



SYSTEM VERSION 6.1

ABB Ability™ System 800xA

AC 800M

Controller Hardware





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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 [Warning, Caution, Information, and Tip Icons on page 30](#).

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.
- 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.

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 185](#) 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.

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.

Table: Electrostatic Sensitive Device


	<p>Electrostatic Sensitive Device Devices labeled with this symbol require special handling precautions as described in the installation section.</p>
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Table: Summary table of GENERAL WARNINGS



GENERAL WARNINGS	
	<p>Equipment Environment All components, whether in transportation, operation or storage, must be in a noncorrosive environment.</p>
	<p>Electrical Shock Hazard During Maintenance Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.</p>

Table: Summary table of SPECIFIC WARNINGS











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p. 70		The AC 800M Controller and associated units must be unpowered and disconnected when being mounted onto a DIN-rail!
p. 70		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.
p. 74		AC 800M units must be disconnected from the power source before removing them from a DIN-rail!
p. 74		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.
p. 121		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.
p. 179		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.
p. 186		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.
p. 421		Explosion hazard - Substitution of components may impair suitability for Class I, Zone 2.
p. 421		Explosion hazard - Do not replace batteries unless the power has been switched off or the area is known to be non-hazardous.
p. 421		Explosion hazard - Do not disconnect equipment unless the power has been switched off or the area is known to be non-hazardous.

Table: Summary table of SPECIFIC CAUTIONS









Page	SPECIFIC CAUTIONS
p. 71	 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!
p. 71	 It is essential that the locking device be placed in the LOCKED position to avoid possible problems caused by vibration and/or intermittent grounding.
p. 75	 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.
p. 75	 The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see Figure 2.8 on page 76).
p. 78	 Do not manipulate the locking device. ABB will take no responsibility for errors caused by manipulating locking devices.
p. 79	 For PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 insert the RCU Link Termination plug TB852, at the RCU Link connector. The termination plug must always be used 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.
p. 80	 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.
p. 89	 Note that in redundant CPU configuration, COM3 and the electrical ModuleBus on the baseplate can not be used.

Table: Summary table of SPECIFIC CAUTIONS
(Continued)






Page	SPECIFIC CAUTIONS
p. 90	 <p>Note that the RCU Link Cable TK851 or TK857 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.</p>
p. 91	 <p>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.</p>
p. 95	 <p>Do not connect the two CEX-Bus segments, separated with BC810, to each other with CEX-Bus extension cable TK850.</p>
p. 96	 <p>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 2.18 or according to Figure 2.19 and nor is it allowed to change the configuration by way of for instance individual circuit breakers between modules.</p>
p. 96	 <p>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. In an AC 800M HI controller this is unconditionally and intentionally leading to a shutdown of the controller.</p> <p>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.</p>

Table: Summary table of SPECIFIC CAUTIONS
(Continued)








Page	SPECIFIC CAUTIONS
p. 101	 Do not connect the two CEX-Bus segments, separated with BC820, to each other with CEX-Bus extension cable TK850.
p. 103	 Hot swap of the BC820 located next to a primary or single controller CPU, otherwise called “direct BC820”, might jeopardize the whole controller and should not be performed unless every module on the CEX-Bus are in a non-operating state.  Hot swap of the BC820 is not located next to a primary or single controller CPU, if located then “indirect BC820”, will shut down and non-redundant interface located on that CEX-Bus segment, should not be performed unless such interfaces already are in a non-operating state or their function is dispensable for the controller.
p. 103	 Hot swap of the BC820 located next to a primary or single controller CPU, otherwise called “direct BC820”, might jeopardize the whole controller and should not be performed unless every module on the CEX-Bus are in a non-operating state.  Hot swap of the BC820 is not located next to a primary or single controller CPU, if located then “indirect BC820”, will shut down and non-redundant interface located on that CEX-Bus segment, should not be performed unless such interfaces already are in a non-operating state or their function is dispensable for the controller.
p. 137	 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 2.38 .
p. 139	 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.

Table: Summary table of SPECIFIC CAUTIONS
(Continued)













Page	SPECIFIC CAUTIONS
p. 149	 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.
p. 151	 Note that the electrical ModuleBus can only be used for connection of S800 I/O when AC 800M is running in single CPU configuration.
p. 174	 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.
p. 178	 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.
p. 187	 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 55 . 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.
p. 188	 Removing the RCU link cable from the primary CPU in some rare cases might cause the CPU to stop. Hence, the recommendation is to remove the RCU link cable from the processor unit to be exchanged.

Table: Summary table of SPECIFIC CAUTIONS
(Continued)

Page	SPECIFIC CAUTIONS
p. 189	 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 55 . 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.
p. 188	 The unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see Figure 2.8 on page 76).
p. 189	 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 refer to the Release Notes (see Released User Manuals and Release Notes on page 33) for detailed information.
p. 189	 Do not replace the optical cable online in a previous version than 5.0. The support for online replacement also depends on hardware Product Revision levels. Please refer to the Release Notes (see Released User Manuals and Release Notes on page 33) for detailed information.
p. 419	 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.
p. 419	 The AC 800M modules are IP20 semi-protected equipment and must be mounted in non-public localities.

About this User Manual



The System 800xA Safety AC 800M High Integrity Safety Manual (3BNP004865*) must be read completely by users of 800xA High Integrity. The recommendations and requirements found in the safety manual must be considered and implemented during all phases of the life cycle.



Any security measures described in this user manual, for example, for user access, password security, network security, firewalls, virus protection, and so on, 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 system.

This User Manual 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 33](#)).

User Manual Conventions

Microsoft Windows conventions as defined in the *Microsoft Manual of Style* are normally used for the standard presentation of material when entering text, key sequences, prompts, messages, menu items, screen elements, and so on.

Warning, Caution, Information, and Tip Icons

This user manual 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 that could result in *electrical shock*.



Warning icon indicates the presence of a hazard that 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 that 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 Terminology and Acronyms (3BSE089190*)*. The listing includes terms and definitions that apply to the 800xA System where the usage is different from commonly accepted industry standard definitions.

Table: Terminology

Term/Acronym	Description
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.

*Table: Terminology
(Continued)*


Term/Acronym	Description
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.
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.

*Table: Terminology
(Continued)*

Term/Acronym	Description
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.
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 EMC Directive EMCD 2014/30/EU, Low Voltage Directive LVD 2014/35/EU and RoHS Directive 2011/65/EU where applicable. 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 Documents (3BUA000263*)*.

System 800xA Released User Documents (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 Library and myABB/My Control System portal when released as part of a major or minor release or System Revision.
- Published to ABB Library and myABB/My Control System portal when a User Manual or Release Note is updated in between any of the release cycles listed in the first bullet.

1 Introduction

1.1 Product Overview

1.1.1 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/PM857/PM858/PM860/PM860A/
PM861/PM861A/PM862/PM863/PM864/PM864A/PM865/PM866/
PM866A/PM867/PM891)
- High Integrity Processor Unit
(consists of PM865 with SM810/SM811 or PM857/PM863/PM867 with SM812, all
with corresponding baseplates)
- Communication interfaces for different protocols (including baseplates)
(CI853/CI854/CI854A/CI854B/CI855/CI856/CI857/CI858/
CI860/ CI862/CI865/CI867/CI868/CI869/CI871/CI872/CI873)
- CEX-Bus Interconnection Unit
(BC810/BC820)

- 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.

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.

PM866A is equivalent to PM866 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 with SM810/SM811 or PM857/PM863/PM867 with SM812 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 1.1 shows the physical appearance of an AC 800M Controller with an S800 I/O Unit. This physical appearance does not apply to PM891.

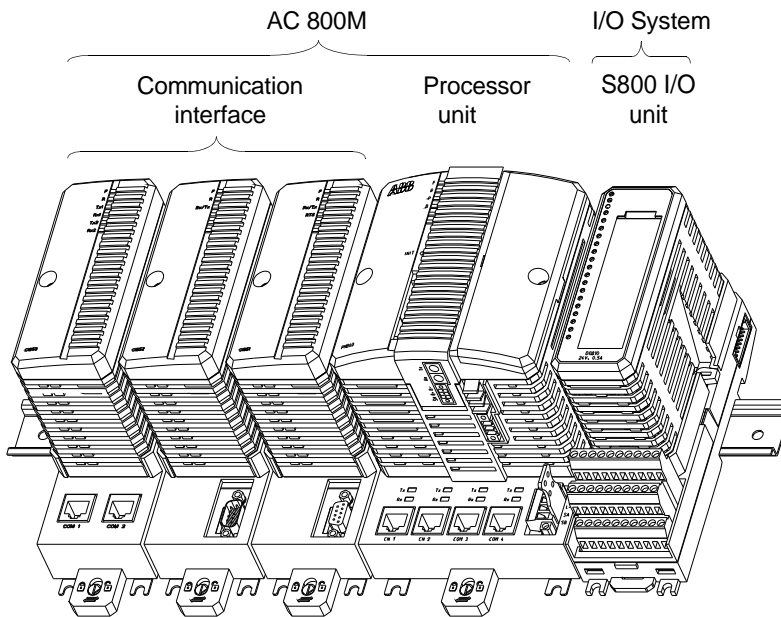


Figure 1.1: Example of an AC 800M Controller (except PM891) with an S800 I/O Unit

Figure 1.2 shows the PM861 processor unit that is part of the AC 800M controller. This processor unit is different from PM891.

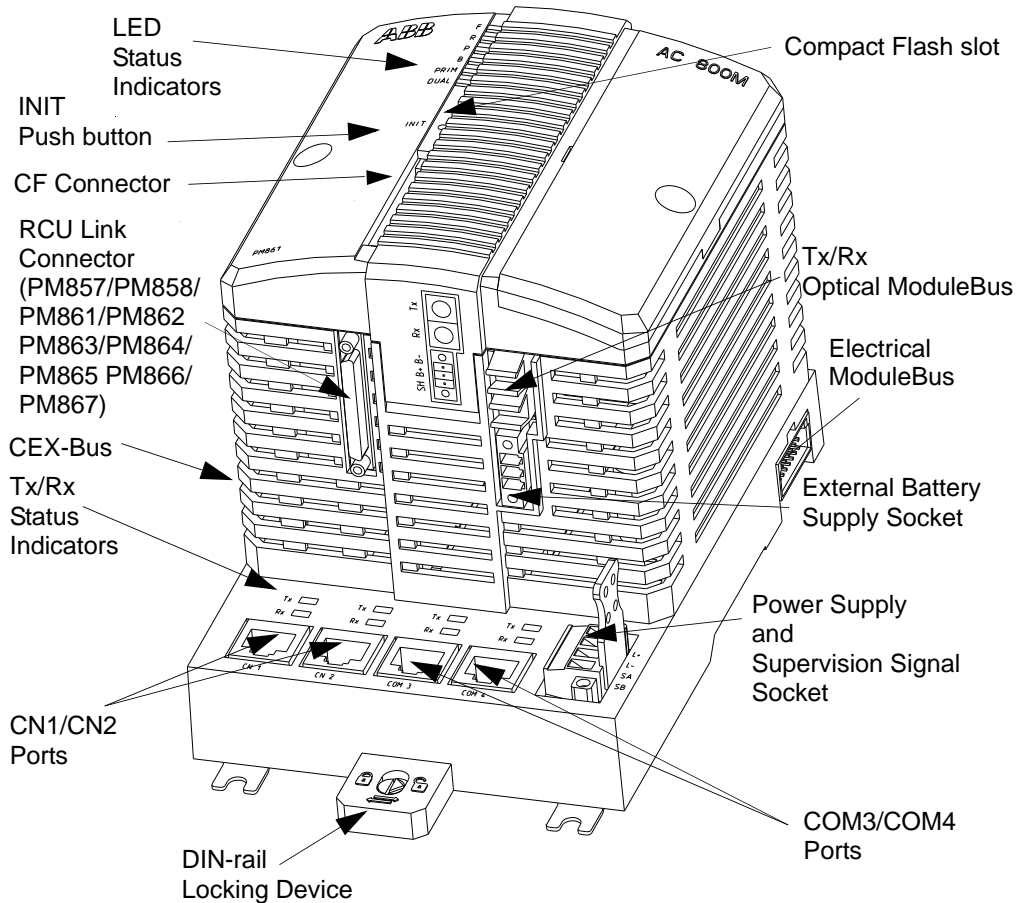


Figure 1.2: Processor Unit – General View (here shown with PM861)

1.1.2 PM8xx/TP830 Processor Unit – General



The topic does not apply to PM891. See [PM891 Processor Unit – General on page 45](#).

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

- Processor Unit
(PM851/PM851A/PM856/PM856A/PM857/PM858/PM860/PM860A/PM861/PM861A/PM862/PM863/PM864/PM864A/PM865/PM866/PM866A/PM867) with processor and Power Supply boards.
- Baseplate (TP830), housing the unit termination board.

For the Functional Block Diagram, see [Figure 1.4 on page 41](#) and [Figure 1.5 on page 42](#). 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.

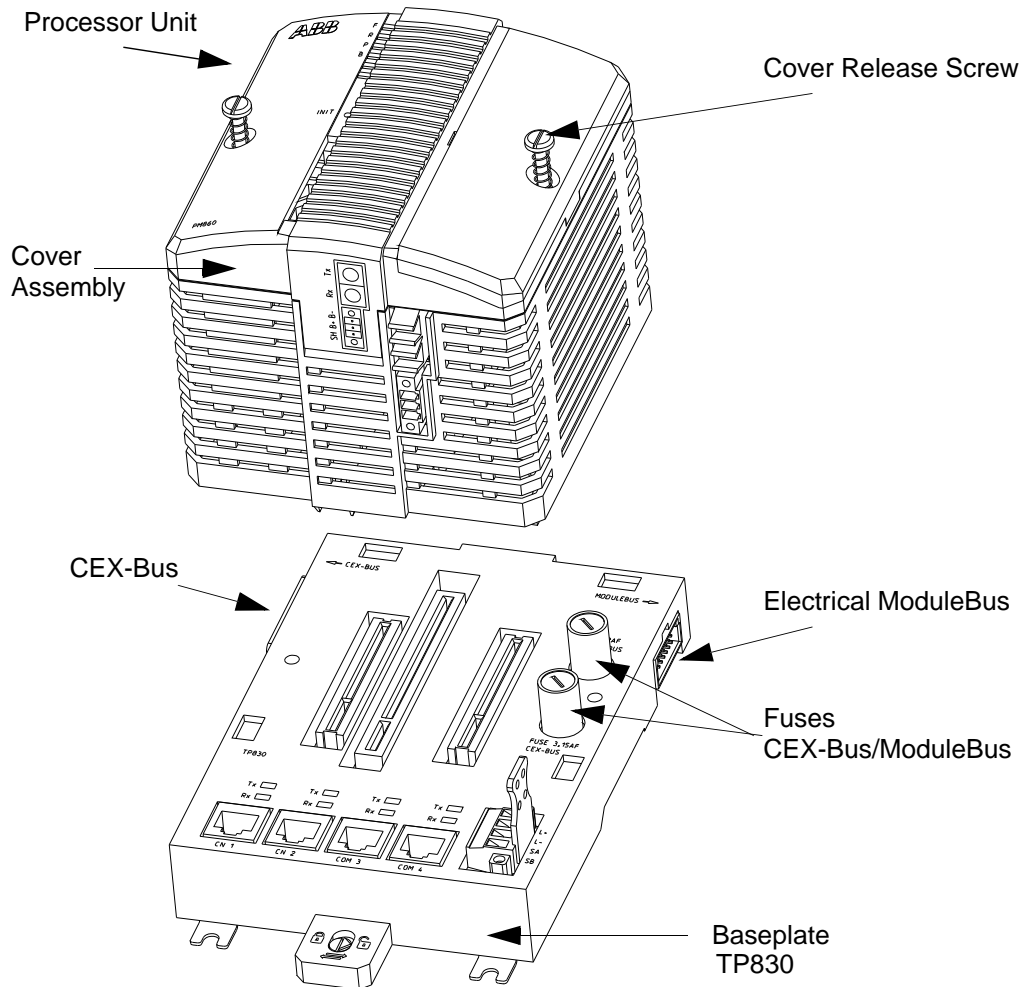


Figure 1.3: Processor Unit Assembly – General View
(here shown with PM860/TP830)

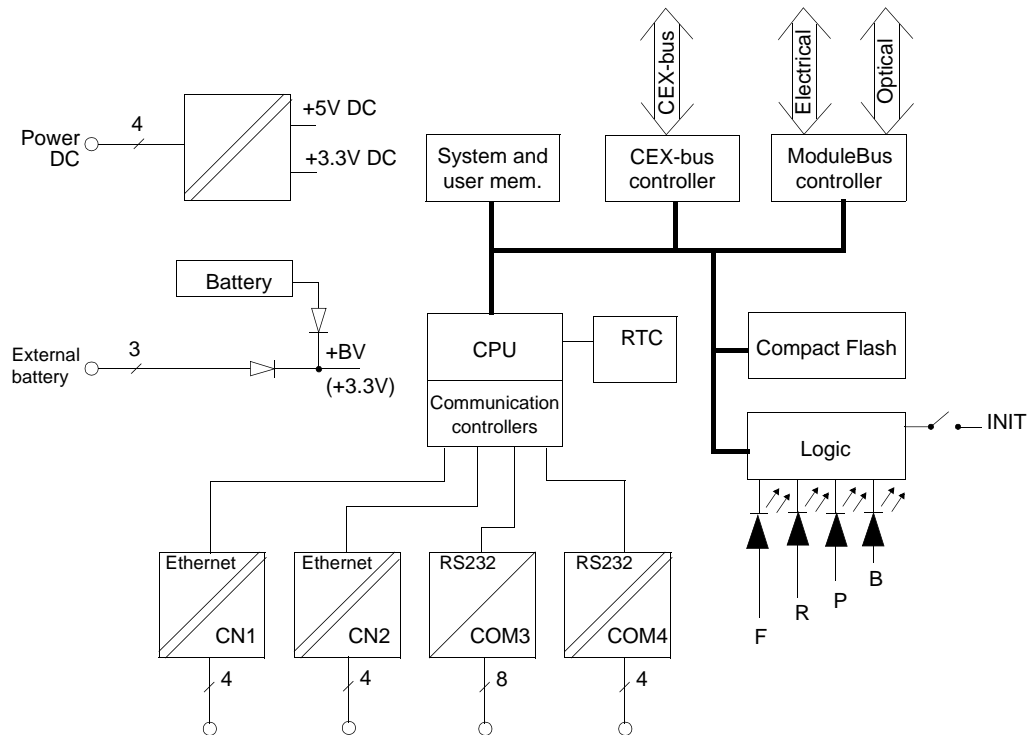


Figure 1.4: PM851/PM856/PM860 – Functional Block Diagram



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

1 Introduction

1.1 Product Overview

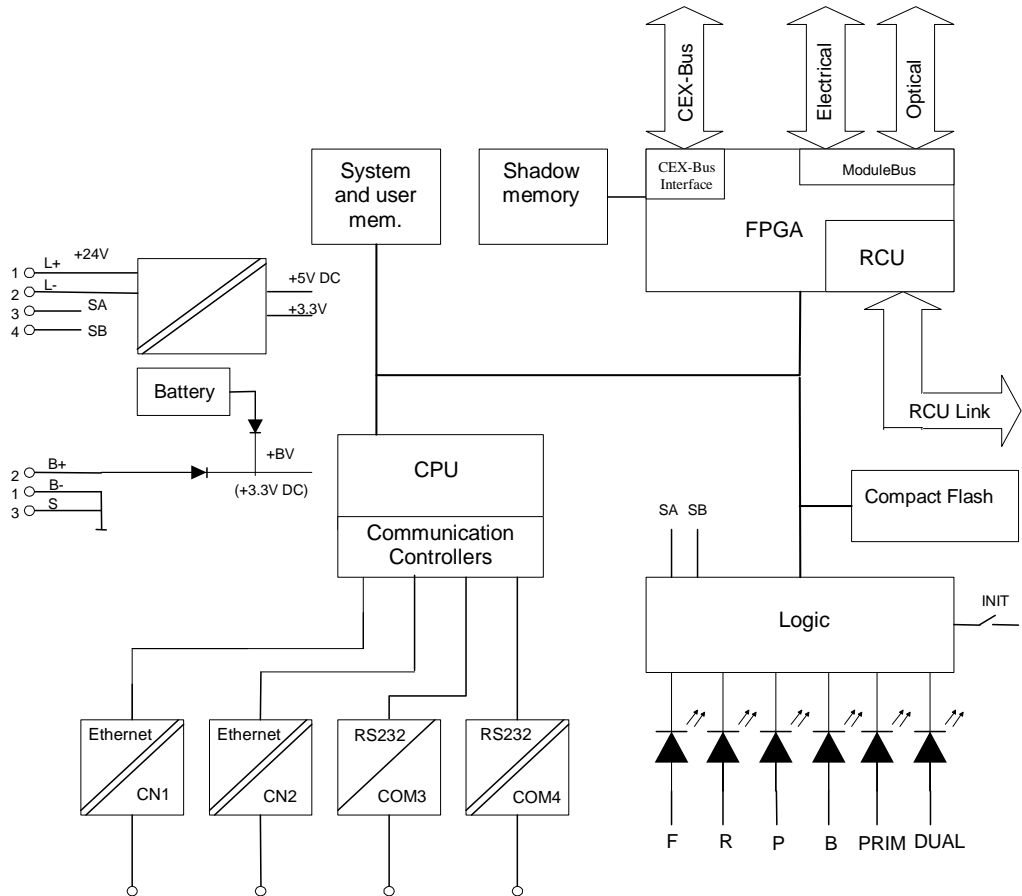


Figure 1.5: PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 – Functional Block Diagram

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 1.6 on page 44 provides examples of various ways to connect the S800 I/O units. It can be seen, at the top right-hand area of Figure 1.6 on page 44, 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 1.6 on page 44, 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 1.7 on page 45 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.

