Bus slave interface. A daughter board contains digital I/O, +3.3V supply with over-voltage protection and voltage monitoring. The termination plate contains CEX-Bus connectors and connectors for the digital I/O.



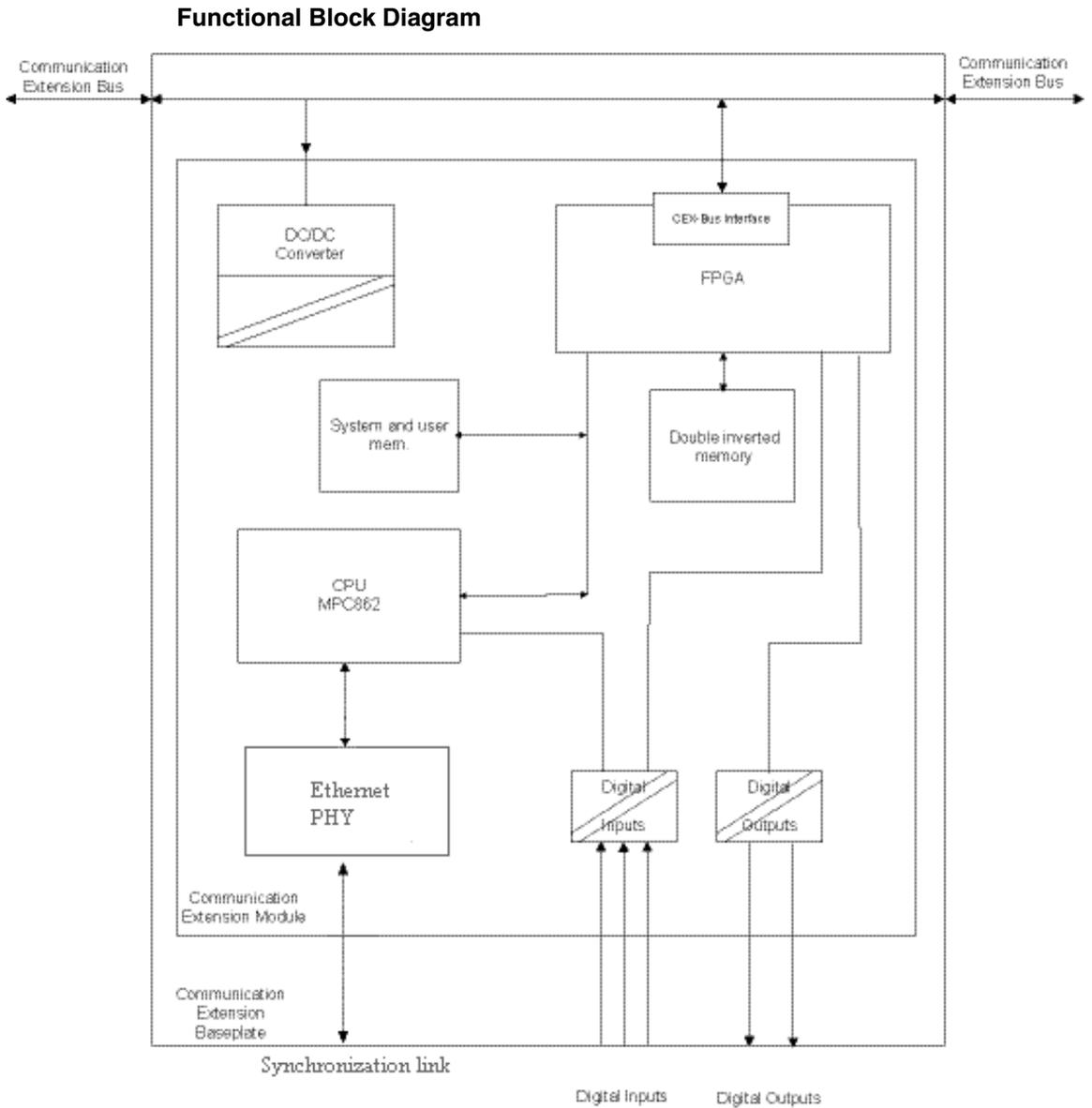


Figure 68. Block Diagram – SM811

## Indicators

Table 72. SM811 – LED Indicators

| Designation/Color        | Function  |
|--------------------------|---|
| F(ault) /Red             | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green             | Operational. Controlled by the Control Software. Cleared by the Hardware during controller Reset.             |
| ACCESS EN(abled) /Yellow | Access Enable switch active.  |
| DEGR(aded) MODE /Yellow  | Reserved for future use.  |
| PRIM /Yellow             | Indicates that the unit is used as the primary SM811.   |
| SYNC(hronized) /Yellow   | Indicates that the SM811 is synchronized. Flashes during SM811 synchronization.                               |

## Technical Data

Table 73. SM811 Specifications

| Item  | Value   |
|---|---|
| Memory  | <ul style="list-style-type: none"> <li>4 MB flash PROM (firmware storage).</li> <li>32 MB of SDRAM.</li> </ul>    |
| Galvanic isolation                            | Yes   |
| Connectors                                    | <ul style="list-style-type: none"> <li>One 7 pin screw connector</li> <li>One RJ45 connector (SM Link)</li> </ul> |
| Current consumption<br>(from CEX-Bus 24 V DC) | 160 mA typical (250 mA max)   |
| Power dissipation                             | 3.8 W typical   |

Table 73. SM811 Specifications (Continued)

| Item       | Value   |
|------------|---|
| Weight     | 700 g (1.5 lb) (package SM811K01 with SM811 and TP868). |
| Dimensions | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

Table 74. SM811 - Digital Input Specifications

| Item  | Value  |
|---|--|
| Electric isolation                                    | Yes  |
| Overvoltage category                                  | II   |
| Rated insulation voltage                              | 50 V   |
| Insulation test voltage                               | 500 V a.c. 1 min                               |
| Nominal voltage                                       | 24 V   |
| Voltage limits<br>( $U_L$ = logic 0, $U_H$ = logic 1) | - 30 V < $U_L$ < 5 V<br>15 V < $U_H$ < 30 V    |
| Nominal current                                       | 12 mA  |
| Current limits  | - 22 mA < $I_L$ < 2 mA<br>6 mA < $I_H$ < 18 mA |
| Input impedance                                       | 1.8 kOhm                                       |

Table 75. SM811 - Digital Output Specifications

| Item                             | Value                             |
|----------------------------------|-----------------------------------|
| Electric isolation               | Yes                               |
| Overvoltage category             | II                                |
| Rated insulation voltage         | 50 V                              |
| Insulation test voltage          | 500 V a.c. 1 min                  |
| Nominal voltage                  | 24 V                              |
| Process voltage range (UP)       | 12... 32 V                        |
| On-state output voltage (UA)     | $UP - 0.5 \text{ V} < UA \leq UP$ |
| Maximum continuous load current  | 0.5 A                             |
| Off-state output leakage current | < 10 mA                           |
| Maximum short circuit current    | < 2.4 mA                          |
| Output impedance                 | < 0.4 ohm                         |

The High Integrity controller is able to run SIL3 applications using SM811.

Performing a Hot swap or inserting an additional/replacement SM811 into a running system affects SIL3 applications.



For performing the hot swap of SM811 running a SIL3 application, the Access enable digital input (I2) must be turned ON through the key switch before the Hot-insert digital input (I3) is turned ON.

The Module should be configured in order to get synchronized. When running SIL3 applications, the start of the synchronization must be accepted by the user, to configure the inserted module.

If one or more SIL3 applications are running in the controller, they are temporarily interrupted in order to get a consistent state of the application to the newly inserted SM811. The user must acknowledge the application stop by creating a edge on digital input 3 on the primary, already running, Safety Module.

This is performed by connecting a physical push-button to the digital input. The system waits for 30 minutes for the acknowledgement, if acknowledgement is not received the inserted SM811 will shut down. To recover, a new hot insert needs to be initiated i.e. the SM811 has to be removed and inserted again.

Synchronization of the SM811 includes:

1. Make sure that the synchronization link between the SM811s is in place, that is, the enclosed TK852V010 cable is properly connected into both SM Link connectors respectively.
2. Insert the SM811 in its position.
3. When the SM811 starts the synchronization LED flashes, and later it continues to blink with 3 blinks and a pause in a sequence.
4. Push the button (create an edge on digital input 3 on the already running Safety Module), once it starts blinking repeatedly with 3 blinks and a pause sequence.
5. The Sync LED flashes faster until the synchronization is complete.
6. The Sync LED turns yellow when the module is synchronized.



Make sure that SM Link Cable TK852V010 is connected before hot-insert and OLU. The SM Link Cable TK852V010 can be replaced if needed, except during hot-insert and OLU. Removing the cable results in a diagnostic error and the cable must be repaired or replaced.



Non-SIL and SIL1-2 applications are not affected by synchronization of SM811. They continue to execute as normal throughout the entire synchronization without being interrupted.

A Hot Swap of SM811 requires the two safety modules to be connected with a synchronization link, used to transfer the application state.

During a hot swap it is not possible to download a new configuration from Control Builder, the controller is reserved. The Control Builder user is notified with an information dialog. The reservation is released when the hot insert is concluded or aborted. If a configuration download is ongoing, then the hot insert starts after the download is completed.

## CI851 and TP851 – PROFIBUS DP Interface

### Key Features

- Provides one PROFIBUS DP port, (a DB9 female connector located on the TP851 Baseplate).
- Simple DIN-rail mounting
- The CI851 handles cyclic read and write messages to the slaves on the PROFIBUS DP. The minimum cycle time can be 1 ms, however, but this will depend on the baud rate used and the number of attached slaves.
- By using repeaters it is possible to connect a maximum of 124 nodes to one PROFIBUS DP (32 nodes are permitted on one segment).
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.

### Description

CI851 / TP851 is used for connecting to remote I/O. Via an external gateway on PROFIBUS DP, field instruments (on PROFIBUS DP) can be connected to AC 800M. The TP851 Baseplate has one female DB9 connector for connecting PROFIBUS DP. The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the TP851 Baseplate.

The CI851 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply, via the CEX-Bus. The PROFIBUS DP must always be terminated at the two outer nodes.

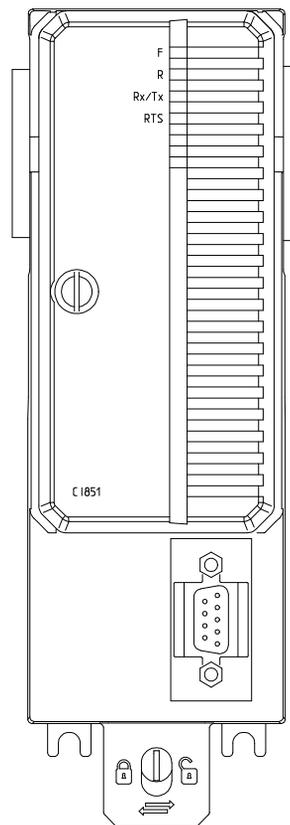


ABB recommends the use of connectors with built-in termination since the fieldbus will always be terminated even if fully disconnected from the unit.



CI851 has been replaced by the CI854 communication interface. CI851 is only described for legacy reasons.

### Functional Block Diagram

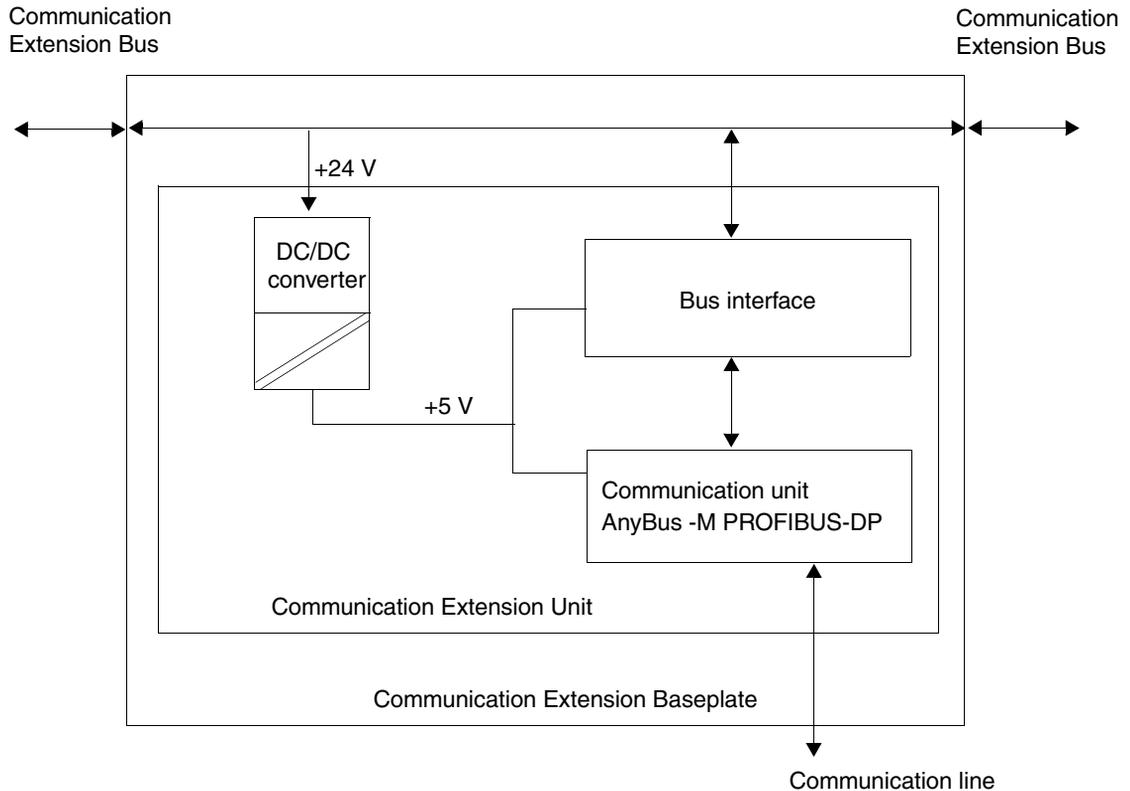


Figure 69. Block Diagram – CI851

**Indicators***Table 76. CI851 – PROFIBUS DP LED Indicators*

| <b>Designation/Color</b> | <b>Function</b>   |
|--------------------------|---|
| F(ault) /Red             | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green             | Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.               |
| Rx/Tx /Yellow            | Transmission to or from the unit.   |
| RTS /Yellow              | Request to transmit from the unit.  |

**Technical Data***Table 77. CI851 PROFIBUS DP Interface Specifications*

| <b>Item</b>                                   | <b>Value</b>  |
|---|---|
| Type  | DP Master Class I   |
| Protocol                                      | PROFIBUS DP   |
| Communication speed                           | 9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 kbit/s  |
| Galvanic isolation                            | Yes   |
| Status indicators                             | Run normally green, Fault exceptionally red, the two traffic indicators RTS and Rx/Tx are yellow flashing controlled by the traffic pace. |
| Connector                                     | DB9, female   |
| Current consumption<br>(from CEX-Bus 24 V DC) | 150 mA typical (200 mA max.)  |
| Power dissipation                             | 3.6 W typical   |

*Table 77. CI851 PROFIBUS DP Interface Specifications (Continued)*

| <b>Item</b>       | <b>Value</b>   |
|-------------------|--|
| Capacity          | Max 32 loads   |
| Protection Rating | IP20 according to EN60529,<br>IEC 529                      |
| Weight            | 700 g (1.5 lb) (package CI851K01 with<br>CI851 and TP851). |
| Dimensions        | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)    |

## CI852 and TP852 – FOUNDATION Fieldbus H1 Interface

### Key Features

- One FOUNDATION Fieldbus port provides a communication speed of 31.25 kbit/s (FF H1)
- Transformer isolated
- No power consumed from the FF H1 bus
- No power is supplied to the FF H1 bus
- Simple DIN-rail mounting
- Pre-set, two letter Alpha code lock, see [Table 4](#) on page 75, installed in unit base to prevent incorrect mounting of non-compatible components.

### Description

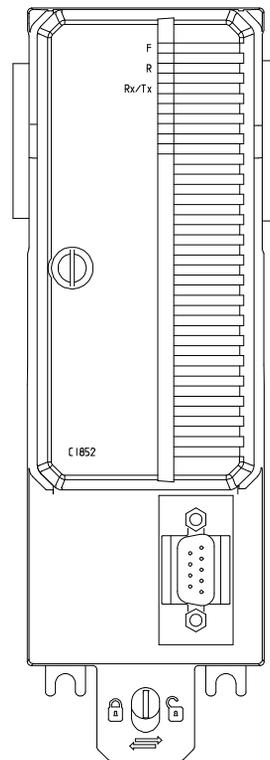
The CI852, connects the FOUNDATION Fieldbus H1 (FF H1) to the AC 800M. The FF H1 has a communication speed of 31.25 kbit/s and is intended for remote connection of field instruments. The CI852 is connected to the bus via a transformer, and as such neither supplies nor consumes bus electrical power.

The number of field instruments that can be connected via the CI852 depends on the physical limitations of the FF H1 network, together with any software limitations (refer to the software documentation).

The FF H1 bus allows reuse of existing cabling for 4-20 mA analog signals. This means the cables often become the dominant dimensioning factor. An FF configuration tool can be connected directly to the FF H1 bus.



CI852 has been replaced by the CI860 communication interface (together with the LD800HSE linking device). CI852 is only described for legacy reasons.



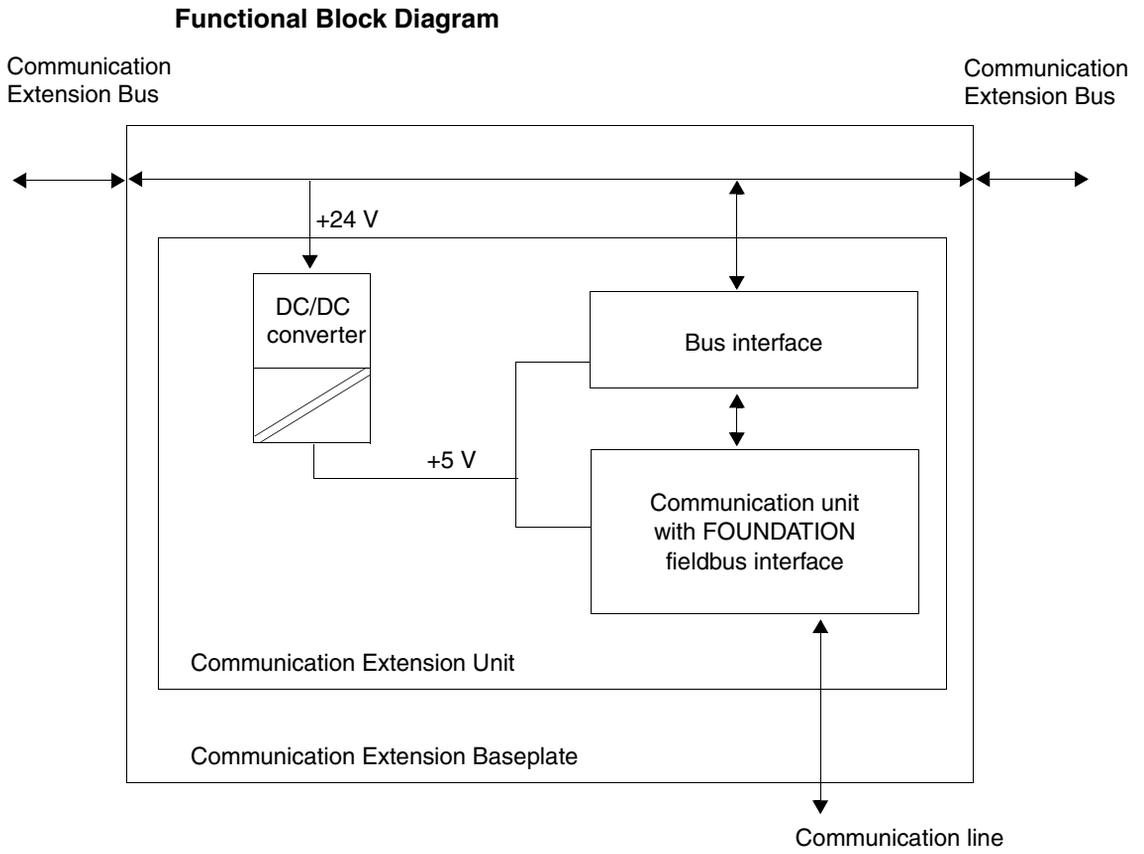


Figure 70. Block Diagram – CI852

**Indicators**

The CI852 FOUNDATION Fieldbus H1 interface has the following LED indicators.

*Table 78. CI852 FOUNDATION Fieldbus H1 – LED Indications*

| Indication/Color | Function  |
|------------------|---|
| F(ault) /Red     | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green     | Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.               |
| Rx/Tx /Yellow    | Transmission to or from the unit.   |

**Technical Data**

*Table 79. CI852 FOUNDATION Fieldbus H1 Interface Specifications*

| Item                 | Description  |
|----------------------|--|
| Type                 | – FOUNDATION Fieldbus H1 master and link schedule.<br>– Note the complete controller has a HW capability necessary for a FOUNDATION Fieldbus linking device. |
| Number of channels   | Single channel FOUNDATION Fieldbus H1 (31.25 kbit/s).  |
| Protocols            | FOUNDATION Fieldbus H1 via port on CI852.  |
| Communication speed  | 31.25 kbit/s (FF H1)   |
| Allowed node address | 20 – 247   |
| Galvanic isolation   | By means of transformer.   |

Table 79. CI852 FOUNDATION Fieldbus H1 Interface Specifications (Continued)

| Item                                  | Description   |
|---------------------------------------|---|
| Status indicators                     | Red LED for error<br>Green LED for run<br>Yellow LED for traffic  |
| Connector                             | Male 9-pin D-type connector.  |
| Current consumption from CEX-Bus 24 V | 140 mA typical (200 mA max.).   |
| Power dissipation                     | 3.4 W typical   |
| Protection Rating                     | IP20 according to EN60529, IEC 529.   |
| Weight                                | 700 g (1.5 lb) (package CI852K01 with CI852 and TP852)  |
| Dimensions                            | W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in). See <a href="#">Mounting Dimensions for Proper Ventilation</a> on page 149. |

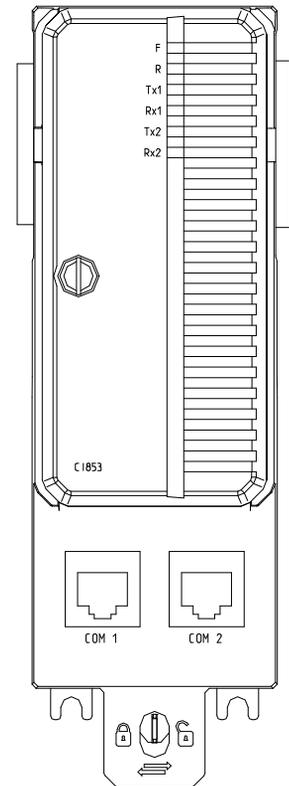
## CI853 and TP853 – RS-232C Interface

### Key Features

- Two RS-232C ports implemented with RJ45 connectors, located on the TP853 Baseplate, (act as an extension of the onboard RS-232C port on PM8xx should more RS-232C ports be required).
- Modem support
- Simple DIN-rail mounting
- Transmission speed selectable between 75 baud and 19200 baud.
- Ready-made Software options for several protocols
- Pre-set, two-letter Alpha code locking device see [Table 4](#) on page 75, installed in unit base, prevents mounting of incompatible components.

### Description

Provides an RS-232C channel with full modem support for each of the COM1 and COM2 ports. A modem (for example TC562) will be required if the cables extend beyond 15 m.



**Functional Block Diagram**

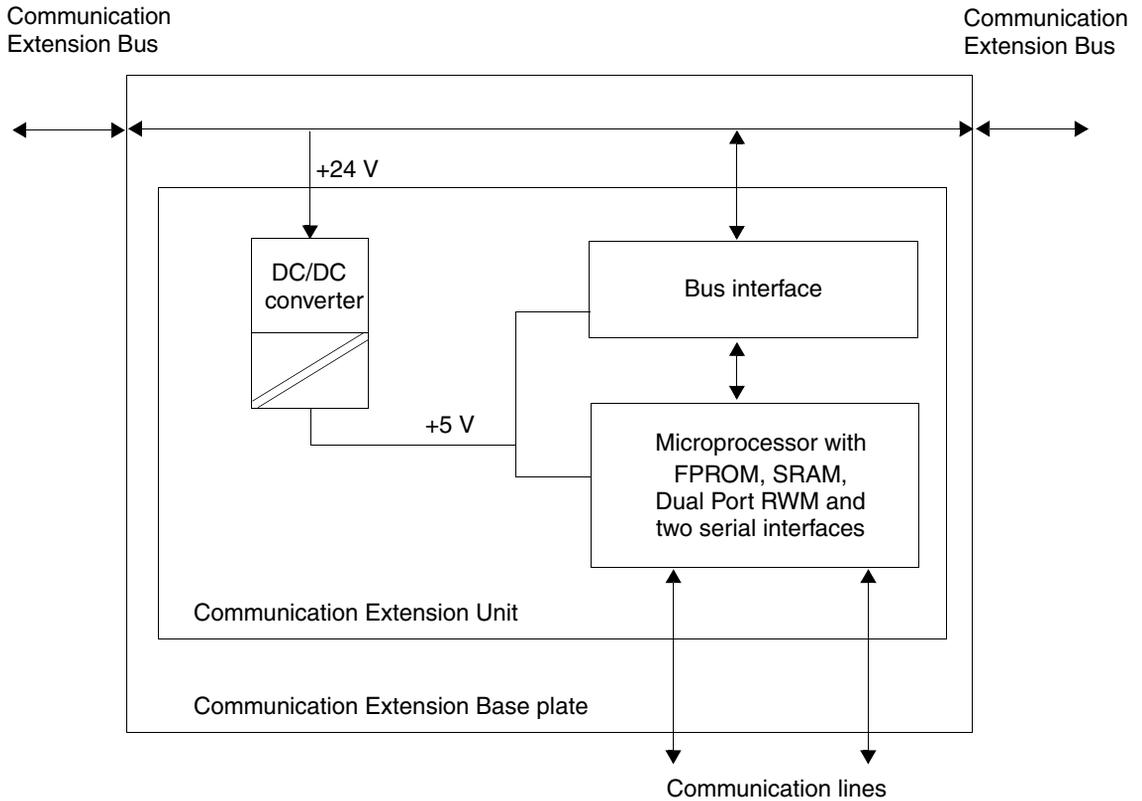


Figure 71. Block Diagram – CI853

**Indicators***Table 80. CI853 RS-232C – LED Indications*

| <b>Indication/ Color</b> | <b>Function</b>   |
|--------------------------|---|
| F(ault) /Red             | Error detected in the unit. Controlled by the Control Software. Set and cleared by the Hardware during Reset of the controller. |
| R(un) /Green             | Operating. Controlled by the Control Software. Cleared by the Hardware during Reset of the controller.                          |
| Tx1 /Yellow              | Flashes if transmission to the COM1 port.   |
| Rx1 /Yellow              | Flashes if receiving from the COM1 port.  |
| Tx2 /Yellow              | Flashes if transmission from the COM2 port.   |
| Rx2 /Yellow              | Flashes if receiving from the COM2 port.  |

**Technical Data***Table 81. CI853 – RS-232C Communication Interface Specifications*

| <b>Item</b>         | <b>Description</b>   |
|---------------------|--|
| Type                | Double unisolated RS-232C ports with modem signals.  |
| Number of channels  | 2 channels   |
| Protocol            | Determined by software, application and licenses. Intended for Modbus, Siemens 3964R, COMLI and custom designed protocols. Please refer to CB for details.             |
| Communication speed | Selectable in steps from 75 to 19200 baud.<br>75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud.<br><b>Protocol specific restrictions apply.</b> |

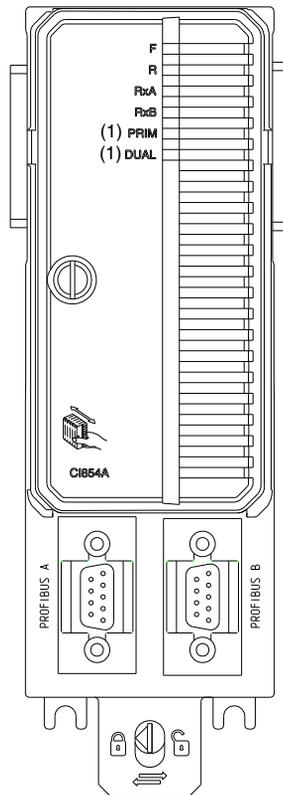
Table 81. CI853 – RS-232C Communication Interface Specifications (Continued)

| Item  | Description  |
|---|--|
| Galvanic isolation                            | Unisolated   |
| Status indicators                             | Running normally: Green. Exceptional fault: Red. Four traffic indicators - Rx and Tx - controlled by traffic pace: Flashing yellow.                            |
| Connector                                     | Two RJ45 connectors on TP853.  |
| Current consumption<br>(from CEX-Bus 24 V DC) | 100 mA typical (150 mA max.)   |
| Power Dissipation                             | 2.4 W typical  |
| Protection Rating                             | IP20 according to EN60529, IEC 529.  |
| Weight  | 700 g (1.5 lb) (package CI853K01 with CI853 and TP853)   |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)<br>For further information see <a href="#">Mounting Dimensions for Proper Ventilation</a> on page 149. |

## CI854/CI854A and TP854 – PROFIBUS DP Interface

### Key Features

- PROFIBUS DP with redundant line interface (two DB9 female connector located on the TP854 Baseplate).
- Simple DIN-rail mounting.
- In addition to the cyclic data transfer the CI854/CI854A supports acyclic DP communication and slave redundancy.
- By using repeaters it is possible to connect a maximum of 124 nodes to one PROFIBUS DP (32 nodes are permitted on one segment).
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Transmission speed selectable between 9.6 kbit/s and 12 Mbit/s.
- Support of PROFIBUS DP master redundancy (CI854A).
- Supports hot swap (CI854A).



(1) CI854A only

### Description

The CI854/CI854A/TP854 connects PROFIBUS DP to AC 800M. PROFIBUS DP slave devices like the remote I/Os S800 and S900 can be connected directly. PROFIBUS PA slave devices can be connected via the PROFIBUS linking device LD 800P.

The Baseplate TP854 has two female DB9 connectors for connecting PROFIBUS DP with support of line redundancy. The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the TP854 Baseplate.

The CI854/CI854A expansion unit contains the CEX-Bus logic, the CPU-kernel with memory, the PROFIBUS interface with line redundancy unit and a DC/DC converter that supplies the appropriate voltages from the +24V supply, via the CEX-Bus.

The PROFIBUS DP must always be terminated at the two outer nodes. This is usually done by using connectors with built-in termination. To guarantee a correct working termination the connector has to be plugged and power supplied.

The PROFIBUS DP requirements for screening/earthing have to be fulfilled. The PROFIBUS DP installation guideline requires that the cable shield should be connected to ground at both ends of the cable. This has to be done although the CI854/CI854A already connects the shield to ground via the connectors.