1 Introduction
 1.1 Product Overview

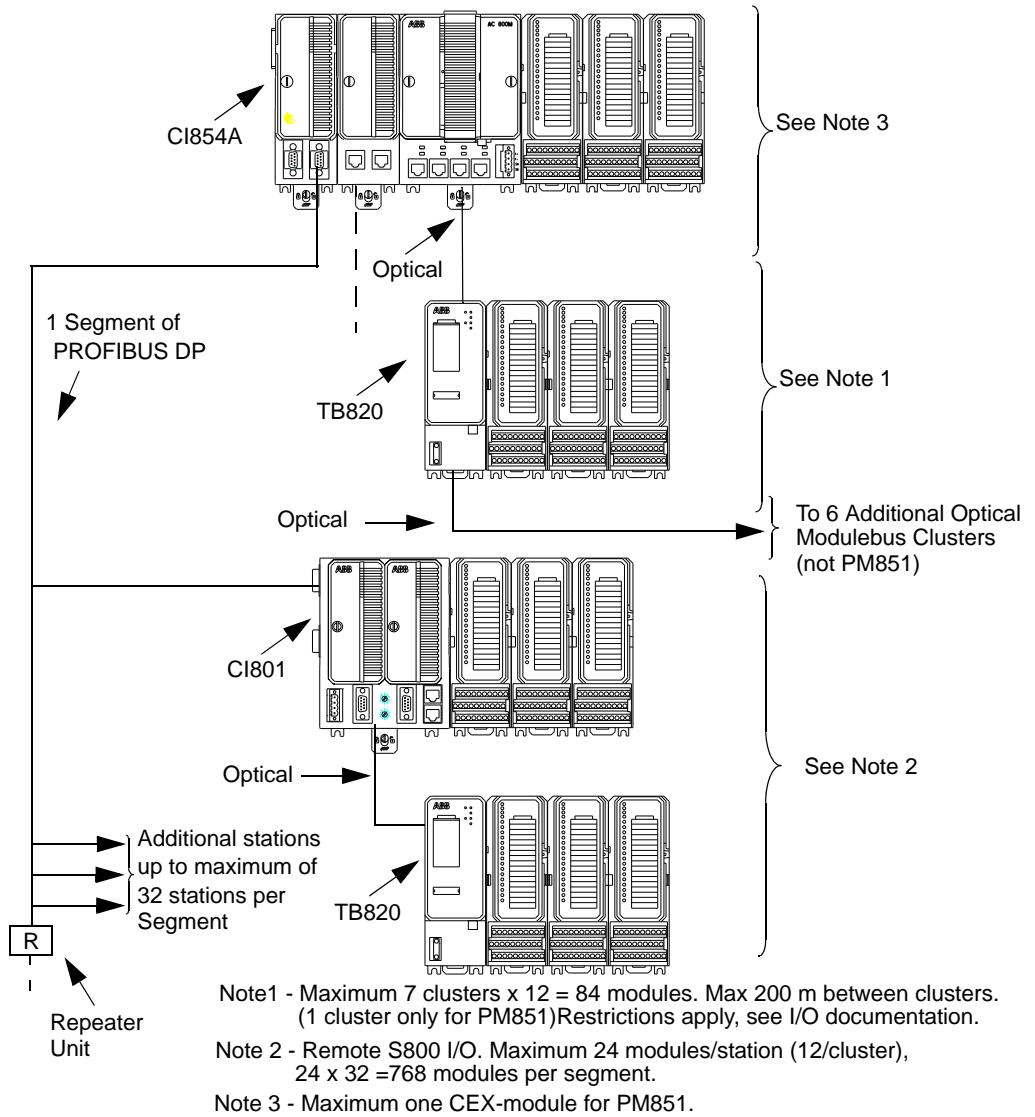


Figure 1.6: Example of AC 800M/S800 I/O Interconnection in Single CPU Configuration

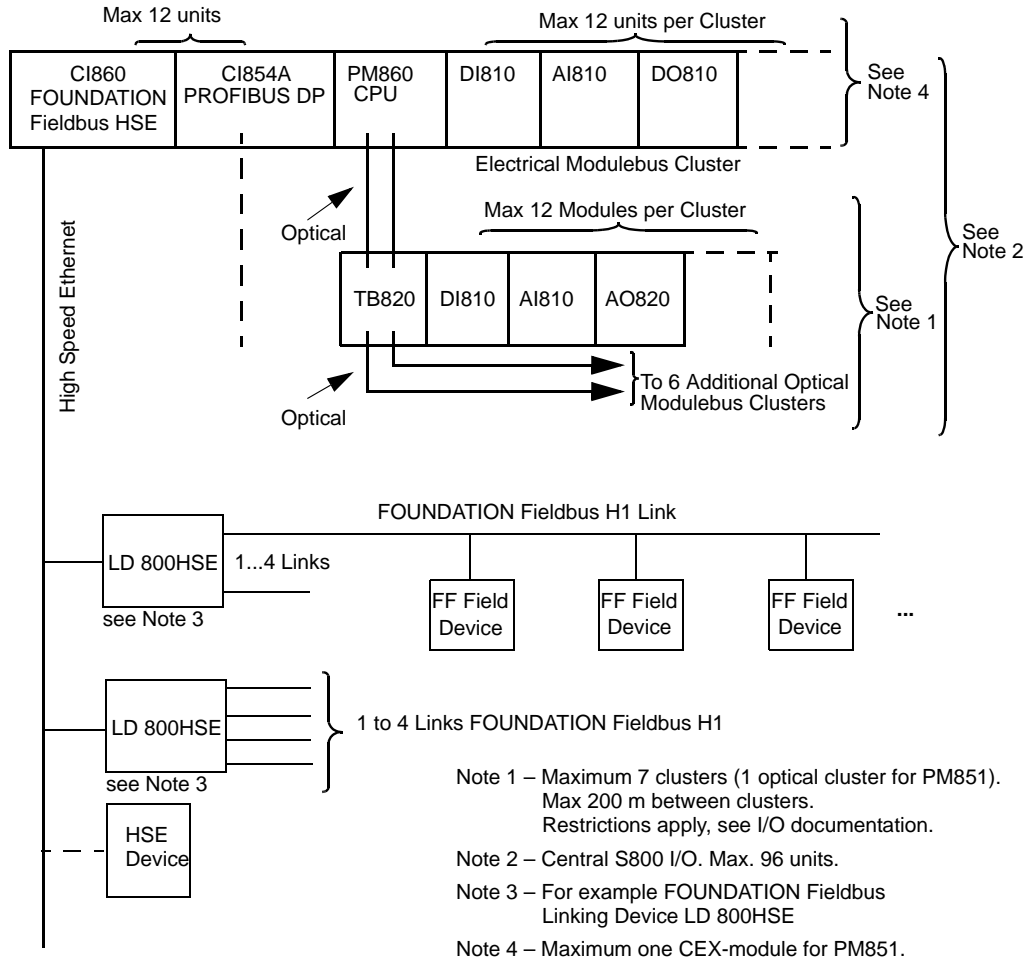


Figure 1.7: Example of AC 800M/S800 I/O and FOUNDATION Fieldbus High Speed Ethernet Interconnection in Single CPU Configuration

1.1.3 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 Communication 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 1.8](#) shows the front view, [Figure 1.9](#) shows the top view, and [Figure 1.10](#) shows the bottom view of PM891.

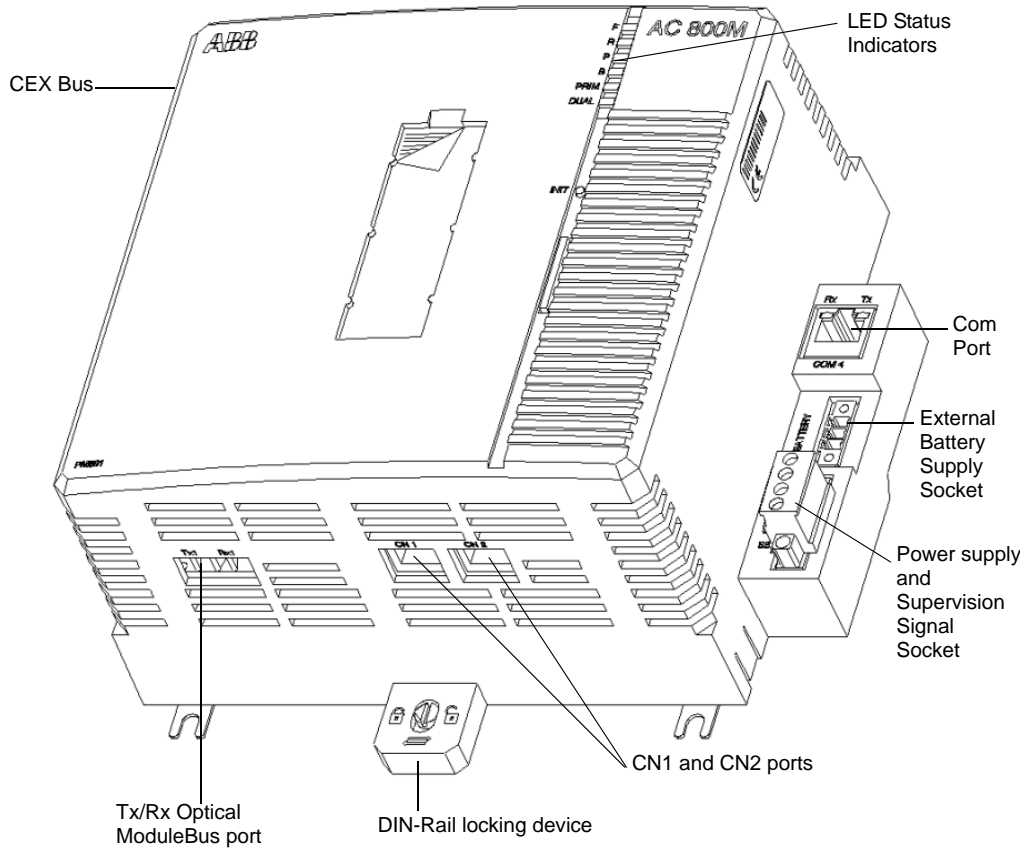


Figure 1.8: PM891-Front view

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.

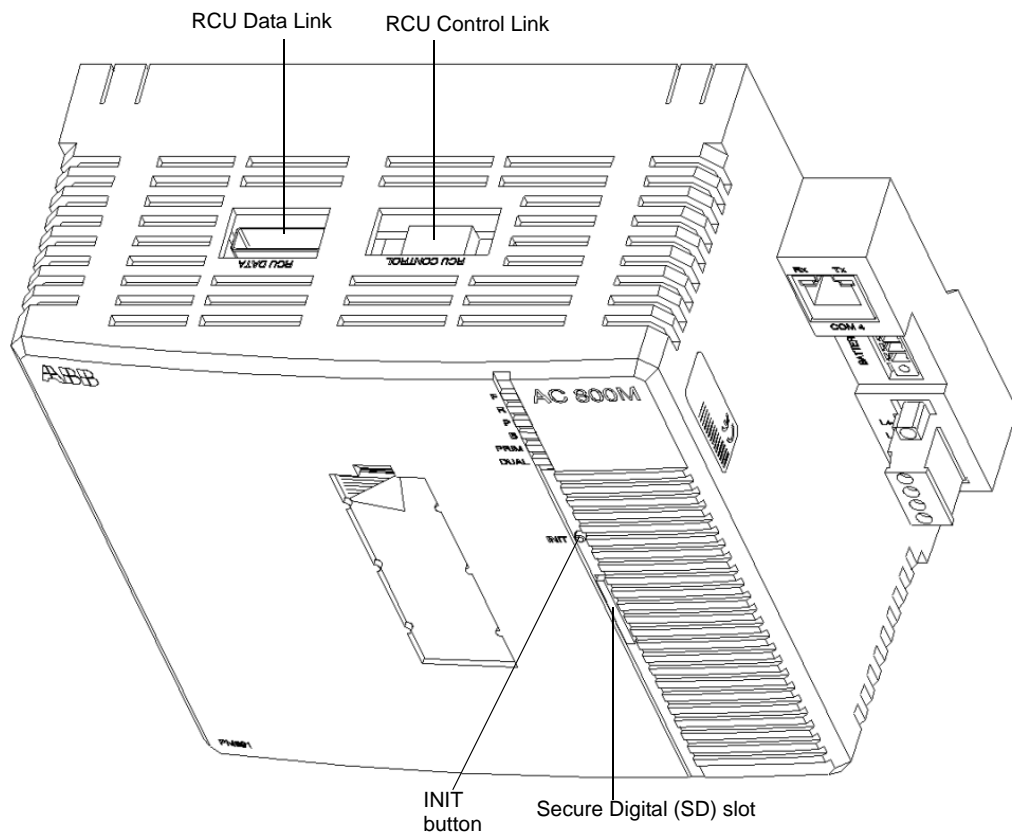


Figure 1.9: PM891-Top view

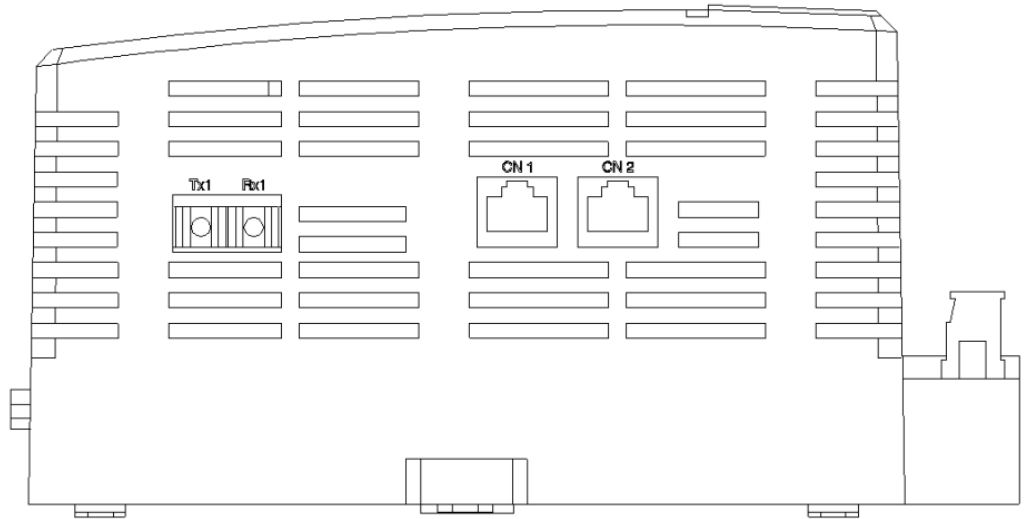


Figure 1.10: PM891 - Bottom view with Tx1/Rx1 and CN1/CN2 ports.

The Redundancy Link consists of two cables; RCU Data Link Cable and RCU Control Link Cable (see [Figure 1.9](#)).

[Figure 1.11](#) shows the block diagram of PM891.

1 Introduction
1.1 Product Overview

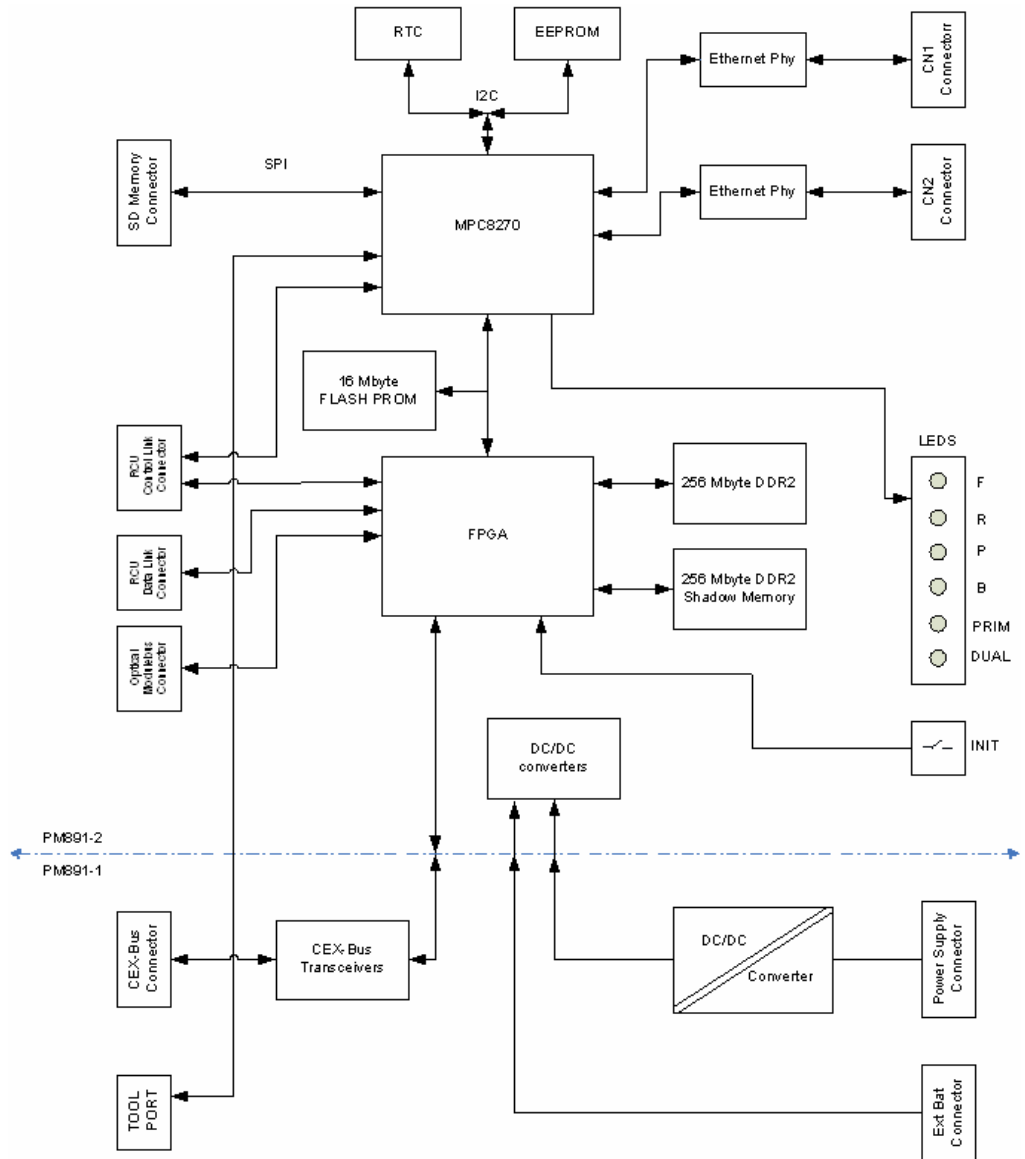


Figure 1.11: Block diagram of PM891

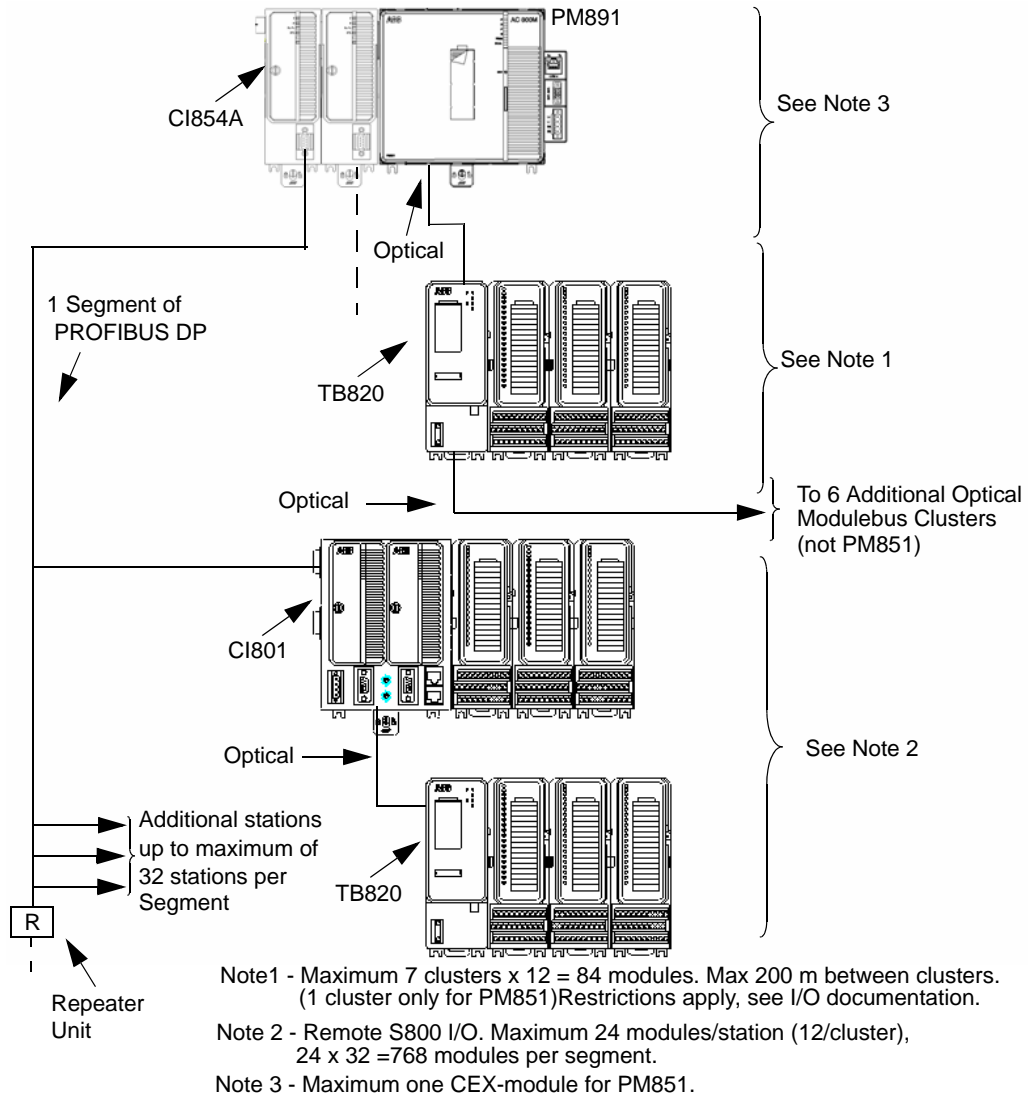


Figure 1.12: AC 800M/S800 I/O Interconnection Configuration with single PM891

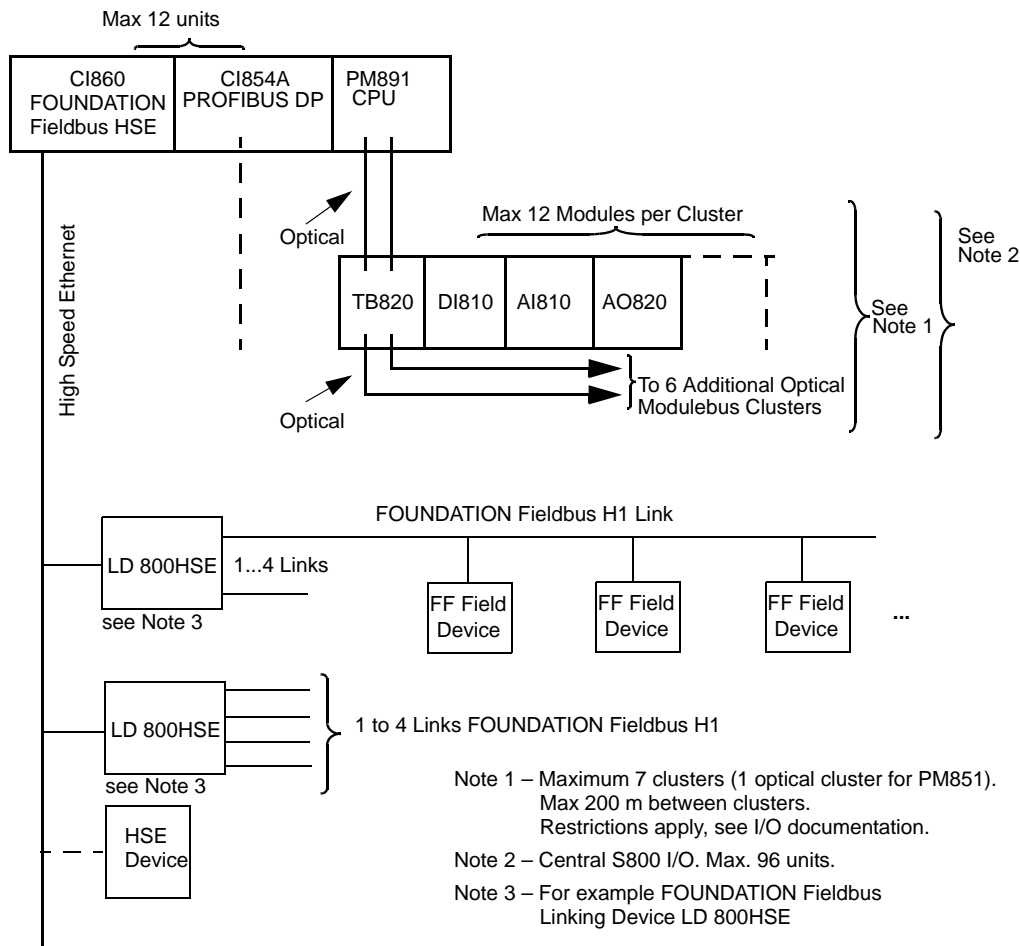


Figure 1.13: Example of AC 800M/S800 I/O and FOUNDATION Fieldbus High Speed Ethernet Interconnection in Single PM891 Configuration

1.1.4 PM8xx/TP830 Processor Unit – Redundancy

Processor unit redundancy is available for PM857, PM858, PM861, PM862, PM863, PM864, PM865, PM866, PM867 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.

PM85x/PM86x/TP830 Redundancy



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

The PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 has an RCU Link Connector for connecting the RCU Link Cable (see [Figure 1.2 on page 38](#)). 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 2.14 on page 92](#)).

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 3.3 on page 153](#)). 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.

1.1.5 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 with SM810/SM811 or
- PM857/PM863/PM867 with SM812,
- SS823 and
- S800 I/O High Integrity, running a High Integrity version of Control Software.

The PM857/PM863/PM865/PM867 processor unit has increased internal diagnostics, compared to PM864. The added functionality on PM857/PM863/PM865/PM867 includes:

- Double over voltage protection on internal voltages
- A additional watchdog timer updated with data from SM810/SM811 or SM812 respectively.
- Increased oscillator supervision
- Support for S800 I/O High Integrity

- Support for SM810/SM811 or SM812 respectively.
- Increased system diagnostic and online self tests.



The following CEX modules cannot be used in a High Integrity controller: 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 or SM812 operates like an SM810 for SIL2 but can also together with the PM865 or PM857/PM863/PM867 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 PM857/PM863/PM865/PM867 and an inverted CRC32 from the SM810/SM811/SM812. 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 or SM812 with PM857/PM863/PM867. 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.

1.1.6 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.

1.1.7 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 1.14 on page 58](#) for label location details. See software documentation for details on loading the software and using Ethernet address.

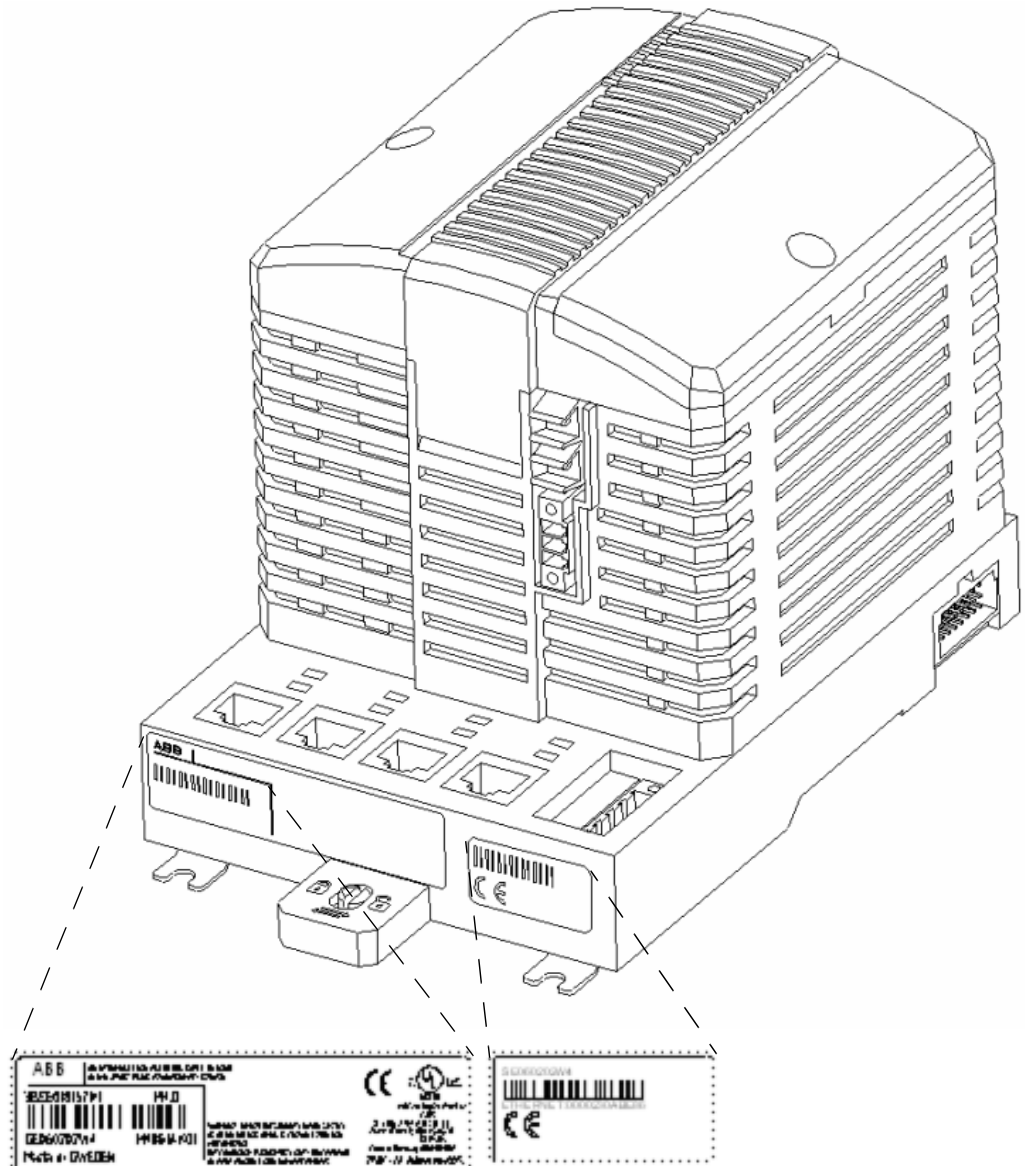


Figure 1.14: Identification Labels and their position on PM8xx (except PM891)

1.1.8 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 1.15 on page 59](#) for label location details of PM891. See software documentation for details on loading the software and using Ethernet address.

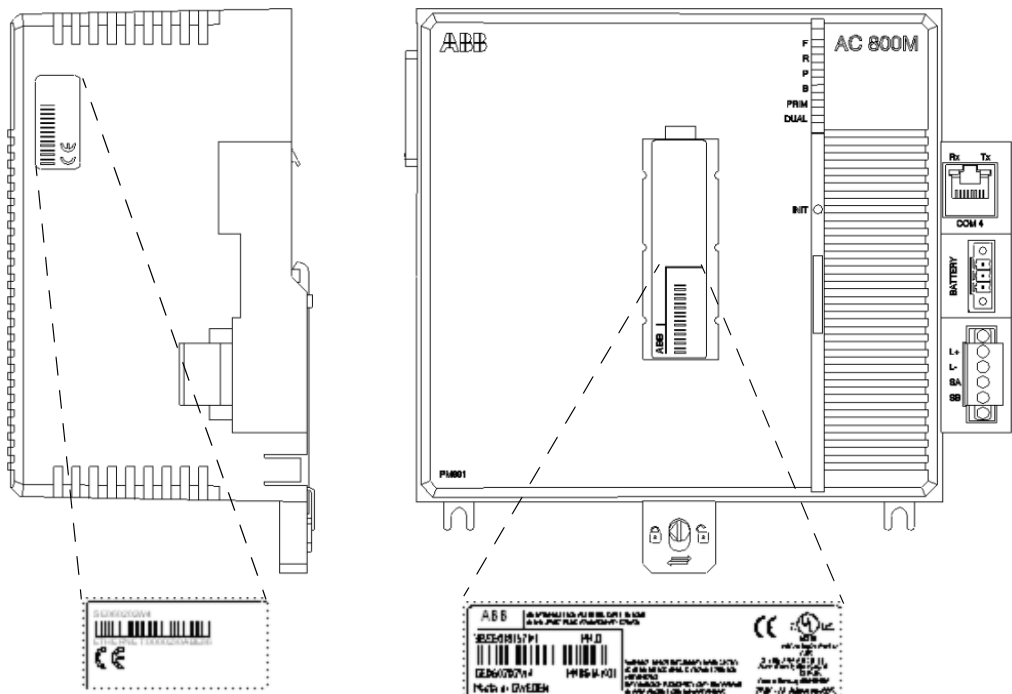


Figure 1.15: Identification Labels and their position on PM891

1.2 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.
- 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
(PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891).
- Redundant/sectioned CEX-Bus using a pair of BC810 or BC820.
- Safety Integrity Level 2 certified controller using PM865 with SM810/SM811 or PM857/PM863/PM867 with SM812.

- Safety Integrity Level 3 certified controller using PM865 with SM811 or PM857/PM863/PM867 with SM812.
- Support for hot swap of CEX-Bus units.

1.3 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 1.1 on page 61](#) for the product version release history of AC 800M.

Table 1.1: AC 800M Release History

Version	Description	User Doc
6.1	PM857 and PM863 added.	3BSE036351-610
6.0.2	PM858 added.	3BSE036351-600 A
6.0	PM862, PM866A, PM867, SM812, BC820, and CI854B are added. CI851 and CI852 are removed.	3BSE036351-600
5.1.1	PM851A, PM856A, and PM860A are added. 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
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	3BSE036351R101

*Table 1.1: AC 800M Release History
(Continued)*

Version	Description	User Doc
3.0	PM865, PM861A, PM864A, BC810, SM810, CI854A, CI858, CI860 and SS823 are added.	3BSE030827R201
2.1	PM864 is added.	3BSE027941R301
2.1	CI855 and CI856 are added.	3BSE027941R101
2.0	PM861 and CI854/CI857 are added.	3BSE026020R101
1.1	PM856 and CI852 are added.	3BSE019193R201
1.0	Initial AC 800M release.	3BSE019193R101

2 Installation

This section contains guidelines for planning the installation of an AC 800M controller system (see [Site Selection and Building Requirements on page 63](#)). A complete list of measures to be taken with respect to the environment and other on-site conditions is not given here. For more information refer to *System 800xA AC 800M and S800 I/O - Installation Rules (3BSE085885*)*

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 68](#)).

2.1 Site Planning

2.1.1 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](#).

2.1.2 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.

2.1.3 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 mm² (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 2.1 on page 67](#).

Table 2.1: 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.

2.1.4 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](#).

2.2 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.

2 Installation

2.2 Mounting AC 800M Units onto DIN-Rail

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.

2.2.1 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.

2.2.2 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.

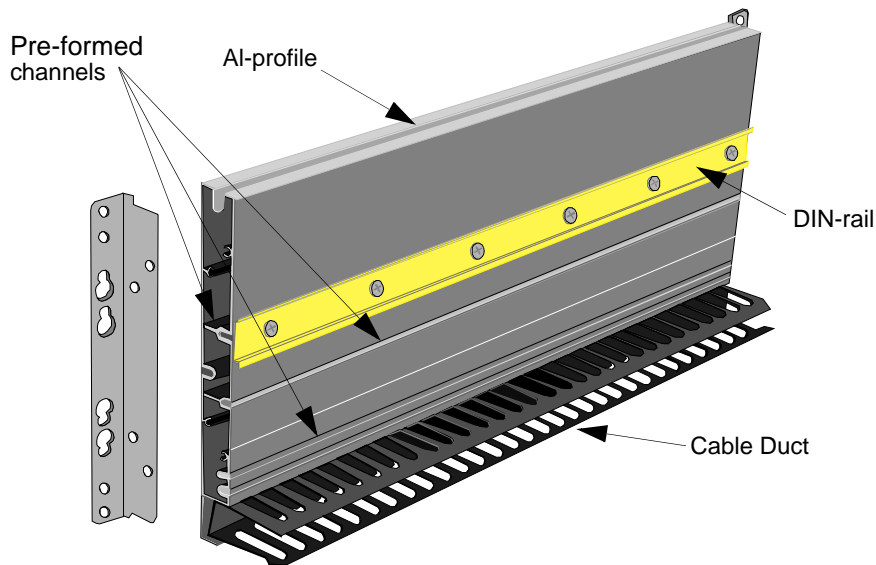


Figure 2.1: Al-profile for DIN-rail support

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 CI8xx Units, Complete with Baseplates



This topic does not apply to PM891. See [Mounting Procedure for PM891 Unit on page 72](#).

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 2.2 on page 71](#).



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 2.3 on page 72](#).

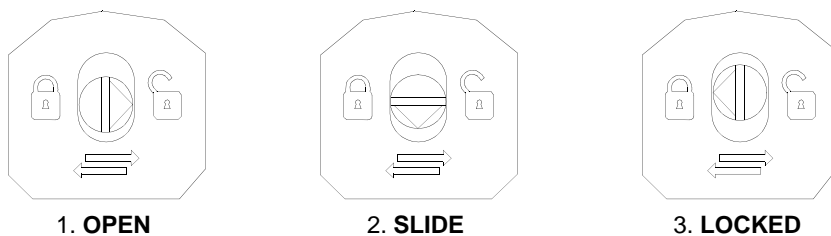


Figure 2.2: Baseplate Locking Device

2 Installation

2.2 Mounting AC 800M Units onto DIN-Rail

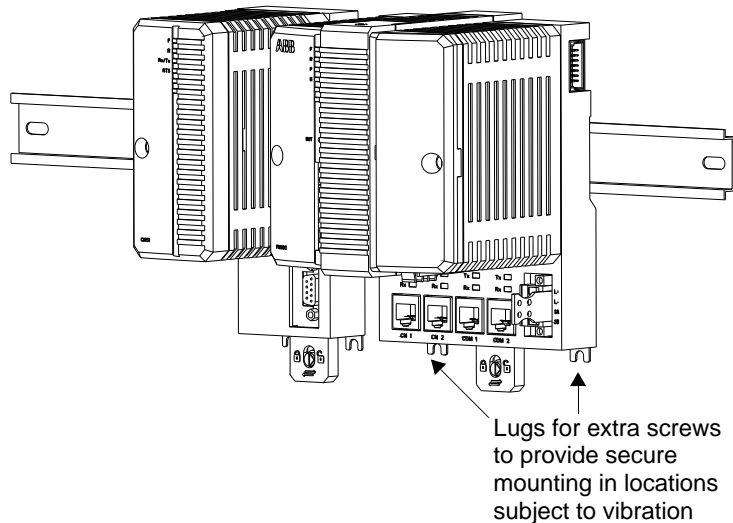


Figure 2.3: DIN-rail Mounting of AC 800M Units

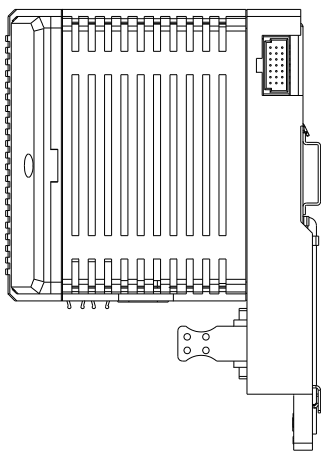


Figure 2.4: AC 800M Controller (except PM891) – Side View

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.

2 Installation

2.2 Mounting AC 800M Units onto DIN-Rail

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 2.5 on page 73](#).

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.

3. 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.

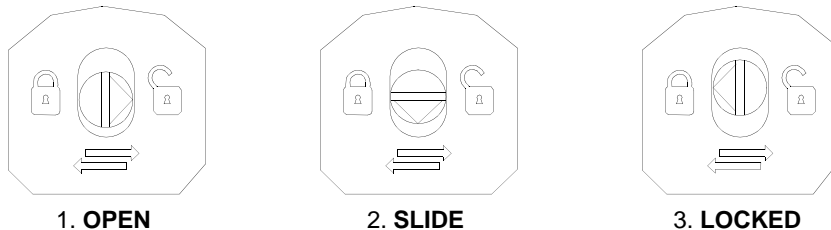


Figure 2.5: Unit locking for PM891

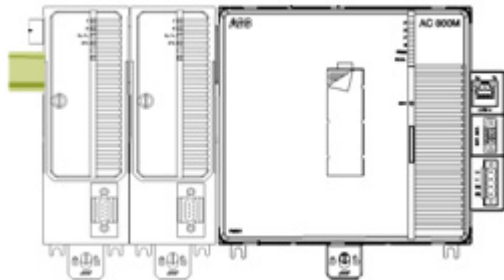


Figure 2.6: PM891 with other units mounted on DIN-rail

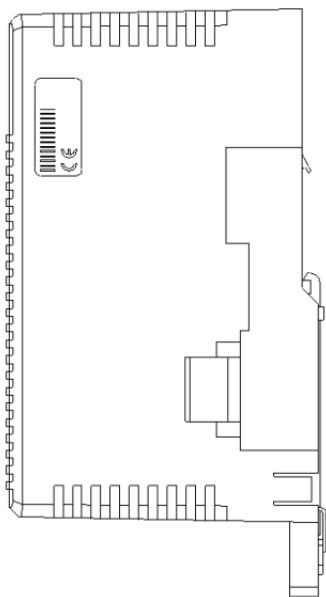


Figure 2.7: PM891 - Side view

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 2.2 on page 71](#).



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 2.8 on page 76](#)).

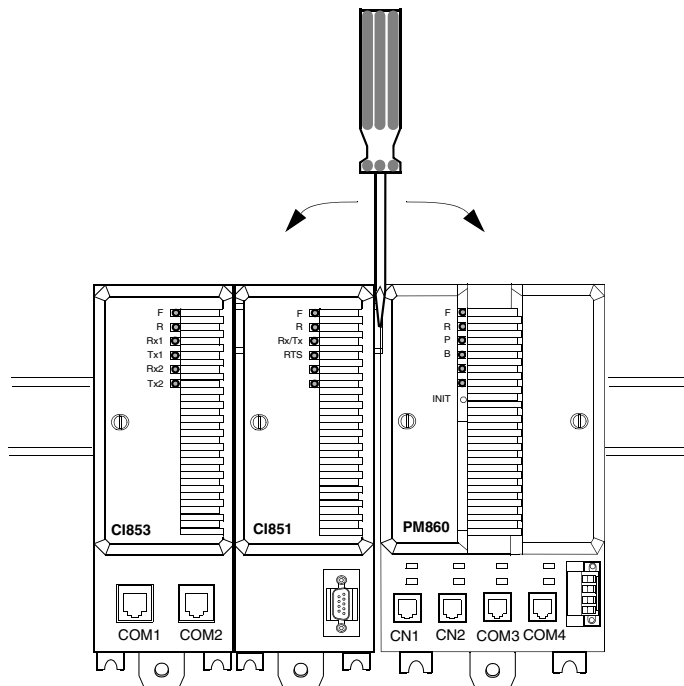


Figure 2.8: Separating the Baseplates

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 2.2 on page 76](#)).

Table 2.2: Factory Pre-set Alpha Codes

Unit	Key Position 1	Key Position 2
CI853 RS-232C Interface	A	C
CI854/CI854A/CI854B PROFIBUS DP Interface	A	D
CI855 Ethernet interface for MasterBus 300	A	E

*Table 2.2: Factory Pre-set Alpha Codes
(Continued)*

Unit	Key Position 1	Key Position 2
CI856 S100 interface	A	F
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 ⁽¹⁾	B ⁽¹⁾
CI868 IEC 61850 Interface	D ¹	B ⁽¹⁾
CI869 AF 100 Interface	D	C
CI872 MOD5 Interface	D	E
CI871 PROFINET IO Interface	D ⁽¹⁾	B ⁽¹⁾
CI873 EtherNet/IP DeviceNet Interface	D ⁽¹⁾	B ⁽¹⁾
BC810 CEX-Bus Interconnection Unit	C	A
BC820 CEX-Bus Interconnection Unit	E	A
SM810	C	B
SM811	D	D
SM812	D	D

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.

2 Installation

2.2 Mounting AC 800M Units onto DIN-Rail

See [Figure 2.9 on page 78](#) 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.

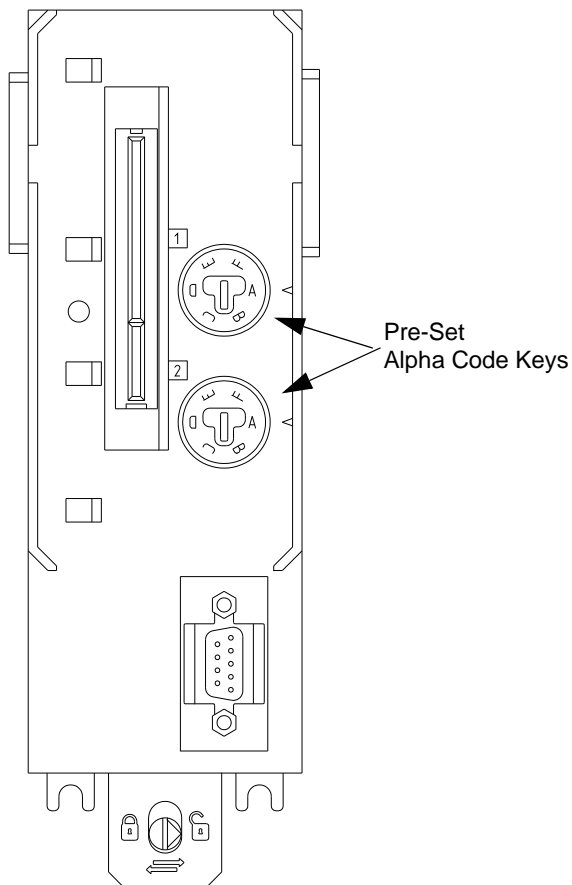


Figure 2.9: Unit Baseplate – Alpha Code Lock Arrangement

2.3 Installing the PM85x/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 PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 insert the RCU Link Termination plug TB852, at the RCU Link connector. The termination plug must always be used 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 2.10 on page 81](#) and [Figure 2.11 on page 82](#). When using BC810/BC820, see [Figure 2.12 on page 83](#). 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.

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

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 2.13 on page 84](#)).
 - 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 1.2 on page 38](#) and [Figure 2.31 on page 127](#)). 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 3.2 on page 152](#).)

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 5.1 on page 181](#)). 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 139](#)/[Installing the SB822 Rechargeable External Battery Unit on page 139](#).



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.

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

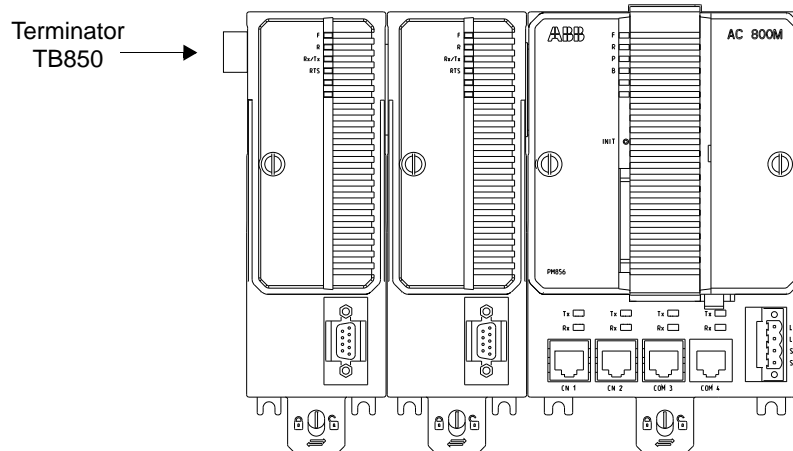




Figure 2.10: TB850 Terminator for CEX-Bus (male)

 A TB850 male CEX-Bus termination unit is supplied with each package (PM851K01, PM851AK01, PM856K01, PM856AK01, PM857K01, PM858K01, PM860K01, PM860AK01, PM861K01, PM861AK01, PM862K01, PM863K01, PM864K01, PM864AK01, PM865K01, PM866K01, PM866AK01, and PM867K01) of the PM8xx/TP830 processor unit.

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

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

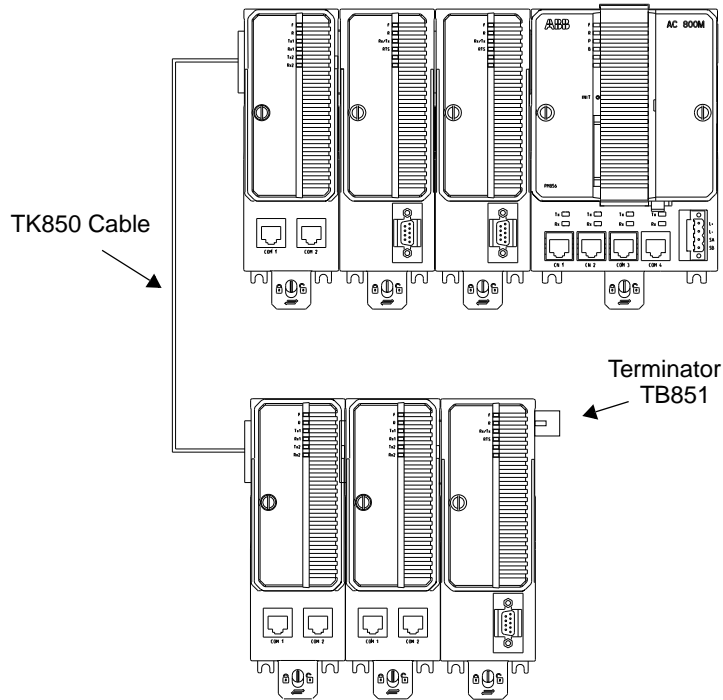


Figure 2.11: TB851 Terminator for CEX-Bus (female)

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

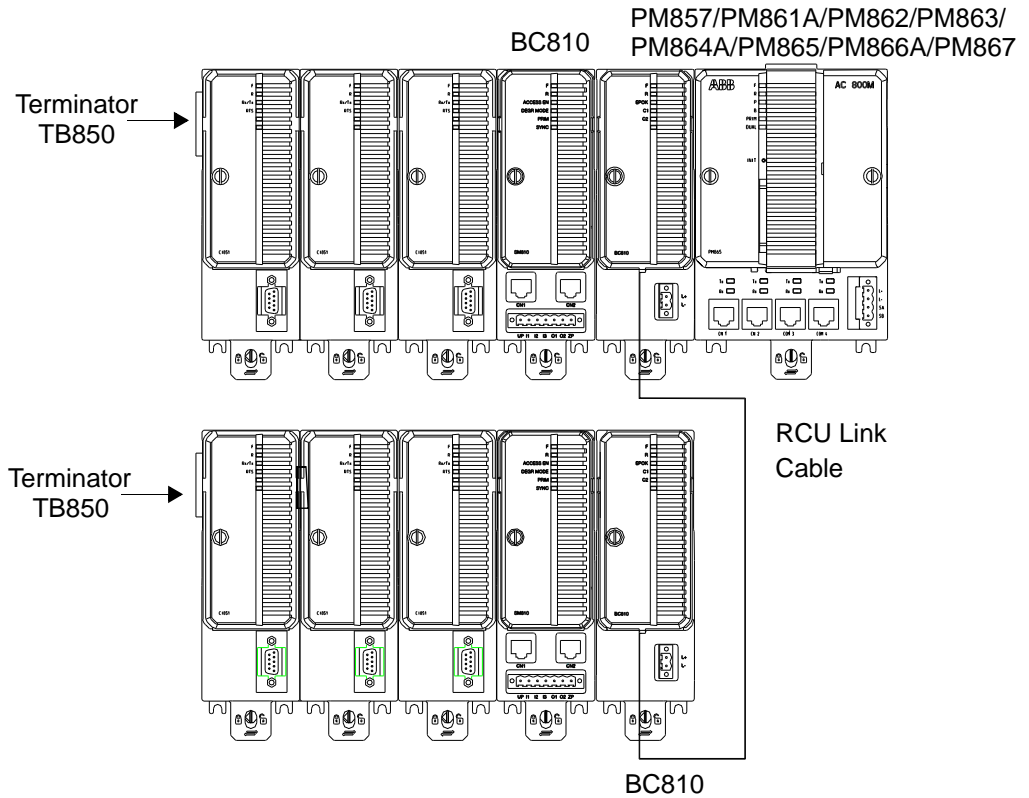


Figure 2.12: CEX-Bus Terminator when using BC810/BC820

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

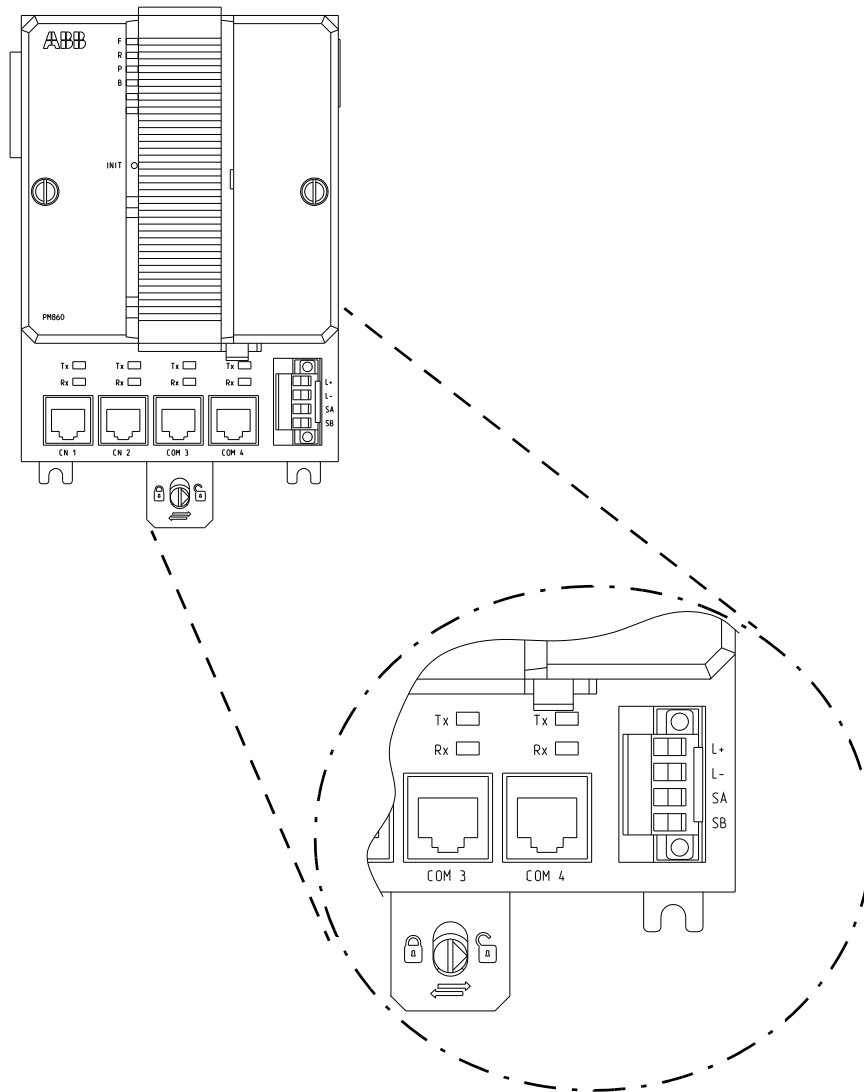


Figure 2.13: SA/SB Connectors for Supervision Signals

Communication Ports

2.3.1 CN1 and CN2

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

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

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 2.3: 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.