Functional Block Diagram

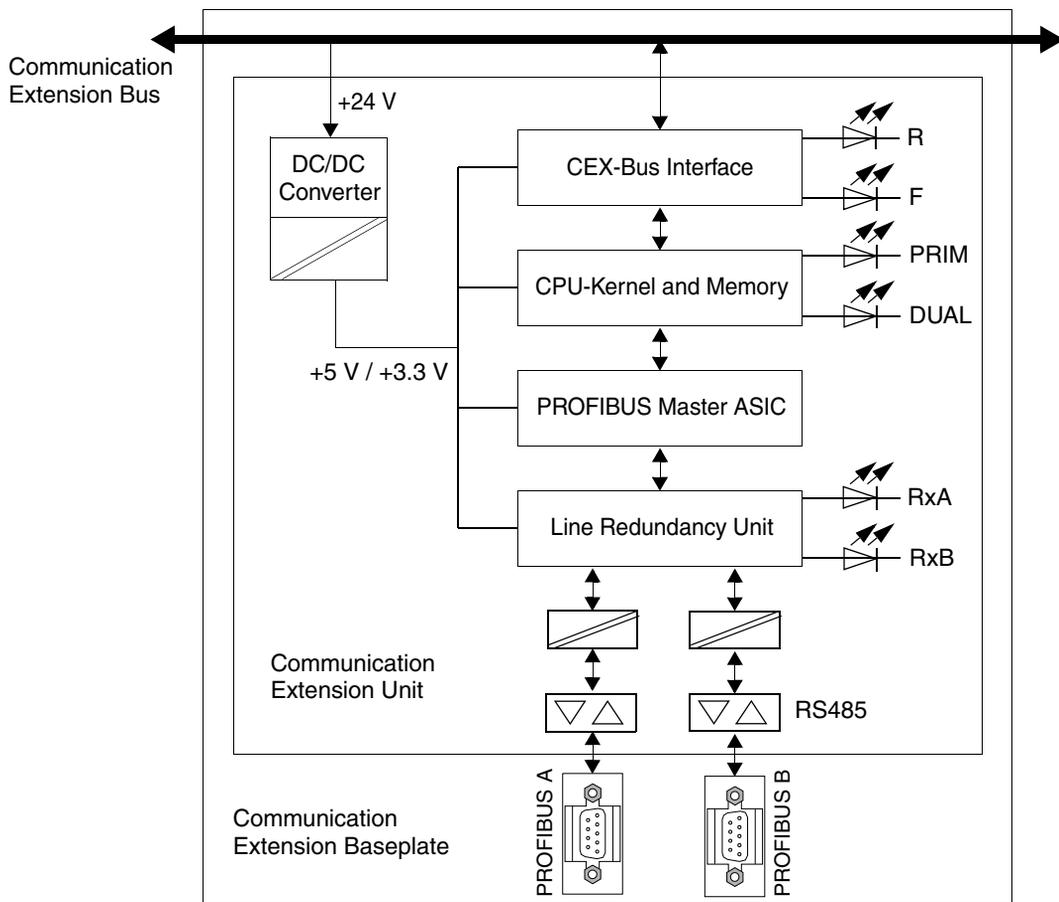


Figure 72. Block Diagram – CI854A. (CI854, same diagram without PRIM/DUAL LEDs)

## Indicators

Table 82. CI854/CI854A – PROFIBUS DP LED Indicators

| Designation/Color          | Function  |
|----------------------------|---|
| F(ault) /Red               | Unit error detected. Set by the Hardware during controller Reset. Controlled by the Control Software after Reset. |
| R(un) /Green               | Operating. Cleared by the Hardware during controller Reset. Controlled by the Control Software after Reset.       |
| RxA /Yellow                | Receive Data on Line A. For each telegram received the LED flashes. In normal operation is seen as static on.     |
| RxB /Yellow                | Receive Data on Line B. For each telegram received the LED flashes. In normal operation is seen as static on.     |
| PRIM(ary) /Yellow (CI854A) | This LED is on in single and redundant configuration. Indicates Primary CI854A in redundant configuration.        |
| DUAL /Yellow (CI854A)      | This LED is on when CI854A is running in redundant configuration.   |

## Technical Data

Table 83. CI854/CI854A PROFIBUS DP Interface Specifications

| Item                | Value  |
|---------------------|--|
| Type                | DP Master Class 1 and 2 for DP Services<br>DP Master Class 2 for DP Services |
| Protocol            | PROFIBUS DP  |
| Communication speed | 9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 kbit/s               |

Table 83. CI854/CI854A PROFIBUS DP Interface Specifications (Continued)

| Item  | Value  |
|---|--|
| Galvanic isolation                            | Yes  |
| Status indicators                             | Running normally: Green.<br>Exceptional fault: Red.<br>Two traffic indicators - RxA and RxB - controlled by traffic pace: Flashing yellow.<br>Running as primary: Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                                    | Two DB9, female on TP854.  |
| Current consumption<br>(from CEX-Bus 24 V DC) | 190 mA typical (max. 240 mA).  |
| Power dissipation                             | 4.6 W typical.   |
| Capacity                                      | Max 32 nodes on PROFIBUS without repeater.   |
| Protection Rating                             | IP20 according to EN60529,<br>IEC 529.   |
| Weight  | 700 g (1.5 lb) (package CI854K01 with CI854 and TP854).<br>700 g (1.5 lb) (package CI854AK01 with CI854A and TP854).   |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)  |

## CI855 and TP853 – Ethernet Interface for MasterBus 300

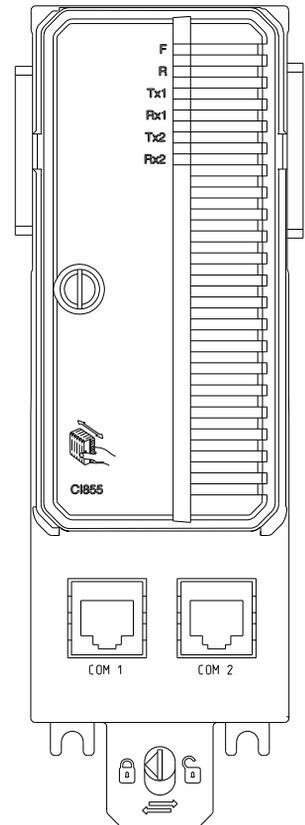
### Key Features

- Provides two Ethernet ports, (two RJ45 connectors located on the TP853 Baseplate).
- Simple DIN-rail mounting
- Provides Redundant Ethernet networks for MasterBus 300.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports Hot swap.

### Description

The CI855/TP853 can be used to connect an AC 800M to single or redundant MB 300 Networks. This allows DataSet communication and transmission of time between AC 400 Master and AC 800M. The TP853 Baseplate has two RJ45 Ethernet connectors for connecting to MB300. The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the TP853 Baseplate.

The CI855 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply, via the CEX-Bus. The Ethernet cable must be connected to the main network through an Ethernet Switch.



### Functional Block Diagram

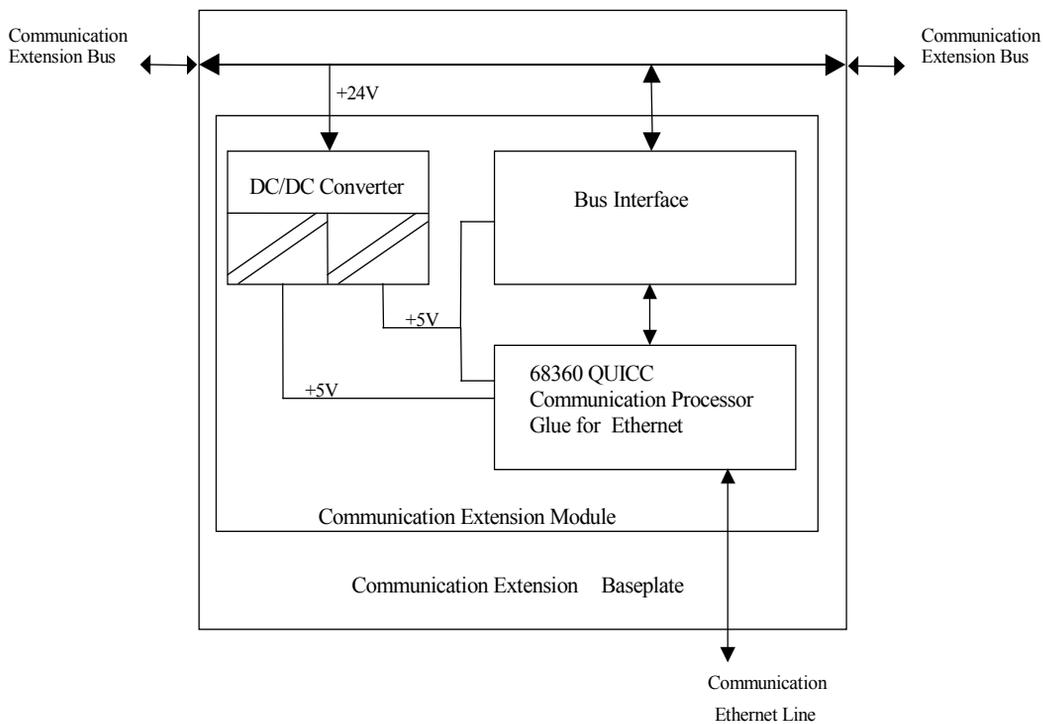


Figure 73. Block Diagram – CI855

## Indicators

Table 84. CI855 – MasterBus 300 LED Indicators

| Designation/Color    | Function  |
|----------------------|---|
| F(ault) /Red         | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green         | Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.               |
| Tx1 /Yellow flashing | A yellow LED indicating transmission from the communication unit COM1 port.                                   |
| Rx1 /Yellow flashing | A yellow LED flashes when data is being received from the COM1 port.  |
| Tx2 /Yellow flashing | A yellow LED indicating transmission from the communication unit COM2 port.                                   |
| Rx2 /Yellow flashing | A yellow LED flashes when data is being received from the COM2 port.  |

## Technical Data

Table 85. CI855 MasterBus 300 Interface Specifications

| Item                | Value  |
|---------------------|--|
| Type                | Ethernet unit  |
| Protocol            | MasterBus 300 based on Ethernet  |
| Communication speed | 10 Mbit/s (half duplex)  |
| Status indicators   | Run normally green, FAIL exceptionally red, the four traffic indicators RX/TX1, RX/TX 2, COLL1 and COLL2 are yellow flashing controlled by the traffic pace. |
| Connector           | 2 RJ45   |

Table 85. CI855 MasterBus 300 Interface Specifications (Continued)

| <b>Item</b>                                   | <b>Value</b>  |
|---|---|
| Current consumption<br>(from CEX-Bus 24 V DC) | 150 mA typical (200 mA max.)                            |
| Power dissipation                             | 3.6 W typical   |
| Protection Rating                             | IP20 according to EN60529, IEC 529                      |
| Weight  | 700 g (1.5 lb) (package CI855K01 with CI855 and TP853)  |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

## CI856 and TP856 – S100 I/O Interface

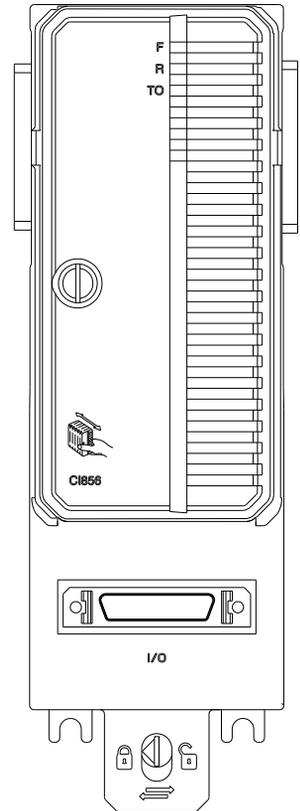
### Key Features

- Provides one S100 I/O port, (a 36 pin centerline miniature ribbon connector located on the TP856 Baseplate).
- Simple DIN-rail mounting
- The CI856 handles I/O scanning and updating of S100 I/O units located in up to five I/O racks. The minimum cyclic scan/update interval is 0.2ms, though this will depend on I/O type and number of I/O points.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports Hot swap.

### Description

The CI856/TP856 connects S100 I/O to AC 800M. The TP856 Baseplate has one 36-pin centerline miniature ribbon connector for connecting S100 I/O racks. The baseplate has a code lock, see [Table 4](#) on page 75, that prevents installation of an incorrect type of unit onto the TP856 Baseplate.

The CI856 expansion unit contains the CEX-Bus logic, S100 I/O-bus logics, CPU and a DC/DC converter that supplies appropriate voltages from the +24 V supply, via the CEX-Bus.



**Functional Block Diagram**

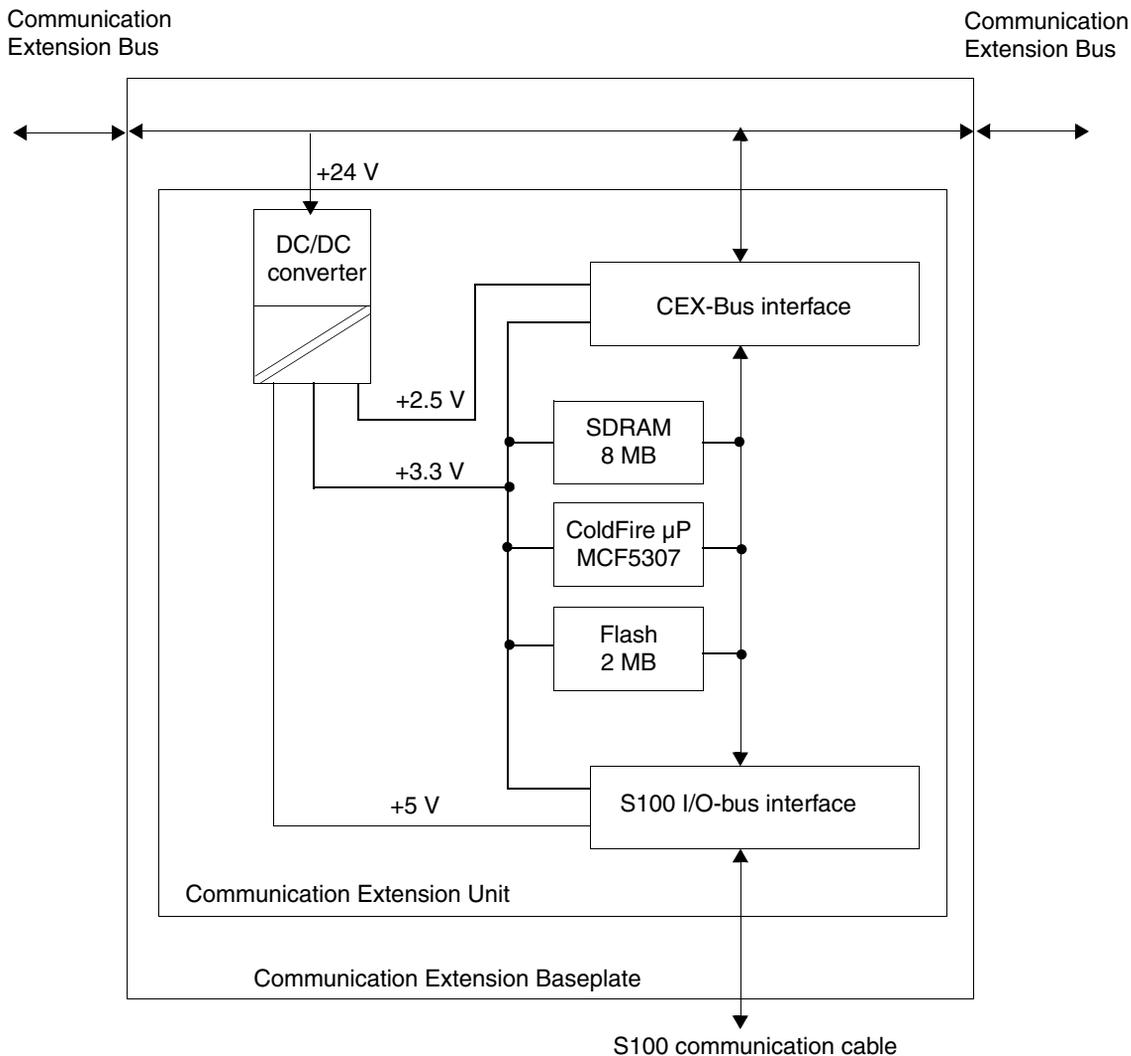


Figure 74. Block Diagram – CI856

## Indicators

Table 86. CI856 – S100 I/O LED Indicators

| Designation/Color | Function  |
|-------------------|---|
| F(ault) /Red      | Unit error detected. Controlled by CI856 Software. Set by the Hardware during controller Reset. Cleared by the CI856 Software after successful startup. |
| R(un) /Green      | Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.   |
| TO /Yellow        | Flashes at S100 I/O access time-outs.   |

## Technical Data

Table 87. CI856 S100 I/O Interface Specifications

| Item  | Value  |
|---|--|
| Type  | S100 I/O Communication Interface   |
| Galvanic isolation                            | No   |
| Status indicators                             | Run normally green, FAIL exceptionally red, the indicator TO are yellow flashing at S100 I/O access time-outs. |
| Connector                                     | 36 pin centerline miniature ribbon connector, female   |
| Current consumption<br>(from CEX-Bus 24 V DC) | 120 mA typical (200 mA max.)   |
| Power dissipation                             | 2.9 W typical  |
| Capacity                                      | Max 5 I/O racks with 20 I/O units each   |
| Protection Rating                             | IP20 according to EN60529, IEC 529   |

*Table 87. CI856 S100 I/O Interface Specifications (Continued)*

| <b>Item</b> | <b>Value</b>  |
|-------------|---|
| Weight      | 700 g (1.5 lb) (package CI856K01 with CI856 and TP856)  |
| Dimensions  | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

## CI857 and TP853 – INSUM Interface

### Key Features

- Provides one Ethernet port, (RJ45 connector located on the TP853 Baseplate). Only COM1 is used for INSUM.
- Simple DIN-rail mounting
- Provides communication with INSUM via Ethernet/LON Gateway
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports Hot swap.

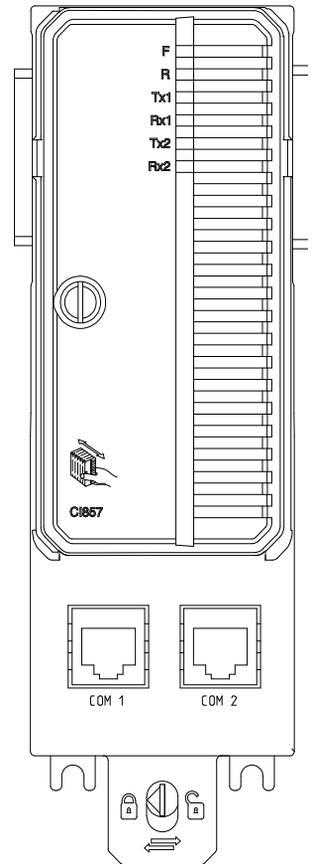
### Description

The CI857/TP853 can be used to connect an AC 800M controller to INSUM through TCP/IP over Ethernet and an INSUM TCP/IP Gateway that has a LON interface communicating with the underlying INSUM system.

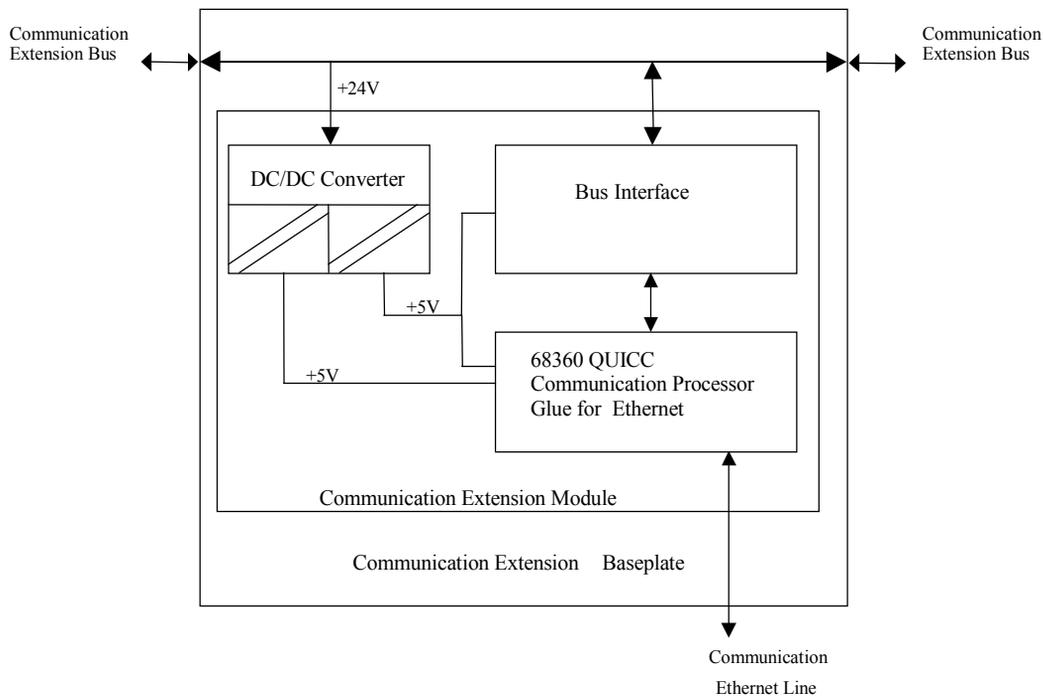
The TP853 Baseplate has two RJ45 Ethernet connectors, though only the COM1 connector is used for connecting to INSUM.

The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the TP853 Baseplate.

The CI857 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply via the CEX-Bus. The Ethernet cable must be connected to the main network through an Ethernet Switch.



**Functional Block Diagram**



*Figure 75. Block Diagram – CI857*

## Indicators

Table 88. CI857 – INSUM Interface LED Indicators

| Designation/Color    | Function  |
|----------------------|---|
| F(ault) /Red         | Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset. |
| R(un) /Green         | Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.               |
| Tx1 /Yellow flashing | A yellow LED indicating transmission from the communication unit COM1 port.                                   |
| Rx1 /Yellow flashing | A yellow LED flashes when data is being received from the COM1 port.  |
| Tx2 OFF              | Not used.   |
| Rx2 OFF              | Not used.   |

## Technical Data

Table 89. CI857 INSUM Interface Specifications

| Item                | Value  |
|---------------------|--|
| Type                | Ethernet unit.   |
| Protocol            | INSUM TCP/IP   |
| Communication speed | 10 Mbit/s (half duplex)  |
| Status indicators   | Running normally: Green. Exceptional fault: Red. Two traffic indicators - Tx1/Rx1 - controlled by traffic pace: Flashing yellow. |
| Connector           | 2 RJ45 (only COM1 is used).  |

Table 89. CI857 INSUM Interface Specifications (Continued)

| <b>Item</b>                                   | <b>Value</b>  |
|---|---|
| Current consumption<br>(from CEX-Bus 24 V DC) | 150 mA typical (200 mA max.).                           |
| Power dissipation                             | 3.6 W typical.  |
| Protection Rating                             | IP20 according to EN60529, IEC 529.                     |
| Weight  | 700 g (1.5 lb) (package CI857K01 with CI857 and TP853). |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

## CI858 and TP858 – DriveBus Interface

### Key Features

- Provides three optical connectors for DriveBus, I/O bus and PC tools.
- Simple DIN-rail mounting.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.

### Description

The CI858 unit consists of a communication expansion base plate, a communication expansion unit. All electronic devices and all functions are located on the communication expansion unit board.

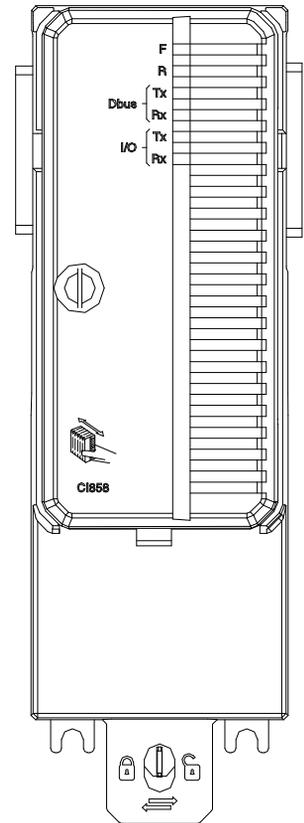
The CI858 has three connectors. DriveBus connector for connection of ABB Drives, see [Drive System](#) on page 168. Special I/O connection, see [I/O Systems](#) on page 158. A tool connection for downloading firmware to the communication unit with the ABB Drives tools DriveDebug or DriveWindow.

The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the Baseplate.

The CI858 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply via the CEX-Bus.



In order to use the tool connection, the PC must be equipped with a PCMCIA/DDCS (laptop) or an ISA/DDCS (desktop) interface.



Functional Block Diagram

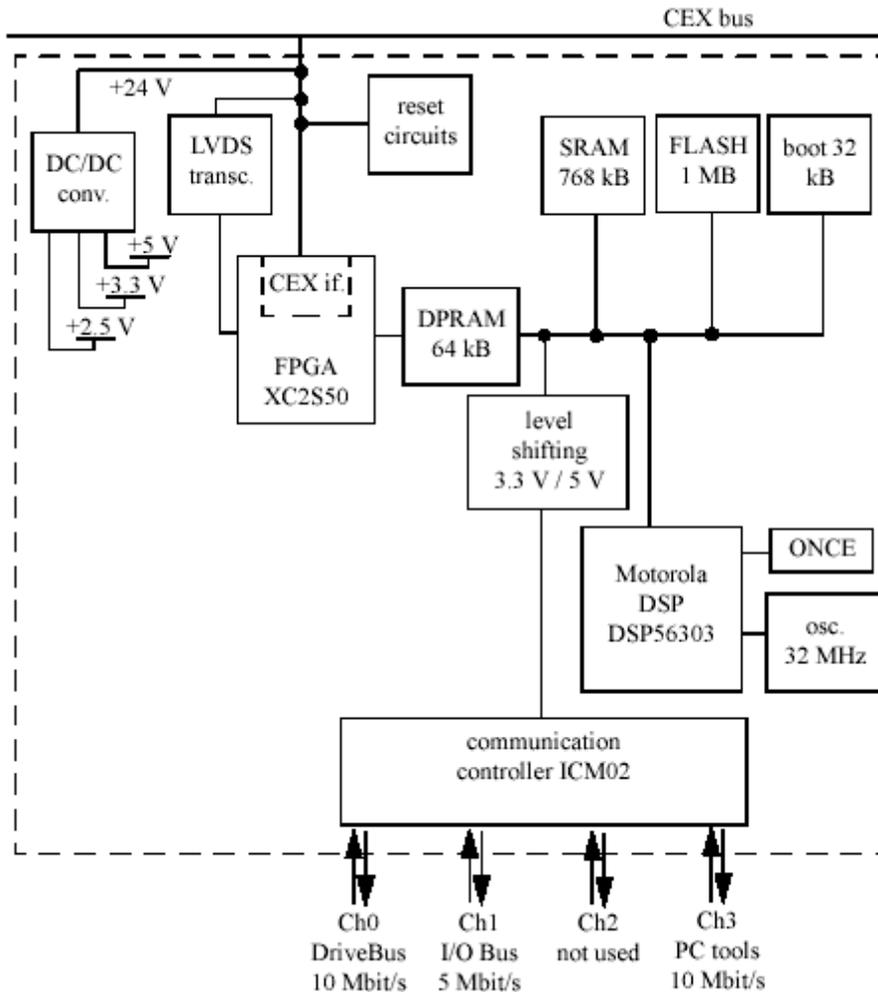


Figure 76. Block Diagram – CI858

## Indicators

Table 90. CI858 – DriveBus Interface LED Indicators

| Designation/Color | Function  |
|-------------------|---|
| F(ault) /Red      | Unit error detected.  |
| R(un) /Green      | Operating.  |
| Dbus; Rx /Yellow  | RECIEVE LED indicating reception of data frames on the DriveBus.                        |
| Dbus; Tx /Yellow  | TRANSMIT LED indicating transmission of data frames on the DriveBus.                    |
| I/O; Rx /Yellow   | RECIEVE LED indicating reception of data frames on the I/O bus.                         |
| I/O; Tx /Yellow   | TRANSMIT LED indicating transmission of data frames on the I/O Bus.                     |
| Tools /Yellow     | RECIEVE LED indicating reception of data frames on the PC Tool bus <sup>(1)</sup> .     |
| Tools /Yellow     | TRANSMIT LED indicating transmission of data frames on the PC Tool Bus <sup>(1)</sup> . |

(1) This LED is not visible in the front of the unit. It can be seen through the ventilation holes in the plastic housing.

## Technical Data

Table 91. CI858 – DriveBus Specifications

| Item                | Value                    |
|---------------------|--------------------------|
| Communication speed | 4 Mbit/s                 |
| Connectors          | Three optical connectors |

Table 91. CI858 – DriveBus Specifications (Continued)

| Item  | Value  |
|---|--|
| Current consumption<br>(from CEX-Bus 24 V DC) | 200 mA max.  |
| External supply voltage                       | 17 V minimum<br>25 V typical<br>30 V max   |
| Protection Rating                             | IP20 according to EN60529, IEC 529.  |
| Approval                                      | CE-marked and meets the requirements specified in EMC Directive EMCD 2004/108/EC according to the standards EN 50081-2 and EN 61000-6-2. |

## CI860 and TP860 – FOUNDATION Fieldbus High Speed Ethernet

### Key Features

- Provides one Ethernet port, (RJ45 connector located on the TP860 Baseplate).
- Simple DIN-rail mounting.
- Provides communication with FOUNDATION Fieldbus High Speed Ethernet devices via Ethernet.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports FF HSE redundancy.
- Supports hot swap.

### Description

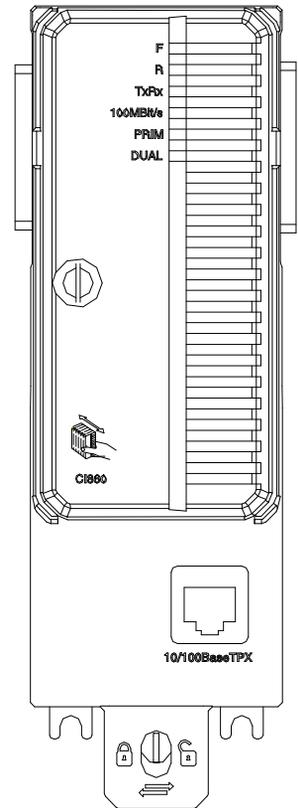
The CI860/TP860 can be used to connect an AC 800M controller to FOUNDATION Fieldbus High Speed Ethernet through TCP/IP via Ethernet.

The TP860 Baseplate has one RJ45 Ethernet connector to connect the unit to the FOUNDATION Fieldbus High Speed Ethernet.

The baseplate has a code lock, see [Table 4](#) on page 75, that prevents the installation of an incorrect type of unit onto the TP860 Baseplate.

The CI860 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply via the CEX-Bus. The Ethernet cable must be connected to an Ethernet device.

To operate FOUNDATION Fieldbus H1 devices with the CI860 these H1 devices must be connected via a FOUNDATION Fieldbus Linking Device (for example LD 800HSE) to adapt them to FOUNDATION Fieldbus High Speed Ethernet.