2.3.2 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 2.4: TP830 COM3 Connections (RJ45 connector)

Pin	Designation	Direction	Description
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

2 Installation

2.3 Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration

*Table 2.4: TP830 COM3 Connections (RJ45 connector)
(Continued)*

Pin	Designation	Direction	Description
7	DCD	In	Data Carrier Detect
8	CTS	In	Clear To Send
Housing	Shield	-	Shield

2.3.3 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 2.5: 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

2.4 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 1.10 on page 49](#)). 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 3.2 on page 152](#).)

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 139](#).

2.4.1 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 2.6: 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

2.4.2 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 2.7: PM891 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

Table 2.7: PM891 COM4 Connections (RJ45 connector)
(Continued)

Pin	Designation	Direction	Description
6	RD	In	Receive Data
7	–	–	Not used
8	–	–	Not used
Housing	Shield	–	Shield

2.5 Installing the PM85x/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 92](#).

In redundant configuration two PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 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 BC810/BC820s are used, the configuration of the segments should be considered. If BC810/BC820s are not 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 BC810 is used, connect the TK851 cable to the two BC810 ([Figure 2.16 on page 97](#)). If BC820 is used, connect the TK857 cable to the two BC820 ([Figure 2.22 on page 105](#)). If BC810/BC820s are not 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 2.14 on page 92](#)).
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. If BC820 is used, connect TK857 between each CPU and it's BC820.



Note that the RCU Link Cable TK851 or TK857 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.



If BC810 is used, 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. For BC820 this is handled by setting the switch on TP850 to either "Lo" or "Up".

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 2.13 on page 84](#)).



If BC810 is used, both CPUs should be powered from the same supply (single or redundant). For redundant power supply, see [Figure 2.37 on page 136](#).

- 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 1.2 on page 38](#) and [Figure 2.31 on page 127](#)). 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 3.3 on page 153](#)).

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 5.1 on page 181](#)). 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 139](#) / [Installing the SB822 Rechargeable External Battery Unit on page 139](#).



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.

2.5.1 Communication Ports

Same as for single configuration (see [Table 2.3 on page 85](#), [Table 2.4 on page 85](#) and [Table 2.5 on page 86](#)).

2 Installation

2.6 Installing the PM891 Processor Unit in Redundant Configuration

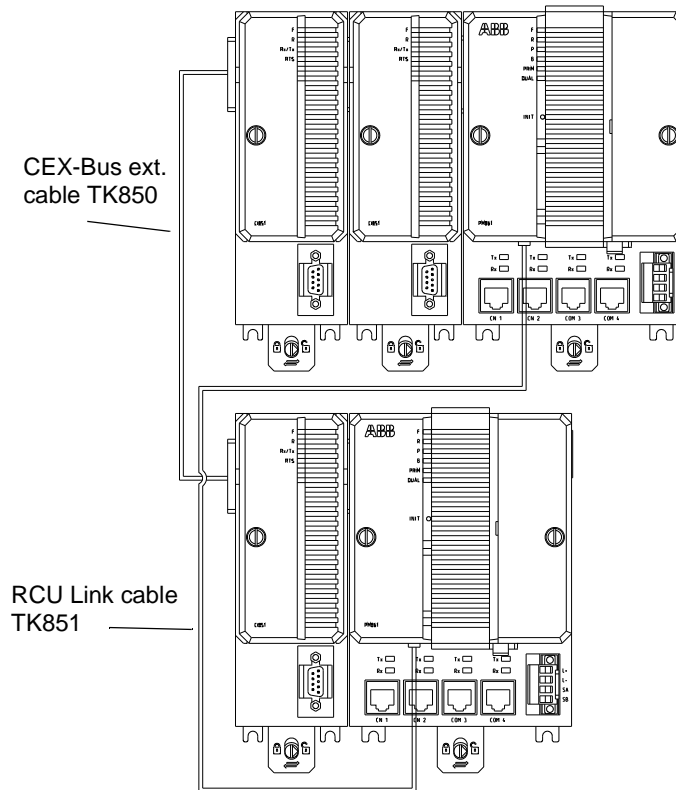


Figure 2.14: Connection of CPU redundancy

2.6 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 BC810 are used, the configuration of the segments should be considered. If BC810 are not used, the interfaces can be divided between the two CPUs in any preferred way.

2 Installation

2.6 Installing the PM891 Processor Unit in Redundant Configuration

3. Press the units gently together and ensure that the CEX-Bus is correctly connected, through the connector on the unit.
4. If BC810 are used, connect the TK851 cable to the two BC810. If BC810 are not 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 2.14 on page 92](#)).
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 2.37 on page 136](#).

- 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.

2 Installation

2.6 Installing the PM891 Processor Unit in Redundant Configuration

7. Connect the optical ModuleBus to the optical contacts on the processor units (see [Figure 1.2 on page 38](#) and [Figure 2.31 on page 127](#)). 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 3.3 on page 153](#)).

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 139](#).

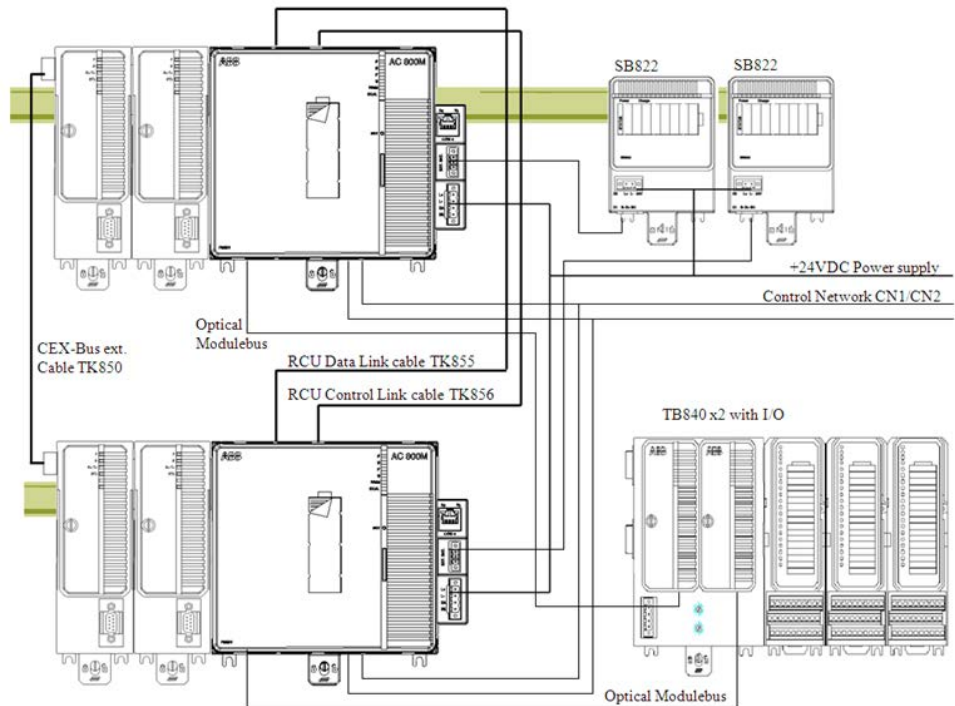


Figure 2.15: Example of PM891-Redundant configuration

2.6.1 Communication Ports

Same as for single configuration (see [Table 2.6 on page 88](#) and [Table 2.7 on page 88](#)).

2.7 Installing the CEX-Bus without BC810/BC820

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 2.10 on page 81](#). 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 2.11 on page 82](#), 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.

2.7.1 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).

2.8 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 SM81x, 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 2.16 on page 97](#) and [Figure 2.17 on page 98](#) 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 2.18 on page 99](#).
- 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 2.19 on page 100](#).



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 132](#). See also [Powering from an External Source on page 165](#).



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 2.18](#) or according to [Figure 2.19](#) 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. 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.

2 Installation

2.8 Installing the CEX-Bus Interconnection Unit BC810/TP857

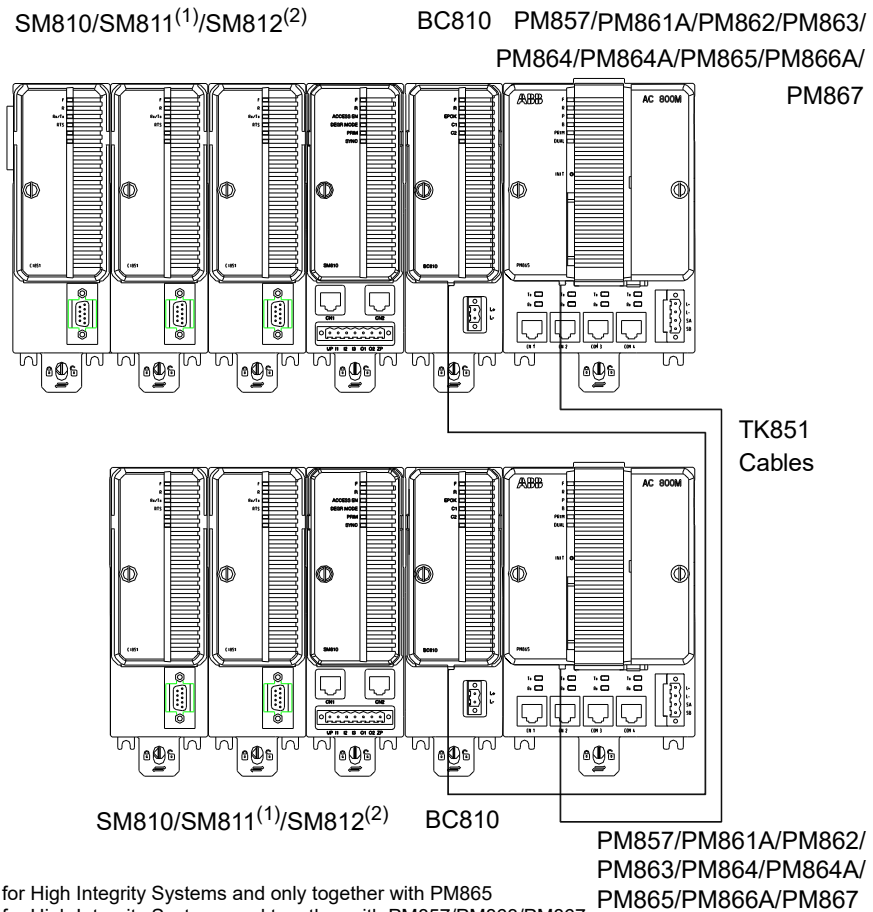
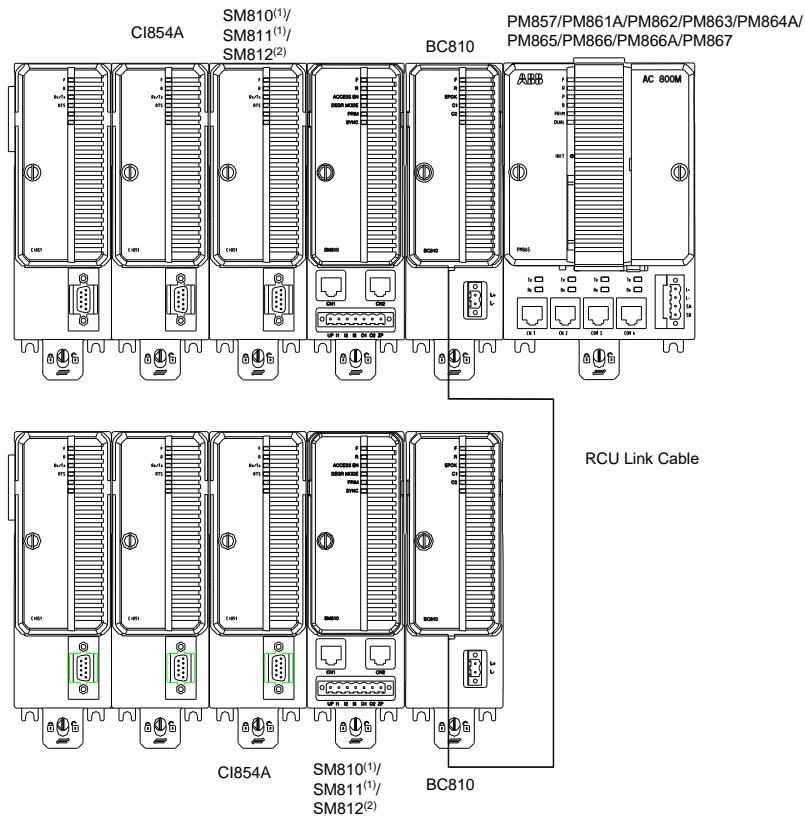


Figure 2.16: Redundant Communication Interface Units and Controllers

2 Installation

2.8 Installing the CEX-Bus Interconnection Unit BC810/TP857



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

(2) Only for High Integrity Systems and together with either of PM857/PM863/PM867.

Figure 2.17: Redundant Communication Interface Units and Single Controller

2 Installation

2.8 Installing the CEX-Bus Interconnection Unit BC810/TP857

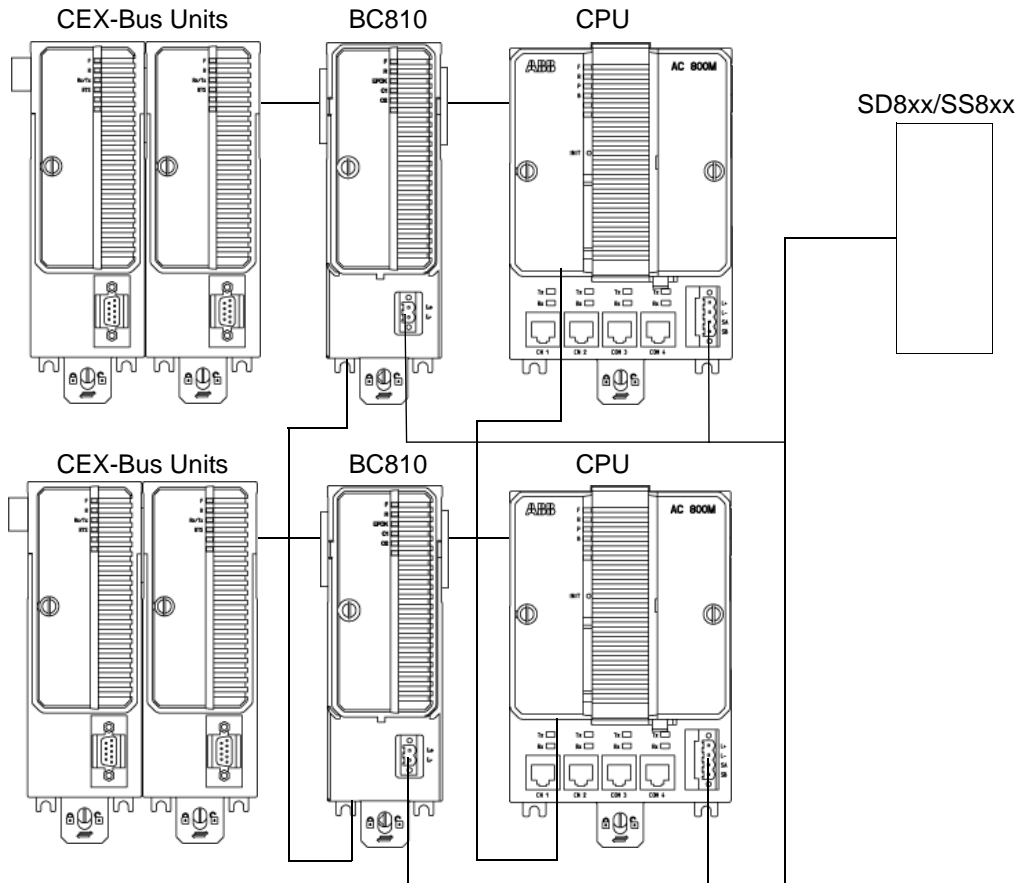
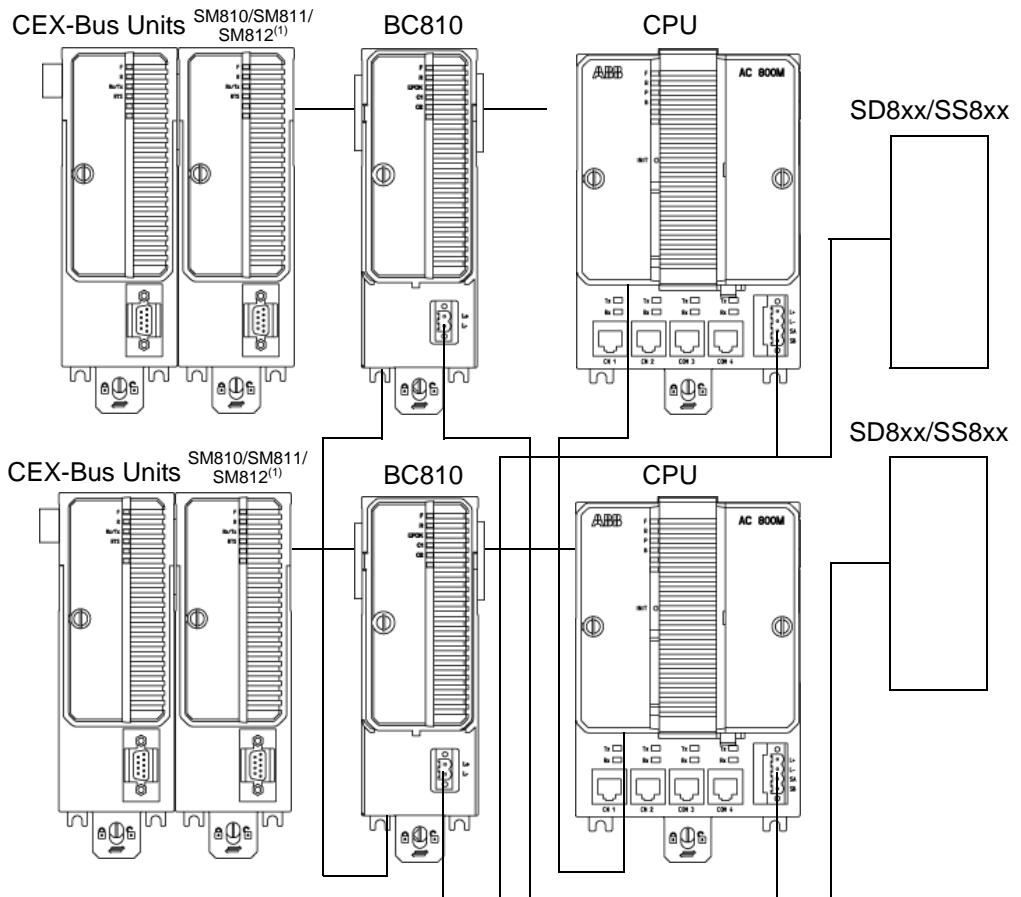


Figure 2.18: The Power Source Connected to the Same PM864/BC810 Segment, see [Installing the CEX-Bus Interconnection Unit BC810/TP857 on page 95](#) and [Power Supply System on page 162](#).

2 Installation

2.8 Installing the CEX-Bus Interconnection Unit BC810/TP857



(1) SM810/SM811 with PM865 CPU and SM812 with PM857/PM863/PM867 CPU.

Figure 2.19: The Power Source Connected to a Different PM865/BC810, PM857/BC810, PM863/BC810 or PM867/BC810 Segment, see [Installing the CEX-Bus Interconnection Unit BC810/TP857](#) on page 95 and [Power Supply System](#) on page 162.

2.9 Installing the CEX-Bus Interconnection Unit BC820/TP850

The BC820 units must be mounted directly to the CEX-Bus on the processor unit base plate. BC820 are interconnected by self-made copper and fiber cables.



The maximum number of CEX-Bus units connected to a BC820 is six. The primary function of BC820 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 BC820 together with redundant CEX-Bus units these units shall be mounted on different BC820 CEX-Bus segments.

See [Figure 2.22 on page 105](#) and [Figure 2.23 on page 106](#) 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 BC820, to each other with CEX-Bus extension cable TK850.

The BC820 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 BC820, there are two valid connection possibilities:

- Single power source (SD8xx or SS8xx) for the processor units and the BC820s on both the segments (say, segments A and B). See [Figure 2.23 on page 106](#).
- One power source (SD8xx or SS8xx) for the processor unit on segment A and the BC820 on segment B, and another power source (SD8xx or SS8xx) for the processor unit on segment B and the BC820 on segment A. See [Figure 2.24 on page 107](#).



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 132](#). See also [Powering from an External Source on page 165](#).

2 Installation

2.9 Installing the CEX-Bus Interconnection Unit BC820/TP850

The BC820 CEX-Bus Interconnection Unit, offers a way to section the CEX-Bus into two independent segments. This improves availability in systems with redundant communication interfaces. [Figure 2.20 on page 102](#) shows a configuration example. The base plate has a preset, two letter Alpha code lock to prevent the installation of an incorrect type of unit onto the TP850 base plate.



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

The BC820 is powered from the processor unit via the CEX-Bus and can also support the CEX-Bus with redundant power through its external connector for power supply.

BC820 transmits the RCU-Link and extends the CEX-Bus and RCU-Link cable length up to 200 m. The number of CEX-Bus interfaces is limited to 6 with each BC820.



BC820 can only be used with PM858, PM862, PM866 (PR:F or later, which corresponds to PR:H or later for PM866K01), PM866A

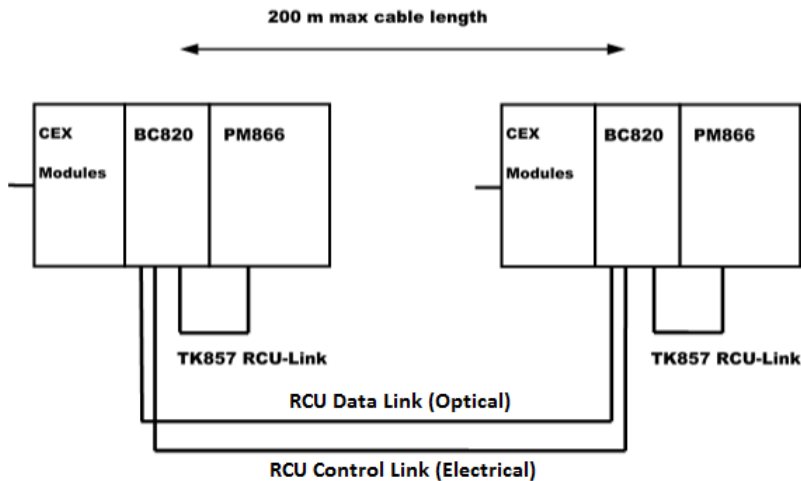


Figure 2.20: Redundant Communication Interface Units and Controllers

Hot swap of the BC820 located next to a primary or single controller CPU, otherwise called “direct BC820”, might jeopardize the whole controller and should not be performed unless every module on the CEX-Bus are in a non-operating state.



Hot swap of the BC820 is not located next to a primary or single controller CPU, if located then “indirect BC820”, will shut down and non-redundant interface located on that CEX-Bus segment, should not be performed unless such interfaces already are in a non-operating state or their function is dispensable for the controller.

The BC820 unit can be set in two different states, called upper or lower. Note that the two units in a pair never are allowed to be set to the same state. i.e. one shall be set to lower and the other to upper. The reason for that is to support functions in role selection, primary and secondary, between the controller CPUs. A toggle switch selects the state, see [Figure 2.21](#).

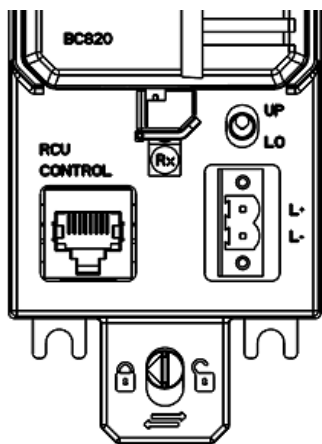


Figure 2.21: BC820 Toggle Switch

2.9.1 Cables and Connectors

RCU Control Link: Modular Jack, RJ45, shielded twisted pair crossover cable with all four pairs crossed: EIA/TIA-568 standard crossover T568A to T568B see [Table 2.8](#) below. Length: max 200m.



All four pairs must be crossed.

2 Installation

2.9 Installing the CEX-Bus Interconnection Unit BC820/TP850

Table 2.8: Crossover cable pinout (shown as T568A to T568B)

Connector A [pin]	Color	Connector B [pin]	Color
1	White/Green	1	White/Orange
2	Green	2	Orange
3	White/Orange	3	White/Green
4	Blue	4	White/Brown
5	White/Blue	5	Brown
6	Orange	6	Green
7	White/Brown	7	Blue
8	Brown	8	White/Blue
Shield	Braid	Shield	Braid

RCU Data Link: The optical interconnection is compatible with LC Duplex optical connector interface conforming to ANSI TIA/EIA60-10 (FOCIS 10A). The type of optical cable is 50/125µm OM3 fiber. Length: max 200m.

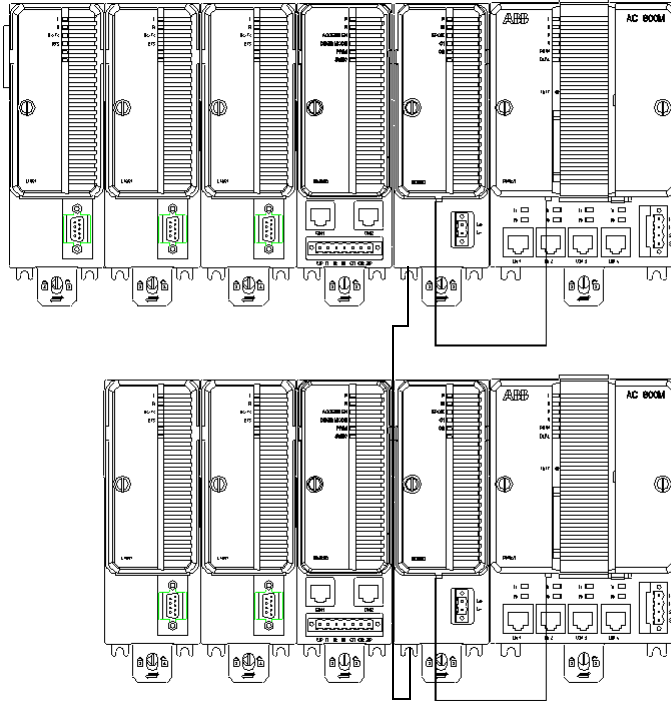
External 24V DC supply (L+, L-): Cable assembly for 2-pole terminal block. Length: max 10m. Plugs included in package.

RCU-Link Cable TK857V0003: Cable between controller CPU and BC820. Length: 0,3M. 2 pieces included in package.

2 Installation

2.9 Installing the CEX-Bus Interconnection Unit BC820/TP850

BC820 PM862/PM866/PM866A



PM862/PM866/PM866A
BC820

Figure 2.22: Redundant Communication Interface Units and Controllers

2 Installation

2.9 Installing the CEX-Bus Interconnection Unit BC820/TP850

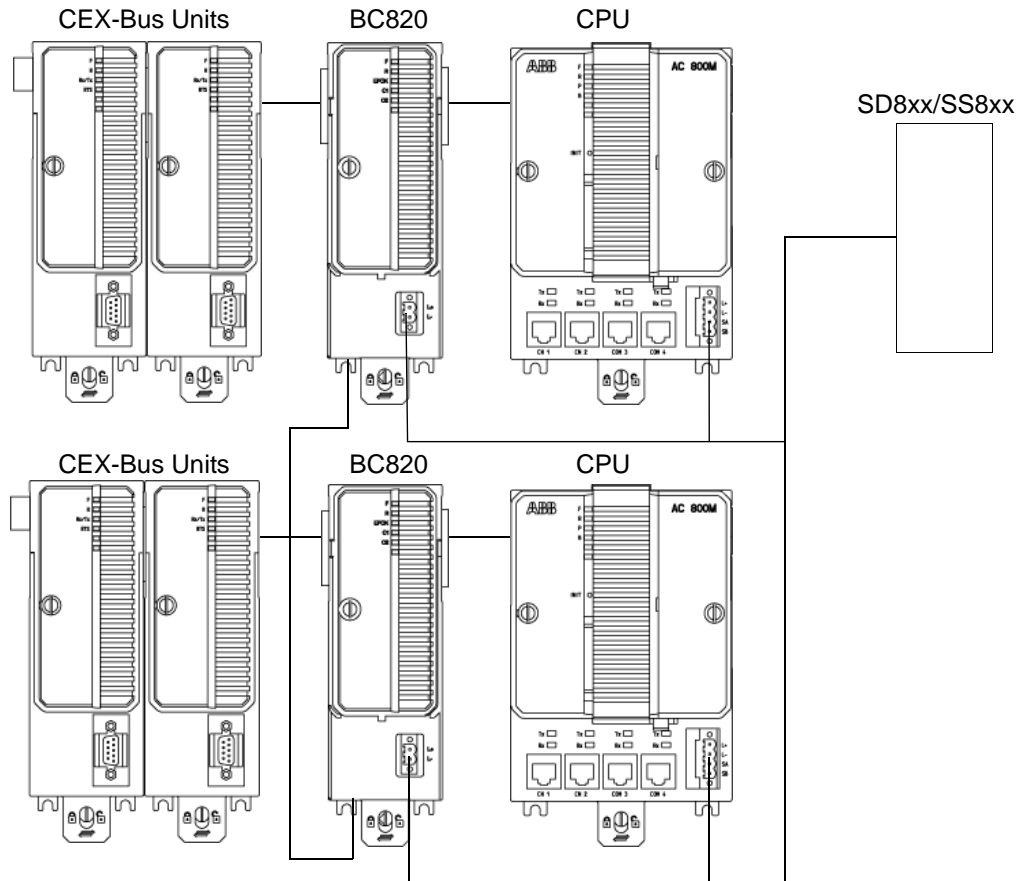


Figure 2.23: The Power Source Connected to the Same PM866/BC820 Segment, see [Installing the CEX-Bus Interconnection Unit BC820/TP850 on page 101](#) and [Power Supply System on page 162](#).

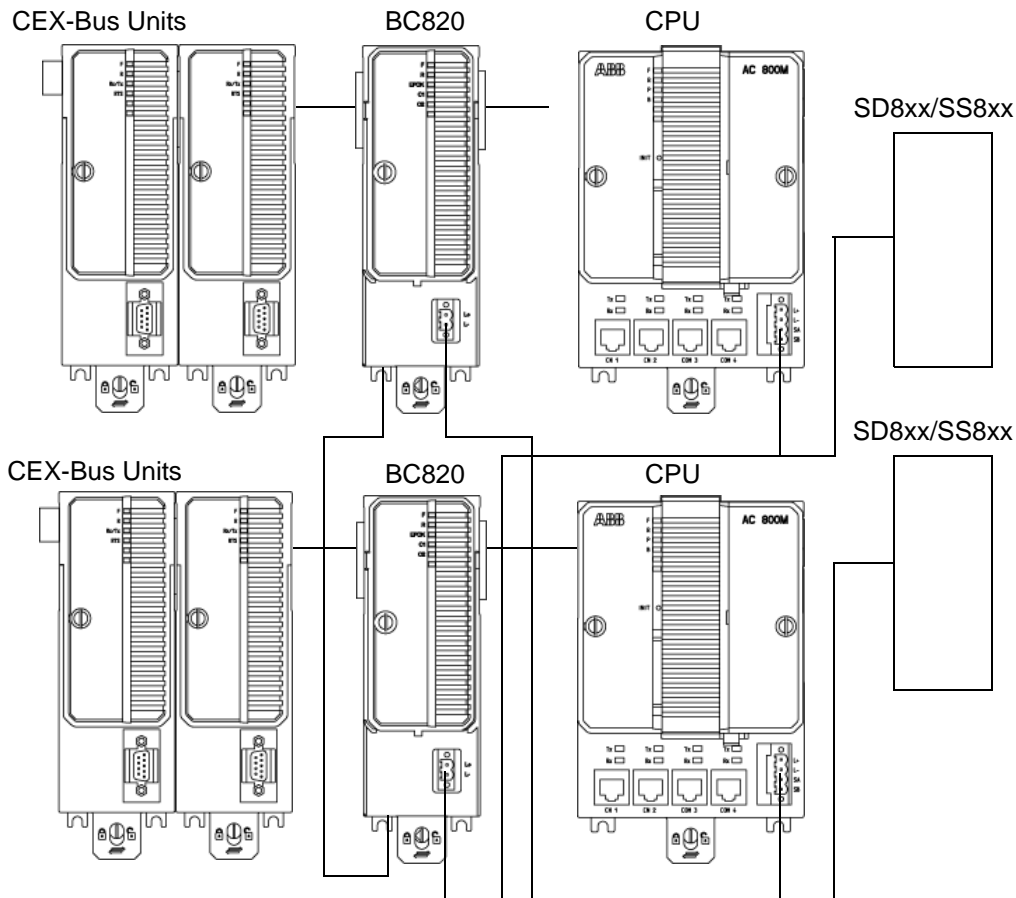


Figure 2.24: The Power Source Connected to a Different PM866/BC820 Segment, see [Installing the CEX-Bus Interconnection Unit BC820/TP850 on page 101](#) and [Power Supply System on page 162](#).

2.10 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 2.16 on page 97](#) and [Figure 2.17 on page 98](#) for configuration examples.

2.10.1 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 2.9](#).



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 2.9: 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

2.10.2 Connection of Input Signals to SM810

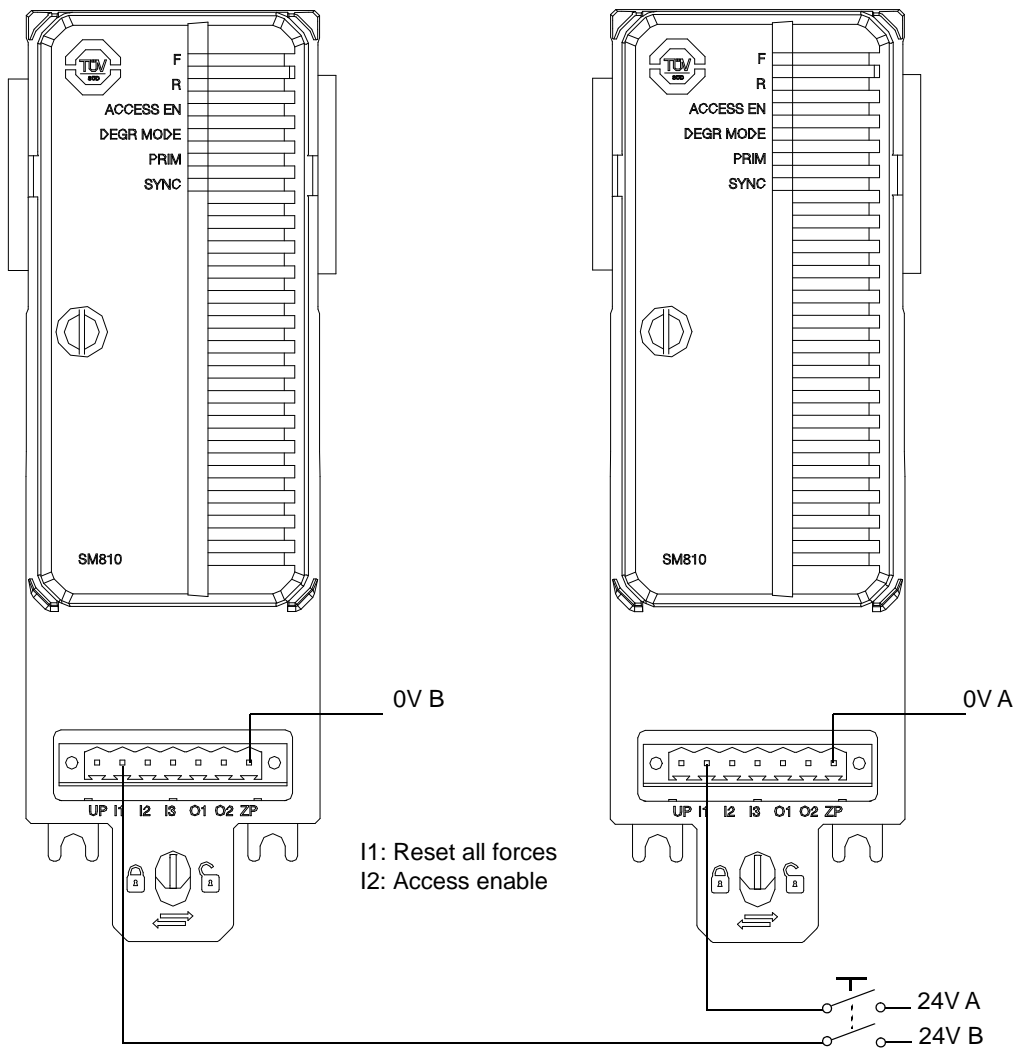


Figure 2.25: Connection of input signals to redundant SM810.

2.10.3 Connection of Output Signals to SM810

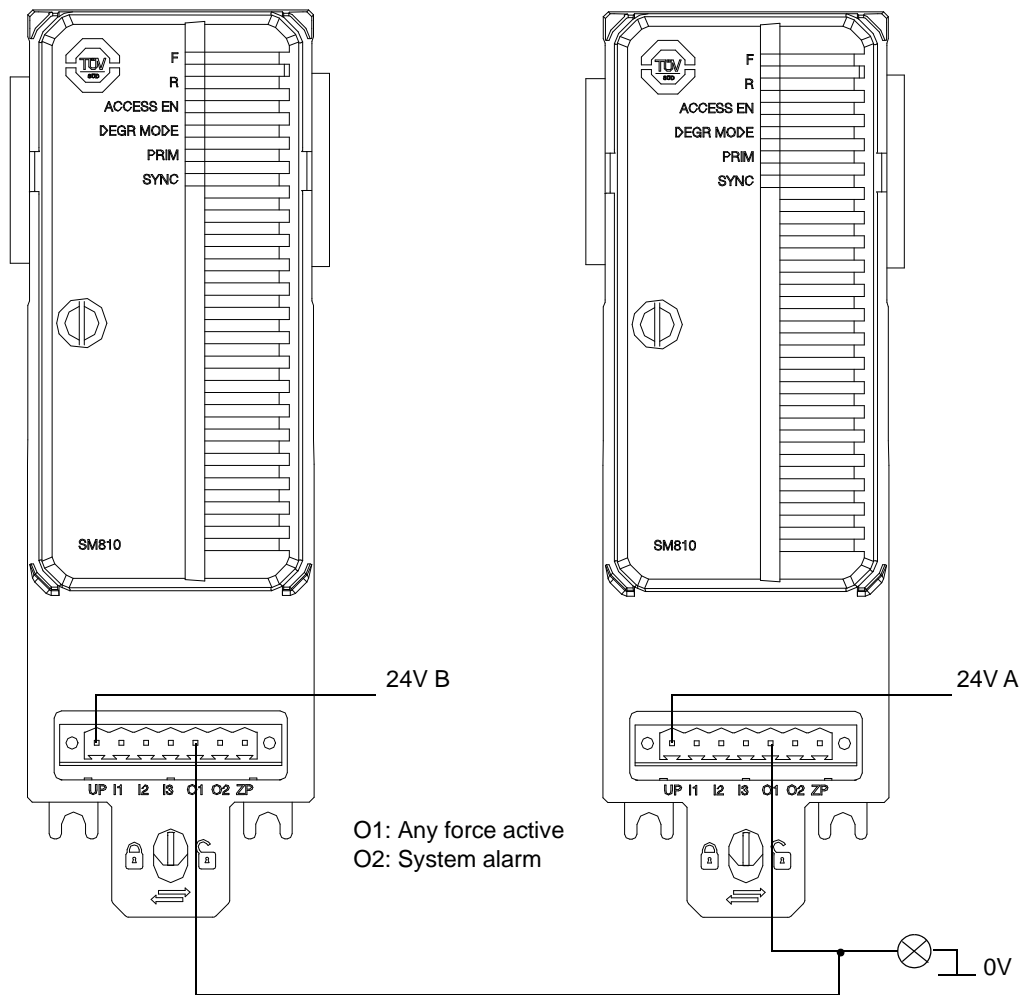


Figure 2.26: Connection of output signals from redundant SM810.

2.11 Installing SM811/TP868 or SM812/TP868

The SM811/SM812 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/SM812. See [Figure 2.16 on page 97](#) and [Figure 2.17 on page 98](#) for configuration examples. Use the enclosed cable TK852V010 to connect the SM Link of the two SM811/SM812 in case of redundant configuration.

2.11.1 Digital I/O Connection

The SM811/SM812 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 2.10](#).

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/SM812's must be connected to common digital input switches. For example, the I3's of both SM811/SM812'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/SM812's.

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

Table 2.10: SM811/SM812 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)
6	O2	Digital output 2 (System alarm)
7	ZP	Common I/O return

2.11.2 Connection of Input Signals to SM811/SM812

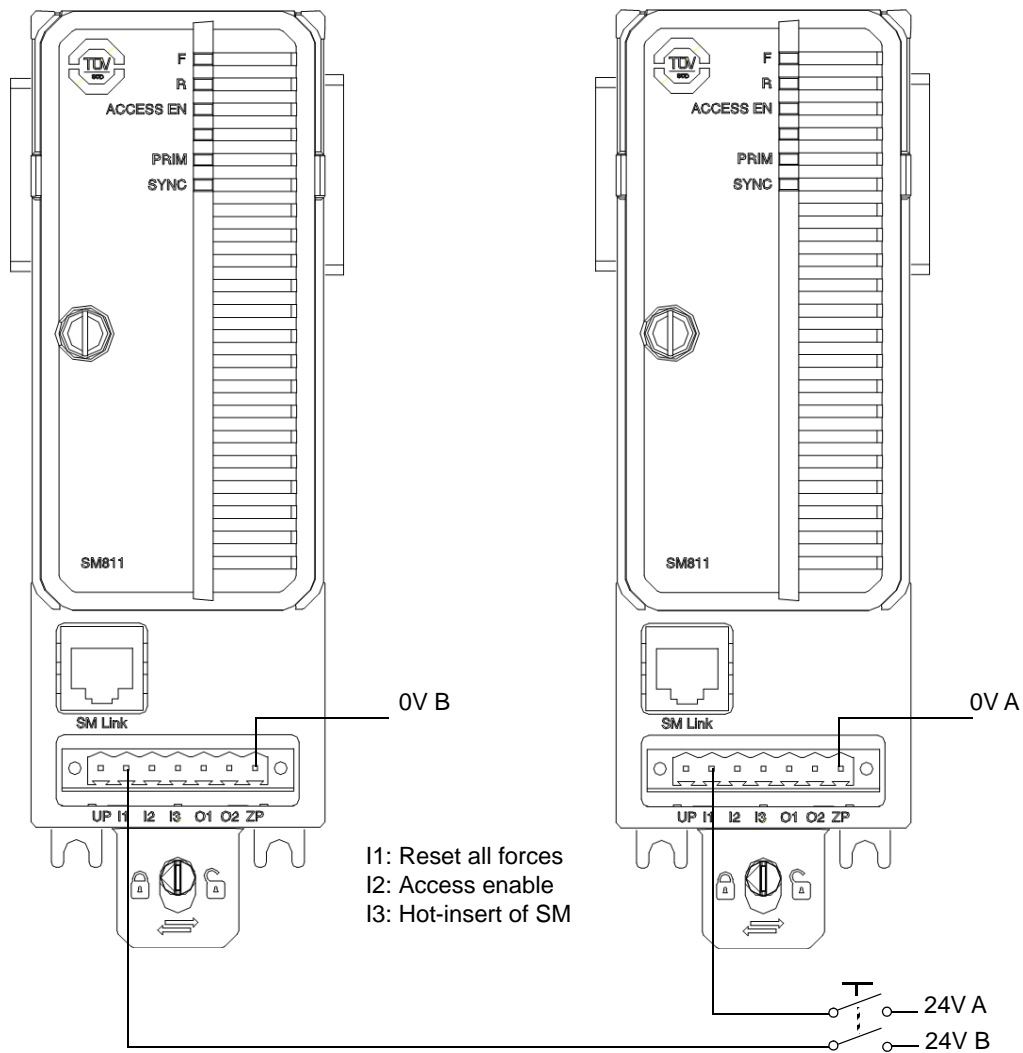


Figure 2.27: Connection of input signals to redundant SM811/SM812

2.11.3 Connection of Output Signals to SM811/SM812

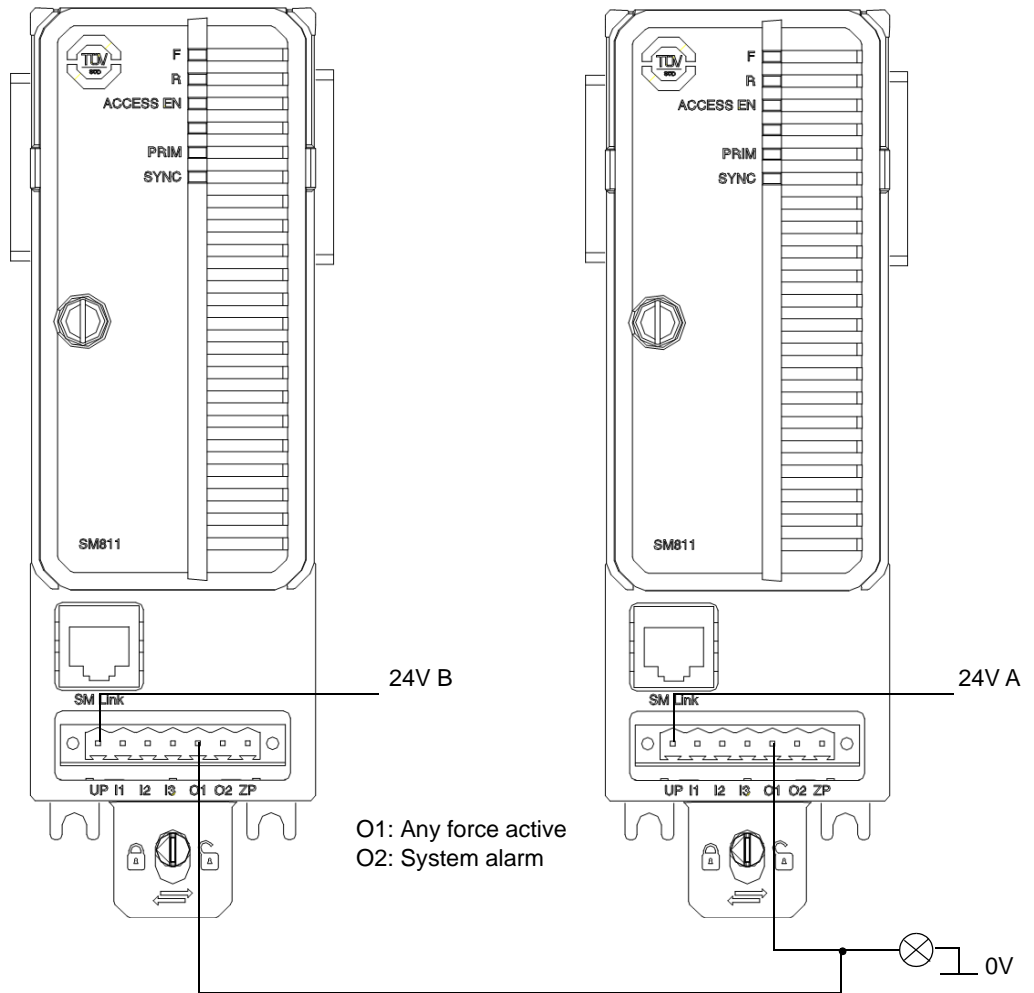


Figure 2.28: Connection of output signals from redundant SM811/SM812

2.12 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 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
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 CI853.
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

2.12.1 Connectors

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

Table 2.11: CI853 RS-232C Interface – COM1 and COM2 Connectors

Pin	Designation	Direction	Description
1–9	–	–	See COM3 on TP830, Table 2.4 on page 85 .