Functional Block Diagram

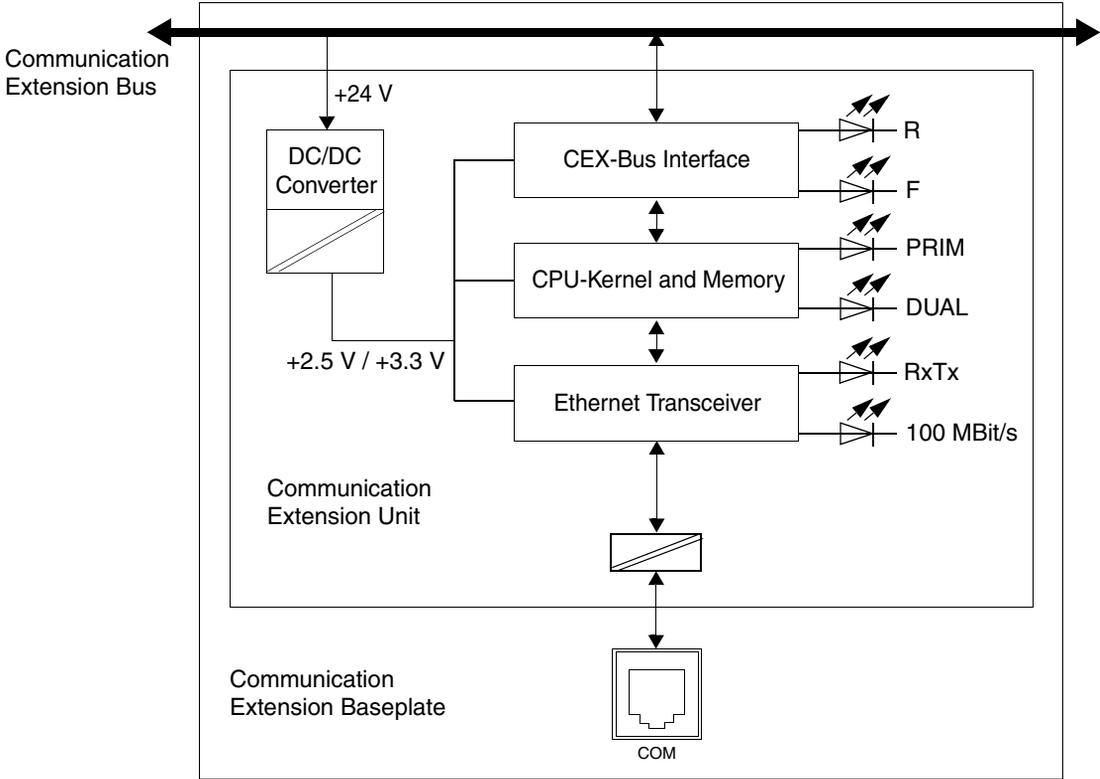


Figure 77. Block Diagram – CI860

**Indicators**

*Table 92. CI860 – FOUNDATION Fieldbus High Speed Ethernet Interface LED Indicators*

| <b>Designation/Color</b> | <b>Function</b>   |
|--------------------------|---|
| F(ault) /Red             | Unit error detected. Controlled by Control Software. Set and cleared by the hardware during controller Reset. |
| R(un) /Green             | Operating. Controlled by the Control Software. Cleared by the hardware during controller Reset.               |
| 100MBit/s is ON          | A valid connection with 100 MBit/s is established when Rx Tx/Yellow is flashing.                              |
| 100MBit/s is OFF         | A valid connection with 10 MBit/s is established when Rx Tx/Yellow is flashing.                               |
| RxTx LED is ON           | A link to the corresponding Ethernet device is established. No Ethernet packages are sent/received            |
| RxTx/Yellow flashing     | A link to the corresponding Ethernet device is established. Ethernet packages are sent/received.              |
| RxTx LED is OFF          | A link with the corresponding Ethernet unit is not established  |
| PRIM                     | A yellow LED for indicating the primary unit in redundant configuration.                                      |
| DUAL                     | The yellow LED indicates the redundant configuration.   |

**Technical Data***Table 93. CI860 – FOUNDATION Fieldbus High Speed Ethernet Specifications*

| <b>Item</b>                                   | <b>Value</b>  |
|---|---|
| Type  | Ethernet unit.  |
| Protocol                                      | FOUNDATION Fieldbus High Speed Ethernet, TCP/IP.  |
| Communication speed                           | 10 Mbit/s / 100 Mbit/s defined in IEEE 802.3 100baseTX.   |
| Status indicators                             | Running normally: Green.<br>Exceptional fault: Red.<br>One traffic indicator - RxTx - controlled by traffic pace. |
| Connector                                     | RJ45  |
| Current consumption<br>(from CEX-Bus 24 V DC) | 100 mA typical (150 mA max.).   |
| Power dissipation                             | 2.4 W typical.  |
| Protection Rating                             | IP20 according to EN60529, IEC 529.   |
| Weight  | 700 g (1.5 lb) (package CI860K01 with CI860 and TP860).   |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)   |

## CI862 and TP862 - TRIO/Genius Interface

### Key Features

- CEX-Bus interface for communication to AC 800M
- LED indicators for R(un), F(ault), Communication Error, Primary (Bus Master), and Dual (redundancy)
- Motorola MCF5307 Microcontroller running at 32 MHz
- 2 MByte Flash memory for code
- 8 MByte SDRAM for configuration and dynamic data, also used as Dual Port Memory between CI862 and AC 800M
- Power supply from the CEX bus +24V supply with DC/DC converters to +5V, +3.3V, and +2.5V
- Hand Held Monitor Port used for reading Local I/O Block
- Field bus termination switch



The CI862 can be used in a redundant processor module configuration under the following conditions:

- a. If the CI862 is used with redundant PM866, only the TK850 CEX-bus extension cable shall be used for interconnection between the PM866 modules. The BC810 shall not be used.
- b. If the CI862 is used with other redundant processor modules (PM861A/PM864A/PM865), either BC810 or TK850 CEX-bus extension cable can be used for interconnection between the two processor modules.



The CI862 is not supported with the PM891 processor module.

### Description

CI862, [Figure 78](#), connects a TRIO Field Bus to the controller AC 800M. The connection between CI862 and AC 800M is done via the CEX-Bus.

A single CI862 can connect 30 blocks to a single TRIO LAN. AC 800M can have up to four single TRIO LANs. The maximum I/O with TRIO is 1000 I/O points.

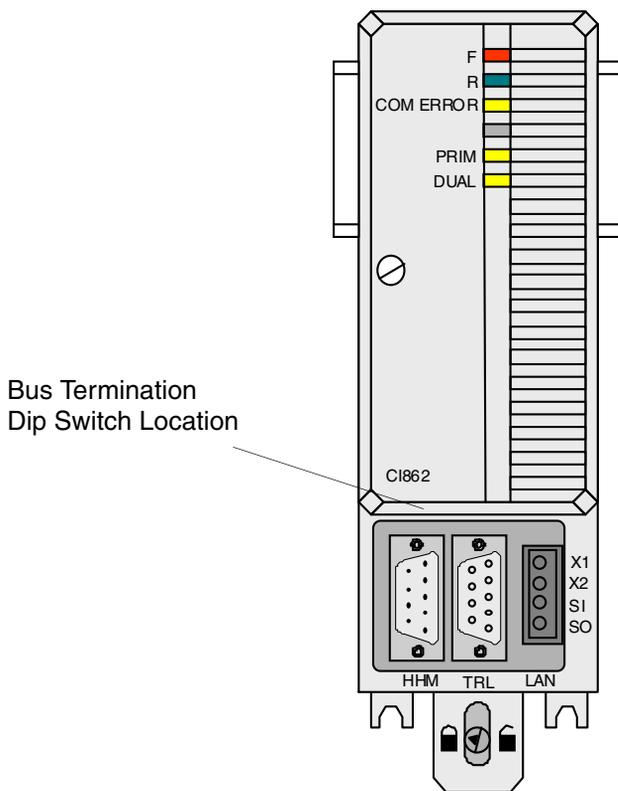


Figure 78. CI862 TRIO/Genius interface.

TRIO blocks, [Figure 79](#), are self-contained, configurable I/O blocks used to interface field devices to the CI862 communications bus. These blocks can be individually installed on machines, in junction boxes, or grouped in racks or panels. A TRIO block is made of cast aluminum, and weighs approximately 1.8 kgs (4 pounds). It measures approximately 22.5 x 10 x 7.5 cm (9 x 4 x 3 inches). Each block has its own communications capability and microprocessor, and provides from 6 to 32 circuits for connecting input and output devices. You can place blocks on the bus in any combination or sequence. You can use a mix of blocks on the same bus. Various types of blocks are available as listed in [Table 94](#).

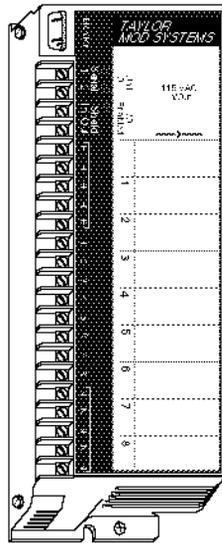


Figure 79. TRIO block.

Table 94. TRIO block types.

| Unit     | Name                  | Type    | Description                       | Can be BSM |
|----------|-----------------------|---------|-----------------------------------|------------|
| 4IN2OUT  | 4 In 2 Out            | Analog  | 4 Input, 2 Output                 | No         |
| CSANALOG | Current Source I/O    | Analog  | 4 Input, 2 Output                 | Yes        |
| TC       | Thermocouple          | Analog  | 6 Input                           | Yes        |
| RTD      | RTD                   | Analog  | 6 Input                           | No         |
| CSAINP   | Current Source Input  | Analog  | 6 Input                           | Yes        |
| CSANAOUT | Current Source Output | Analog  | 6 Output                          | Yes        |
| IO_16CKT | 16 Circuit I/O        | Digital | 16 Input or Output (configurable) | Yes        |
| IO_32CKT | 32 Circuit I/O        | Digital | 32 Input or Output (configurable) | Yes        |
| GRP_8CKT | 8 Circuit Grouped     | Digital | 8 Input or Output (configurable)  | Yes        |

Table 94. TRIO block types.

| <b>Unit</b> | <b>Name</b>          | <b>Type</b> | <b>Description</b>                       | <b>Can be BSM</b> |
|-------------|----------------------|-------------|--|-------------------|
| ISO_8CKT    | 8 Circuit Isolated   | Digital     | 8 Input or Output (configurable)         | Yes               |
| IN_16CKT    | 16 Circuit Input     | Digital     | 16 Input                                 | No                |
| OP_16CKT    | 16 Circuit Output    | Digital     | 16 Output                                | Yes               |
| HSC_A       | High Speed Counter A | Counter     | 4 16 bit Up/Down Counters                | No                |
| HSC_B       | High Speed Counter B | Counter     | 2 Bi-directional 24 bit Up/Down Counters | No                |

### Functional Block Diagram

A complete CI862K01 unit consists of a TP862 baseplate, a CI862 communication interface board, and their mechanics, [Figure 80](#). All electronic devices and all functions are located on the board which also includes the  $\mu$ Genie slave module. The baseplate and CI862 are connected via an 80-pin edge connector. Connections to the outside world are made on the baseplate.

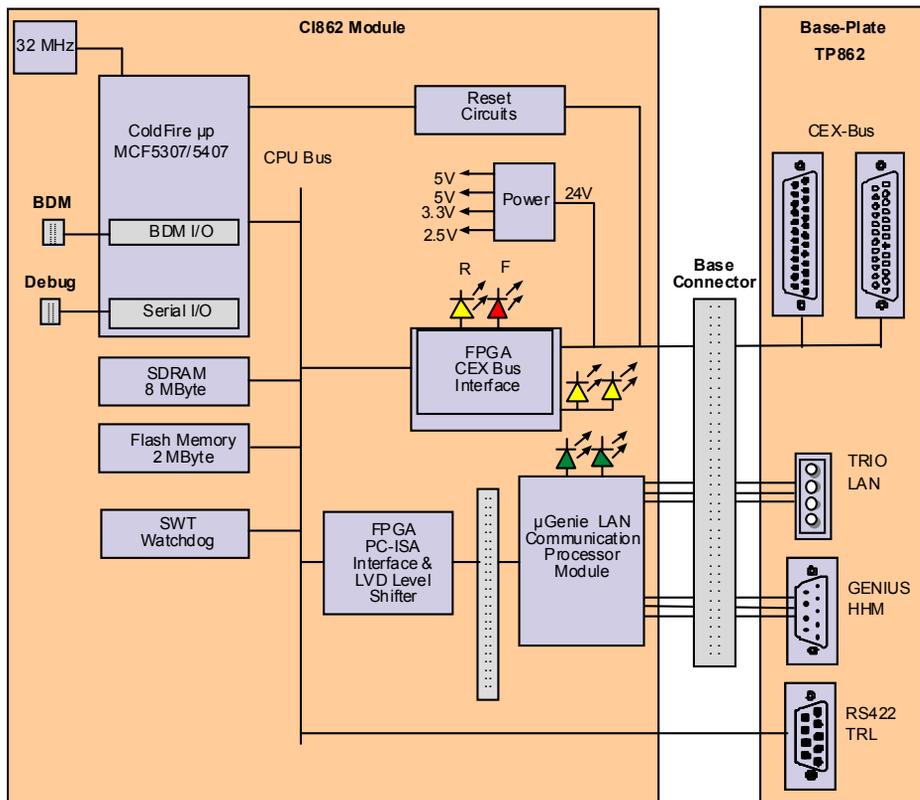


Figure 80. CI862 functionality

The baseplate contains only passive elements. It holds the input and output connectors for the CEX-Bus, a slot for the CI862 unit, a port used for the Genius Bus Hand Held Monitor, a high speed serial port used for module redundancy link communications and a port for the TRIO Field Bus connection.

CI862 contains the Coldfire MCF5307 Microcontroller with Flash memory, RAM, LED indicators, power supply, and CEX-Bus interface with dual port memory, bridged to a GE/Fanuc  $\mu$ Genie Communication Module. The  $\mu$ Genie handles all data transfer between the CI862 Carrier module and the TRIO FIELD BUS, allowing the Carrier CPU to control the remote I/O.

### Indicators

LED indicators for R(un), F(ault), Communication Error, Primary (Bus Master), and Dual (redundancy)

### Technical Data

Table 95. TRIO/Genius interface CI862

| Item                | Value   |
|---------------------|---|
| Bus Type            | Daisy-chained bus cable; single twisted pair plus shield or Twinax.   |
| Protocol            | similar to the RS422 standard   |
| Communication speed | 153.6 ext, 38.4, 76.8, 153.6 std kbit/s   |
| Bus Capacity        | (one segment) Max 32 devices. 16 devices at 38.4 Kbaud. Includes CI862 and Hand-held Monitor.   |
| Bus Termination     | 75, 100, 120, or 150 ohm resistor at both ends of electrical bus cable.   |
| Maximum Bus Length  | 7500 feet at 38.4 Kbaud, 4500 feet at 76.8 Kbaud, 3500 feet at 153.6 Kbaud extended, 2000 feet at 153.6 Kbaud, standard. Maximum length at each baud rate also depends on cable type. |
| Galvanic Isolation  | Yes   |
| Status Indicators   | Red LED for error<br>Green LED for run<br>Yellow LED for traffic<br>Yellow LED for primary<br>Yellow LED for dual mode  |

Table 95. TRIO/Genius interface CI862

| <b>Item</b>                                | <b>Value</b>  |
|--|---|
| Connector                                  | one 4 pin (connects TRIO FIELD BUS)<br>one DB9S (male) (connects Hand-held Monitor)<br>one DB9, female (connects CEX expansion bus) |
| Current Consumption from CEX-Bus 24 V d.c. | <i>Typical 190 mA (max. 200 mA)</i>   |
| Dimensions                                 | W 58 x H 165 x D 122 mm<br>(W 2.3 x H 6.4x D 4.81 inches)   |
| Hot swap                                   | Supported   |

## CI865 and TP865 – Satt I/O Interface

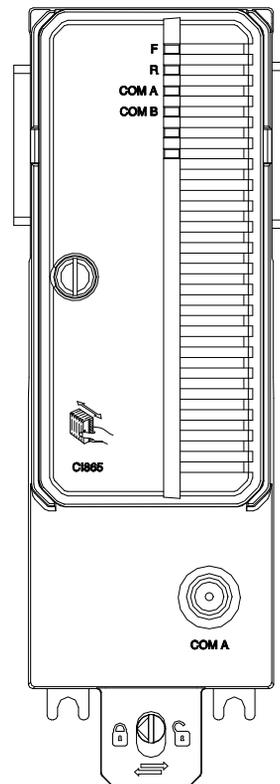
### Key Features

- Provides one ControlNet port, (a BNC connector located on the TP865 Baseplate).
- Simple DIN-rail mounting.
- Handles I/O scanning of up to 31 distributed I/O nodes.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports Hot swap.

### Description

The CI865/TP865 connects ControlNet to AC 800M. The module makes it possible to use older Satt I/O system (Rack I/O and Series 200 I/O) with the AC 800M controller platform but it can not be used as a general ControlNet interface. The TP865 Baseplate has one BNC connector for connecting I/O racks. The baseplate has a code lock, see [Table 4](#) on page 75, that prevents installation of an incorrect type of unit onto the TP865 Baseplate.

The CI865 expansion unit contains the CEX-Bus logic, ControlNet bus logic, CPU and a DC/DC converter that supplies appropriate voltages from the +24 V supply, via the CEX-Bus.



**Functional Block Diagram**

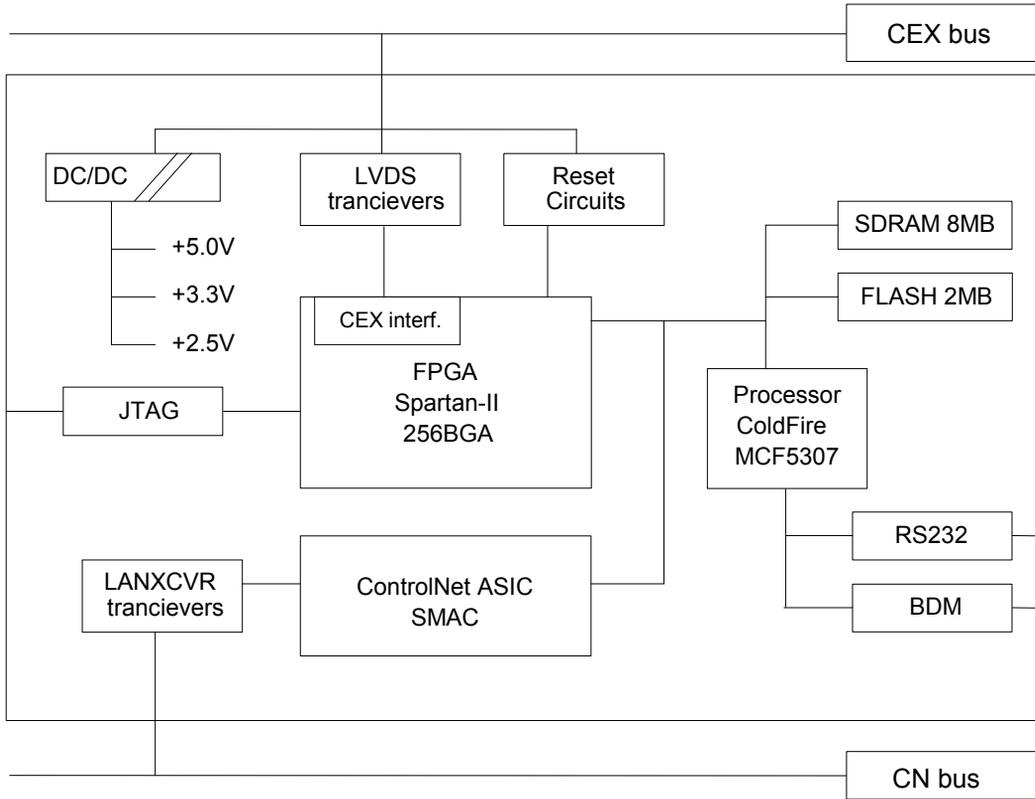


Figure 81. Block Diagram – CI865

**Indicators**

*Table 96. Satt I/O CI865 – Fault Finding*

| Designation/Color                      | Function   |
|--|--|
| Neither R(un) nor F(ault) LED's are ON | The CI865 unit is in the process of being configured. Allow time for this to finalize.<br>If the condition persists, and no other unit LED on the CEX-Bus is lit: <ul style="list-style-type: none"> <li>• Check the CEX-Bus fuse inside the PM8xx processor unit</li> <li>• Initiate a reset signal (INIT) from the PM8xx processor unit</li> <li>• Replace the CI865 unit</li> </ul> |
| F(ault) LED is ON                      | The CI865 unit is in the process of being restarted. Allow time for this to finalize.<br>Replace unit if the condition persists.   |
| COM A/COM B LED is OFF                 | Power OFF or Reset Mode  |
| COM A/COM B LED is solid green         | Channel OK   |
| COM A/COM B LED is flashing green      | Temporary error or need initial setup  |
| COM A/COM B LED is solid red           | Module is broken, has to be replaced   |
| COM A/COM B LED is flashing red        | Bad channel cable  |
| COM A/COM B LED is railroad red        | The road is not configured right for the network   |
| COM A/COM B LED is flashing red/green  | Network has data flow problem  |
| COM A/COM B LED is railroad red/green  | Self test  |

**Technical Data***Table 97. Satt I/O CI865 Interface Specifications*

| <b>Item</b>                                   | <b>Value</b>  |
|---|---|
| Type  | Satt I/O Communication Interface                        |
| Galvanic isolation                            | Yes   |
| Status indicators                             | Run normally green, FAIL exceptionally red, COM A/COM B |
| Connector                                     | BNC   |
| Current consumption<br>(from CEX-Bus 24 V DC) | 120 mA typical (200 mA max.)                            |
| Power dissipation                             | 2.9 W typical   |
| Capacity                                      | Up to 3968 binary I/O channels                          |
| Protection Rating                             | IP20 according to EN60529, IEC 529                      |
| Weight  | 700 g (1.5 lb) (package CI865xxx with CI865 and TP865)  |
| Dimensions                                    | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in) |

## CI867 and TP867 – Modbus TCP Interface

### Key Features

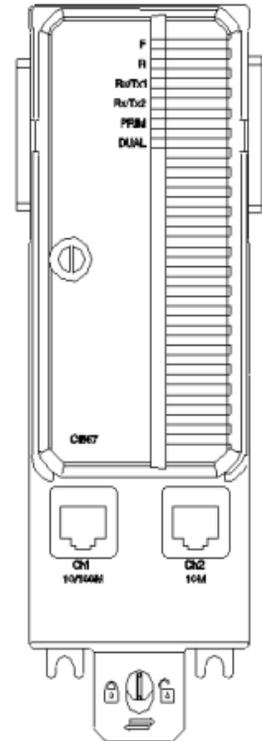
- Provides one 10/100Mbps Fast Ethernet port, (RJ45 connector located on the TP867 Baseplate).
- Provides one 10Mbps Ethernet port, (RJ45 connector located on the TP867 Baseplate).
- Simple DIN-rail mounting.
- Provides communication with Modbus TCP protocol via Ethernet.
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.
- Supports hot swap.

### Description

The CI867/TP867 can be used to connect an AC 800M controller to external Ethernet devices using Modbus TCP protocol.

The TP867 Baseplate has two RJ45 Ethernet connectors, where CH1 connector can use 10Mbps or 100Mbps (Mega bits/sec.) and CH2 use 10Mbps only. The baseplate has a code lock (see [Table 4](#) on page 75) that prevents the installation of an incorrect type of unit onto the TP867 Baseplate.

The CI867 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply via the CEX-Bus. The Ethernet cable must be connected to the main network through an Ethernet Switch.



## Functional Block Diagram

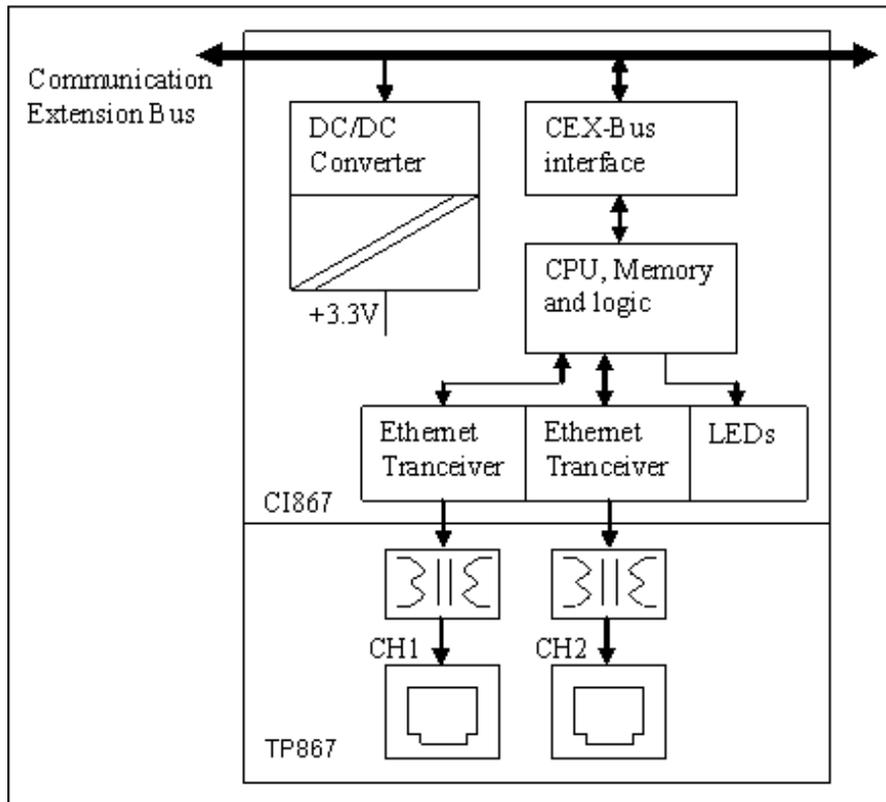


Figure 82. Block Diagram – CI867

**Indicators**

*Table 98. Modbus TCP Interface CI867 - LED indicators*

| <b>Designation/Color</b> | <b>Function</b>   |
|--------------------------|---|
| F(ault) / Red            | Unit error detected. Set by the Hardware during Controller Reset. Controlled by Control Software after Reset. |
| R(un) / Green            | Operating. Cleared by the Hardware during Controller Reset. Controlled by Control Software after Reset.       |
| RxTx1 / Yellow           | When flashing. Ethernet packages are sent/received at CH 1.   |
| RxTx2 / Yellow           | When flashing. Ethernet packages are sent/received At CH 2.   |
| PRIM(ary)                | This LED is on in single and redundant configuration. Indicates Primary CI867 in redundant configuration.     |
| DUAL                     | This LED is on when CI867 is running in redundant configuration.  |

**Technical Data**

*Table 99. Modbus TCP Interface CI867 - Technical Specification*

| <b>Item</b>             | <b>Value</b>  |
|-------------------------|---|
| Type                    | Ethernet unit   |
| Protocol                | Modbus TCP  |
| Communication speed CH1 | 10 Mbit/s / 100 Mbit/s defined in IEEE 802.3u 10/100Base-Tx |
| Communication speed CH2 | 10 Mbit/s defined in IEEE 802.3 10Base-T                    |

Table 99. Modbus TCP Interface CI867 - Technical Specification

|  |   |
|--|---|
| Status indicators                        | Running normally: Green.<br>Exceptional fault: Red.<br>Two traffic indicators – RxTx1 and RxTx2 -- controlled by traffic pace: Flashing Yellow<br>Traffic indicator CH2 – RxTx2 - controlled by traffic pace.<br>Running as primary: Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                               | RJ45  |
| Current consumption (from CEX-Bus 24VDC) | 160 mA typical (250 mA max)   |
| Power dissipation                        | 3.8W typical  |
| Protection Rating                        | IP20 according to EN60529, IEC 529.   |
| Weight                                   | 700 g (1.5 lb) (package CI867K01 with CI867 and TP867).   |
| Dimensions                               | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)   |

## CI868 and TP867 – IEC 61850 Interface

### Key Features

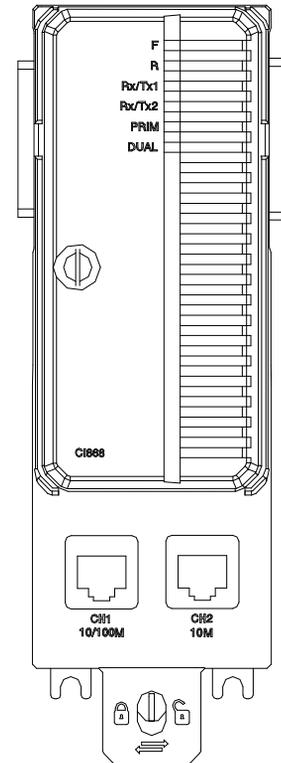
- CEX-Bus Module.
- MPC862P 96MHz.
- 32 MB SDRAM with integrity check.
- 4 MB Flash PROM.
- Ethernet/IEEE 802.3u supporting full Fast Ethernet 10/100Mbps operation.
- Support IEC 61850 protocol
- 10/100 Mbps use IEEE standard Media Independent Interface (MII)

### Description

The CI868 can be used to connect an AC 800M controller to external Ethernet devices using IEC 61850 protocol.

The TP868 Baseplate has two RJ45 Ethernet connectors, where CH1 connector can use 10Mbps or 100Mbps (Mega bits/sec.). The baseplate has a code lock (see [Table 4](#) on page 75) that prevents the installation of an incorrect type of unit onto the TP867 Baseplate.

The CI868 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply via the CEX-Bus. The Ethernet cable must be connected to the main network through an Ethernet Switch.



**Functional Block Diagram**

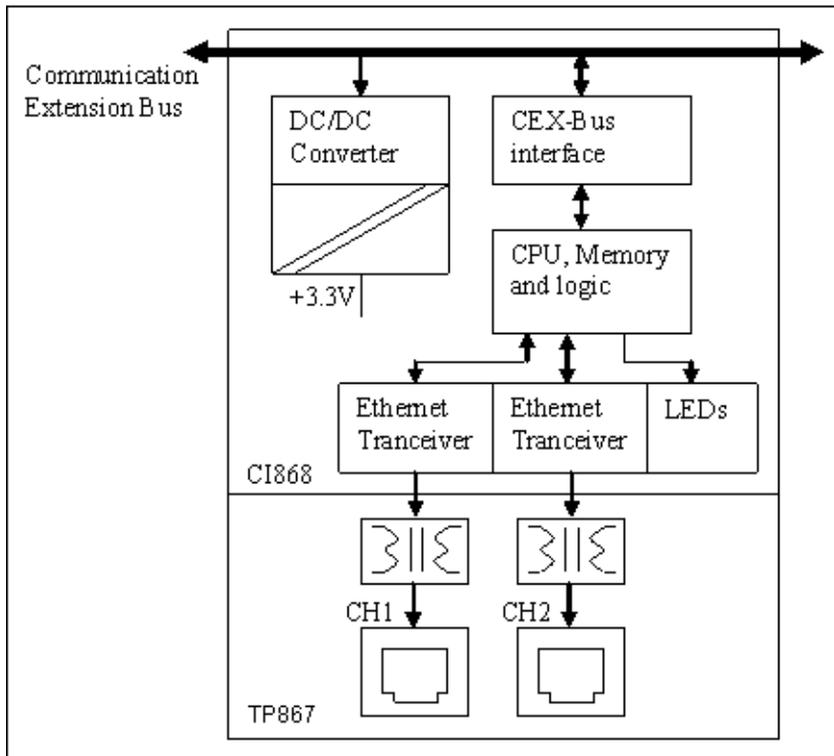


Figure 83. Block Diagram – CI868

### Indicators

There are six LED indicators on the front panel of CI868 that indicate various states and conditions on the CI868.