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

2.13 Installing the PROFIBUS DP Interface, CI854/CI854A/CI854B/TP854

The CI854/CI854A/CI854B 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/CI854B/TP854:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail on page 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
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/CI854B. Connect the data cable wire A to the terminal PIN8 (Rx/D/TxD-N) and the data cable wire B to the terminal PIN3 (Rx/D/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.

2 Installation

2.13 Installing the PROFIBUS DP Interface, CI854/CI854A/CI854B/TP854

5. If the CI854/CI854A/CI854B is at the end of the PROFIBUS DP cable, switch the bus termination ON. Otherwise leave the bus termination switched OFF.
6. The following applies for CI854A/CI854B:

If the CI854A/CI854B is installed in a redundant configuration connect the PROFIBUS DP cable to primary and backup module. Do it like described in [Figure 2.29 on page 116](#). Switch the termination ON for the interface on primary or backup module that is at the end of the line.

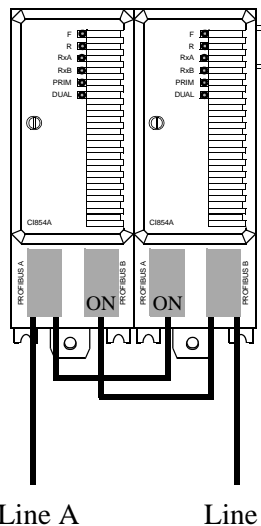


Figure 2.29: Connection of Redundant PROFIBUS DP (CI854A/CI854B)

2.13.1 PROFIBUS DP Connection

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

2.13.2 Installation of PROFIBUS DP

Table 2.12: CI854/CI854A/CI854B – PROFIBUS DP Connector

PIN	Designation	Description
1	Shield	Shield/protective ground
2	–	Not Used

Table 2.12: CI854/CI854A/CI854B – PROFIBUS DP Connector
(Continued)

PIN	Designation	Description
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.



There is no unit redundancy and hotswap is not supported for the CI854 unit. These features are supported by CI854A/CI854B.

2.14 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 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
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.

2.14.1 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 2.3 on page 85](#).



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

2.15 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 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
2. Connect the S100 I/O cable, TK575/TK580, to the contact on the baseplate. A bus extender, DSBC174/DSBC176/DSBC173A, must be used.

2.15.1 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.

2.15.2 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.

2.16 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 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
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.

2.16.1 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 2.3 on page 85](#).



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

2.17 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 68](#), [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#) and [CI858 and TP858 – DriveBus Interface on page 316](#).

2.17.1 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 2.13: 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.

2.18 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 68](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 79](#).
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.

2.18.1 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 2.3 on page 85](#).

2.19 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.

2.19.1 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.

2.19.2 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 C.9](#). 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 2.14](#). 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 2.14: Field Bus Termination Switch Settings of the CI862

Dip Switch ¹	Setting
1	75 ohms
2	110 ohms ²
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.



Open the module top cover to locate the dip switches.

Figure 2.30 shows the TRL cable details.

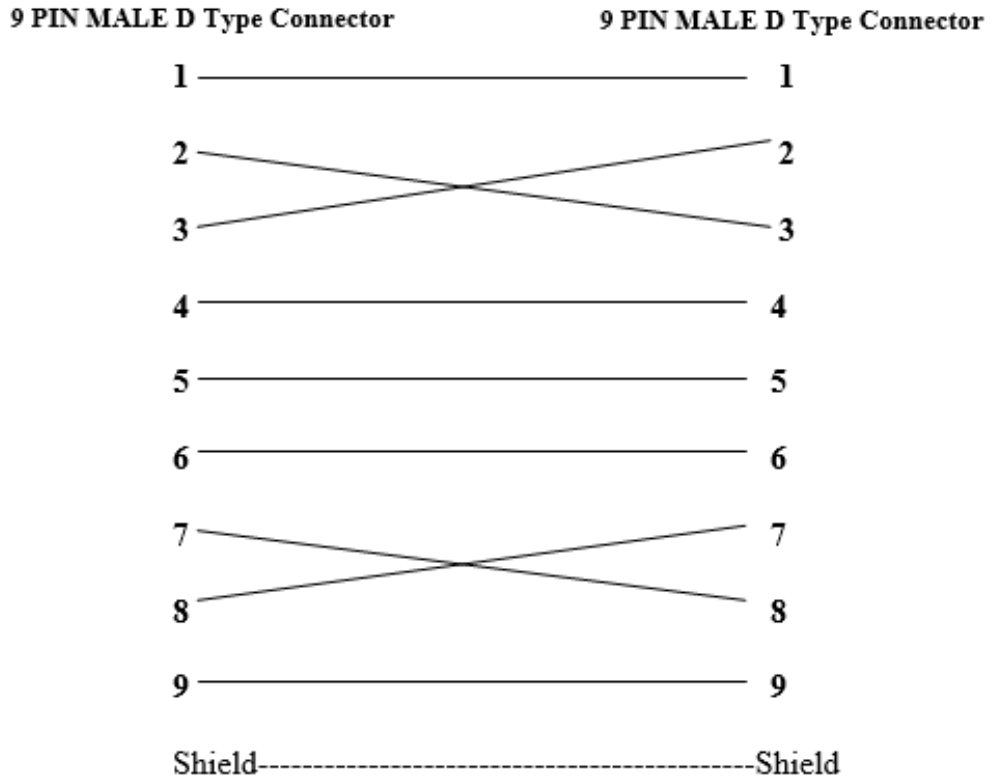


Figure 2.30: TRL Cable Details

As shown in [chapter A.26](#), the dip switch is located at the bottom of the housing when looking from the front. Switch 1 is towards the top of the housing.

2.20 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 *System 800xA AC 800M - Interfacing SATT IO (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.

2.21 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 72](#) and [Installing the PM85x/PM86x/TP830 Processor Unit in Single Configuration on page 85](#).
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.

2.21.1 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 2.3 on page 85](#).

2.22 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 72](#).
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.

2.23 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 68](#).
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 Guide (3BSE000506*)*.

2.24 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.

2.25 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.

2.25.1 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 μm multimode glass fiber.
- Connector type: ST.
- Max nominal fiber damping including connectors: 11 dB.

2.26 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.

2.27 Installing the ModuleBus for PM8xx



This topic does not apply to PM891. See [Installing the ModuleBus for PM891 on page 127](#).

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 2.31 on page 127](#) provides details of the fiber optic connectors, together with the PM8xx optical ModuleBus ports.

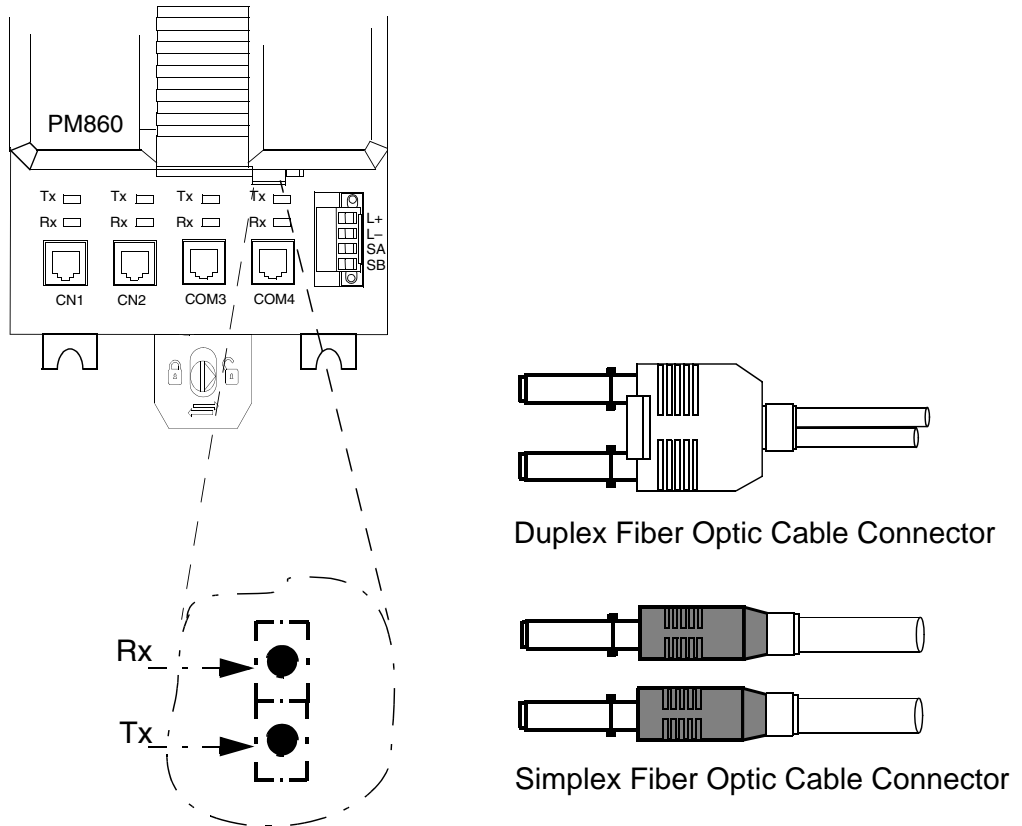


Figure 2.31: PM8xx Connectors for Optical ModuleBus

2.28 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 2.32 on page 128](#) provides details of the fiber optic connectors, together with the PM891 optical ModuleBus ports.

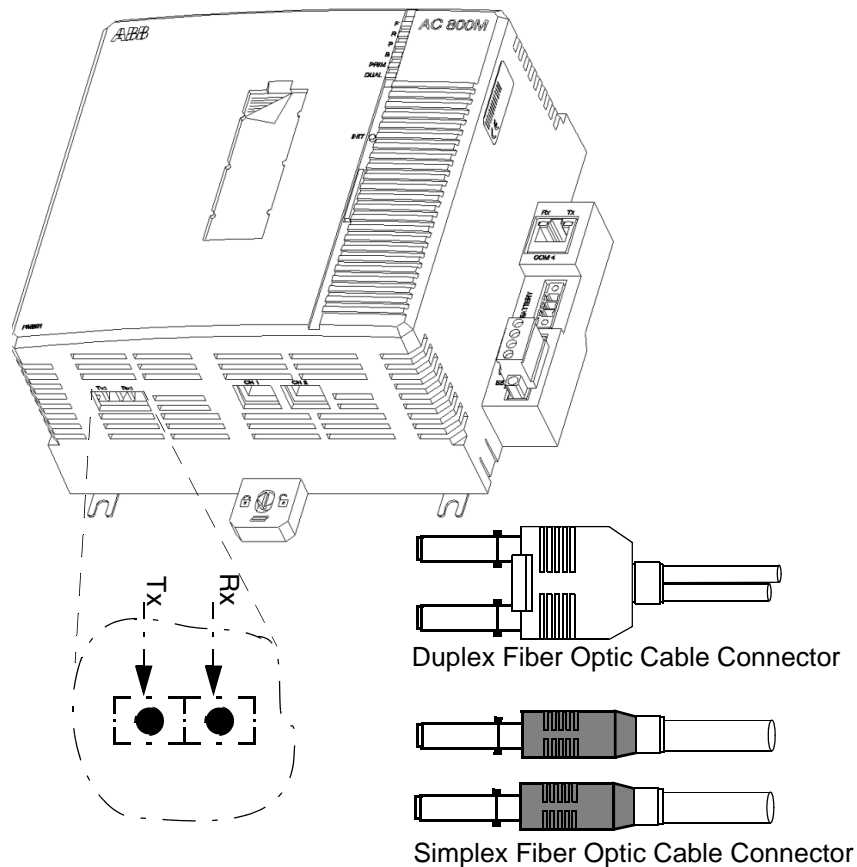


Figure 2.32: PM891 connectors for Optical ModuleBus

2.29 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

2 Installation

2.29 Installing the SD83x Power Supply

- 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 2.15: PSU's SD831, 832, 833, 834 - Mounting space and weight.

Parameter	SD831 Converter	SD832 Converter	SD833 Converter	SD834 Converter
Mounting spacing top ¹	40 mm	40 mm	40 mm	40 mm
Mounting spacing bottom ²	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.

2.30 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 3.9 on page 166](#) and [Figure 3.10 on page 167](#). 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 2.33 on page 131](#)).
 - 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 2.33 on page 131](#).
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.

2 Installation
2.30 Installing the Mains Breaker Unit

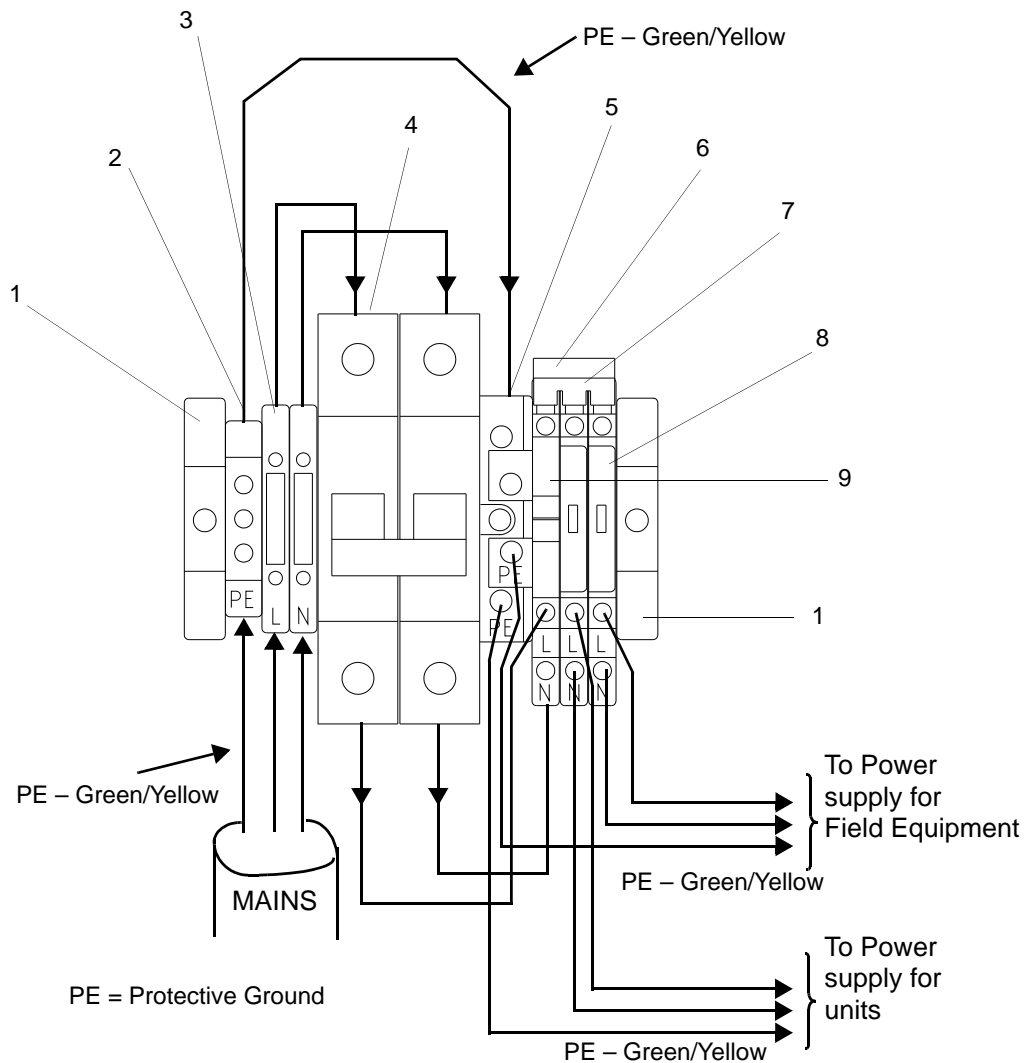


Figure 2.33: Installation of Mains Breaker Assembly

2.31 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 2.34 on page 133](#) for SS823, [Figure 2.35 on page 134](#), and [Figure 2.36 on page 135](#) 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 Installation
2.31 Installing the SS823/SS832 Voting Unit

2. Connect the voting unit to the selected SD83x power supply units, in required configuration. See [Figure 2.35 on page 134](#) and [Figure 2.36 on page 135](#) for SS832.

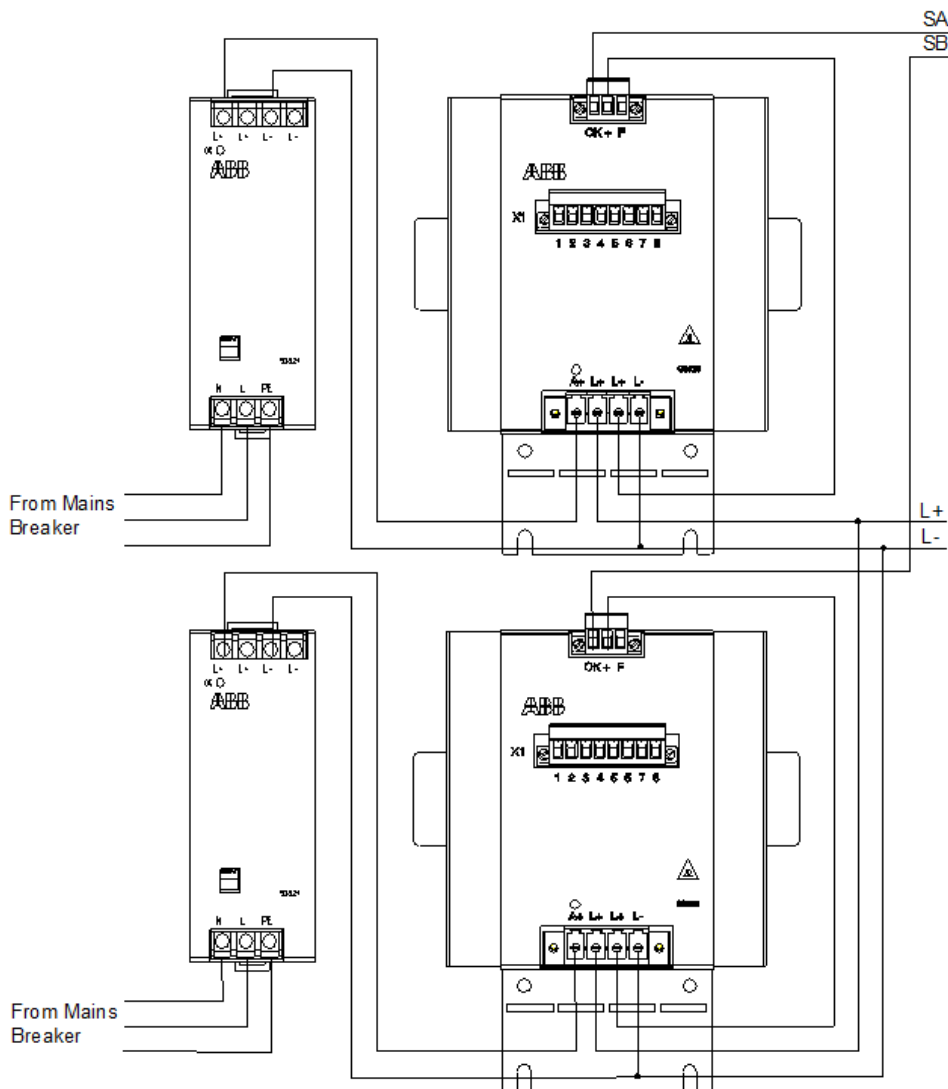


Figure 2.34: Redundant Power Supply for SS823

2 Installation
2.31 Installing the SS823/SS832 Voting Unit

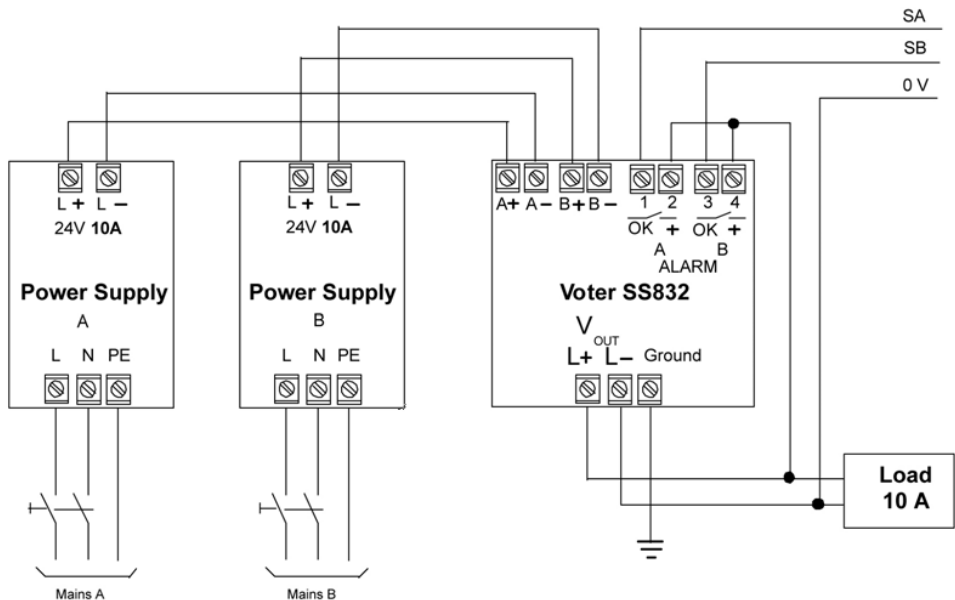


Figure 2.35: SS832 Redundant Configuration up to 10 A

2 Installation

2.31 Installing the SS823/SS832 Voting Unit

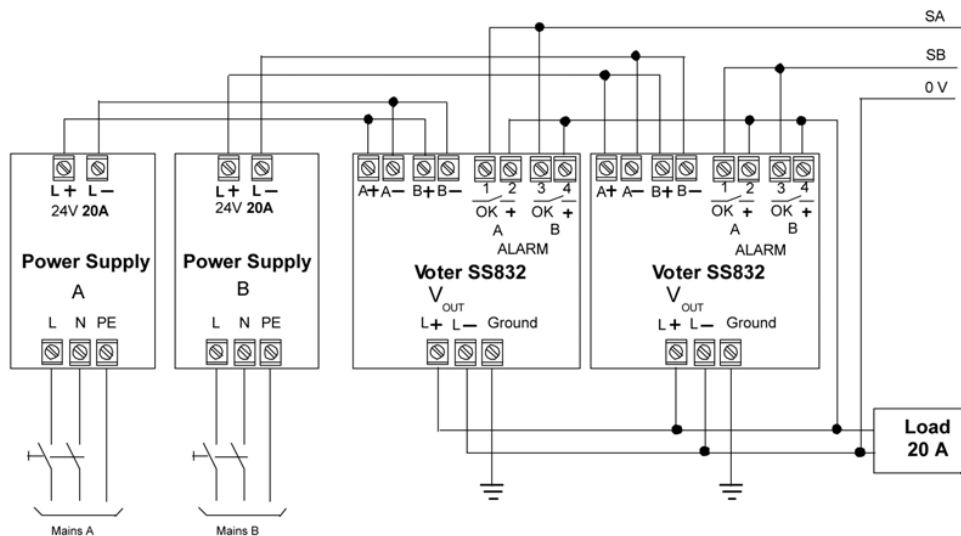


Figure 2.36: SS832 Redundant Configuration up to 20 A

3. Connect the SS82x voting unit to the processor unit. [Figure 2.37 on page 136](#) shows the connection to PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 in redundant configuration.

2 Installation

2.31 Installing the SS823/SS832 Voting Unit

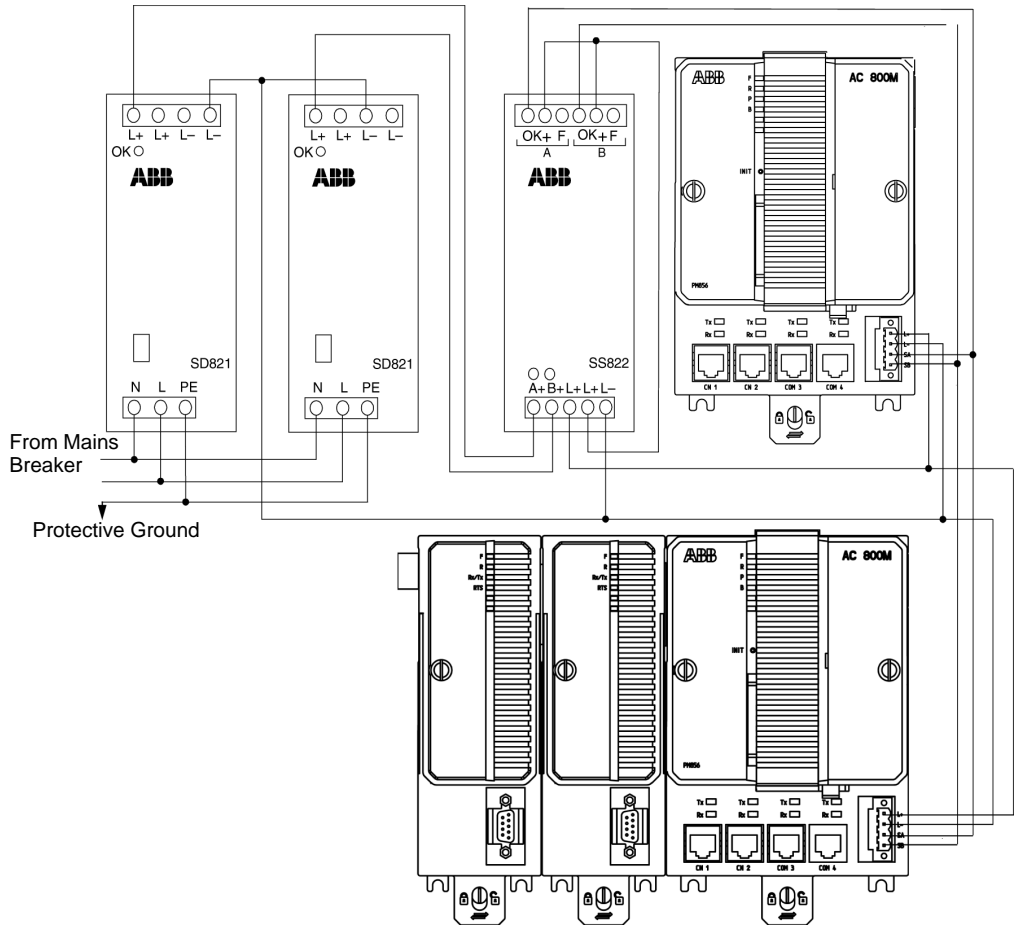


Figure 2.37: Redundant Power Supply Powering Redundant CPUs

2.31.1 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 2.37 on page 136](#), [Figure 2.38 on page 137](#) and [Figure 2.39 on page 138](#).

[Figure 2.37 on page 136](#) show redundant power supplies powering AC 800M units. Here the SA/SB signals also indicate physical power supplies.

2 Installation

2.31 Installing the SS823/SS832 Voting Unit

Figure 2.39 on page 138 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 2.38.

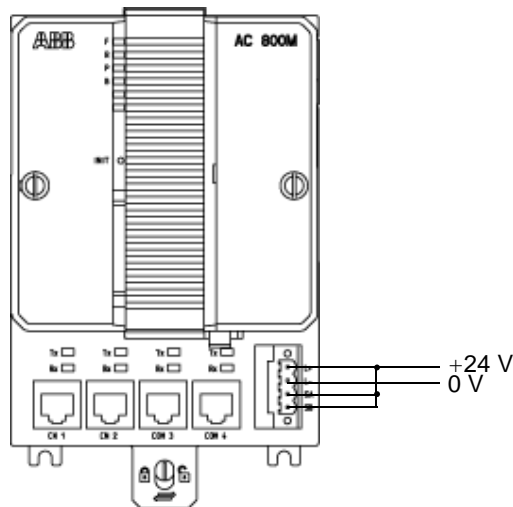


Figure 2.38: Connection of SA/SB using Single Power Supply

2 Installation
 2.31 Installing the SS823/SS832 Voting Unit

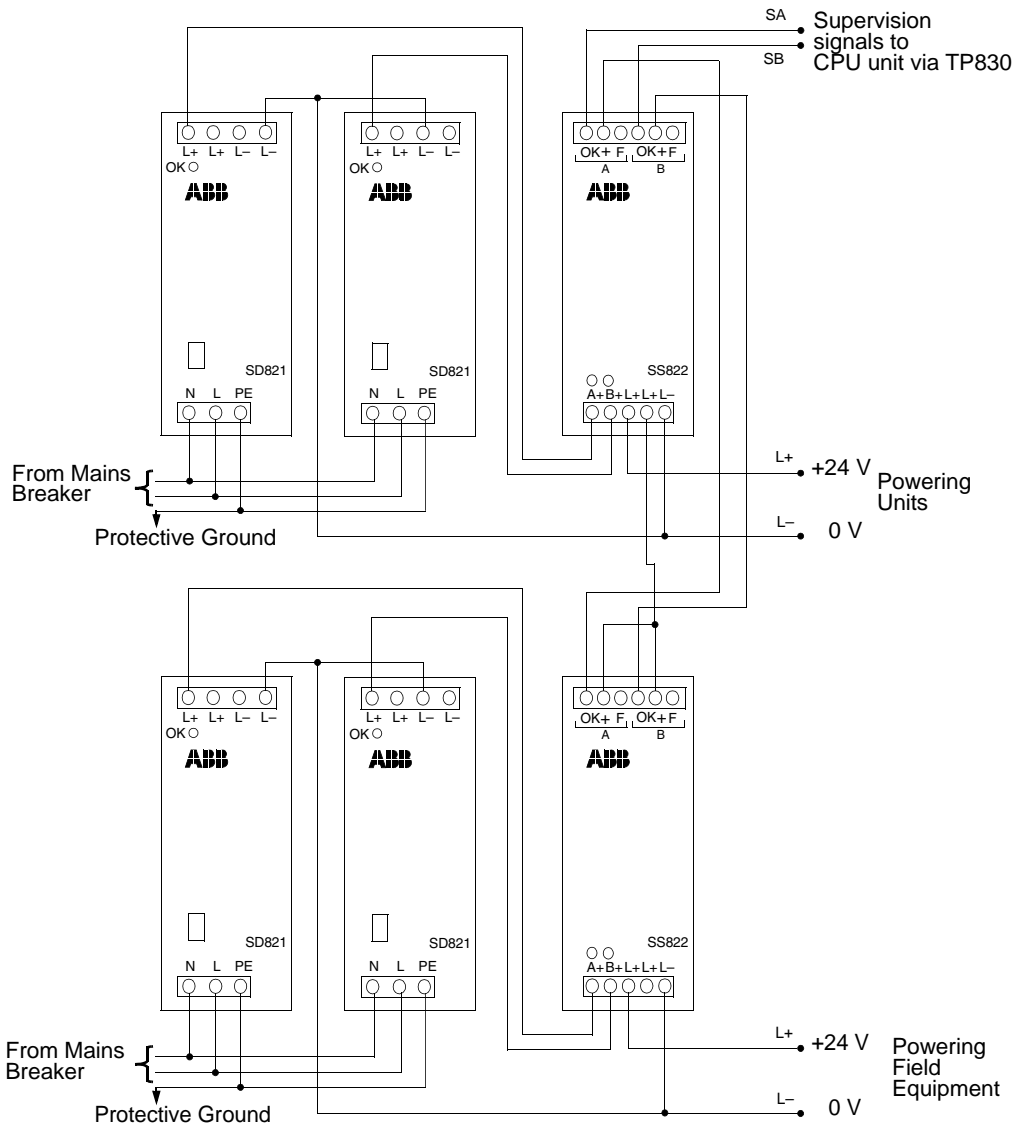


Figure 2.39: Redundant Power Supply Powering Units and Field Equipment

2.32 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 1.2 on page 38](#)).
3. In redundant CPU configuration containing two PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 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.

2.33 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 1.2 on page 38](#)).

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 PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/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

2.34 Installation of I/O Units

For further information regarding mounting, removing and releasing procedures for I/O Units, refer to *System 800xA S800 I/O - Getting Started (3BSE020923*)*.

2.35 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. For more information refer to *System 800xA AC 800M and S800 I/O - Installation Rules (3BSE085885*)*

- [Figure 2.40 on page 141](#): Wall Cabinet – Single Power Supply Arrangement
- [Figure 2.41 on page 142](#): Wall Cabinet – Dual Power Supply (Local/Field) Arrangement
- [Figure 2.42 on page 143](#): Floor Mounted Cabinet – Unit Arrangement (Redundant PSU)

The DIN-rails are using the supporting Al-profile to ensure rigidity. See [Figure A.53 on page 400](#).

The cabinets shown in the figures are ABB manufactured cabinets:

- RE820: Wall Cabinet
- RM550: Floor Cabinet

2 Installation
2.35 Installation in Cabinets

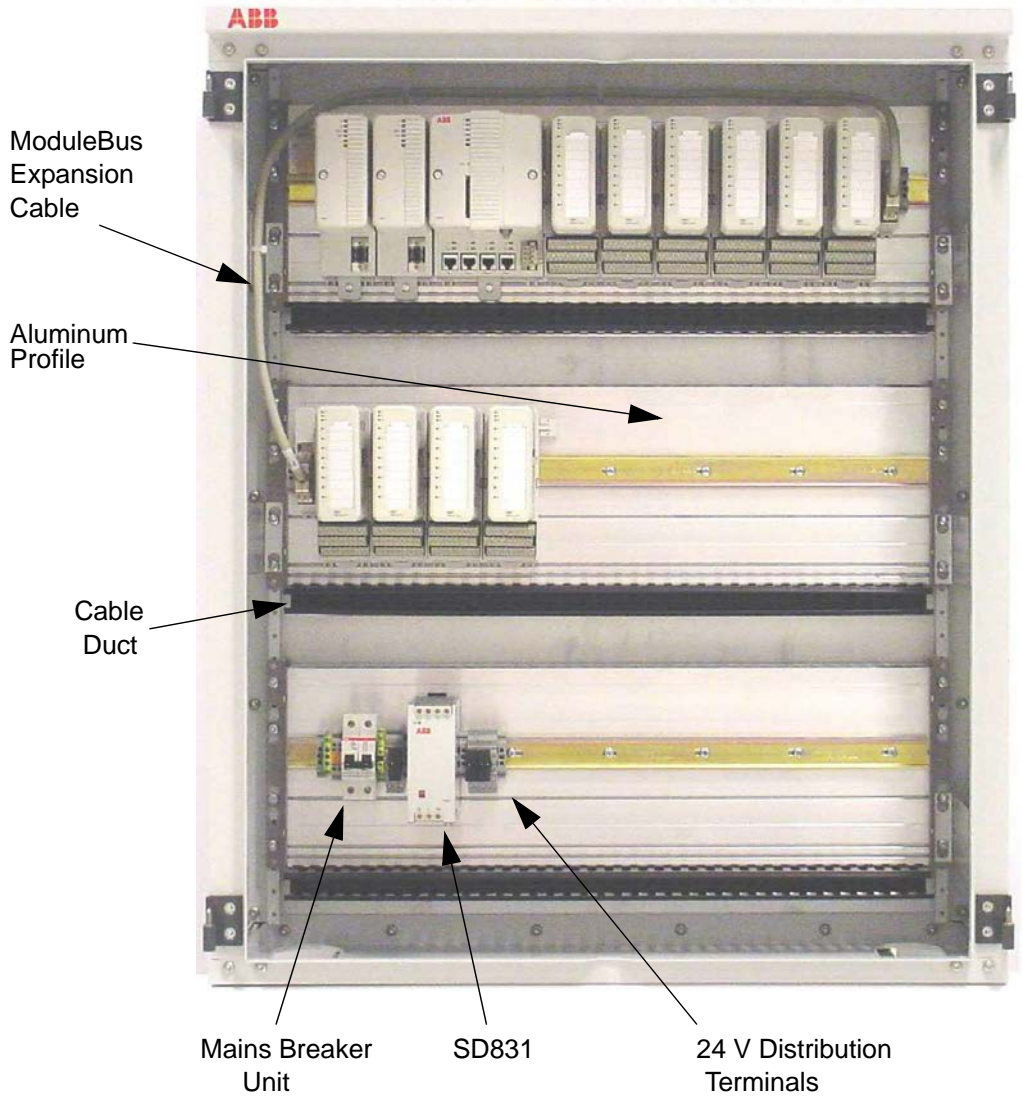


Figure 2.40: Wall Cabinet – Single Power Supply Arrangement

2 Installation
2.35 Installation in Cabinets

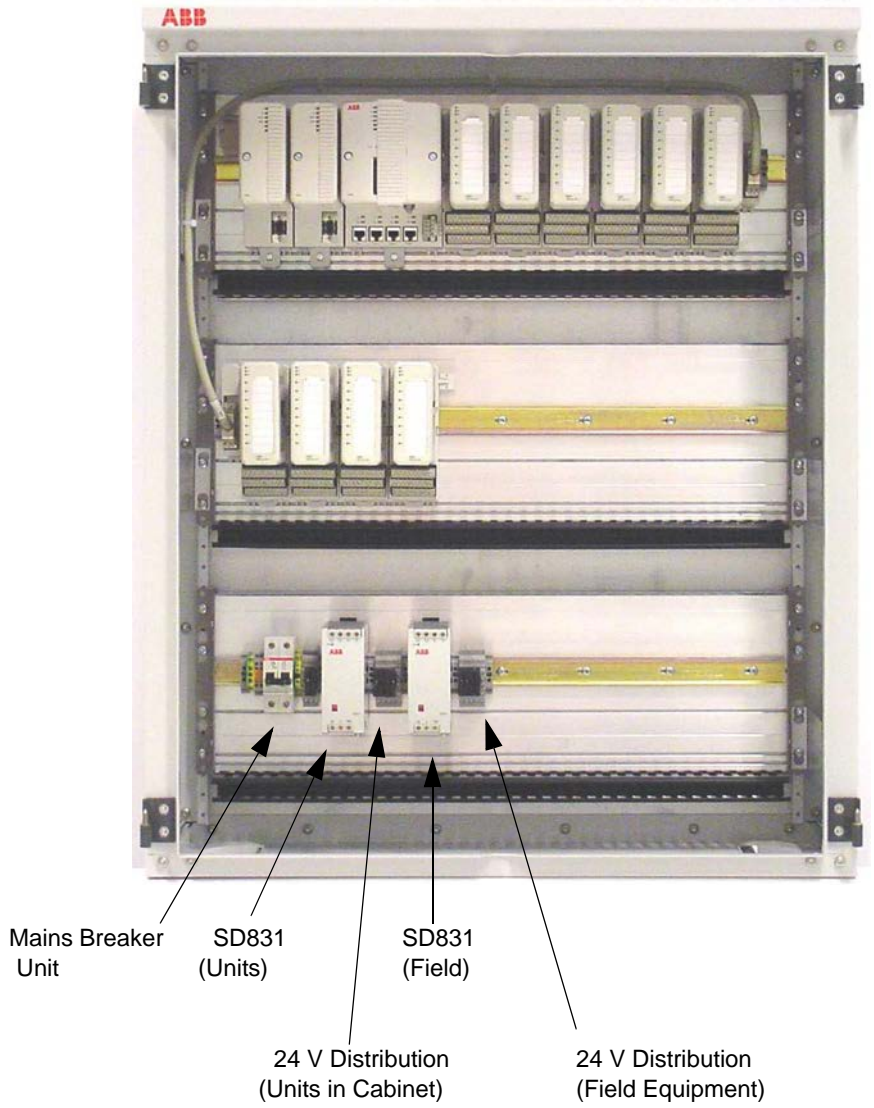


Figure 2.41: Wall Cabinet – Dual Power Supply (Local/Field) Arrangement

2 Installation
2.35 Installation in Cabinets

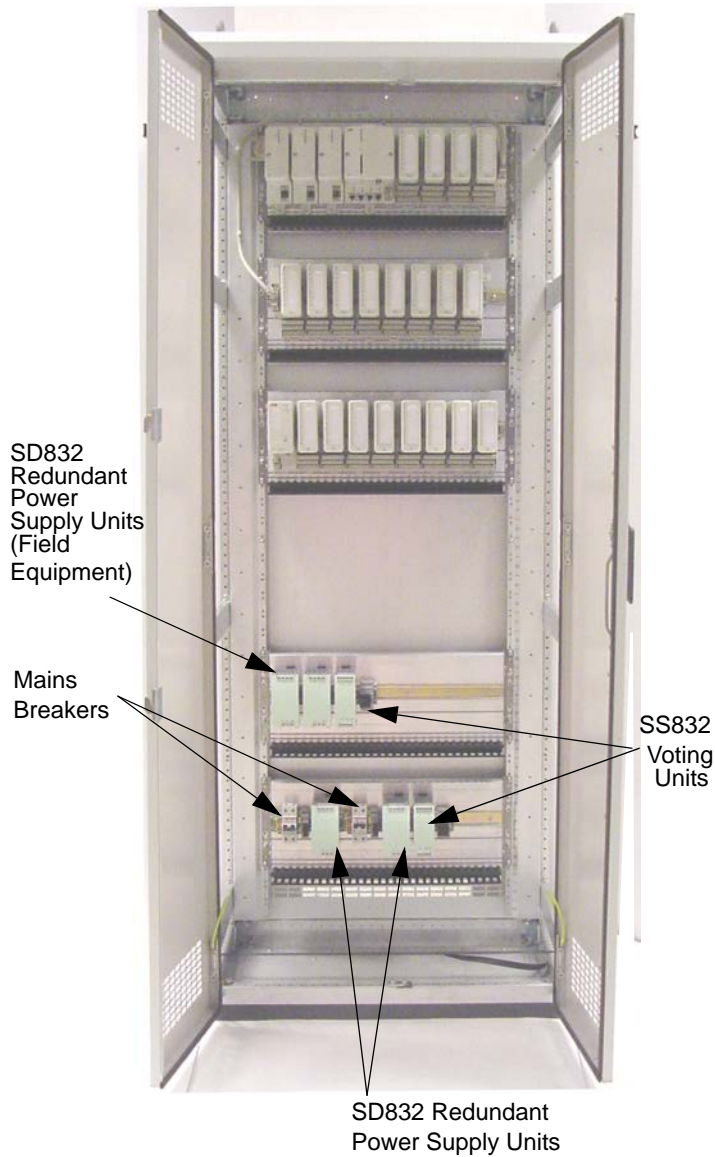


Figure 2.42: Floor Mounted Cabinet (Horizontal Unit Arrangement)

2.36 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 2.43 on page 144](#).



The CPU and Communication Interfaces must be mounted on a **horizontal** DIN-rail.

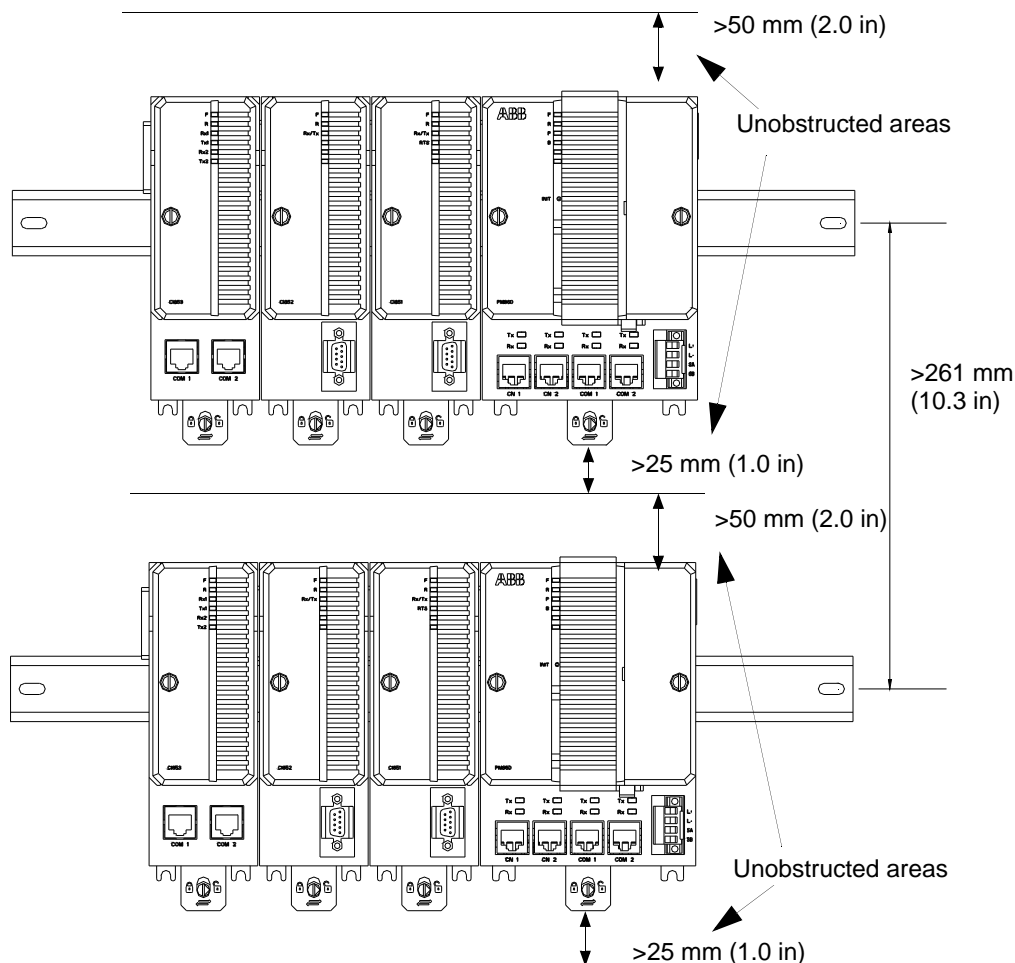


Figure 2.43: Ventilation Requirements – Minimum Mounting Dimensions

3 Configuration

3.1 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.

3.2 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 3.1 on page 146](#)).

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.

3.3 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.

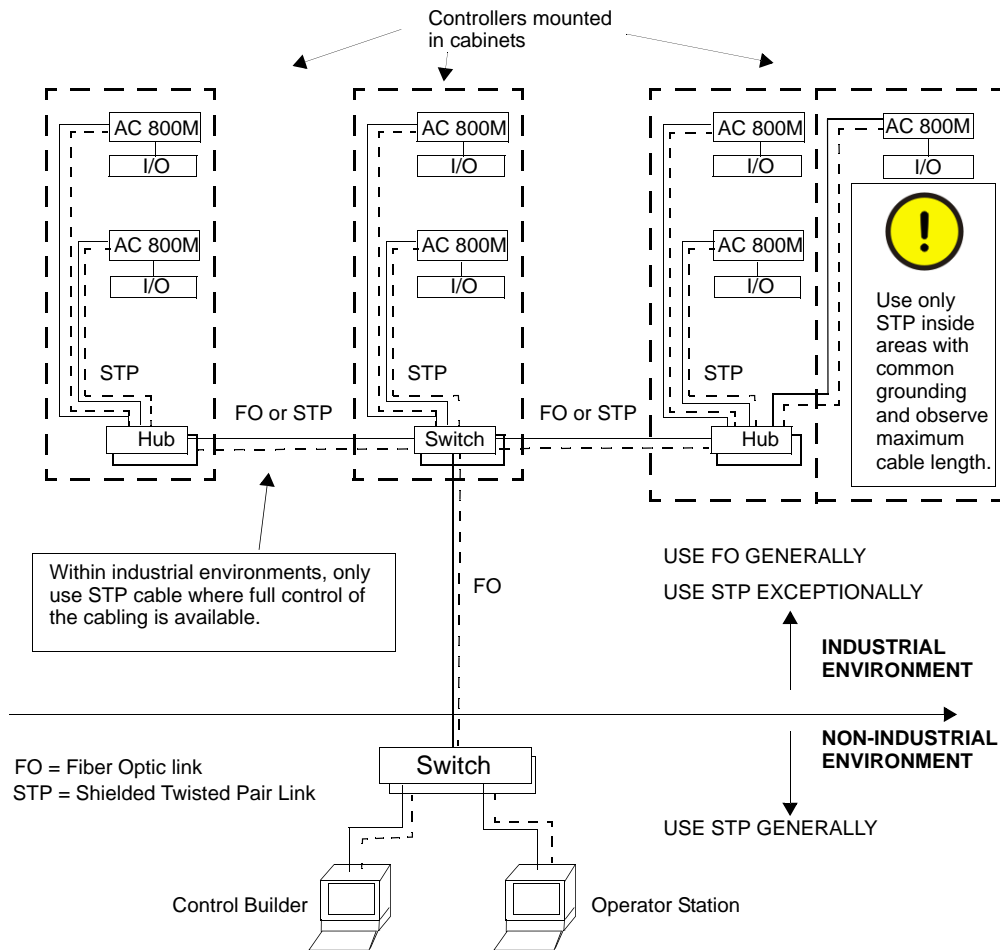


Figure 3.1: Example of AC 800M Controllers Connected to a Control Network

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 3.1 on page 146](#).