*Table 100. IEC 61850 Interface CI868 - LED indicators*

| Designation/Color | Function   |
|-------------------|--|
| F(ault) / Red     | The red F(ault) LED indicates a fault condition on CI868. Reset turns the F LED on. Software can turn it on and off via a register in the CEX-Bus controller.  |
| R(un) / Green     | The green R(un) LED indicates that CI868 is operational. Reset turns the LED off. Software can turn the LED on and off via a register in the CEX-Bus controller.   |
| RxTx1 / Yellow    | The yellow Rx/Tx1 LED is intended to be lit to indicate a receiving/transmitting telegram at Ch1. The LED is controlled by Ethernet PHY. It is turned off by reset.  |
| RxTx2 / Yellow    | The yellow Rx/Tx2 LED (LED will always be switched OFF) is intended to be lit to indicate a receiving/transmitting telegram at Ch2(The channel is disabled). The LED is controlled by Ethernet PHY. It is turned off by reset. |
| PRIM(ary)         | The PRIM LED is ON when the module is used in a single configuration (CI868 does not support redundant configuration).   |

### Technical Data

*Table 101. IEC 61850 Interface CI868 - Technical Specification*

| Item     | Value         |
|----------|---------------|
| Type     | Ethernet unit |
| Protocol | IEC 61850     |

Table 101. IEC 61850 Interface CI868 - Technical Specification

|  |   |
|--|---|
| Communication speed CH1                  | 10 Mbit/s / 100 Mbit/s defined in IEEE 802.3u 10/100Base-Tx   |
| Status indicators                        | Running normally: Green.<br>Exceptional fault: Red.<br>Two traffic indicators – RxTx1 and RxTx2(LED will always be switched off) -- controlled by traffic pace: Flashing Yellow<br>Running as primary: Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                               | RJ45  |
| Current consumption (from CEX-Bus 24VDC) | 160 mA typical (250 mA max)   |
| Power dissipation                        | 3.8W typical (6W max)   |
| Protection Rating                        | IP20 according to EN60529, IEC 529.   |
| Weight                                   | 500 g (700g with package) (package CI868K01with CI868 and TP867).   |
| Dimensions                               | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)   |

## CI869 and TP869 - AF 100 Interface

### Key Features

- CEX-Bus Module.
- Simple DIN rail mounting
- Supports communication interface redundancy
- Supports redundant connections to AF 100 Bus through twisted wire pair.

### Description

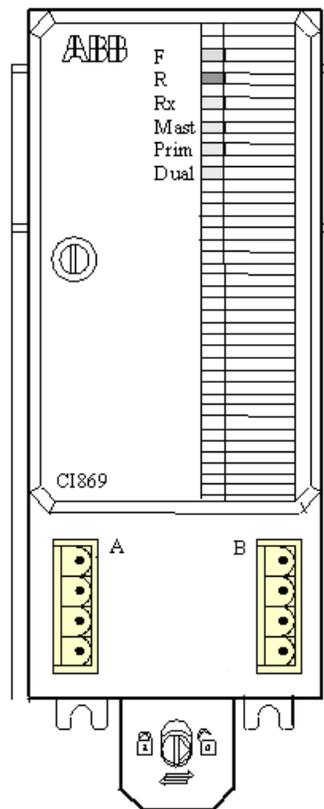
The CI869 is an AC 800M communication interface that connects to the AF 100 field bus through the twisted pair (TWP) cable.

The CI869 can be configured for both redundant cables and redundant communication interfaces.

For details about the operation and configuration of CI869 connected to AF 100 bus, refer to *Advant Fieldbus 100 User Manual (3BSE000506\*)*.

The Termination Plate (TP869) contains the CEX-Bus connectors and two 4-pin connectors for AF 100 TWP.

The baseplate has a code lock (see [Table 4](#) on page 75) that prevents the installation of an incorrect type of unit onto the TP869 Baseplate.



## Functional Block Diagram

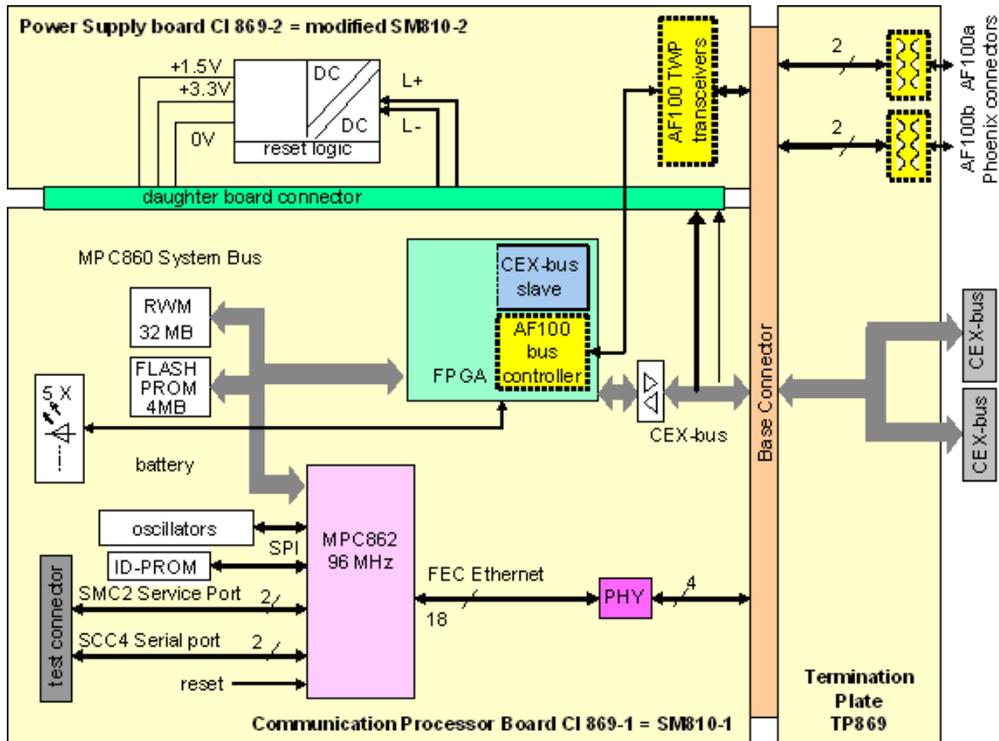


Figure 84. Block Diagram - CI869

## Indicators

There are six LED indicators on the front panel of CI869. The *Mast* LED is not used as CI869 cannot function as bus master. The other LEDs indicate the various states and conditions of the CI869 unit.

Table 102. AF 100 Interface, CI869 - LED indicators

| Designation/Color | Function  |
|-------------------|---|
| F(ault) / Red     | The red F(ault) LED indicates a fault condition on CI869. A reset turns the F LED ON, till the unit is initialized.   |
| R(un) / Green     | The green R(un) LED indicates that the CI869 is operational. A reset turns the R LED OFF.   |
| Rx / Yellow       | The yellow Rx LED indicates that the CI869 receives traffic.<br>The Rx LED is ON, without flashing, when traffic is normal.<br>The Rx LED flashes with less frequency when no bus traffic is detected, flashes with 50% more frequency when the module has bus traffic and the device is not configured, and flashes with 75% more frequency when the device is configured, but the CDPs are not correctly polled.<br>A reset turns the Rx LED OFF. |
| Mast(er)          | This LED is not used.   |
| Prim(ary)         | The yellow Prim(ary) LED indicates that the CI869 is the primary module of a redundant pair. A reset turns the Prim LED OFF.  |
| Dual              | The yellow Dual mode LED indicates that the redundancy is active. A reset turns the Dual LED OFF.   |

**Technical Data***Table 103. AF100 Interface CI869 - Technical Specification*

| <b>Item</b>                              | <b>Value</b>  |
|--|---|
| Type                                     | AF 100 Communication Interface  |
| Protocol                                 | Advant Fieldbus 100   |
| Communication speed TWP                  | 1.5 Mbit/s  |
| Status indicators                        | Running normally: Green.<br>Exceptional fault: Red.<br>Traffic indicator – Rx -- controlled by traffic pace:<br>Flashing Yellow<br>Running as primary: Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                               | Twisted Pair (TWP)  |
| Current consumption (from CEX-Bus 24VDC) | 160 mA typical (250 mA max)   |
| Power dissipation                        | 3.8W typical (6W max)   |
| Protection Rating                        | IP20 according to EN60529, IEC 529  |
| Weight                                   | 500 g   |
| Dimensions                               | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in)   |

## CI871 and TP867 – PROFINET IO Interface

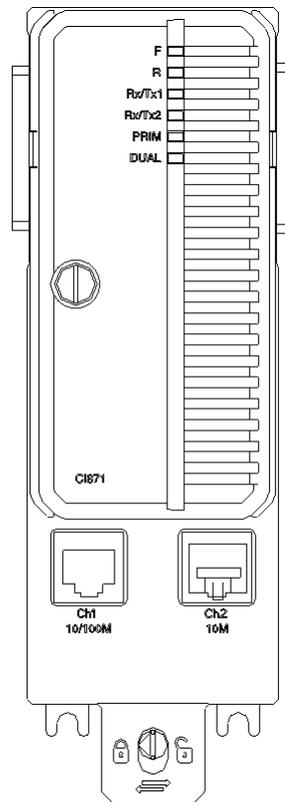
### Key Features

- Provides one 10/100 Mbps fast Ethernet port for PROFINET IO (RJ45 connector located on the TP867 base plate).
- Simple DIN-rail mounting.
- Provides communication with PROFINET IO protocol through Ethernet with 100 Mbps.
- Preset, two letter Alpha code locking device installed in the unit base, which prevents mounting of incompatible components.
- Supports hot swap.

### Description

The CI871 can be used to connect an AC 800M controller to PROFINET IO devices.

The TP867 Baseplate has two RJ45 Ethernet connectors. CH1 connector supports 10 Mbps or 100 Mbps. CH2 connector supports only 10 Mbps.



By default, the CH1 connector is used in PROFINET IO as it supports 100 Mbps.

The Ethernet cable must be connected to the PROFINET IO network through an Ethernet switch. The baseplate has a code lock (refer [Table 4](#) on page 75), which prevents the installation of an incorrect type of unit onto the TP867 baseplate.

The CI871 expansion unit contains the CEX-Bus logic, a communication unit, and a DC/DC converter that supplies the required voltage from +24 V supply through the CEX-Bus.

## Functional Block Diagram

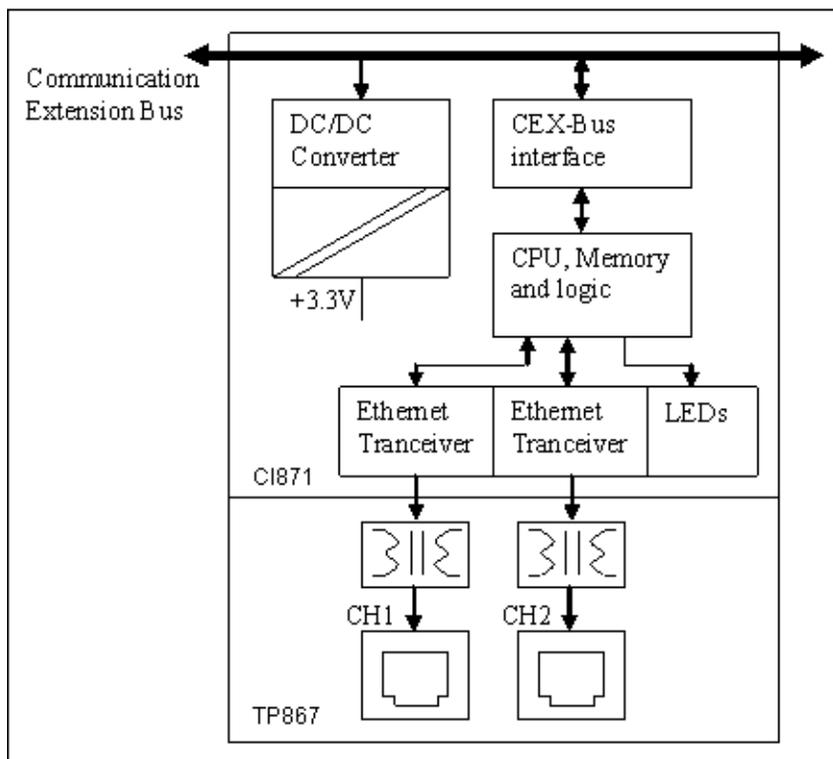


Figure 85. Block Diagram – CI871

**Indicators**

There are six LED indicators on the front panel of CI871 to indicate various states and conditions of CI871.

*Table 104. PROFINET IO Interface CI871 - LED indicators*

| <b>Designation/Color</b> | <b>Function</b>  |
|--------------------------|--|
| F(ault) / Red            | The red F(ault) LED indicates a fault condition on CI871. Reset turns the LED on. Software can turn it on and off through a register in the CEX-Bus controller.          |
| R(un) / Green            | The green R(un) LED indicates that the CI871 is operational. Reset turns the LED off. Software can turn the LED on and off through a register in the CEX-Bus controller. |
| RxTx1 / Yellow           | The yellow Rx/Tx1 LED is intended to be ON to indicate a receiving/transmitting telegram at CH1. The LED is controlled by Ethernet PHY. It is turned off by reset.       |
| RxTx2 / Yellow           | The yellow Rx/Tx2 LED is intended to be ON to indicate a receiving/transmitting telegram at CH2. The LED is controlled by Ethernet PHY. It is turned off by reset.       |
| PRIM (ary)               | The yellow LED indicates if the module is active or not. It does not describe the redundancy configuration of a module.  |
| DUAL                     | The LED is ON when CI871 is operational in redundant configuration.<br>This LED is always OFF as redundancy is not supported.  |

**Technical Data***Table 105. PROFINET IO Interface CI871 - Technical Specification*

| <b>Item</b>                                 | <b>Value</b>   |
|---|--|
| Type  | Ethernet unit  |
| Protocol                                    | PROFINET IO  |
| Communication speed CH1                     | 10 Mbps / 100 Mbps defined in IEEE 802.3u 10/100 Base-Tx.  |
| Status indicators                           | Running normally: Green.<br>Exceptional fault: Red.<br>Two traffic indicators – RxTx1 and RxTx2(LED is always switched off) controlled by traffic pace: Flashing Yellow.<br>Running as primary: Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                                  | RJ45   |
| Current consumption<br>(from CEX-Bus 24VDC) | 160 mA typical (250 mA max).   |
| Power dissipation                           | 3.8 W typical (6 W max).   |
| Protection Rating                           | IP20 according to EN60529, IEC 529.  |
| Weight                                      | 500 g (700 g with package) (package CI871K01 with CI871 and TP867).  |
| Dimensions                                  | W 59 x H 185 x D 127.5 mm.<br>(W 2.9 x H 7.3 x D 5.0 in).  |

## CI872 and TP858 - MOD5 Interface

### Key Features

- CEX-Bus Module
- Simple DIN rail mounting
- Supports communication interface redundancy
- Three full duplex fiber optic ports
- Supports MOD5-to-MOD5 protocol

### Description

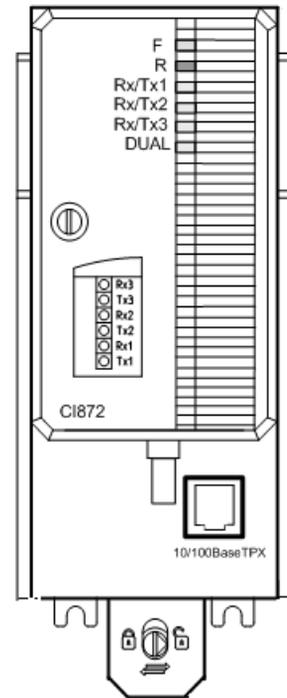
The MOD5 communication interface, type - CI872, connects the AC 800M controller to the MOD5 controllers.

The baseplate has a code lock that prevents the installation of an incorrect unit onto the TP858 baseplate.

The CI872 expansion unit contains the CEX-bus logic, a communication unit, and a DC/DC converter that supplies appropriate voltages from the +24 V supply through the CEX-bus.

CI872 should be mounted only on a horizontal DIN- rail. The base plate has a locking mechanism that contacts the metal back plate to the DIN-rail, which provides an effective ground connection. The CI872 and its base plate are supplied as a single unit (CI872), and there is no requirement to separate them during the mounting procedure. To mount the modules on the DIN-rail, it is necessary to use only a flat bladed screwdriver.

In case of assembling after a separation (hot insertion), verify that the key coding is same for the base plate and the electronic module.



Functional Block Diagram

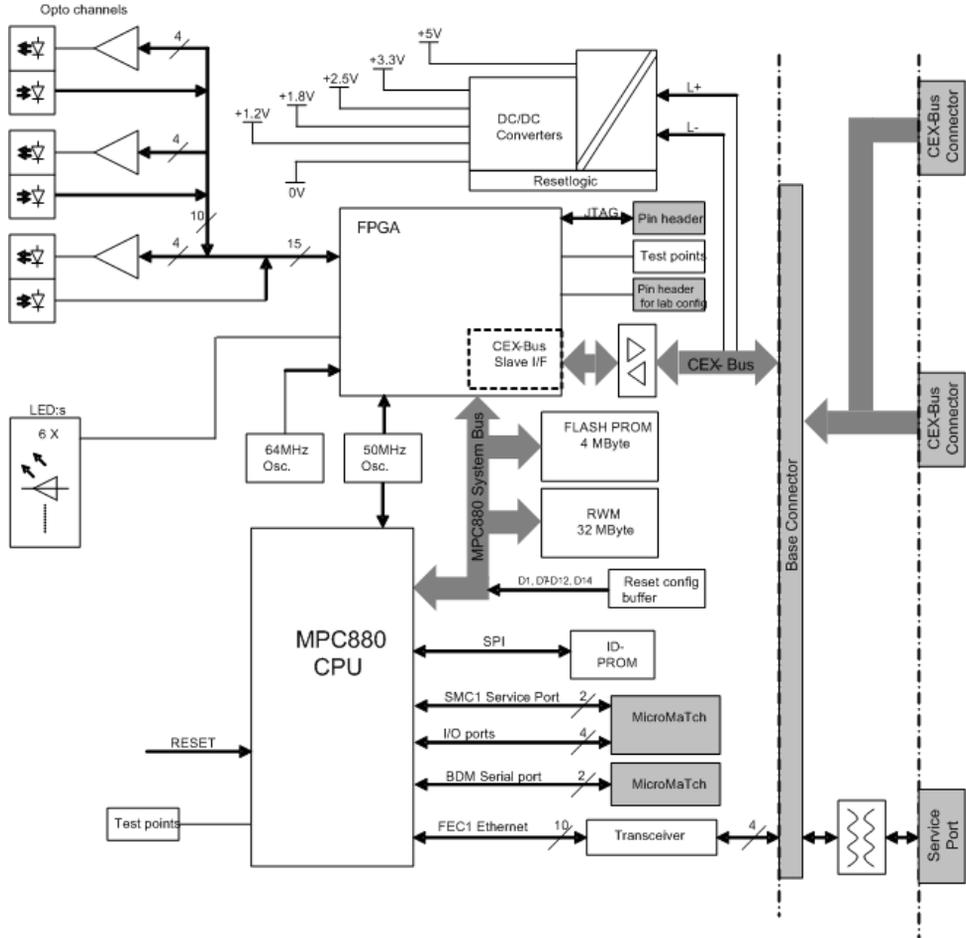


Figure 86. Block Diagram – CI872

**Indicators**

There are six LED indicators on the front panel of CI872 that indicate different states of the CI872 module including communication on the optical ports states.

*Table 106. MOD5 Interface CI872 - LED indicators*

| <b>Designation/Color</b> | <b>Function</b>  |
|--------------------------|--|
| F(ault) / Red            | The red F(ault) LED indicates a fault condition on CI872.  |
| R(un) / Green            | The green R(un) LED indicates that CI872 is operational.   |
| RxTx1 / Yellow           | The yellow Rx/Tx1 LED is illuminated when receiving or transmitting a byte at the optical channel–Ch1.   |
| RxTx2 / Yellow           | The yellow Rx/Tx2 LED is illuminated when receiving or transmitting a byte at the optical channel–Ch2.   |
| Rx/Tx3/Yellow            | The yellow Rx/Tx3 LED is illuminated when receiving or transmitting a byte at the optical channel–Ch3.   |
| DUAL/Yellow              | The yellow DUAL LED is illuminated when CI872 is run in redundant configuration and a working partnership between the two CI872s is established. |

**Technical Data**

*Table 107. MOD5 Interface CI872 - Technical Specification*

| <b>Item</b>         | <b>Value</b>                        |
|---------------------|-------------------------------------|
| Type                | Fiber optic connection.             |
| Protocol            | MOD5-to-MOD5.                       |
| Communication speed | Full duplex at a speed of 500 Kbps. |

Table 107. MOD5 Interface CI872 - Technical Specification

|  |  |
|--|--|
| Status indicators                        | Running normally: Green.<br>Exceptional fault: Red.<br>Three traffic indicators – RxTx1, RxTx2 and RxTx3 - controlled by traffic pace: Flashing Yellow.<br>Running in a redundant configuration: Yellow. |
| Connectors                               | Wavelength: 820 nm.<br>Fiber size: 62.5/125 $\mu$ m multimode glass fiber.<br>Connector type: ST - non threaded.<br>Max nominal fiber damping including connectors: 11 dB.                               |
| Current consumption (from CEX-bus 24VDC) | Max 124 mA.  |
| Power dissipation                        | Max 3.0 W.   |
| Protection Rating                        | IP20 according to EN60529, IEC 520.  |
| Weight                                   | 500 g (700 g with package).  |
| Dimensions                               | W 59 x H 185 x D 127.5 mm.<br>(W 2.9 x H 7.3 x D 5.0 in).  |

## CI873 and TP867 - EtherNet/IP Interface

### Key Features

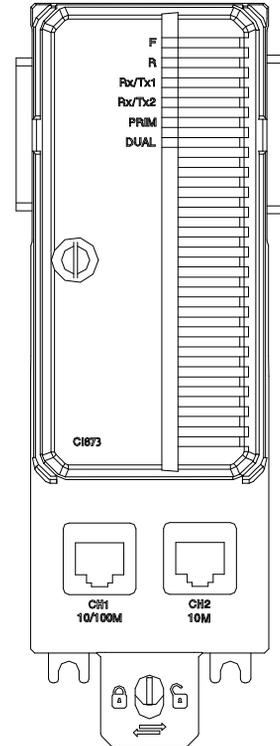
- CEX-Bus Module.
- MPC862P 96MHz.
- 32 Mbps SDRAM with integrity check.
- 4 Mbps Flash PROM.
- Ethernet/IEEE 802.3u supporting full Fast Ethernet 10/100Mbps operation.
- Supports EtherNet/IP protocol.
- 10/100 Mbps use IEEE standard Media Independent Interface (MII)

### Description

The CI873 can be used to connect an AC 800M controller to external Ethernet devices using the EtherNet/IP protocol.

The TP867 Baseplate has two RJ45 Ethernet connectors. For CI873, only the CH1 connector that supports 10 Mbps/100 Mbps is used. The baseplate has a code lock which prevents the installation of an incorrect unit type onto the TP867 Baseplate.

The CI873 expansion unit contains the CEX-Bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24 V supply through the CEX-Bus. The Ethernet cable must be connected to the main network through an Ethernet Switch.



**Functional Block Diagram**

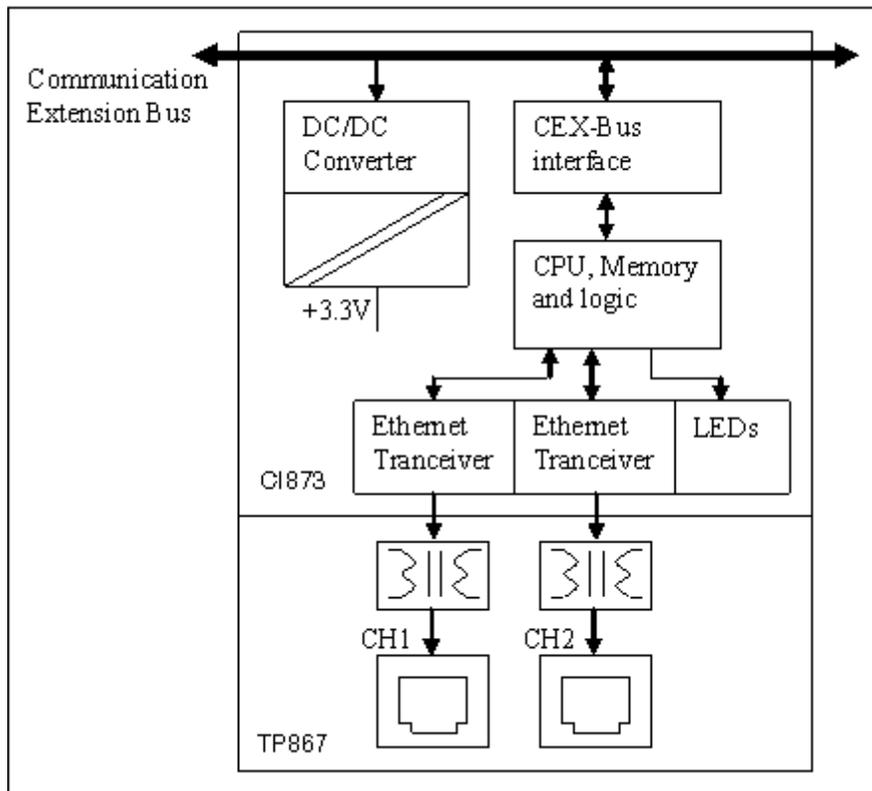


Figure 87. Block Diagram – CI873

### Indicators

There are six LED indicators on the front panel of CI873 that indicate the various states and conditions on the CI873.

*Table 108. EtherNet/IP Interface CI873 - LED indicators*

| <b>Designation/Color</b> | <b>Function</b>  |
|--------------------------|--|
| F(ault) / Red            | The red F(ault) LED indicates a fault condition on CI873. Reset turns the LED ON. Software can turn it On and OFF through a register in the CEX-Bus controller.  |
| R(un) / Green            | The green R(un) LED indicates that the CI873 is operational. Reset turns the LED OFF. Software can turn the LED ON and OFF through a register in the CEX-Bus controller.   |
| RxTx1 / Yellow           | The yellow Rx/Tx1 LED is intended to be ON to indicate a receiving/transmitting telegram at CH1. The LED is controlled by Ethernet PHY. It is turned OFF by reset.   |
| RxTx2 / Yellow           | The yellow Rx/Tx2 LED (LED will always be switched OFF) is intended to be ON to indicate a receiving/transmitting telegram at CH2 (The channel is disabled). The LED is controlled by Ethernet PHY. It is turned OFF by reset. |
| PRIM(ary)                | This LED is ON if this CI873 acts as the primary in a redundant configuration.   |
| DUAL                     | The yellow DUAL LED is ON when both CI873's in a redundant pair are synchronized. The LED is controlled by software. It is turned OFF by reset.  |

**Technical Data***Table 109. EtherNet/IP Interface CI873 - Technical Specification*

| Item                                     | Value  |
|--|--|
| Type                                     | Ethernet unit.   |
| Protocol                                 | EtherNet/IP.   |
| Communication speed CH1                  | 10 Mbps / 100 Mbps defined in IEEE 802.3u 10/100 Base-Tx.  |
| Status indicators                        | Running normally: Green.<br>Exceptional fault: Red.<br>Two traffic indicators – RxTx1 and RxTx2(LED will always be switched off) -- controlled by traffic pace: Flashing Yellow<br>Running as primary: Yellow. |
| Connectors                               | RJ45.  |
| Current consumption (from CEX-Bus 24VDC) | 160 mA typical (250 mA max).   |
| Power dissipation                        | 3.8W typical (6W max).   |
| Protection rating                        | IP20 according to EN60529, IEC 529.  |
| Weight                                   | 500 g (700g with package) (package CI873K01with CI873 and TP867).  |
| Dimensions                               | W 59 x H 185 x D 127.5 mm<br>(W 2.9 x H 7.3 x D 5.0 in).   |

## Power Supply Units – Types SD821, SD822 and SD823

### Key Features

- Simple DIN-rail mounting
- Class I Equipment (when connected to Protective Ground, (PE))
- Overvoltage Category III for connection to primary main TN network of Installation Category III
- Protective separation of secondary circuit from primary circuit
- Secondary outputs;
  - SD823 = 24 Volts DC regulated @ 10 A
  - SD822 = 24 Volts DC regulated @ 5 A
  - SD821 = 24 Volts DC regulated @ 2.5 A
- Accepted for SELV and PELV applications
- Switch for selection of 115 or 230 V AC

### Safety Classification

The Power Supply Units (PSU) are designed to meet all applicable electrical safety data in accordance with EN 50178 harmonized European Standard Publication, and the additional safety and function data required by EN 61131-2 and UL 508.

The secondary output circuitry is accepted for SELV or PELV applications.

SELV according to EN 50178, EN 60950 and VDE 0100 Part 410.

For PELV applications; in accordance with EN 50178.

### Protection Rating

IP20 according to EN 60529, IEC 529

Protective Class I according to EN 50718; 3.56

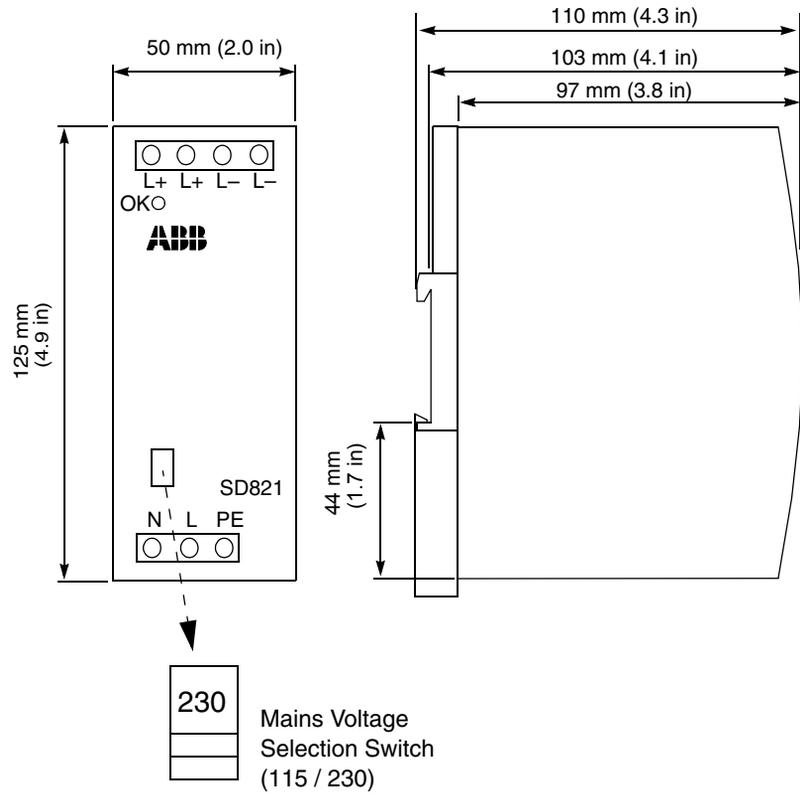


Figure 88. SD821 Connections for 2.5 A Power Supply

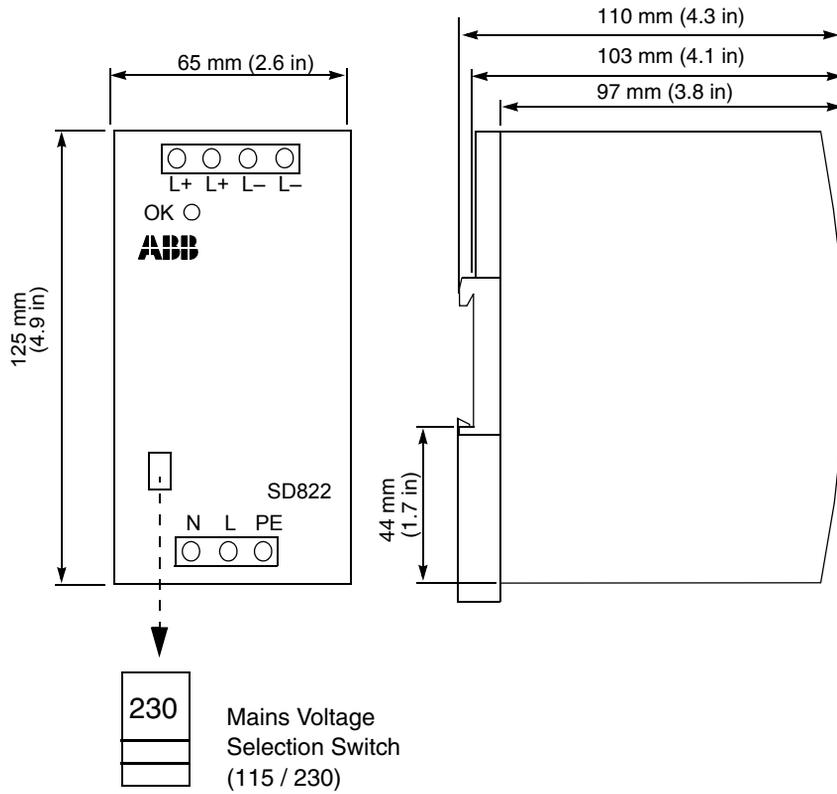


Figure 89. SD822 Connections for 5 A Power Supply

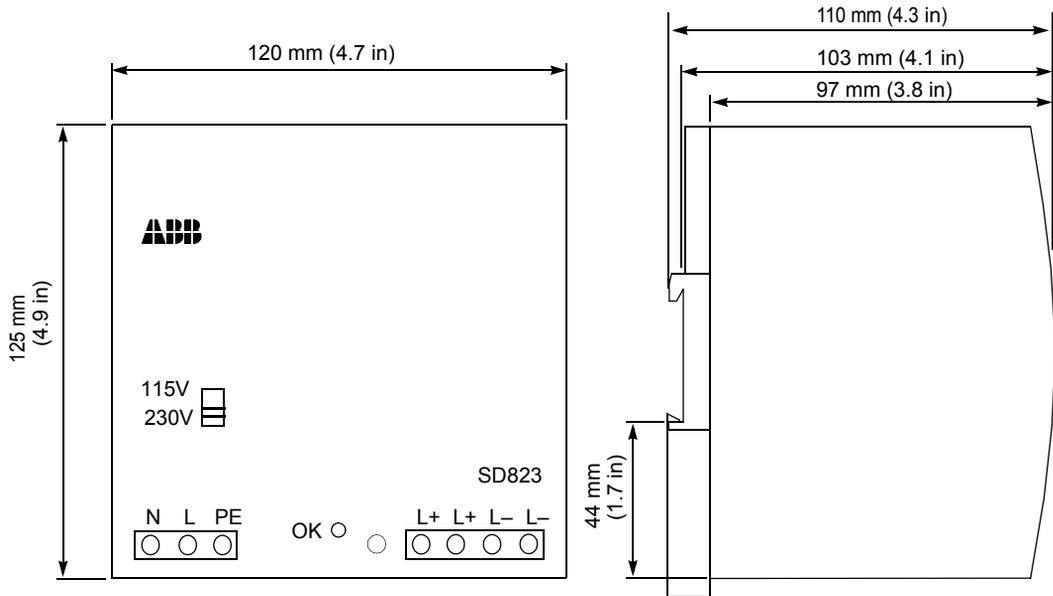


Figure 90. SD823 Connections for 10 A Power Supply

### Power Supply Units Types SD821/822/823 – Description

ABB recommends the use of these robust and reliable power supply units (PSUs) for providing power to the AC 800M Controller when connected to an industrial mains network of installation category III. All three PSUs can be used for both non-redundant and redundant applications.

The three PSUs were designed as switch mode power converters, converting AC mains supply voltage to a regulated 24V DC output. Rated output capacity:

- SD823 = 24 Volts DC regulated @ 10 A
- SD822 = 24 Volts DC regulated @ 5 A
- SD821 = 24 Volts DC regulated @ 2.5 A

The mains input voltage is set to either 115 or 230 V by means of a switch mounted on the face of the unit. The factory default position for this switch is 230 V.

The output voltage of all three PSUs is a regulated, low noise, 24 V DC. A green LED on the PSU front panel indicates that the output circuit is providing the correct output voltage level. The double connectors provided on the 24 V DC output terminals allow for connecting more than one piece of equipment.

A surge current limiter within the PSU circuit provides a soft-start feature. Consequently the controlled power-on of a PSU will not trip fuses or ground-fault circuit breakers. In addition, the normal disturbances that occur within an industrial main network will not result in transient fault conditions or tripping.

This results in the surge current limiter effectively reducing the peak inrush current caused by a power disruption, to a level the PSU can tolerate.

This soft-start, surge current limiter facility simplifies designing the system power distribution circuits.

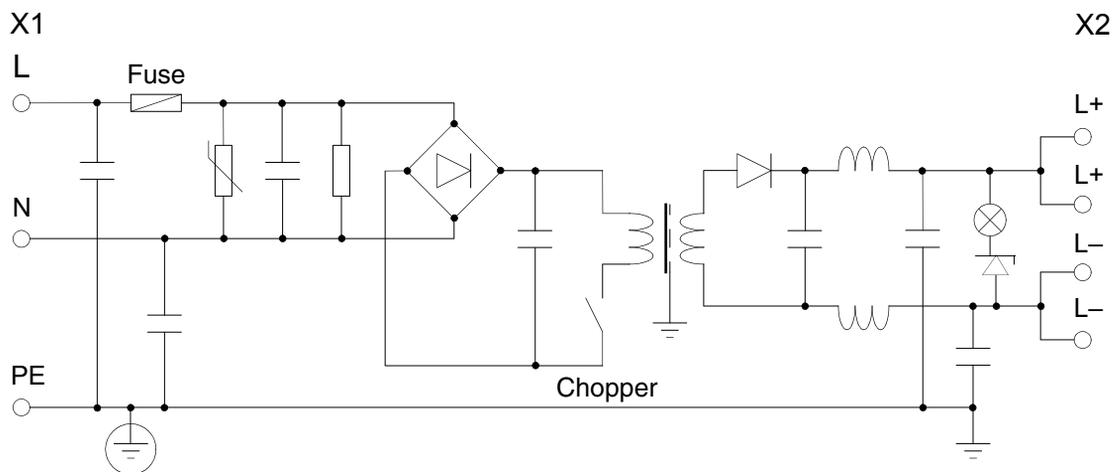


Figure 91. PSU's SD821, 822 and 823 – Block Diagram

### Insulation of Power Supply Units (PSU)

Basic with protective conductor; primary circuit separated from all other live circuits by reinforced insulation.

Rated insulation voltage, Primary to Secondary 300 V AC.

Dielectric test voltage 3000 V AC (EN 60950).

### Fuses and Protective Devices

Internal primary main fuses are arranged to meet the requirements of electrical safety publications for connection to the Phase – Neutral terminals of the primary main network; TN network, 1 (one) fuse. Recommended primary external fuse:

- Micro Circuit Breaker (MCB) 10 Amperes, characteristic B.

*Table 110. Power Supply Units – Fuses and Protective Devices*

| Fuse  | SD821               | SD822               | SD823                |
|---|---------------------|---------------------|----------------------|
| Primary: Internal fuse                            | 3.15 AT             | 4 AT                | 6.3 AT               |
| Primary: Recommended external fuse <sup>(1)</sup> | 10 A <sup>(1)</sup> | 10 A <sup>(1)</sup> | 10 A <sup>(1)</sup>  |
| Secondary: Short circuit                          | <5 A                | <10 A               | <20 A                |
| Secondary: Over-load protection                   | 3 A > I<br>I < 5 A  | 6 A < I<br>I < 10 A | 12 A < I<br>I < 20 A |
| Secondary: Over-Voltage protection                | 32 V typ            | 29 V typ            | 35 V typ             |

(1) Microcircuit Breaker (MCB), Characteristic B

**Technical Data***Table 111. PSU's SD821, 822 and 823 – Technical Data*

| Parameter  | SD821 Converter                    | SD822 Converter | SD823 Converter |
|--|------------------------------------|-----------------|-----------------|
| Rated output current (A)   | 2.5 A                              | 5 A             | 10 A            |
| Rated output power   | 60 W                               | 120 W           | 240 W           |
| Rated output voltage   | 24 V                               | 24 V            | 24 V            |
| Rated input power  | 160 VA<br>70 W                     | 280 VA<br>135 W | 690 VA<br>265 W |
| Mains/input voltage, nominal   | 115/230 V AC                       | 115/230 V AC    | 115/230 V AC    |
| Mains voltage variation allowed a.c. (recommended operating condition) | 85–110%                            | 85–110%         | 85–110%         |
| Mains frequency a.c. (recommended operating condition)                 | 45–65 Hz                           | 45–65 Hz        | 45–65 Hz        |
| Absolute maximum supply voltage (short term), max. a.c.                | 138/275 V AC                       | 138/275 V AC    | 138/275 V AC    |
| Surge; Primary peak current at power on                                | 25 A                               | 15 A            | 30 A            |
| Power Factor (at rated output power)                                   | 0.47 typ                           | 0.5 typ         | 0.5 typ         |
| Heat dissipation   | 8.6 W                              | 13.3 W          | 26.7 W          |
| Efficiency factor  | 87% typ                            | 90% typ         | 90% typ         |
| Output voltage regulation at max. current                              | ±2%                                | ±2%             | ±2%             |
| Ripple (peak to peak)  | 25 mV                              | 25 mV           | 30 mV           |
| Secondary voltage holdup time at mains blackout                        | >20 ms                             | >20 ms          | >20 ms          |
| Maximum output current   | 5 A                                | 10 A            | 20 A            |
| Protection Rating  | IP20 according to EN60529, IEC 529 |                 |                 |

Table 112. PSU's SD821, 822 and 823 – Mounting Dimensions

| Parameter  | SD821 Converter | SD822 Converter | SD823 Converter |
|--|-----------------|-----------------|-----------------|
| Dimensions, Width<br>HxD = 125 x 110<br>mm (4.9" x 4.3") | 50 mm (2.0 in)  | 65 mm (2.6 in)  | 120 mm (4.7 in) |
| Mounting spacing<br>W mm                                 | 10 mm (0.4 in)  | 15 mm (0.6 in)  | 15 mm (0.6 in)  |
| Mounting spacing<br>H mm                                 | 25 mm (1.0 in)  | 25 mm (1.0 in)  | 25 mm (1.0 in)  |
| Weight (lbs)   | 600 g (1.3 lb)  | 700 g (1.5 lb)  | 1100 g (2.4 lb) |

## Power Supply Units - Types SD831, SD832, SD833, and SD834

### Key Features

- Simple DIN-rail mounting.
- Class I Equipment, (when connected to Protective Earth, (PE)).
- Over-voltage Category III for connection to primary main TN network of Installation Category III.
- Protective separation of secondary circuit from primary circuit.
- Accepted for SELV and PELV applications.
- The output of the units is protected against over current (current limit) and over voltage (OVP).
- SD834 can be connected in parallel to increase output power.
- Both a.c. and d.c. input at SD831 and SD834.
- Floating DC-OK relay contact at SD834.

### **Equipment Class**

The Power Supply Units, (PSU), are designed to meet all the applicable electrical safety data stated by the EN 50178 harmonized European Standard Publication and the additional safety and function data required by EN 61131-2 and UL 508.

The secondary output circuitry is accepted for SELV or PELV applications.

SELV according to EN 50178, EN 60950 and VDE 0100 Part 410.

For PELV applications; in accordance with EN 50178.

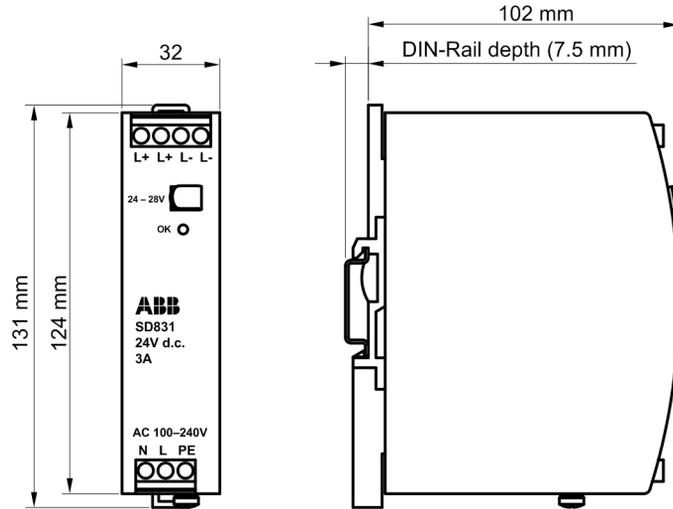
UL 508, listed E 198865.

### **Ingress Protection**

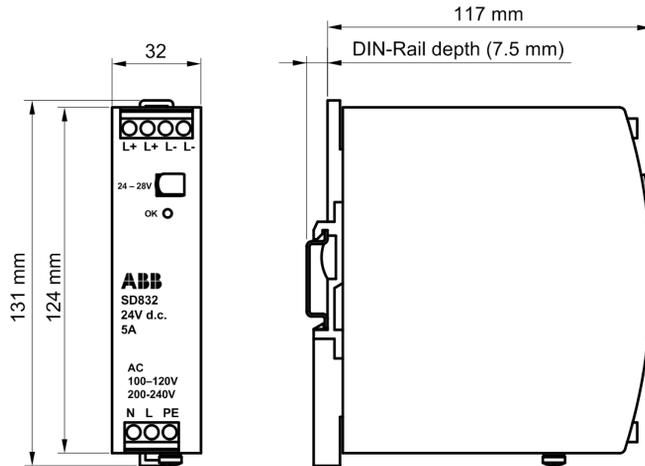
IP20 according to EN 60529, IEC 60529

Protective Class I according to EN 50718; 3.56

**Dimensions and Connections**



*Figure 92. SD831 Dimension and Connections for 3 A Power Supply*



*Figure 93. SD832 Dimensions and Connections for 5 A Power Supply*

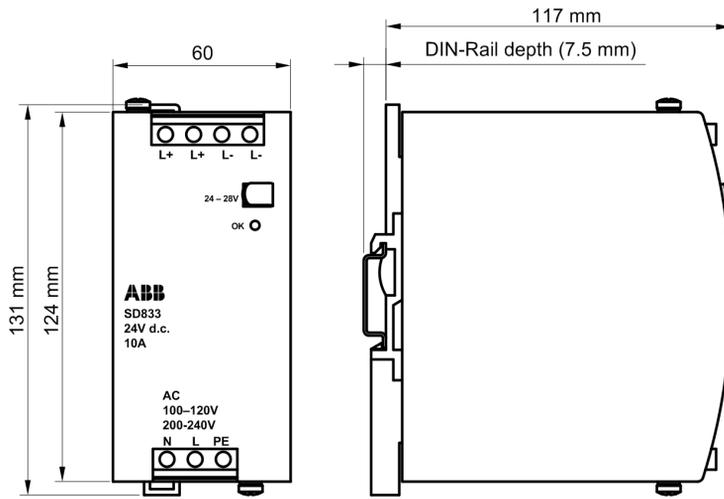


Figure 94. SD833 Connections for 10 A Power Supply

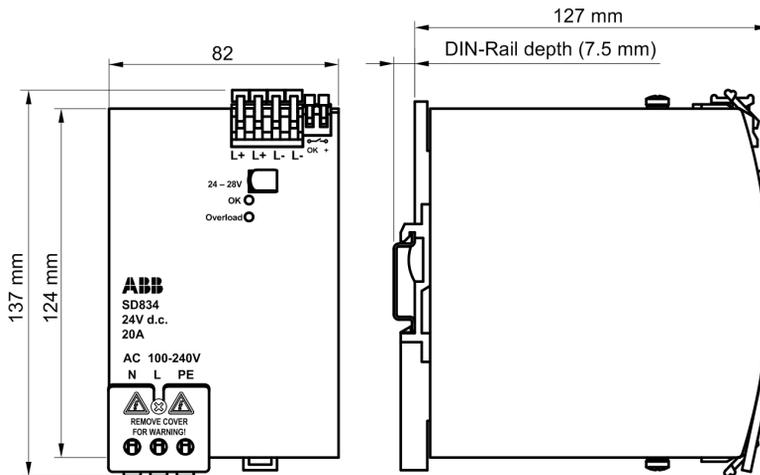


Figure 95. SD834 Connections for 20 A Power Supply

**Power Supply Units Types SD831 / 832 / 833 / 834- Description**

ABB recommend the use of robust and reliable power supply units, (PSUs), for providing power to the AC800 and S800I/O system, when connected to an industrial mains network of installation category III. PSUs can be used for both non-redundant and redundant applications.

The four PSUs are designed as switch mode power converters. They converting a.c. or d.c. mains supply voltage to a regulated d.c. 24 V output. The four PSUs have data as follows:

- SD831 = Input a.c. 100-240 V or d.c. 110-300 V.  
Output d.c. 24 Volts regulated @ 3 A.
- SD832 = Input a.c. 100-120 or 200-240 V.  
Output d.c. 24 Volts regulated @ 5 A
- SD833 = Input a.c. 100-120 or 200-240 V.  
Output d.c. 24 Volts regulated @ 10 A
- SD834 = Input a.c. 100-240 V or d.c. 110-300 V.  
Output d.c. 24 Volts regulated @ 20 A

The output voltage of the four PSUs is, as stated, a regulated, low noise, d.c. 24 V. A LED, mounted on the PSU front panel indicates that the output voltage is within range.

The PCS's provide a soft start feature. The controlled power-on of a PSU therefore, will not trip fuses or earth-fault circuit breakers. In addition, the normal disturbances that occur within an industrial main network will not cause any transient fault conditions or trips to occur.

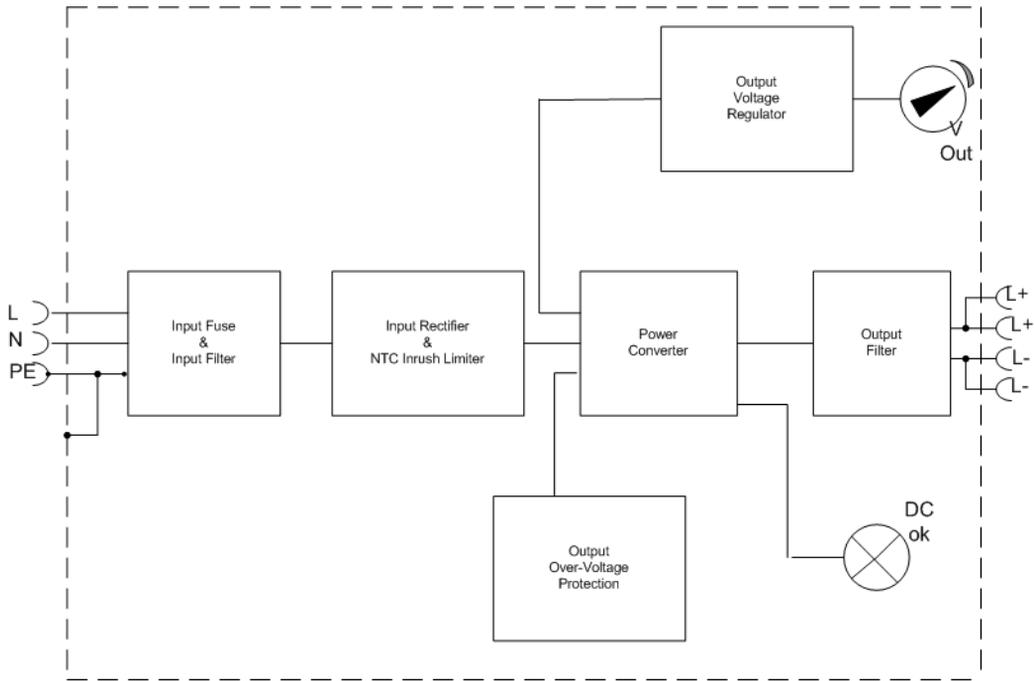


Figure 96. Functional Diagram SD831 for a 3 A Power Supply

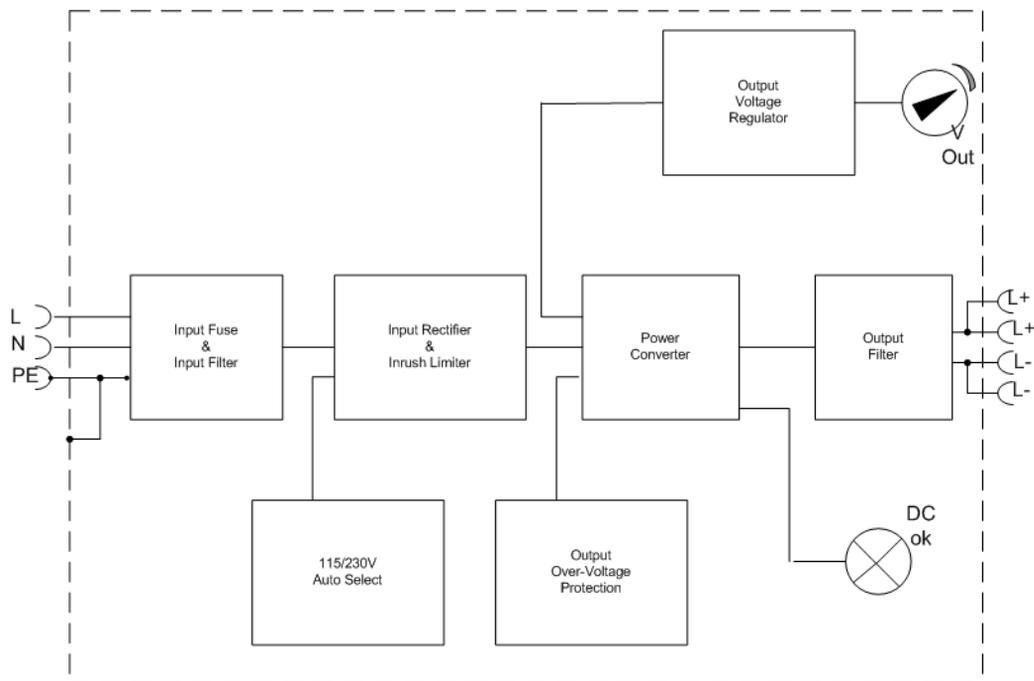


Figure 97. Functional Diagram SD832/SD833 for a 5 A/ 10 A Power Supply

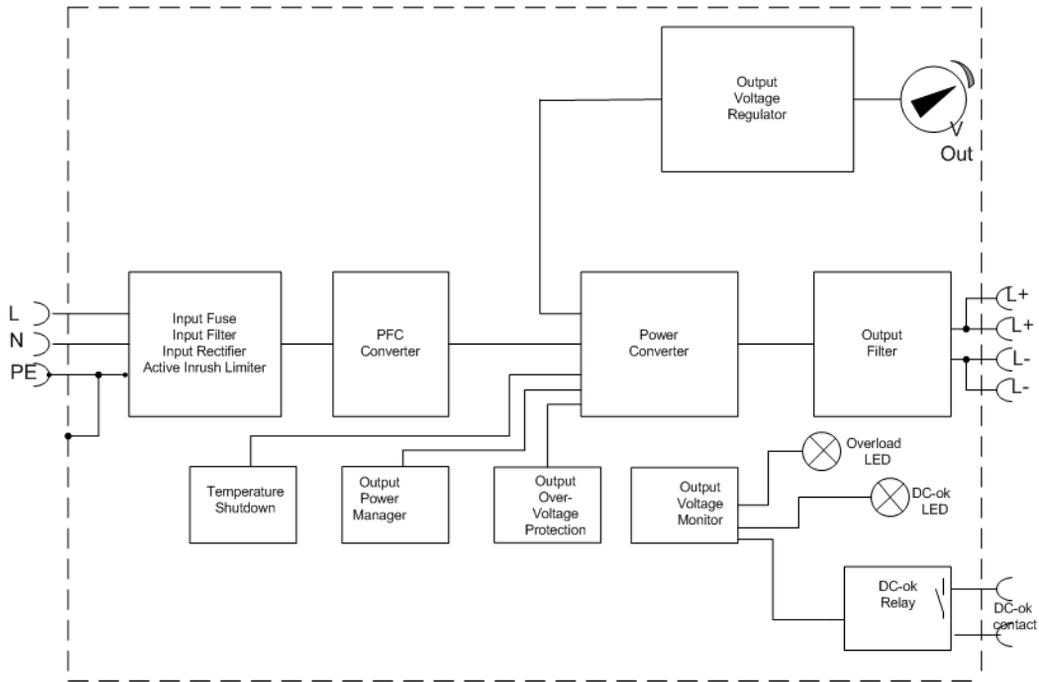


Figure 98. Functional Diagram SD834 for a 20 A Power Supply

**Dielectric strength**

Basic with protective conductor. The primary circuit is separated from all other live circuits by reinforced insulation.

Table 113. Dielectric Strength

|  |   | A          | B          | C         |
|--|---|------------|------------|-----------|
|  | Dielectric test voltage   | a.c. 2500V | a.c. 3000V | a.c. 500V |
|  | Field test  | a.c. 2000V | a.c. 2000V | a.c. 500V |
|  | Rules for Field test:<br>Use appropriate test equipment which applies the voltage with a slow ramp. Connect L and N together as well as all output poles. |            |            |           |

**DC-OK relay contact (SD834 only)**

This feature monitors the output voltage, which is produced by the power supply itself. It is independent of a backfed voltage from a unit that is connected in parallel to the power supply output.

Short dips will be extended to a signal length of 250ms. Dips shorter than 1ms will be ignored.

Contact closes: for output voltage > 90% of the adjusted output voltage.

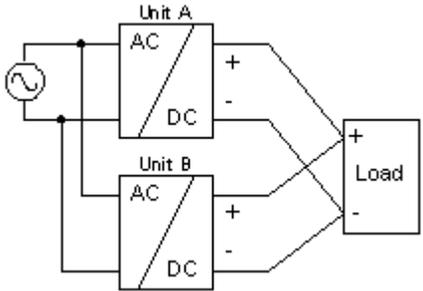
Contact opens: for output voltage dips > 10% below the adjusted output voltage.

Contact ratings: max 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A resistive load  
Min. >1mA, >5 V over open contact.

Isolation voltage: Field test: a.c. 2000 V to input. a.c. 500 V to output.

**SD834 in parallel to increase output power**

Table 114. SD834 Schematic and Instructions for parallel use.

| Schematic for parallel operation  | Instructions for parallel use  |
|---|--|
|  | <p>a) Only SD834 can be used in parallel connection.</p> <p>b) Adjust the output voltages of all power supplies to approximately the same value (<math>\pm 500\text{mV}</math>). Otherwise, the DC-OK signal might not work properly.</p> <p>c) A fuse (or diode) on the output is only required if more than three units are connected in parallel.</p> <p>d) Do not continuously load the terminals with more than 25A. Keep an installation clearance of 15mm (left/right) between two power supplies and avoid installing the power supplies on top of each other.</p> |

**Fuses and Protective Devices**

Recommended primary external fuse:

Table 115. Power Supply Units - Fuses and Protective Devices Power Supply Units Types SD83x

| Fuse  | SD831    | SD832    | SD833    | SD834    |
|---|----------|----------|----------|----------|
| Primary: Recommended external fuse <sup>(1)</sup> min/max | 10 - 20A | 10 - 20A | 10 - 20A | 10 - 20A |
| Primary: Recommended external fuse <sup>(2)</sup> min/max | 6 - 20A  | 6 - 20A  | 6 - 20A  | 10 - 20A |
| Secondary: Short circuit                                  | <8 A     | <14 A    | <18 A    | <40 A    |
| Secondary: Over-Voltage protection                        | <39 V    | <39 V    | <39 V    | <37 V    |

(1) Microcircuit Breaker (MCB), Characteristic B or a delayed action fuse.

(2) Microcircuit Breaker (MCB), Characteristic C

**Technical Data**

Table 116. Technical Data PSU's SD831, 832, 833 and 834

| Parameter  | SD831 Converter                  | SD832 Converter  | SD833 Converter  | SD834 Converter                  |
|--|----------------------------------|--|--|----------------------------------|
| Rated output current (A)                                     | 3 A                              | 5 A  | 10 A   | 20 A                             |
| Rated power output   | 72 W                             | 120 W  | 240 W  | 480 W                            |
| Rated output voltage   | d.c. 24 V                        | d.c. 24 V  | d.c. 24 V  | d.c. 24 V                        |
| Rated input power<br>a.c. 120/230 V                          | 134/143 VA<br>82/80 W            | 240/283 VA<br>134/133 W                                  | 447/514 VA<br>264/262 W                                  | 547/568 VA<br>519/511 W          |
| Mains/input voltage,<br>nominal. a.c. 47-63Hz                | a.c. 100-240 V<br>d.c. 110-300 V | a.c. 100-120 V<br>a.c. 200-240 V<br>Auto-select<br>input | a.c. 100-120 V<br>a.c. 200-240 V<br>Auto-select<br>input | a.c. 100-240 V<br>d.c. 110-300 V |
| Mains voltage variation<br>allowed                           | a.c. 90-264 V<br>d.c. 88-375 V   | a.c. 90-132 V<br>a.c. 180-264 V                          | a.c. 90-132 V<br>a.c. 180-264 V                          | a.c. 85-276 V<br>d.c. 88-375 V   |
| Max input voltage <0.5s                                      | a.c. 264-300 V                   | a.c. 264-300 V   | a.c. 264-300 V   | a.c. 276-300 V                   |
| Primary peak current at<br>power on at a.c.120/230V          | <28/<54 A                        | <10 A  | <10 A  | <13 A                            |
| Power Factor (at rated<br>output power)<br>a.c. 120/230V typ | 0.61/0.56                        | 0.56/0.47  | 0.59/0.51  | 0.95/0.90                        |
| Heat dissipation<br>a.c. 120/230 V                           | 10/8 W                           | 14/13 W  | 24/22 W  | 39.6/31.4 W                      |
| Efficiency factor<br>a.c. 120/230 V typ                      | 88/89.8%                         | 89.4/90.2%   | 91/91.6%   | 92.4/93.9%                       |
| Line/load regulation   | < 50 mV /<<br>100 mV             | < 70 mV /<<br>100 mV                                     | < 70 mV /< 100<br>mV                                     | < 10mV /< 100mV                  |
| Ripple (peak to peak)  | < 50 mV                          | < 50 mV  | < 50 mV  | < 100mV                          |
| Holdup time at mains<br>blackout a.c. 120/230 V<br>typ       | 29/120 ms                        | 80/78 ms   | 46/47 ms   | 32/51 ms                         |

Table 116. Technical Data PSU's SD831, 832, 833 and 834 (Continued)

| Parameter   | SD831 Converter  | SD832 Converter                | SD833 Converter                 | SD834 Converter  |
|---|--|--------------------------------|---------------------------------|--|
| Maximum output current                              | 3.3 A  | 6 A<br>At ambient temp < 45 °C | 12 A<br>At ambient temp < 45 °C | 30 A < 4 s   |
| Maximum ambient temperature <sup>(1)</sup>          | 55 °C  | 55 °C                          | 55 °C                           | 55 °C  |
| Acceptable wire sizes<br>Power connection terminals | Solid: 0.5 – 6 mm <sup>2</sup><br>Stranded wire: 0.5 – 4 mm <sup>2</sup> , 20 – 10 AWG<br>Recommended torque: 0.8 Nm |                                |                                 |  |
| Acceptable wire sizes<br>DC-OK-signal terminals     |  |                                |                                 | Solid: 0.3 - 4 mm <sup>2</sup><br>Stranded wire:<br>0.3 - 2.5 mm <sup>2</sup> ,<br>26 - 12 AWG |

(1) Mounting on a horizontal DIN rail.

## SS822/SS823/SS832 Voting Unit (for Redundant Power Supply)

The Voting Unit has been specifically designed to be employed as a control unit within a redundant power supply configuration. The output connections from two Power Supply Units, (PSUs), are connected to the Voting Unit.

The Voting Unit separates the redundant PSUs, supervises the voltage supplied, and generates supervision signals to be connected to the computer system. Green LED's, mounted on the front panel of the voting unit, provide a visual indication that the correct output voltage is being delivered. Simultaneously with the green LED illuminating, a voltage free contact closes the path to the corresponding "OK connector". Voting Unit trip level's, are factory preset. Three different types of voting units are available:

SS822 up to 20 A.

SS823 up to 20 A, with over voltage protections and enlarge diagnostics.

SS832 up to 10A.

See [Table 117](#) for the selection of voting unit based on the type of power supply.

*Table 117. Selection of Voting Unit*

|       | <b>SS822</b> | <b>SS832</b> | <b>SS823</b> |
|-------|--------------|--------------|--------------|
| SD831 | (x1)         | x1           | x2           |
| SD832 | (x1)         | x1           | x2           |
| SD833 | (x1)         | x2           | x2           |
| SD834 | (x2)         | x2           | x2           |

(x#) not preferred solution, x2 it needs two in parallel.

### **SS822**

For SS822 Block diagram and Dimensions see [Figure 99](#) and [Figure 100](#). [Table 118](#) and [Table 119](#) shows the supervision data and the technical data respectively. For connection of SS822 in a redundant configuration see [Figure 101](#).

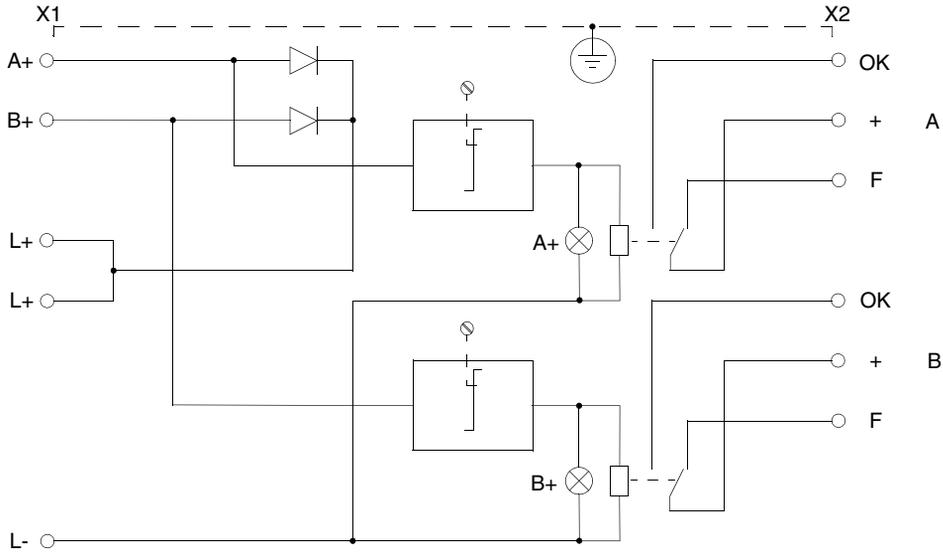


Figure 99. SS822 Block Diagram

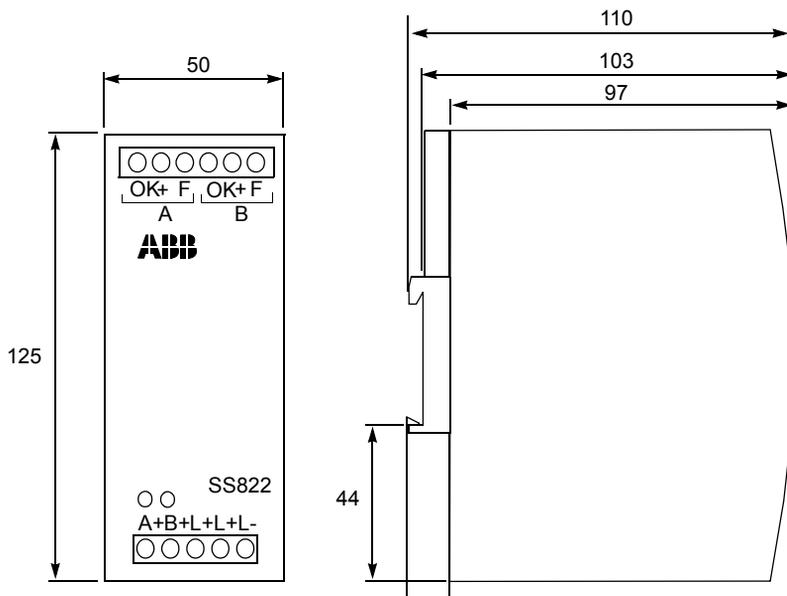


Figure 100. SS822 Voting Unit Connections

Table 118. SS822 Voting Unit - Supervision Data

| Supervision Data                                 | SS822 <sup>(1)</sup>  |
|--|---|
| Voltage, low trip level (for decreasing voltage) | 22 V  |
| Voltage, low trip hysteresis                     | 0.7 V   |
| Voltage, high trip level for rising voltage      | 30 V  |
| High trip hysteresis                             | 0.7 V   |
| Contact rating a.c.                              | Max. 120 V and max. 0.5 A                                   |
| Contact rating d.c.                              | Max. 28 V and max. 1 A;<br>min. 1 mA, recommended min. 5 mA |

(1) SS822Z is G3 compliant version according to ISA-S71.04.

Table 119. SS822 - Technical Data and Mounting Dimensions

| Parameter   | SS822 Voter   |
|---|---|
| Rated output current (A)                                      | 20 A  |
| Rated output voltage  | 35 V  |
| Rated input power   | 500 W   |
| Mains/input voltage, nominal                                  | 2 x 24 V d.c.   |
| Rated/input voltage   | 35 V d.c.   |
| Heat dissipation  | 10 W at 20 A and 2,5 W at 5 A   |
| Output voltage regulation at max. current                     | 0,5 V lower than input  |
| Maximum output current  | 35 A (Overload)   |
| Ingress Protection  | IP20 according to EN60529, IEC 60529.   |
| Max ambient temperature                                       | 55°C <sup>(1)</sup>   |
| Acceptable wire sizes<br>Input/output terminals               | Solid: 0.5 - 6 mm <sup>2</sup><br>Stranded: 0.5 - 4mm <sup>2</sup> , 20 - 10 AWG<br>Recommended torque: 0.8 Nm      |
| Acceptable wire sizes<br>Supervision output terminals         | Solid: 0.2 - 1.5 mm <sup>2</sup><br>Stranded: 0.2 - 1.5 mm <sup>2</sup> , 22 - 14 AWG<br>Recommended torque: 0.8 Nm |
| Dimensions, Width<br>HxD = 125 x 110 mm<br>(4.9 x 4.3 inches) | 50 mm (1.97")   |
| Mounting spacing W mm   | 10 mm (0.39")   |
| Mounting spacing H mm   | 25 mm (0.98")   |
| Weight (lbs.)   | 630 g (1.4 lbs.)  |

(1) Mounting on a horizontal DIN rail

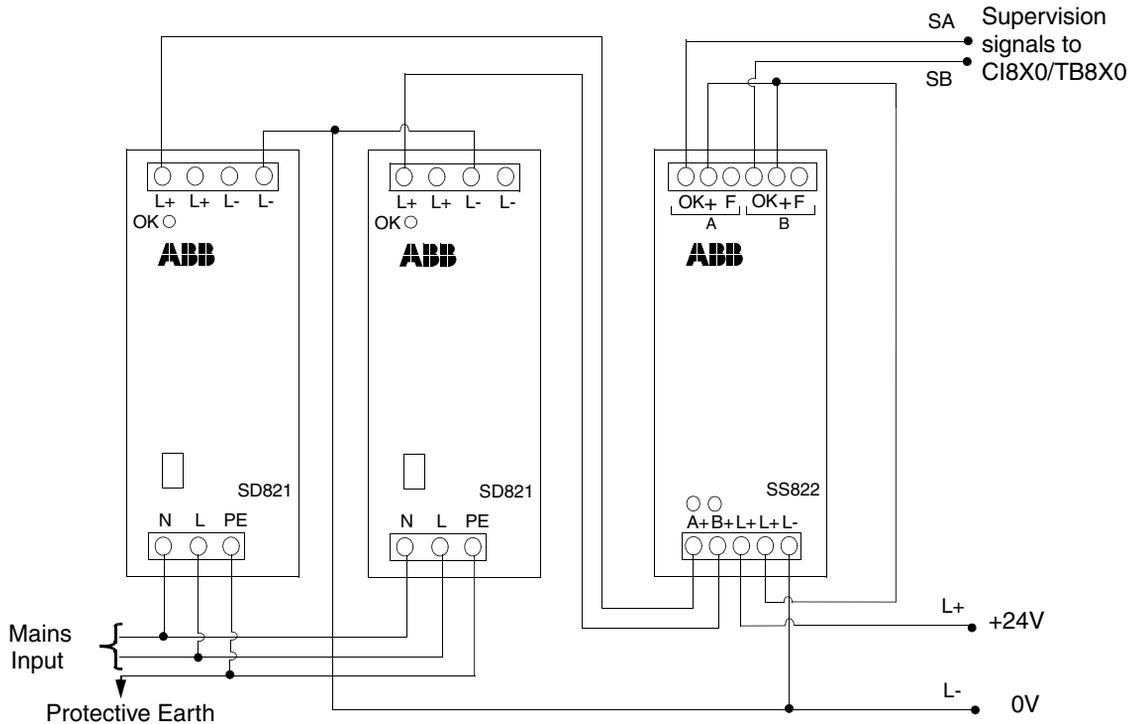


Figure 101. SS822 - Used in Redundant SD821 Configuration

### SS823

The SS823 Voting Unit has double overvoltage protection circuit on both inputs. It is also able to detect both short and open circuit in the voting element. For details see [Table 120](#).



Two SS823 can never be configured in parallel to achieve more current.

Block diagram and dimensions for SS823 see [Figure 102](#) and [Figure 103](#). [Table 120](#) and [Table 121](#) shows supervision data and technical data for SS823. For connection of SS823 in a redundant configuration see [Figure 104](#).

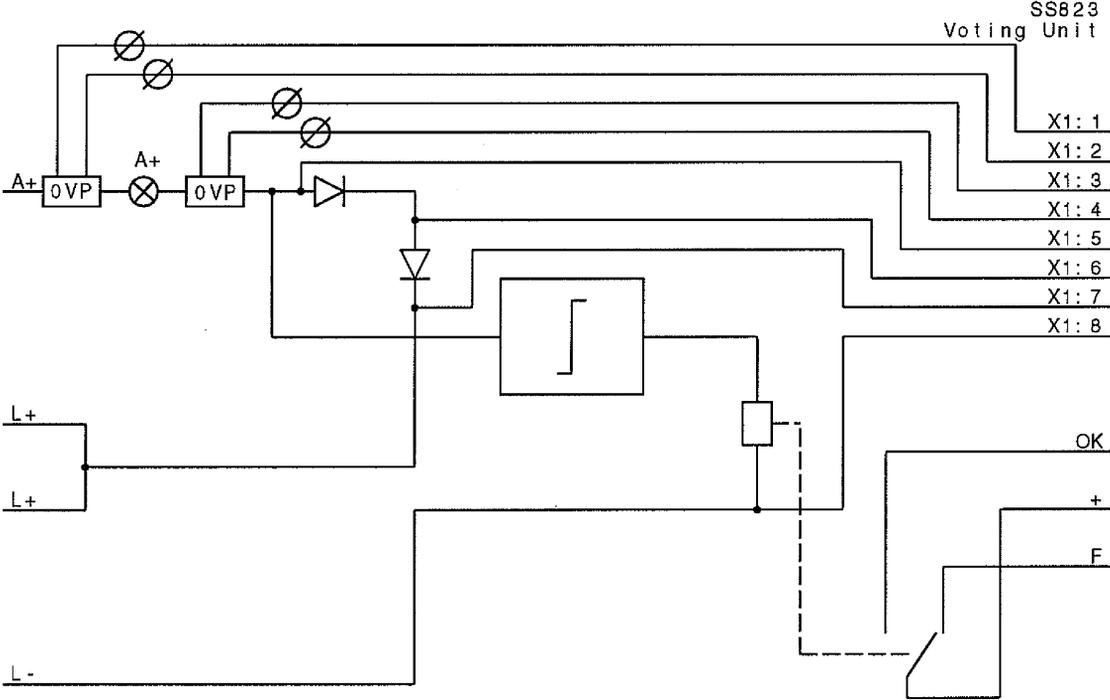


Figure 102. SS823 Block Diagram

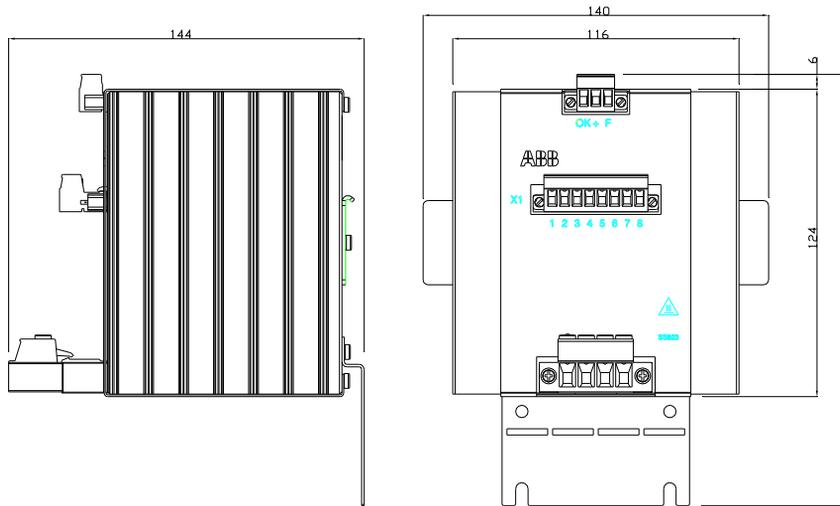


Figure 103. SS823 Power Voter Unit Connections

Table 120. SS823 Power Voter Unit - Supervision Data

| Supervision Data                                 | SS823   |
|--|---|
| Voltage, low trip level (for decreasing voltage) | 22 V  |
| Voltage, low trip hysteresis                     | 0.7 V   |
| Voltage, high trip level for rising voltage      | 30 V  |
| High trip hysteresis                             | 0.7 V   |
| Contact rating a.c.                              | Max. 120 V and max. 0.5 A                                   |
| Contact rating d.c.                              | Max. 28 V and max. 1 A;<br>min. 1 mA, recommended min. 5 mA |

Table 121. SS823 - Technical Data and Mounting Dimensions

| Parameter                                      | SS823 Voter   |
|--|---|
| Rated output current (A)                       | 20 A  |
| Rated output voltage                           | 24 V  |
| Rated input power                              | 500 W   |
| Mains/input voltage, nominal                   | 24 V d.c.   |
| Mains/input voltage, max                       | 30 V d.c. <sup>(1)</sup>  |
| Dual level OVP (Overvoltage protection)        | Trip 32.0 V nominal<br>Return 31.5 V nominal                                |
| Heat dissipation                               | 24 W max  |
| Output voltage regulation at max. current      | 1.2 V lower than input  |
| Maximum output current                         | Static 35 A typical, dynamic 150 A for 100 $\mu$ s typical                  |
| Ingress Protection                             | IP20 according to EN60529, IEC 60529.                                       |
| Max ambient temperature                        | 55°C <sup>(2)</sup>   |
| Acceptable wire sizes<br>Connector X1 and OK+F | 0.2 - 2.5 mm <sup>2</sup> , 24 - 12 AWG<br>Recommended torque: 0.5 - 0.6 Nm |
| Acceptable wire sizes<br>Connector A+, L+, L-  | 0.2 - 6 mm <sup>2</sup> , 24 - 10 AWG<br>Recommended torque: 0.7 - 0.8 Nm   |
| Mounting spacing W mm                          | 15 mm (0.59")   |
| Mounting spacing H mm                          | 25 mm (0.98")   |
| Width  | 140 mm (5.51")  |
| Depth  | 144 mm (5.67")  |
| Height   | 174 mm (6.85")  |
| Weight   | 800 g (1.8 lbs.)  |

(1) Electronically limited by OVP, voltage between 32 V and 60 V will result in 0 V output

(2) Mounting on a horizontal DIN rail

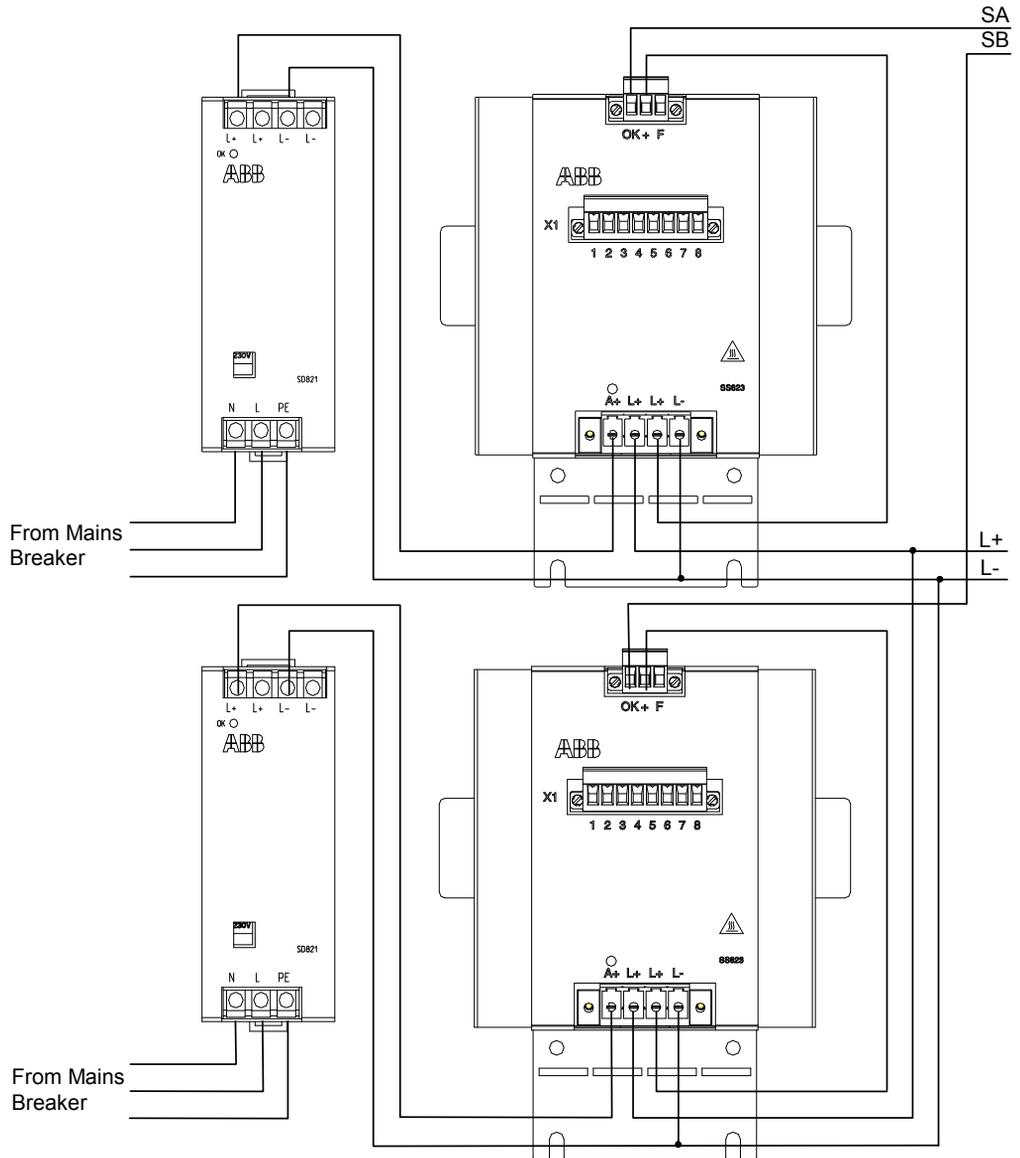


Figure 104. SS823 - Used in Redundant SD821 Configuration

**SS832**

SS832 is can be used directly for load up to 10 A and for loads up to 20 A two SS832 modules must be used. See [Figure 106](#) and [Figure 107](#).

For Block diagram and connections of SS832 see [Figure 105](#) and [Figure 108](#). [Table 122](#) and [Table 123](#) shows supervision data and technical data respectively. [Figure 109](#) shows connection of SS832 in redundant configuration with maximum 10 A load, see [Figure 110](#) for load up to 20 A.

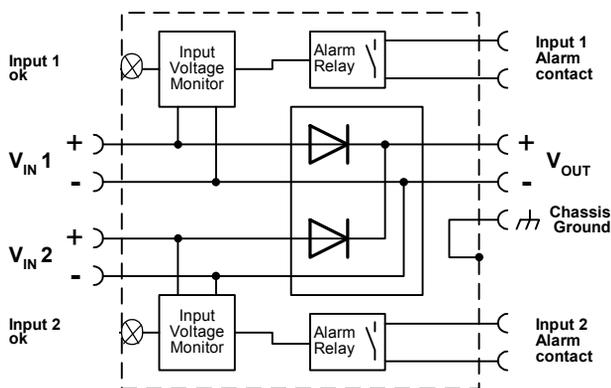


Figure 105. SS832 Block Diagram

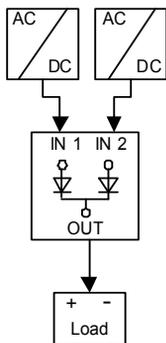


Figure 106. SS832 up to 10 A

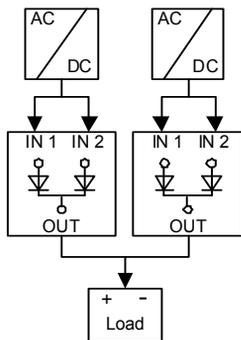


Figure 107. SS832 up to 20 A

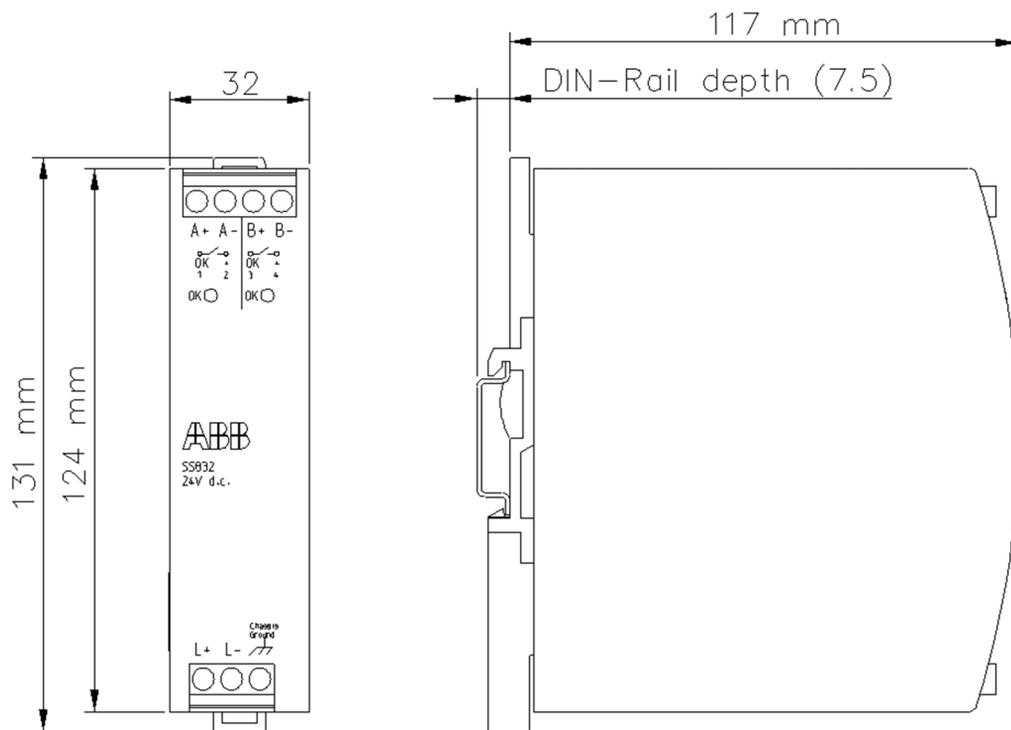


Figure 108. SS832 Voting Unit Dimensions and Connections

Table 122. SS832 Voting Unit - Supervision Data

| Supervision Data                                 | SS832        |
|--|--------------|
| Voltage, low trip level (for decreasing voltage) | 21.5 +- 0.5V |
| Voltage, low trip hysteresis                     | 0.7 V        |
| High trip hysteresis                             | 0.7 V        |

Table 122. SS832 Voting Unit - Supervision Data (Continued)

| Supervision Data      | SS832  |
|-----------------------|--|
| Contact rating a.c.   | Max. 30 V and max. 0.5 A, resistive load   |
| Contact rating d.c.   | Max. 60 V and max 0.3 A, 30 V max 0.5 A<br>resistive load<br>min. 1 mA at 5 V d.c. |
| Acceptable wire sizes | 0.2 -1.5 mm <sup>2</sup> , 22 - 14 AWG<br>Recommended torque: 0.4 Nm               |

Table 123. Technical Data and Mounting Dimensions

| Parameter                                    | SS832 Voter   |
|--|---|
| Input current                                | 10A per input   |
| Rated output current                         | 20 A  |
| Mains/input voltage, nominal                 | 2 x 24 V d.c.   |
| Rated/input voltage                          | 60 V d.c.   |
| Heat dissipation                             | 8.9 W at 10 A and 4.6 W at 5 A  |
| Input to output voltage drop at max. current | 0,85 V  |
| Maximum output current                       | 25 A (Overload)   |
| Ingress Protection                           | IP20 according to EN60529, IEC 60529.   |
| Max ambient temperature                      | 55°C <sup>(1)</sup>   |
| Acceptable wire sizes                        | Solid: 0.5 - 6 mm <sup>2</sup> , 20 - 10 AWG<br>Stranded: 0.5 - 4 mm <sup>2</sup> , 20 - 10 AWG<br>Recommended torque: 0.8 Nm |

Table 123. Technical Data and Mounting Dimensions (Continued)

| Parameter          | SS832 Voter   |
|--------------------|---|
| Dimensions         |   |
| Width              | 32 mm (1.26")   |
| Depth              | 117 mm (4.6")   |
| Height             | 124 mm (4.9")   |
| Mounting spacing W | 5 mm (0.2"), In case the adjacent device is a heat source 15 mm (0.59") |
| Mounting spacing H | 40 mm (1.57") on the top, 20 mm (0.79") on the bottom                   |
| Weight             | 350 g (0.77 lbs.)   |

(1) Mounting on a horizontal DIN rail

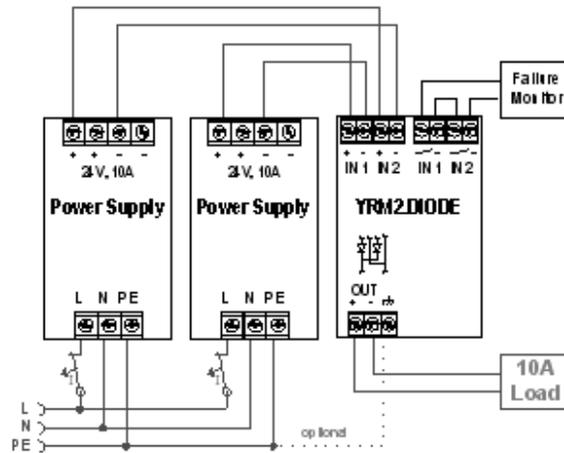


Figure 109. SS832 Redundant Configuration up to 10 A

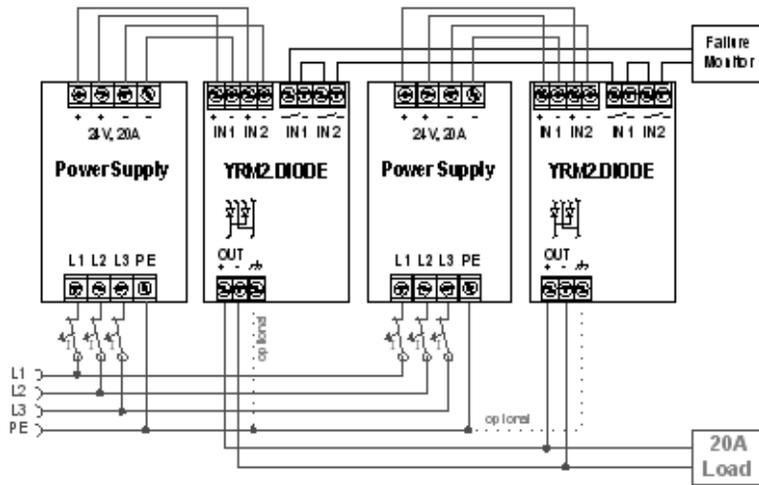


Figure 110. SS832 Redundant Configuration up to 20 A

## TC562 Modem Unit – (Westermo MD-12DC)

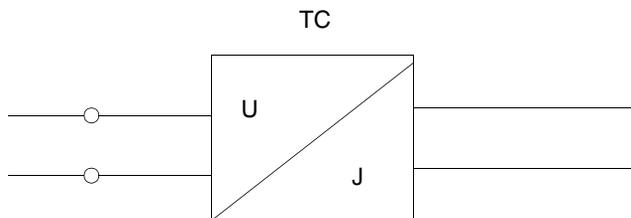


Figure 111. TC562 (MD-12DC) Modem

### Description

The TC562 Short Distance Modem unit can be used both for point-to-point communication and for communication over a distance between pieces of

equipment or units, for example a computer and printer or a robotic device. ABB recommends their use when the distance between units/equipment exceeds 15 m. For further details refer to the manufacturer's documentation (Westermo).

Using a modem allows distances between pieces of equipment to be as much as 18000 m, and, depending on the distance, can provide a data transmission speed of up to 38400 bit/s. The modems are manufactured for simple mounting onto a standard 35 mm DIN-rail.

Transfer between modems takes place along two twisted pair cables, one at full or half duplex and the other at simplex. The transfer distance is fully dependent on cable resistance and capacitance. ABB recommends a minimum cable gauge of 0.2 mm<sup>2</sup> with a capacitance of 40-80 pF/m within an industrial environment.

For an office environment, ABB recommends a minimum cable of 0.14 mm, and a capacitance of 40-100 pF/m. Use a shielded cable in a heavy industrial environment and an unshielded cable in an office environment. A shielded cable is often given a higher capacitance and will therefore provide a higher data transmission speed.

**Technical Data***Table 124. TC562 – Technical Data*

| Type              | TC562 – Short Distance Modem<br>Manufacturer – Westermo – MD-12DC |
|-------------------|---|
| Transfer          | Asynchronous, full/half duplex/simplex                            |
| Power Supply      | 24 V DC (Min. 12 V DC – Max 36 V DC)                              |
| Power Consumption | 3 W   |
| Dimensions        | 55 x 100 x 128 mm (2.2 x 3.9 x 5.0 in.)                           |
| Weight            | 400 g (0.9 lb)  |

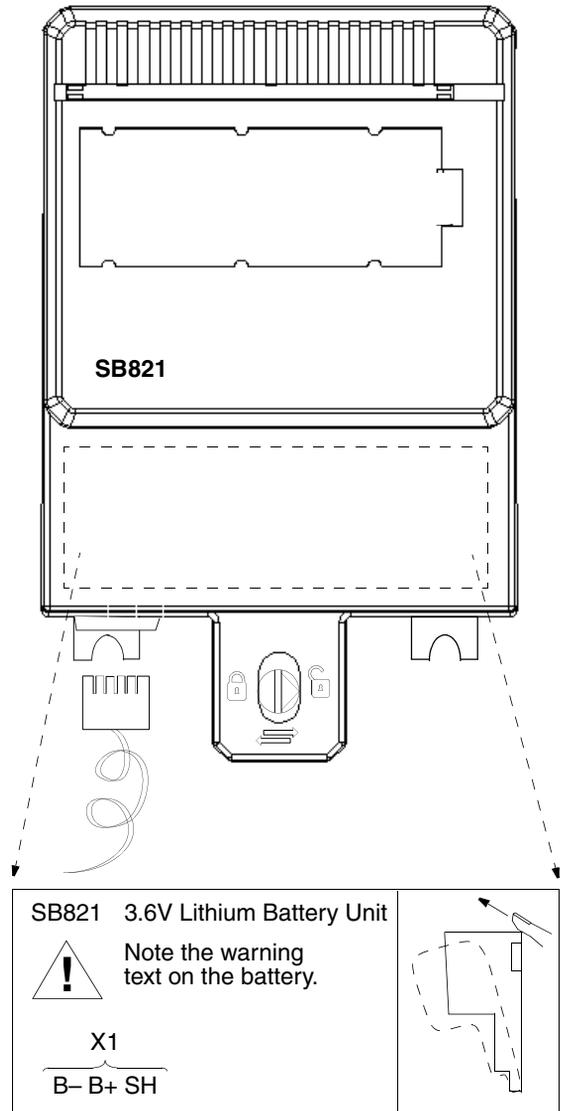
*Table 125. Transfer Distance (Cable 0.3 mm<sup>2</sup>/42 pF/m)*

| Meters (yd.)  | bit/s |
|---------------|-------|
| 1000 ( 1094)  | 19200 |
| 2500 ( 2734)  | 9600  |
| 5000 ( 5468)  | 4800  |
| 8000 ( 8749)  | 2400  |
| 12000 (13123) | 1200  |
| 18000 (19685) | 600   |

## SB821 External Battery – AC 800M Memory Back-up

### Description

The SB821 battery unit is used as an external power supply to provide extended memory back-up for the AC 800M Controller. The unit is DIN-rail mounted and provided with a separate connecting cable (TK821V020), 2 m (2.2 yd.) in length.



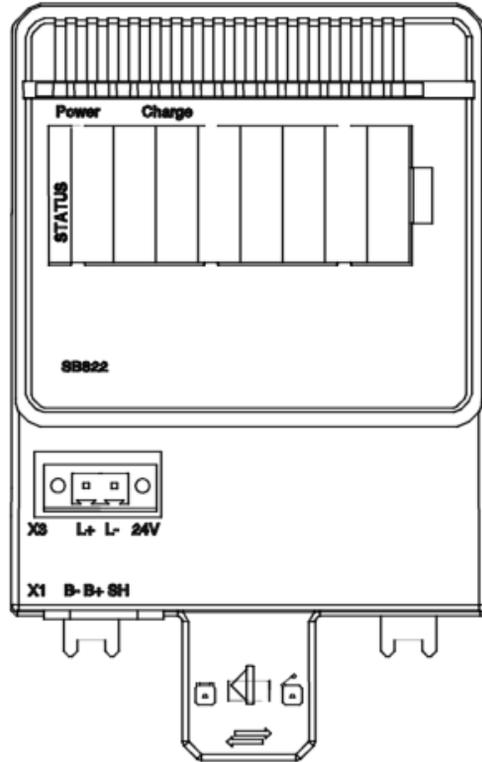
**Technical Data***Table 126. SB821 – External battery data*

| <b>Item</b>       | <b>Value</b>   |
|-------------------|--|
| Battery Type      | Low rate lithium,<br>3.6 V, 16 Ah                          |
| Size              | ANSI size D<br>IEC size R20                                |
| Lithium content   | 5.6 g (0.18 oz.)   |
| Back-up-time      | See data for the PM8xx unit                                |
| Dimensions        | W 85.6 x D 51 x H 136 mm<br>(3.4 x 2 x 5.4 in)             |
| Weight            | 600 g (1.3 lb) (package with SB821, battery and TK821V020) |
| Protection Rating | IP20 according to EN60529, IEC 529                         |

## SB822 Rechargeable External Battery – AC 800M Memory Back-up

### Description

The SB822 battery unit is used as an external power supply to provide extended memory back-up for the AC 800M Controller. The unit is DIN-rail mounted and provided with a separate connecting cable (TK821V020) 2 m (2.2 yd.) in length.



### Technical Data

Table 127. SB822 – Rechargeable External battery data

| Item                       | Value  |
|----------------------------|--|
| Battery type               | Rechargeable Lithium-Ion<br>3.75V 2.3 Ah                   |
| Battery size               | Prismatic 14.5x43x50 mm                                    |
| Lithium equivalent content | 0.8g   |
| Back-up-time               | See data for the PM8xx unit                                |
| Dimensions                 | W 85.6 x D 51 x H 136 mm<br>(3.4 x 2 x 4.4 in)             |
| Weight                     | 600 g (1.3 lb) (package with SB822, battery and TK821V020) |
| Protection Rating          | IP20 according to EN60529                                  |



When using the SB822 external battery unit, remove the internal battery from the processor unit as status monitoring is only provided for one battery.

## DIN-Rail – TS 35/7.5

The figure below shows the profile and dimensions in mm (in.) of the DIN-rail TS 35/7.5.

Normal supplied length is 2 m (6.6 ft.) (to standard DIN 46 277, EN 50 022).

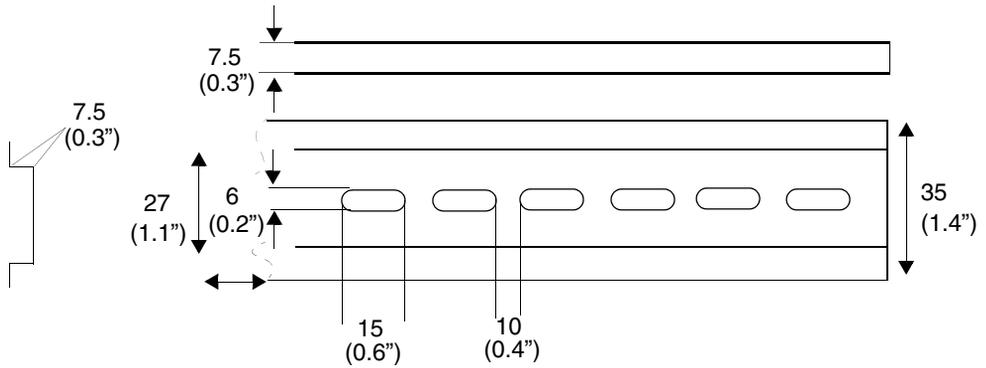


Figure 112. DIN-rail TS 35/7.5 – Dimensions

# Miscellaneous Equipment

## TB850 Terminator for CEX-Bus (Male)

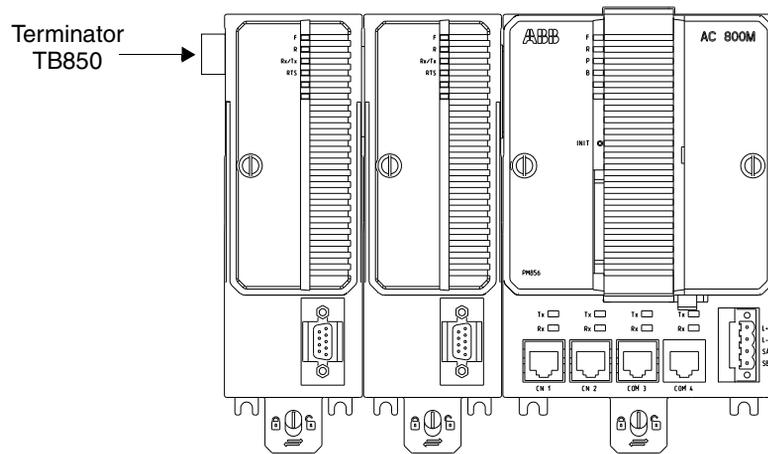


Figure 113. TB850 Terminator for CEX (male)

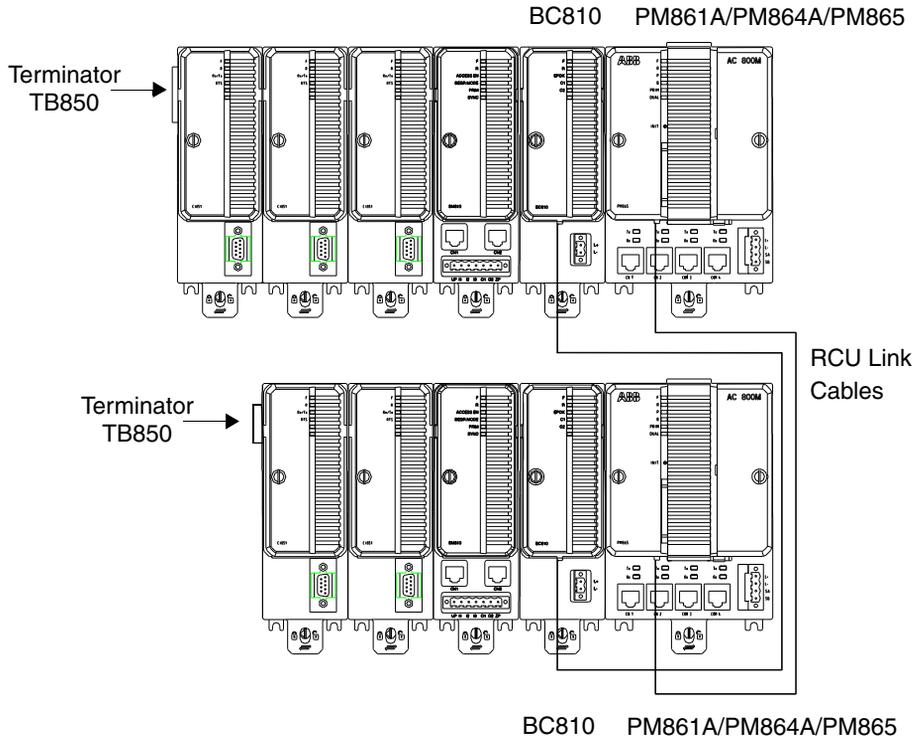


Figure 114. CEX-Bus Terminator when using Redundant Communication Interface Units (with BC810) and Controllers

## TB851 Terminator for CEX-Bus (Female)

A TB851 (female) Terminator for CEX-Bus is required when a TK850 extension cable is used.

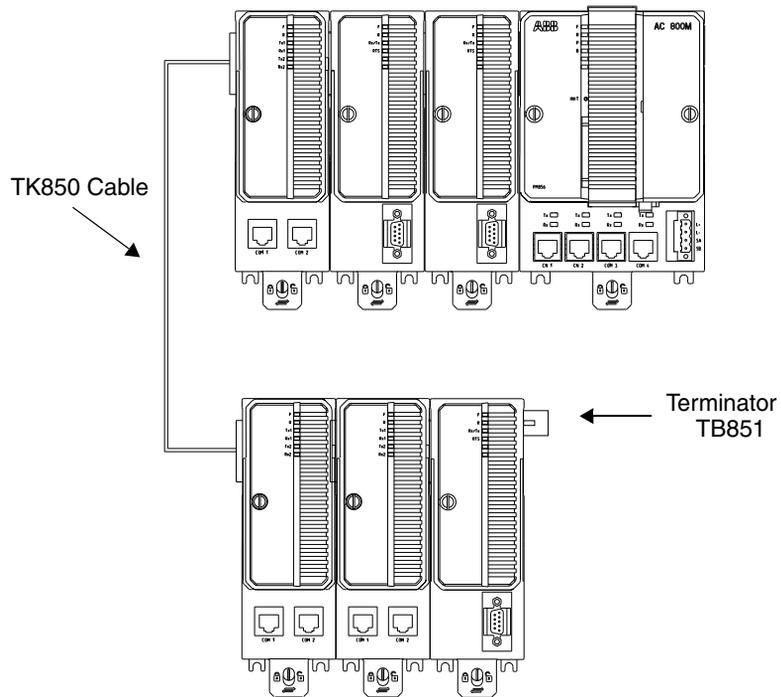


Figure 115. TB851 Terminator for CEX-Bus (female)

## **TB807 ModuleBus Terminator Plug**

The Terminator plug must always be mounted on the last I/O unit of the ModuleBus. If no units are used on the ModuleBus, no bus termination is required. No ModuleBus termination is required in redundant CPU configuration.

## **TB852 RCU Link Terminator Plug**

The TB852 RCU Link Terminator Plug is required when the PM861/PM864 processor unit operates in single configuration.

## **TB853 RCU Control Link Terminator Plug**

The TB853 RCU Control Link Terminator Plug is required when the PM891 processor unit operates in single configuration. This is plugged to the RCU Control port at the top of the PM891 unit.

## **TK850 CEX-Bus Extension Cable**

A 0.7 m (2.3 ft.) extension cable, complete with connector (type DB25P-metal housing) provides connectivity to Communication Interface units between adjacent DIN-rails. It is always used in redundant CPU configuration for connecting the CEX-Bus between the two processor units.

## **TK851 RCU Link Cable**

The Redundant Control Unit Link Cable is used to transfer log data from the Primary CPU to the Backup CPU, and to exchange status and control information between the Primary and Backup CPUs. The RCU Link uses 68-pole connectors, one of which is labeled “UPPER”. The CPU connected to this connector will be defined as the upper CPU in the Control Builder and Operator Station.

The RCU Link Cable is also used as interconnection cable between two BC810.

## TK853

### Technical Data

Table 128. TK853 – Technical Data

| Item       | Value  |
|------------|--|
| Connectors | <ul style="list-style-type: none"> <li>One 9-pole male D-sub (DE9P)</li> <li>One 8-pole RJ45 plug</li> </ul> |
| Weight     | 100 g (0.2 lb) (TK853V02)  |
| Length     | 2.0 m (6.56') (TK853V02)   |

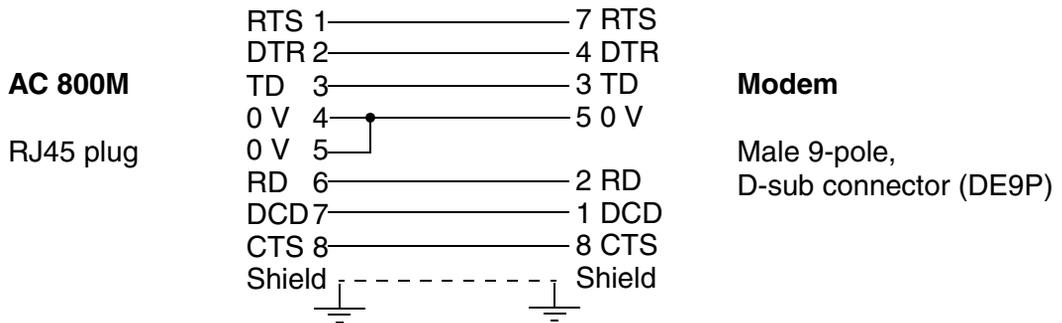


Figure 116. TK853 – Cable Characteristics

### TK855 RCU Data Link Cable

The TK855 Redundant Control Unit Data Link Cable, connected between redundant PM891 units, transfers the data required to keep the backup PM891 synchronized with the primary PM891.

## TK856 RCU Control Link Cable

The TK856 Redundant Control Unit Control Link Cable, connected between redundant PM891 units, provides role selection and CPU identity assignment (UPPER/LOWER).

## TK212A Tool Cable

### Technical Data

Table 129. TK212A Tool Cable – Technical Data

| Item       | Value  |
|------------|--|
| Connectors | <ul style="list-style-type: none"> <li>One 9-pole female D-type</li> <li>One 8-pole RJ45 plug</li> </ul> |
| Weight     | 125 g (0.3 lb)   |
| Length     | 3.0 m (9.84')  |

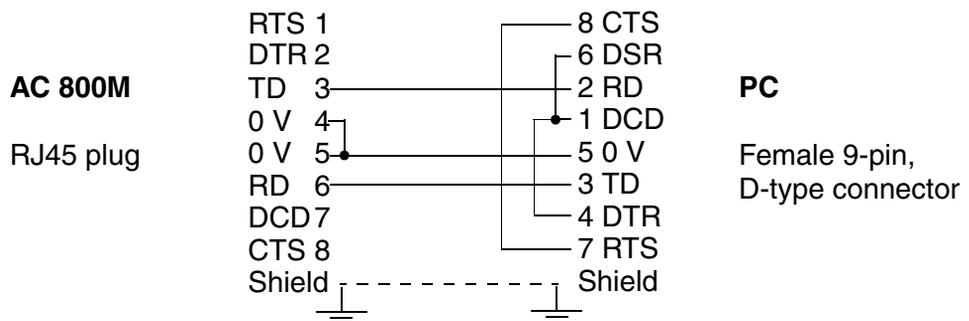
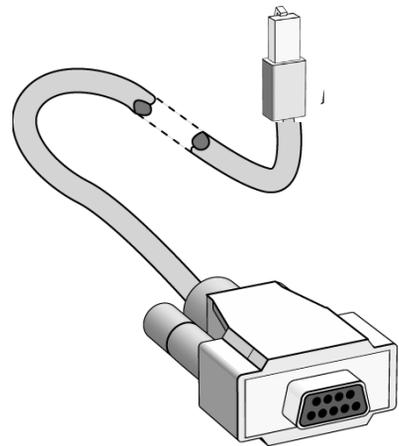


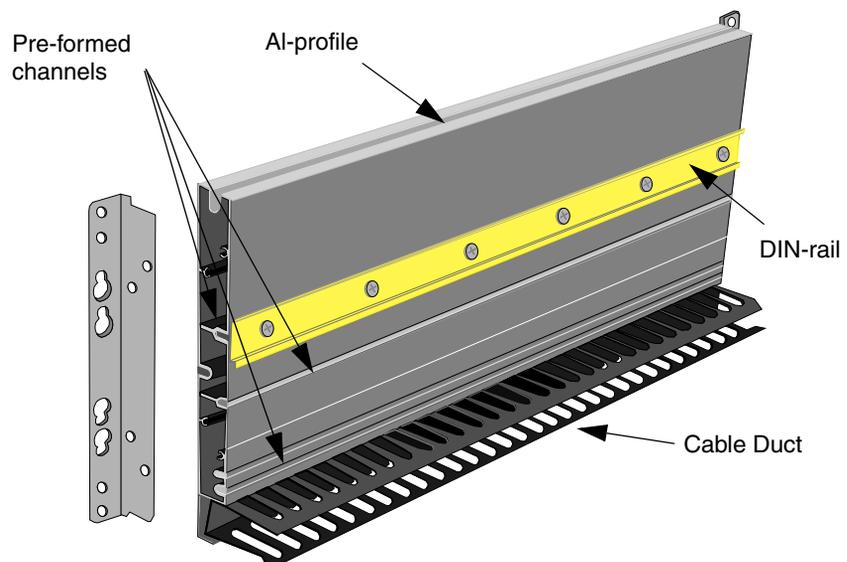
Figure 117. TK212A – Cable Characteristics

## Al-Profile Support For DIN-Rail

Units comprising the AC 800M controller are mounted onto DIN-rails (type: TS 35/7.5). However, the DIN-rail itself is not rigid enough to support the units on its own. For this reason a support is recommended, such as an Al-profile, specifically designed for supporting DIN-rails (see [Figure 118](#) on page 403 and [Figure 119](#) on page 404).

Key features of the Al-profile are:

- Simple mounting.
- No drilling required; profile incorporates pre-formed channels suitable for self-tapping screws.
- Provides secure mounting in locations subject to extreme vibration, see [Figure 18](#) on page 69.
- Rigid construction.
- Easy-fit, press-in cable-retaining duct.



*Figure 118. Al-Profile for DIN-rail Support*

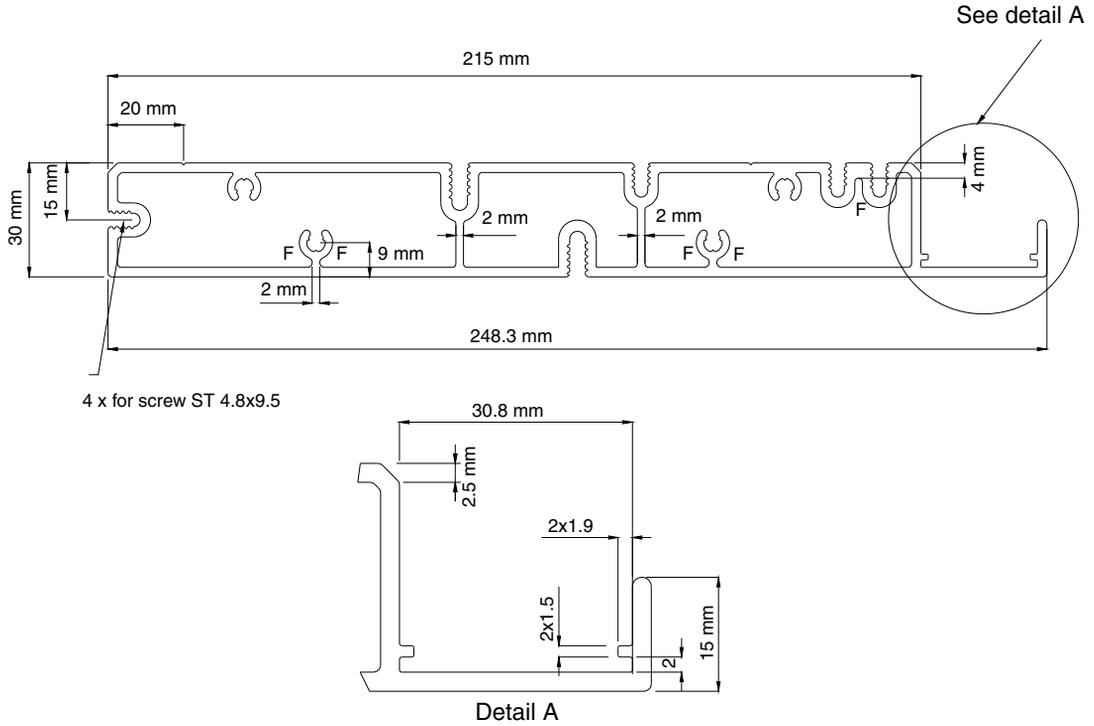


Figure 119. Al-Profile for DIN-rail - Dimension Drawing

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# Appendix B Power Consumption

## General

At an ambient temperature of 40°C (104°F) it is considered unnecessary to calculate the heat dissipation requirements for a standard AC 800M Controller with S800 I/O configuration, mounted within ABB floor-mounted or wall-mounted cabinets.

For a standard AC 800M Controller configuration housed within a floor-mounted or wall-mounted cabinet, the recommended fuse rating for the external mains supply is:

*Table 130. AC 800M Mounted in ABB Cabinet – Fuse Requirements*

| Fuse Rating | Fuse Type           |
|-------------|---------------------|
| 10 A        | Delayed-action fuse |

Should the configuration be other than that stated, detailed instructions for calculating current consumptions can be found in the following text.

The following tables present current consumption and power dissipation for all relevant hardware units included in AC 800M Controller.

Use this information for:

- Dimensioning the supply requirements of an AC 800M and S800 I/O configuration.
- Calculating cabinet-generated power loss.

The values given in the tables are typical and adapted to these applications. It is assumed that 70% of unit channels are active simultaneously.

## Current Consumption and Power Dissipation

See [Table 131](#) on page 406 for typical current consumption and power dissipation data for AC 800M units.

*Table 131. Current Consumption and Power Dissipation Data for AC 800M Units*

| Unit       | Current at 24 V |        | Power Dissipation |        | Remarks |
|------------|-----------------|--------|-------------------|--------|---------|
|            | Typical         | Max    | Typical           | Max    |         |
| PM851      | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM856      | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM860      | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM851A     | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM856A     | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM860A     | 180 mA          | 300 mA | 5.0 W             | 8.0 W  | (1)     |
| PM861      | 250 mA          | 430 mA | 6.0 W             | 10.3 W | (1)     |
| PM861A     | 250 mA          | 430 mA | 6.0 W             | 10.3 W | (1)     |
| PM864      | 287 mA          | 487 mA | 6.9 W             | 11.4 W | (1)     |
| PM864A     | 287 mA          | 487 mA | 6.9 W             | 11.4 W | (1)     |
| PM865      | 287 mA          | 487 mA | 6.9 W             | 11.4 W | (1)     |
| PM866      | 210 mA          | 360 mA | 5.1 W             | 8.6 W  | (1)     |
| PM891      | 660 mA          | 750 mA | 15.8 W            | 18 W   | (1)     |
| BC810      | 50 mA           | 70 mA  | 1.2 W             | 1.7 W  |         |
| SM810      | 160 mA          | 250 mA | 3.8 W             | 6.0 W  |         |
| SM811      | 160 mA          | 250 mA | 3.8 W             | 6.0 W  |         |
| CI851      | 150 mA          | 200 mA | 3.6 W             | 5.0 W  |         |
| CI852      | 140 mA          | 200 mA | 3.4 W             | 5.0 W  |         |
| CI853      | 100 mA          | 150 mA | 2.4 W             | 3.6 W  |         |
| CI854/854A | 190 mA          | 240 mA | 4.6 W             | 5.8 W  |         |

Table 131. Current Consumption and Power Dissipation Data for AC 800M Units

| Unit  | Current at 24 V |        | Power Dissipation |       | Remarks |
|-------|-----------------|--------|-------------------|-------|---------|
|       | Typical         | Max    | Typical           | Max   |         |
| CI855 | 150 mA          | 200 mA | 3.6 W             | 5.0 W |         |
| CI856 | 120 mA          | 200 mA | 2.9 W             | 5.0 W |         |
| CI857 | 150 mA          | 200 mA | 3.6 W             | 5.0 W |         |
| CI858 | 150 mA          | 200 mA | 3.6 W             | 5.0 W |         |
| CI860 | 100 mA          | 150 mA | 2.4 W             | 3.6 W |         |
| CI862 | 190 mA          | 200 mA | 3.0 W             | 4.0 W |         |
| CI865 | 120 mA          | 200 mA | 2.9 W             | 5.0 W |         |
| CI867 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |
| CI868 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |
| CI869 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |
| CI871 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |
| CI872 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |
| CI873 | 160 mA          | 250 mA | 3.8 W             | 6.0 W |         |

- (1) These figures apply only to the PM8xx. For current-consumption data relating to the CEX-Bus and the ModuleBus units, see [Table 132](#) on page 407. Due to transfer or conversion losses in the CPU when current supply to ModuleBus and CEX-Bus is utilized, the CPU power dissipation increases by maximum 5 W (3 W for PM851/PM851A) in addition to the values given in [Table 131](#) on page 406.

The CPU supplies current, via TP830, to units on the CEX-Bus and ModuleBus, see [Table 132](#) on page 407.

Table 132. CPU Current Supply to CEX-Bus and ModuleBus

| Bus                      | +5 V                      | +24 V      |
|--------------------------|---------------------------|------------|
| ModuleBus <sup>(1)</sup> | max. 1.5 A <sup>(2)</sup> | max. 1.0 A |
| CEX-Bus                  | Not Applicable            | max. 2.4 A |

- (1) Not for PM891  
 (2) Corresponds to additional 0.5 A on +24 V.

Maximum current of the +24 V supplied to the CPU (incl. ModuleBus and CEX-Bus) is shown in [Table 133](#) on page 408:

*Table 133. Maximum Current Supply to CPU incl. ModuleBus and CEX-Bus (24 V)*

| <b>CPU</b>             | <b>Maximum Supply Current</b> |
|------------------------|-------------------------------|
| PM851                  | 2.2 A                         |
| PM856                  | 4.2 A                         |
| PM860                  | 4.2 A                         |
| PM851A                 | 2.2 A                         |
| PM856A                 | 4.2 A                         |
| PM860A                 | 4.2 A                         |
| PM861 (single)         | 4.3 A                         |
| PM861 (redundant pair) | 3.3 A (no ModuleBus)          |
| PM861A                 | 4.3 A                         |
| PM864 (single)         | 4.4 A                         |
| PM864 (redundant pair) | 3.4 A (no ModuleBus)          |
| PM864A                 | 4.4 A                         |
| PM865 (single)         | 4.4 A                         |
| PM865 (redundant pair) | 3.4 A (no ModuleBus)          |
| PM866 (single)         | 4.2 A                         |
| PM866 (redundant pair) | 3.2 A (no ModuleBus)          |
| PM891(single)          | 3.2 A (no ModuleBus)          |
| PM891 (redundant pair) | 3.9 A (no ModuleBus)          |

**Calculations**

1. Calculate the current requirements for each bus (ModuleBus and CEX-Bus). Be sure not to exceed the limits given in [Table 132](#) on page 407. Data relating to TB820, TB840, CI801 and CI840 is accessible from the S800 I/O documentation.
2. Calculate the current consumption at 24 V, for each electrical ModuleBus, by adding:

$$I_m = I_{(24\text{ V})} + I_{(5\text{ V})} \times 0.3$$

3. To calculate the requirement for a specific power supply unit, total the results of the 24V current consumption calculations, as follows:

$$I_{\text{tot}} = I_{m1} + I_{m2} + \dots + I_{\text{units Table 131}} + I_{\text{CI801s}} + I_{\text{CI840s}} + I_{\text{TB820s}} + I_{\text{TB840s}}$$

If redundant CPUs are used, current for both CPUs must be included.



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# Appendix C Recommended Components

## Recommended Components

All recommended components listed below were successfully utilized during exhaustive tests made by ABB, prior to launching the AC 800M Controller.

*Table 134. Recommended Components – PROFIBUS DP*

| <b>Component</b> | <b>Description</b>   |
|------------------|--|
| PROFIBUS DP      | Due to the large selection of commercially available equipment manufactured to PROFIBUS DP Standard, there is no recommendation for specific PROFIBUS DP components.<br>For further details refer to PROFIBUS DP Web Site. |

Table 134. Recommended Components – PROFIBUS DP (Continued)

| Component                               | Description  |
|---|--|
| PROFIBUS DP/PA Linking Device (LD 800P) | <p>LD 800P performs the following tasks:</p> <ul style="list-style-type: none"> <li>• Potential separation between the PROFIBUS DP and the PROFIBUS PA</li> <li>• Conversion of the RS 485 physical arrangement of the PROFIBUS DP to the physical arrangement based on IEC 61158-2 of the PROFIBUS PA.</li> <li>• Adapting the PROFIBUS DP transfer rate to the PROFIBUS PA transfer rate of 31.25 kBd.</li> <li>• Power supply of PROFIBUS PA stations over the bus line.</li> <li>• Diagnostics via LEDs.</li> <li>• Ensuring intrinsic safety if the PL 890 power link module with an intrinsically safe interface is used.</li> </ul> <p>A PROFIBUS DP master (class 1 master), which organizes the exchange of process data, is contained in the controller (PLC/PCS). Moreover, a configuration tool, usually a PC, can be connected as class 2 master to the PROFIBUS DP. Parameterization and configuration of the bus elements usually takes place by means of this configuration tool - even during operation. This is performed using the acyclic channel of the PROFIBUS DP or PROFIBUS PA. LD 800P supports both cyclic as well as acyclic PROFIBUS communication.</p> |

Table 134. Recommended Components – PROFIBUS DP (Continued)

| Component                                       | Description   |
|---|---|
| PROFIBUS DP/PA Linking Device (LD 800P) (cont.) | <p>The way in which LD 800P works is essentially transparent. This means that PROFIBUS DP masters have direct access to PROFIBUS PA slaves. This offers the following advantages:</p> <ul style="list-style-type: none"><li>• No configuration of the Linking Device is required</li><li>• PROFIBUS PA slaves can be treated like PROFIBUS DP slaves</li><li>• There is no PROFIBUS DP address setting on the Linking Device</li><li>• Because of this, there is no restriction on the amount of data to 244 bytes of I/O data per PROFIBUS PA segment for the PROFIBUS PA.</li></ul> <p>See <a href="#">Figure 120</a> on page 414 for LD 800P Interface. For more information see fieldbus documentation.</p> |

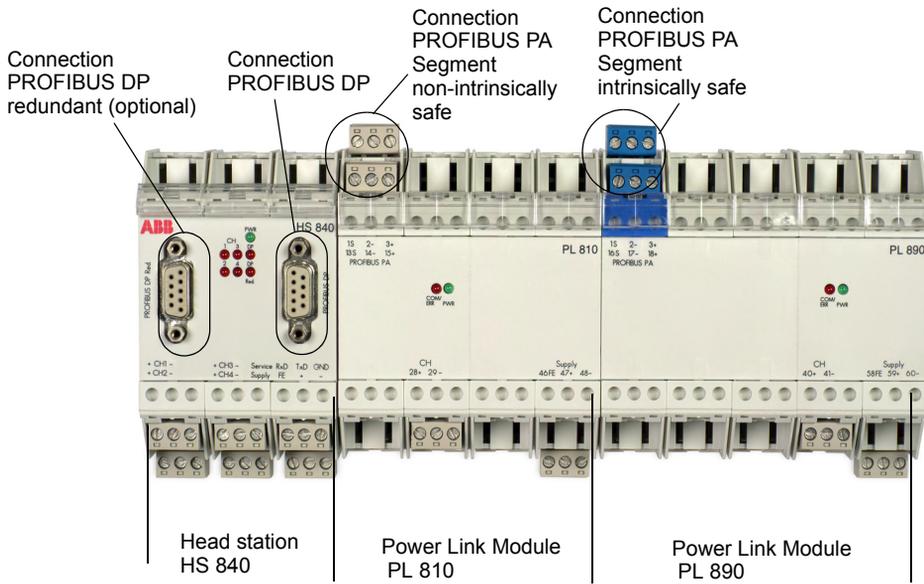


Figure 120. LD 800P Interface

Table 135. Recommended components - PROFINET IO

| Component | Description  |
|-----------|--|
| MNS iS    | MNS iS is a motor control center solution that can be used in PROFINET IO network. MNS iS delivers all the functions for control, protection and monitoring of motors and motor starters using software and hardware modules for the specific tasks. <i>MLink</i> , one of the interface modules in MNS iS, serves as the serial gateway interface to higher level systems which communicate to all modules through PROFINET IO. |

Table 136. Recommended components - EtherNet/IP and DeviceNet

| Component | Description  |
|-----------|--|
| LD 800DN  | The LD 800DN adapter, which functions as a gateway to connect control level networks with device level networks, provides a router or bridge functionality to connect EtherNet/IP to DeviceNet. The LD 800DN provides centralized data storage for data that is shared between the DeviceNet and Ethernet/IP networks. |

*Table 137. Recommended Components – FOUNDATION Fieldbus*

| <b>Component</b>    | <b>Description</b>   |
|---------------------|--|
| FOUNDATION Fieldbus | <p>Due to the large selection of commercially available equipment manufactured to FOUNDATION Fieldbus Standard (IEC 1158-2), there is no recommendation for specific FOUNDATION Fieldbus components.</p> <p>This statement covers all FOUNDATION Fieldbus equipment, including:</p> <ul style="list-style-type: none"><li>• FOUNDATION Fieldbus filters.</li><li>• FOUNDATION Fieldbus bus spur distribution terminals.</li><li>• FOUNDATION Fieldbus termination.</li></ul> <p>For further details refer to FOUNDATION Fieldbus documentation and the FOUNDATION Fieldbus Web Site.</p> |

Table 138. Recommended Components – FOUNDATION Fieldbus High Speed Ethernet

| Component                               | Description   |
|---|---|
| FOUNDATION Fieldbus High Speed Ethernet | <p>All used components must be compatible with the FOUNDATION Fieldbus High Speed Ethernet specification.</p> <p>FOUNDATION Fieldbus High Speed Ethernet use a high speed bus (for example 100 Mbit/s) and in addition providing redundancy. The HSE architecture is effectively an enhanced standard Ethernet model (IEEE 802.3). The HSE Application Layer contains the Dynamic Host Configuration Protocol (DHCP), Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP).</p> <p><b>System data High Speed Ethernet (HSE)</b></p> <p><b>Max. devices: Has IP addressing, which can support unlimited nodes</b></p> <p><b>Max. baudrate: 100 Mbit/s</b></p> <p><b>Typical max. extension:</b><br/>100m at 100Mbit/s on twisted pair,<br/>2000m at 100Mbit/s on fibre</p> <p><b>Vendor specific restrictions apply.</b></p> <p><b>Physical Media:</b> Twisted pair, fibre</p> <p><b>Network Topology:</b> Star</p> |

Table 138. Recommended Components – FOUNDATION Fieldbus High Speed Ethernet (Continued)

| Component                                      | Description   |
|--|---|
| FOUNDATION Fieldbus Linking Device (LD 800HSE) | <p>The LD 800HSE is a gateway between an FF High Speed Ethernet (FF-HSE) subnet and FF-H1 links. It supports device redundancy.</p> <p>The Linking Device is designed according to class 42c of the HSE profile, therefore providing the following functions:</p> <ul style="list-style-type: none"> <li>• It supports up to four separate FF-H1 links. In each of these links, the Linking Device can be operated as the Link Master as well as the Time Manager.</li> <li>• Identification of the devices connected to the H1 links.</li> <li>• Configuration of the connected H1 devices by <b>System Management</b> and <b>Network Management</b> via HSE.</li> <li>• Access to the function blocks of the connected H1 devices via HSE.</li> <li>• <b>Republishing</b> of process data from one H1 link into another.</li> <li>• <b>Republishing</b> of process data from H1 to HSE and vice versa.</li> </ul> <p>See <a href="#">Figure 121</a> on page 419 for LD 800HSE Interface. For more information see fieldbus documentation.</p> |

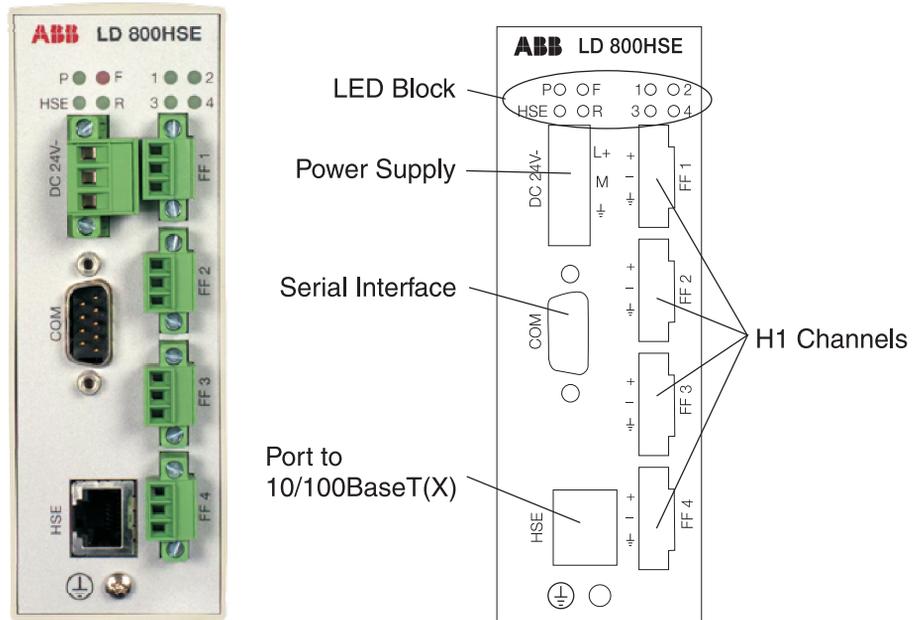


Figure 121. LD 800HSE Interface

Table 139. Recommended Components for Control Networks

| Component                                 | Description   |
|---|---|
| HUBS<br>(For Non-Industrial Environments) | 3Com Hub, 8/TPO – (8 ports, RJ45)<br>BayStack, 350/24 – (24 port, Star topology, RJ45)  |
| HUBS<br>(Industrial Environments)         | Hirschmann Rail Hub RH1-TP– (4 ports, RJ45)   |
| SWITCHES<br>(Industrial Environments)     | Hirschmann Rail Switch RS2 (8 ports, Ring, Bus or Star topology RJ45)<br>On-Time Switch<br>(FSU100 series, FSU200 series, FSU208, FSR208, FST208) |
| CABLES                                    | Electrical – Class 5, or higher, STP<br>Optical – As recommended by Manufacturer of HUBS and SWITCHES   |

Table 140. Recommended Components – Miscellaneous

| Component            | Description  |
|----------------------|--|
| DIN-rail             | Phoenix: <ul style="list-style-type: none"> <li>• TS 35/7.5</li> <li>• Steel, yellow chromated with holes</li> <li>• DIN 46 277, EN 50 022</li> </ul>  |
| DIN-rail Accessories | DIN-rail end support device<br>Phoenix: UK 4-TG+ST-BE<br>(Standard commercially available components)  |
| Cabinets             | ABB Automation Technology Products, LV systems<br>Wall cabinet RE820 <ul style="list-style-type: none"> <li>• For 3 DIN-rails</li> <li>• W 800 x H 1200 x D 330 mm (31.5 x 40.1 x 13.0 in)</li> <li>• IP54</li> </ul> Floor cabinet RM550 <ul style="list-style-type: none"> <li>• For 6 DIN-rails</li> <li>• W 840 x H 2125 x D 512 mm (33.1 x 83.7 x 20.2 in)</li> <li>• IP54</li> </ul> See <a href="#">Figure 49</a> on page 146, <a href="#">Figure 50</a> on page 147 and <a href="#">Figure 51</a> on page 148. |

Table 141. Recommended Components – Process Cables

| Component                               | Description   |
|---|---|
| Mains                                   | Various Manufacturers, to Standard; <ul style="list-style-type: none"> <li>• RKFK 3x1.5 mm<sup>2</sup></li> </ul>   |
| RS-232C                                 | Unitronic <ul style="list-style-type: none"> <li>• CY 3 x 0.25 mm<sup>2</sup></li> <li>• CY 7x 0.25 mm<sup>2</sup></li> </ul> Belden <ul style="list-style-type: none"> <li>• Belden 8723 2 pair (0.34 mm<sup>2</sup>)</li> <li>• Belden 9729 2 pair (0.22 mm<sup>2</sup>)</li> <li>• Belden 9730 3 pair (0.34 mm<sup>2</sup>)</li> </ul> |
| FOUNDATION Fieldbus                     | Unitronic <ul style="list-style-type: none"> <li>• Suitable Commercially Available Cable.</li> </ul> Belden <ul style="list-style-type: none"> <li>• Suitable Commercially Available Cable.</li> </ul>  |
| FOUNDATION Fieldbus High Speed Ethernet | <ul style="list-style-type: none"> <li>• All cables must correspond to ISO / IEC 11801 2nd edition. Use in minimum cable of category 5 / link class D (UTP cables).</li> <li>• Max. length 100 m from CI860 to next Ethernet device (Twisted pair).</li> </ul>  |
| PROFIBUS DP                             | Unitronic <ul style="list-style-type: none"> <li>• Twisted pair, 0.34 mm<sup>2</sup></li> <li>• Unitronic-Bus L2/F.I.P</li> </ul> Belden <ul style="list-style-type: none"> <li>• Twisted pair, 0.34 mm<sup>2</sup></li> <li>• Belden 3079A</li> </ul>  |

Table 141. Recommended Components – Process Cables (Continued)

| Component                   | Description   |
|-----------------------------|---|
| PROFINET IO Interface CI871 | <ul style="list-style-type: none"> <li>• Use in minimum cable of category 5 (STP cables).</li> </ul> <p>For more information, refer to <i>Automation System Network Design and Configuration (3BSE034463*)</i>.</p> |
| TRIO Fieldbus CI862         | <ul style="list-style-type: none"> <li>• See <a href="#">Table 142</a></li> </ul>   |
| Modbus TCP Interface CI867  | <ul style="list-style-type: none"> <li>• Use in minimum cable of category 5 (STP cables).</li> <li>• Max. length 30 m from CI867 to next Ethernet device.</li> </ul>  |
| IEC 61850 Interface CI868   | <ul style="list-style-type: none"> <li>• Use in minimum cable of category 5 (STP cables).</li> <li>• Max. length 30 m from CI868 to next Ethernet device.</li> </ul>  |
| AF 100 Interface CI869      | <ul style="list-style-type: none"> <li>• Twisted pair cable according to IEC 1158-2 fieldbus standard.</li> <li>• Max. 750m per segment.</li> </ul>   |
| EtherNet/IP Interface CI873 | <ul style="list-style-type: none"> <li>• Use in minimum cable of category 5 (STP cables).</li> <li>• Max. length 30 m from CI873 to next Ethernet device.</li> </ul>  |

Table 142. Cables for the CI862 TRIO Field Bus

| Cable                 | Outer Diameter in (mm) | Terminating Resistor ( $\Omega$ ) | Indoor Installation       | Conductors / AWG | DiElectric Voltage | Ambient Temp. Rating ( $^{\circ}\text{C}$ ) | NEC Rating         |
|-----------------------|------------------------|-----------------------------------|---------------------------|------------------|--------------------|---|--------------------|
| Taylor 6201C          | .35 (8.89)             | 150                               | in conduit                | 2 / #22          | 30                 | 60  | CL2 <sup>(1)</sup> |
| B3078F <sup>(2)</sup> | .385 (9.78)            | 150                               | cable tray <sup>(3)</sup> | 2 / #22          | 300                | 75  | PLTC/CM            |
| A9823C <sup>(4)</sup> | .35 (8.89)             | 150                               | in conduit                | 2 / #22          | 30                 | 60  | CL2                |
| C4596 <sup>(5)</sup>  | .35 (8.89)             | 150                               | in conduit                | 2 / #22          | 30                 | 60  |                    |
| B89182                | .308 (7.82)            | 150                               | in plenum                 | 2 / #22          | 150                | 200   | CL2P               |
| B9207                 | .33 (8.38)             | 100 <sup>(6)</sup>                | in conduit                | 2 / #20          | 300                | 75  | CM                 |
| B89207                | .267 (6.78)            | 100 <sup>(6)</sup>                | in plenum                 | 2 / #20          | 150                | 200   | CMP                |
| A4794                 | .282 (7.16)            | 100 <sup>(6)</sup>                | in plenum                 | 2 / #20          | 150                | 200   |                    |
| B9815                 | .33 (8.38)             | 100 <sup>(6)</sup>                | direct burial             | 2 / #20          |                    | 80  | NONE               |
| B9855                 | .270 (6.86)            | 100 <sup>(6)</sup>                | in conduit                | 4 / #22          | 150                | 60  | CM/MP              |
| B89696                | .264 (6.71)            | 100 <sup>(6)</sup>                | in plenum                 | 4 / #22          | 150                | 200   | CMP/MPP            |
| B89855                | .240 (6.10)            | 100 <sup>(6)</sup>                | in plenum                 | 4 / #22          | 150                | 200   | CMP/MPP            |
| B9463                 | .243 (6.17)            | 75                                | in conduit                | 2 / #20          | 300                | 80  | CM                 |
| A9814                 | .243 (6.17)            | 75                                | in conduit                | 2 / #22          | 150                | 60  | CM                 |
| B9302                 | .244 (6.2)             |                                   | in conduit                | 4 / #22          | 300                | 80  | CM                 |

(1) Cables rated CL2 can go into a wire tray.

(2) B stands for Belden.

(3) Can also be used in cable tray outdoors.

(4) A stands for Alpha.

(5) C stands for Consolidated.

(6) Use the 110 ohm option on the CI862 if termination is required (see [Bus Termination](#) on page 124).





---

## Appendix D Directive Considerations

Relevant products comply with EMC Directive EMCD 2004/108/EC and Low Voltage Directive LVD 2006/95/EC. The products are provided with a CE marking.

### Electro-Magnetic Compatibility (EMC)

Modules mentioned in this document, for which the product or packing is CE marked, are tested and approved according to the following standards:

- EN 61131-2 Product Standard, Programmable Controller  
- Industrial Environment
- EN 61000-6-4 EMC – Generic Emission Standard,  
Part 4 – Industrial Environment
- EN 61000-6-2 EMC – Generic Immunity Standard,  
Part 2 – Industrial Environment.

### Low-Voltage Directive (LVD)

Modules mentioned in this manual, for which product or packing is CE marked, comply with the LVD where applicable.

To fulfill the LVD for AC 800M and S800 I/O, the power supplies shall provide a secondary Safety Extra Low Voltage (SELV) or a Protected Extra Low Voltage (PELV). The power supplies described in this manual, SD82X and SD83X, fulfill these requirements, see [Power Supply Units – Types SD821, SD822 and SD823](#) on

page 356 and [Power Supply Units - Types SD831, SD832, SD833, and SD834](#) on page 363.



If you use other power supplies, except SD82X and SD83X, to provide the 24V d.c. for AC 800M it is required that they also are CE marked, Underwriters Laboratories (UL ) listed and fulfill the LVD (SELV and PELV) criteria.



The AC 800M modules are IP20 semi-protected equipment and must be mounted in non-public localities.

---

## Appendix E Standards

The information below is applicable to products approved for hazardous locations according to CSA and/or UL standard UL60079-15 (2002).

### Hazardous Location Approval

To comply with CSA and/or UL certification for use at hazardous locations, the following information is relevant for CSA and/or UL-certified ABB industrial control products.

- Equipment labeled with reference to Class I, Zone 2, AEx nC IIC, hazardous locations is suitable for use in Class I, Zone 2, AEx nC IIC, or non-hazardous locations only.
- Equipment labeled with reference to Class I, Zone 2, AEx nC IIC, hazardous locations and is to be mounted in Class I, Zone 2, AEx nC IIC, hazardous locations requires an overall enclosure or cabinet with ingress protection rating of IP54 as a minimum. The enclosure shall be capable to withstand an impact of minimum 7 joule and installation is only allowed in pollution degree 2 environment or lower.
- Equipment labeled with reference to Class I, Zone 2, AEx nC IIC, hazardous locations and is to be mounted in Class I, Zone 2, AEx nC IIC, hazardous locations requires that provisions are made to prevent transient disturbances of more than 40% of rated voltage.



Explosion hazard - Substitution of components may impair suitability for Class I, Zone 2.



Explosion hazard - Do not replace batteries unless the power has been switched off or the area is known to be non-hazardous.



Explosion hazard - Do not disconnect equipment unless the power has been switched off or the area is known to be non-hazardous.

---

# Appendix F Environmental Data

## Environmental Data for AC 800M Products

The immunity of products to environmental factors met during operation, transportation and storage is summarized in this section.

**Industrial environment** are supplied with power from a high-voltage or medium-voltage transformer dedicated to supplying installations feeding manufacturing or similar plants. The existence of industrial apparatus and heavy, frequently-switched inductive or capacitive loads characterize an **Industrial environment**. The associated magnetic fields are high.

Control products incl. I/O-systems are normally intended for **Industrial environment**.

Products manufactured by ABB and other companies are normally type-tested or evaluated to ensure compliance with the environmental standards specified below.

Environmental specifications applicable to peripheral equipment, for example printers, may differ. Please refer to the relevant product data sheets.

The degree to which the units resist environmental influence depends on their components and design. System enclosures, cable types and how these are routed determine the environmental specification of the entire system.

## Climatic and Mechanical Environmental Conditions

### Industrial Environment

Table 143. Industrial Environment

| Environmental Specification |                    |  |  | Compliance with Standard             |
|-----------------------------|--------------------|--|--|--------------------------------------|
|                             | Environment Factor | Transportation and Storage                                   | Operative Range  |                                      |
| <b>Climatic Conditions</b>  | Temperature        | -40 to +70°C<br><br>-40 to +60°C                             | <b>Cabinets</b> <sup>(1)</sup> :<br>+5 to +40°C<br><b>Units</b> <sup>(2)</sup> :<br>+5 to +55°C<br>+10 to +40°C <sup>(3)</sup> | EN 61131-2                           |
|                             | Temp. change       | Min. 3 min within temp. range                                | 3°C/min.   | EN 61131-2                           |
|                             | Humidity           | RH=5-95%<br>RH=20-80% <sup>(3)</sup><br>non-condensation     | RH=5-95%<br>RH=20-80% <sup>(3)</sup><br>max 29 g/m <sup>3</sup><br>non-condensation  | EN 61131-2                           |
|                             | Altitude           | 3000 m   | 2000 m   | EN 61131-2                           |
|                             | Pollution degree   | Degree 2   |  | IEC 60664                            |
|                             | Corrosion          | Copper corrosion of 300 Angstrom <sup>(4)</sup> over 28 days | Copper corrosion of 300 Angstrom <sup>(4)</sup> over 28 days   | ISA 71.04 class G1<br>ITF SSG 4251G1 |

Table 143. Industrial Environment (Continued)

| Environmental Specification |                    |   |                 | Compliance with Standard |
|-----------------------------|--------------------|---|-----------------|--------------------------|
|                             | Environment Factor | Transportation and Storage  | Operative Range |                          |
| Mechanical Conditions       | Vibration          | 10 < f < 50 Hz, Continuous:<br>0.0375 mm amplitude<br>(Occasional: 0.075 mm amplitude)<br>50 < f < 150 Hz, Continuous: 0.5 g acceleration<br>(Occasional: 1.0 g acceleration) |                 | EN 61131-2               |
|                             | Emitted noise      | –   | <55dB (A)       |                          |
|                             | Shock, no package  | 5 > f < 8.4 Hz, Continuous: 1.75 mm displacement<br>(Occasional 3.5 mm displacement).<br>8.4 > f < 150 Hz, Continuous 0.5 g acceleration<br>(Occasional 1.0 g acceleration).  |                 | EN 61131-2               |
|                             | Fall in package    | <10 kg: 1 m<br>10–40 kg: 0.5 m<br>>40 kg: 0.25 m<br>>100 kg: 0.025 m  |                 | EN 61131-2               |

- (1) **Cabinets** = Enclosures, Cases, Consoles
- (2) **Units** = Subracks, plug-in units, printed circuit boards
- (3) **Workstation, PC computers and peripherals**, for example printers
- (4) 1000 Angstrom for S800 I/O-family (2000 Angstrom for coated products)

## CE Compliance

All products comply with EMC Directive EMCD 2004/108/EC and Low Voltage Directive LVD 2006/95/EC. Products are CE-marked. Some products require enclosures, as specified in User Guides, to meet the EMC Directives.

Compliance is verified through conformity with the following minimum standards:

- EMC Directive EMCD 2004/108/EC.
- EN 61131-2 Product standard, Programmable controllers.
- EN 61000-6-4 Generic emission standard.
- EN 61000-6-2 Generic immunity standard.
- Low Voltage Directive LVD 2006/95/EC.

## Electromagnetic Compatibility and Main Voltage Conditions

Table 144. Electromagnetic Compatibility and Main Voltage Conditions

| Environmental Specification              |  |   | Compliance with Standard |
|--|--|---|--------------------------|
|  | Environment Factor                                   | Industrial Environment  |                          |
| Electromagnetic Compatibility Conditions | Emission<br>–Radiated<br>–Conducted                  | Class A   | EN 55011                 |
|  | Immunity<br>–Radiated RF field                       | 10V/m 80M - 1000MHz<br>3V/m 1.4G - 2.0GHz<br>1V/m 2.0G - 2.7GHz | EN 61000-4-3             |
|  | Immunity<br>–Conducted RF field                      | 10 V  | EN 61000-4-6             |
|  | Immunity<br>–ESD (Electrical Discharge)              | ±4kV contact discharge<br>±8kV air discharge                    | EN 61000-4-2             |
|  | Immunity<br>–EFT/B (Electrical Fast Transient/Burst) | ±2kV power ports<br>±1kV other lines                            | EN 61000-4-4             |
|  | Immunity<br>–Damped oscillatory wave                 | –   | IEC 60255-22-1           |
|  | Immunity<br>–Power frequency magnetic field          | 30 A/m, cont.<br>3 A/m for CRTs                                 | EN 61000-4-8             |
|  | Immunity<br>–Surge                                   | ±0.5kV common<br>±0.5kV differential                            | EN 61000-4-5             |

Table 144. Electromagnetic Compatibility and Main Voltage Conditions

| Environmental Specification              |  |                            | Compliance with Standard |
|--|--|----------------------------|--------------------------|
|  | Environment Factor   | Industrial Environment     |                          |
| Electromagnetic Compatibility Conditions | Main voltage a.c   | $U_{nom}$ : -15% to +0%    |                          |
|  | Main voltage DC  | -15% to 20% of rated value |                          |
|  | Main frequency a.c.  | 47–63 Hz, $\pm 5\%$        | IEC 60255-6              |
|  | Main voltage interruption, a.c.                              | Max 10 ms                  | EN 61000-4-11            |
|  | Overvoltage Category<br>–Permanently connected equipment     | Class III                  |                          |
|  | Overvoltage Category<br>–Non-permanently connected equipment | Class II                   |                          |

## Installation Requirements

Installation regulations for all products are included in relevant product documentation. Some general installation rules and applications are given below.

### Laying Field Cables

There are no special requirements for laying field and communication cables connected to products. However:

Cables for short-distance communication without modems should always be routed at a distance of 10 cm (4 in.) from other cables.

All product-connected cables should be routed at a distance of 30 cm (12 in.) from non-product power cables (heavy current cables) and 10 cm (4 in.) from class 4 cables of relevant international immunity standards.

### Types of Field Cable

Shielded cables are always necessary for:

- Communications (see product documentation for cable type)
- High-frequency pulse transmission (see product documentation for cable type)
- Low-level analog signals, for example Pt100 and thermocouples

For other applications unshielded cables may be used. Digital and analog signals of the same type can be run on the same cable.

Signal and return conductors should be located on the same cable.

### DIN-Rail Mounting

It is required that the DIN-rail is properly attached to either the prefabricated aluminum profile or a metal sheet with conductive surface. The fulfilment of this requirement will ensure mechanical stability and enable a stable and well defined ground plane for the chassis, which is of great importance from EMC perspective.

## Lightning Protection

Industrial installations and power plants are normally provided with well-integrated grounding networks, installed as part of the power distribution system. Such installations do not require additional lightning protection.

Additional lightning protection is always necessary when:

- Cables extend beyond the area covered by the ground line network
- Cables are located above ground
- Overhead cables are used.

## Inductive Load Suppression

Inductive loads, such as relays and contactors connected directly to products, do not require suppression. The necessary suppression components (varistors or snubbers-RC units) are installed on the circuit boards.

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# Revision History

## Introduction

This section provides information on the revision history of this User Manual.



The revision index of this User Manual is not related to the 800xA 5.1 System Revision.

## Revision History

The following table lists the revision history of this User Manual.

| <b>Revision Index</b> | <b>Description</b>                               | <b>Date</b>  |
|-----------------------|--|--------------|
| -                     | First version published for 800xA 5.1            | June 2010    |
| A                     | Added new contents for AC 800M 5.1.1 and 5.1.0-2 | January 2013 |

## Updates in Revision Index A

The following table shows the updates made in this User Manual for Revision Index A.

| Updated Section/Sub-section   | Description of Update  |
|---|--|
| Section 1, Introduction<br>Section 2, Installation<br>Section 3, Configuration<br>Appendix A, Hardware Units<br>Appendix B, Power Consumption | Added contents for the new AC 800M controllers - PM851A/PM856A/PM860A. |
| Section 5, Maintenance  | Updated contents for the redundancy support of C1873.                  |



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