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

3.4 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 145](#)). 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 3.1 on page 148](#).

Table 3.1: 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 ¹²	
CI853 (RS-232C)	12	12	2
CI854/CI854A/CI854B (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)	12		1 ³
CI869 (AF100)	12		2
CI871 (PROFINET IO)	12		2 ⁽³⁾
CI872 (MOD5)	4	8	3
CI873 (EtherNet/IP)	4	12	2 ⁽³⁾

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.

3.4.1 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 55](#).

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 PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/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.

3.5 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/CI854B 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/CI854B 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.

3.5.1 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 3.2 on page 152](#)) – 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 3.2 on page 152](#)) – 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.

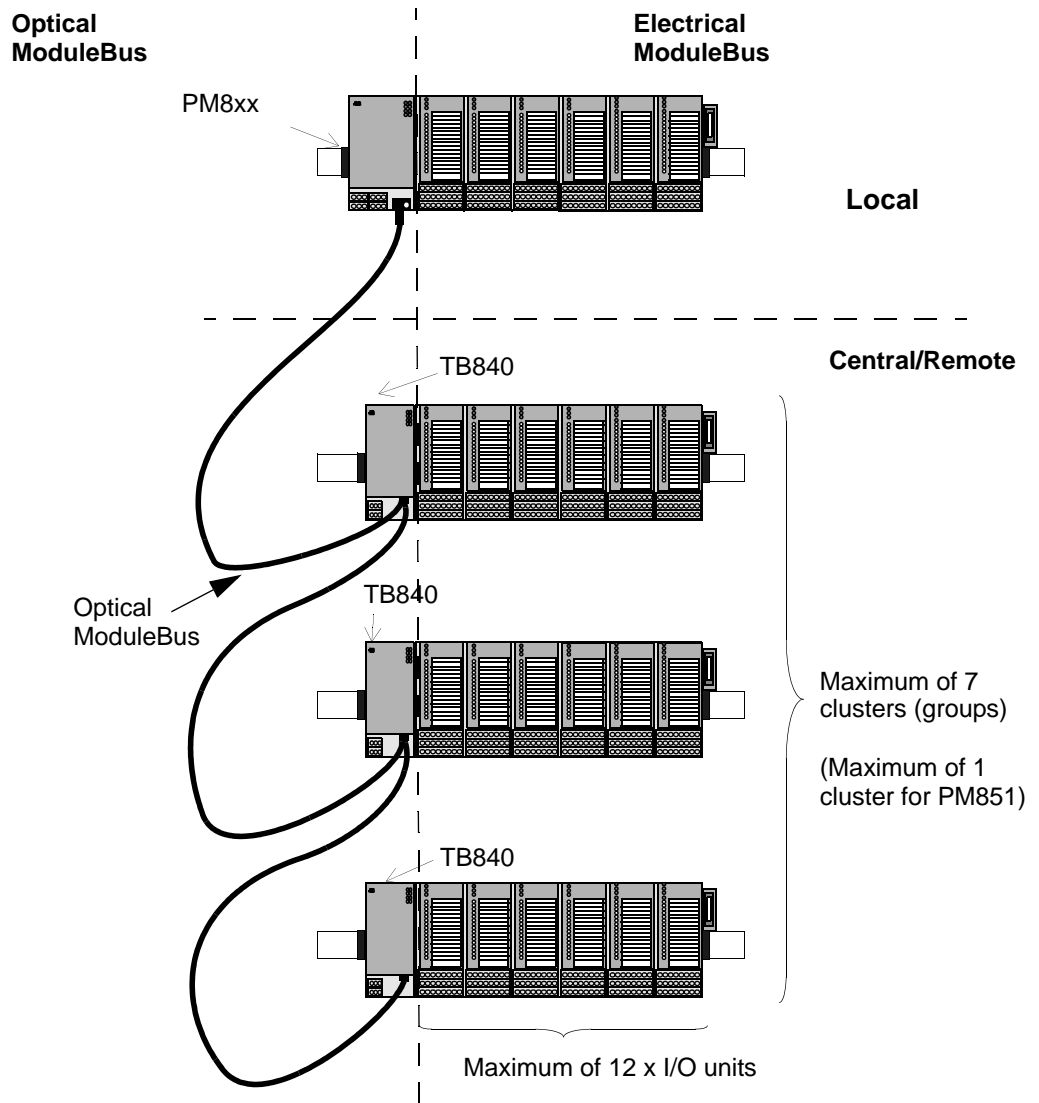


Figure 3.2: Electrical and Optical ModuleBus Configuration

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 3.3 on page 153](#)).

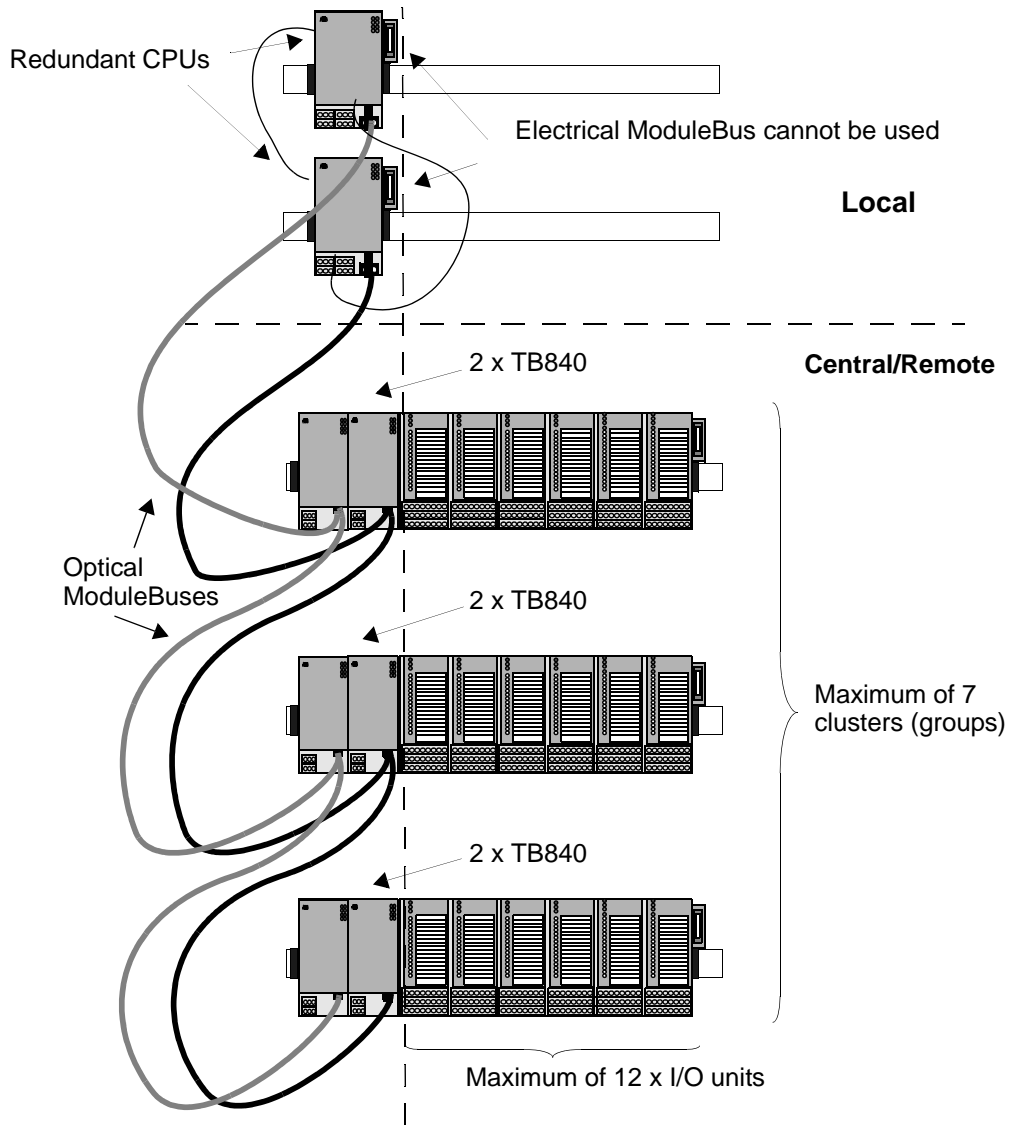


Figure 3.3: Optical ModuleBus connection in redundant CPU configuration

3.5.2 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/CI854B/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.

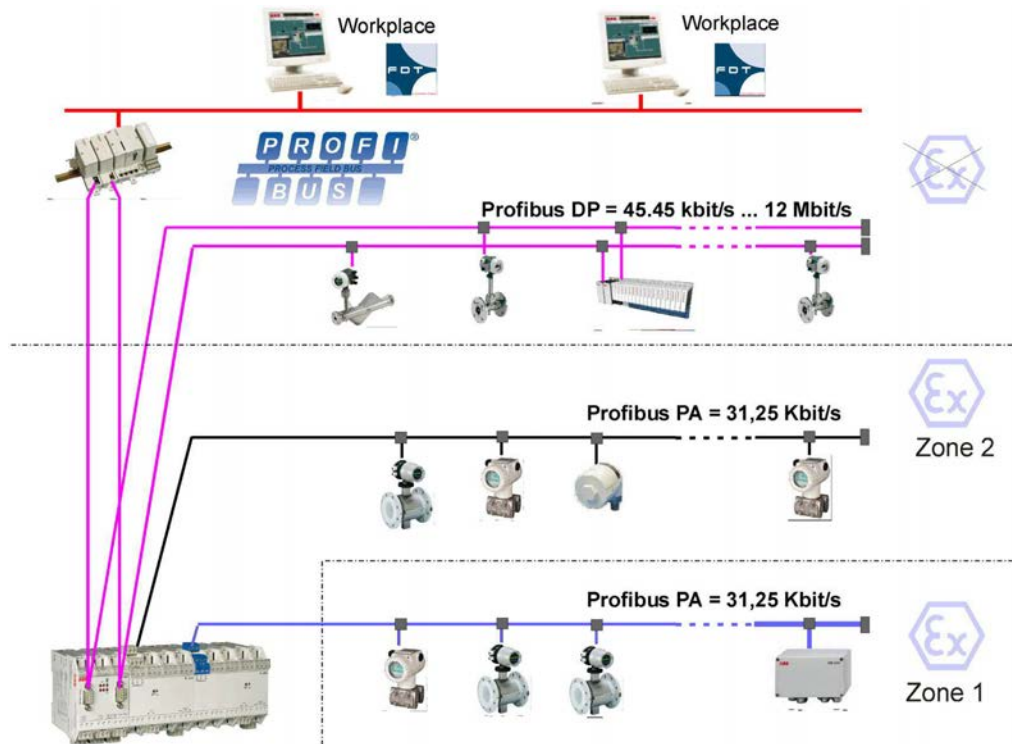


Figure 3.4: Example of System Structure for PROFIBUS

3.5.3 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.

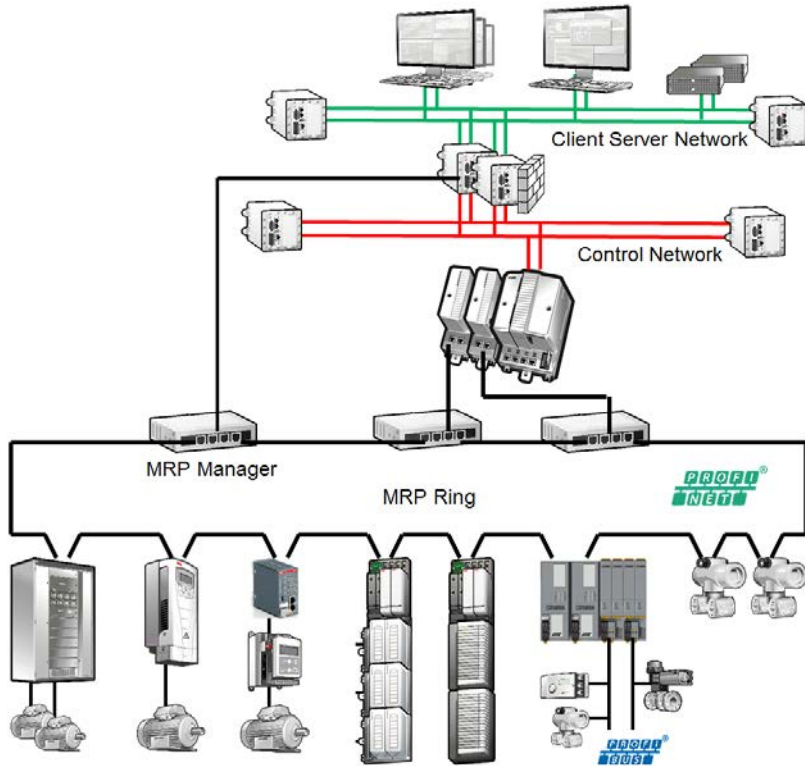


Figure 3.5: PROFINET IO with AC 800M

3.5.4 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 1.7 on page 45](#). 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.

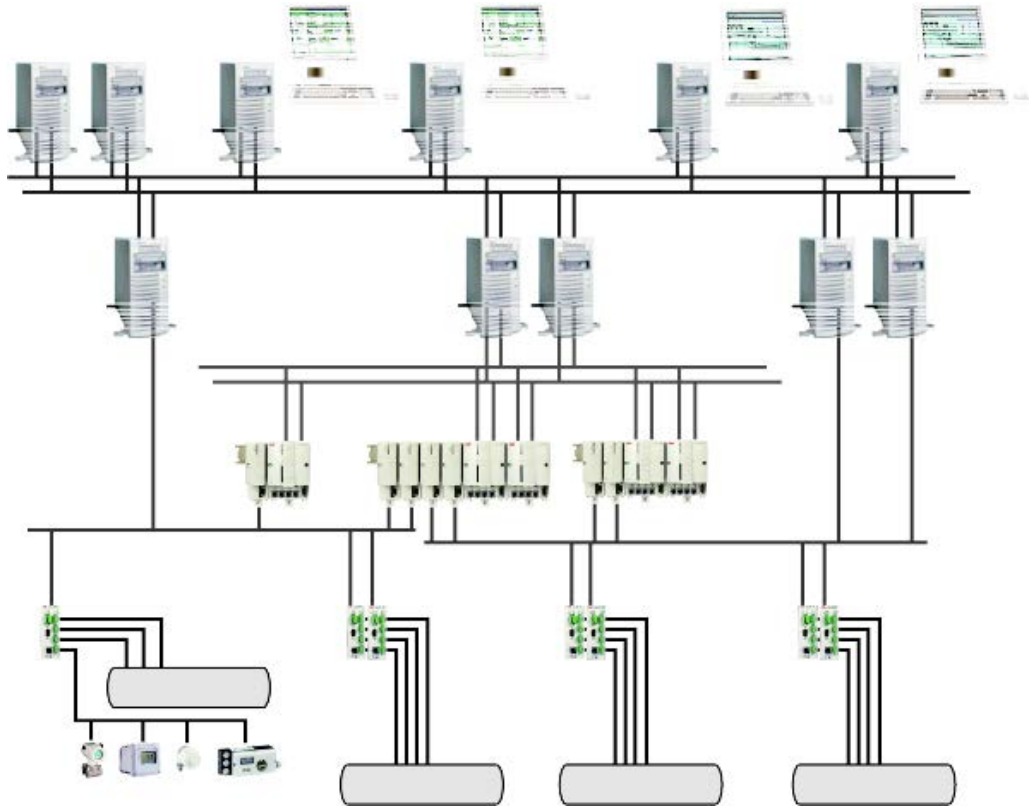


Figure 3.6: Example of system structure for FOUNDATION

3.5.5 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.

3.6 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.

3.6.1 ModuleBus

In single CPU configuration, ABB Drives can be connected to the processor unit via the optical ModuleBus. See [Figure 3.7 on page 161](#). The number of ABB Drives which can be connected to the optical ModuleBus, can be described by the following equation:

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

that is, each Drive uses 12 consecutive ModuleBus positions.

3.6.2 PROFIBUS DP and CI801

In single and redundant CPU configuration, ABB Drives can be connected via PROFIBUS DP and CI801. See [Figure 3.7 on page 161](#). Only Standard Drives can be connected to CI801. Nine (9) 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 3.7 on page 161](#)) see ABB Drive System documentation.

ABB drives can also be connected via PROFIBUS DP (CI854/CI854A/CI854B), with direct connection to PROFIBUS DP slave modules NPBA-12, RPBA-01, and FPBA-01.

3.6.3 PROFINET IO and CI871

The RETA-02 Ethernet Adapter module and FENA-01/-11/-21 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.

3.6.4 DriveBus Interface CI858

ABB drives can be connected to the AC 800M via the CI858 unit, see [Figure 3.7 on page 161](#) and [Figure 3.8 on page 162](#). 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 3.8 on page 162](#). 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 316](#)

3 Configuration

3.6 Drive System

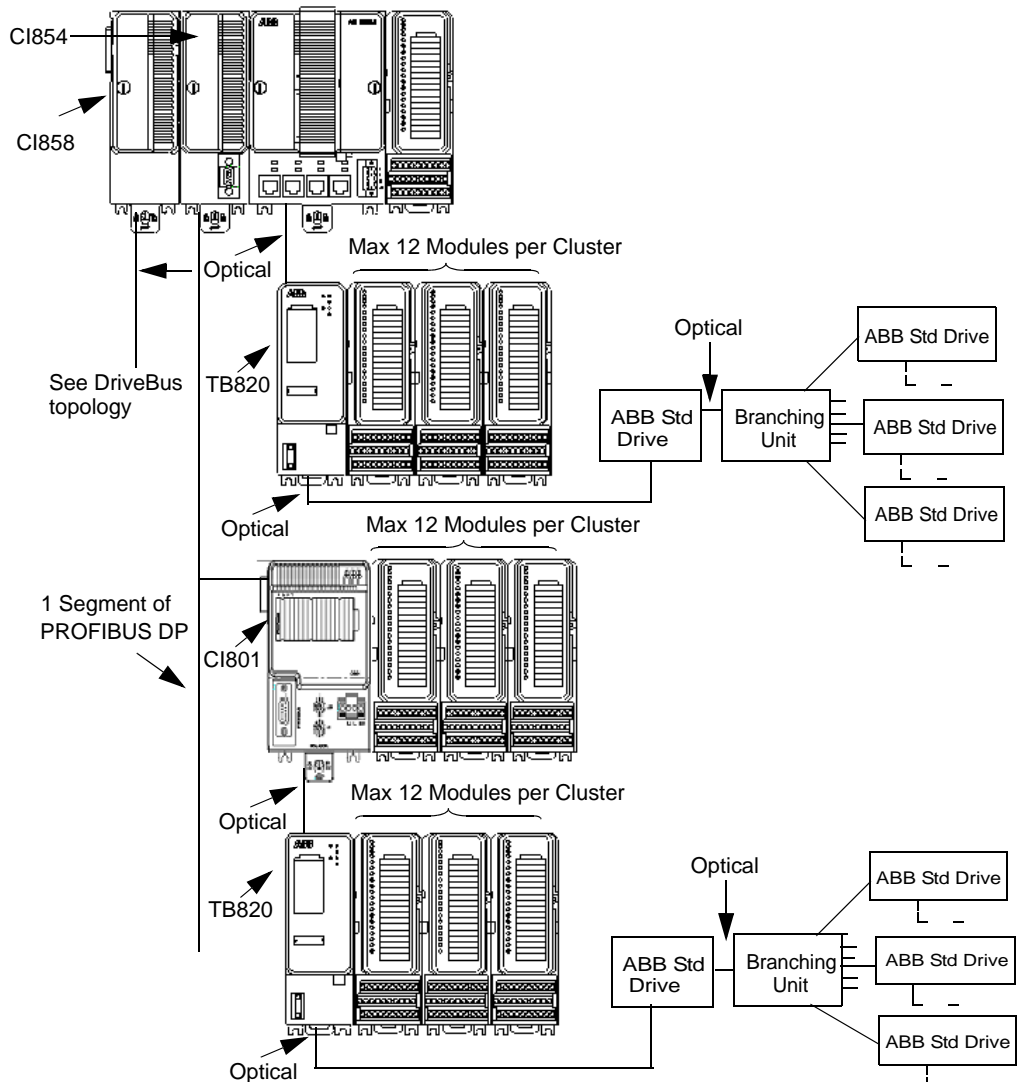


Figure 3.7: Example of Connection of ABB Drives in Single CPU Configuration

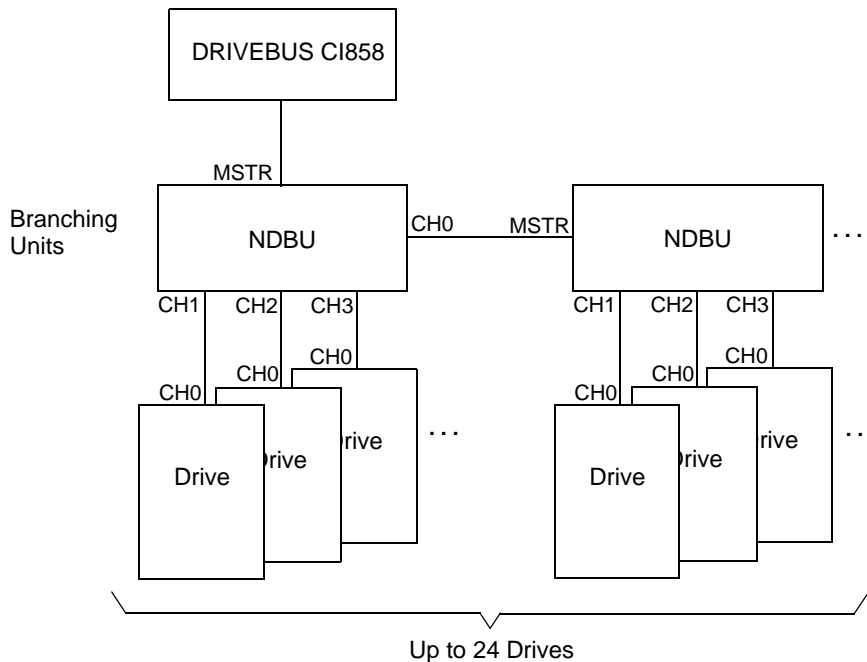


Figure 3.8: DriveBus Topology

3.7 Power Supply System

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

3.7.1 Configurations

Figure 3.9 on page 166 and Figure 3.10 on page 167 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.

3.7.2 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

3.7.3 Cabinet Containing I/O System

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

3.7.4 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/BC820 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.

3.7.5 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 65](#).

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 2.41 on page 142](#) and [Figure 2.42 on page 143](#)).

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 3.9 on page 166](#) and [Figure 3.10 on page 167](#)). 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 3.10 on page 167](#)).

3.7.6 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.



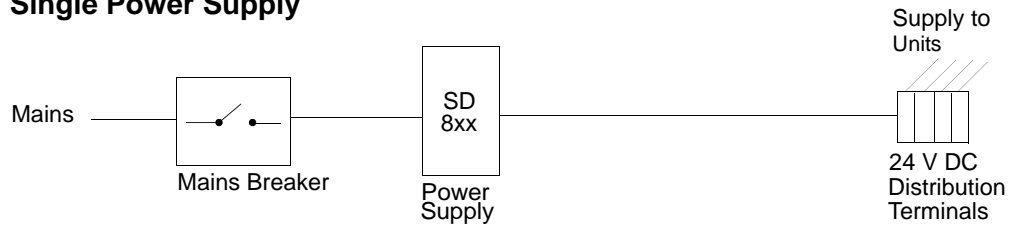
Should there be a risk that the +24 V at the PM8XX power terminals could drop below 19.2 V for more than 1 ms, then an energy reservoir must be used for Powering Units.

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.

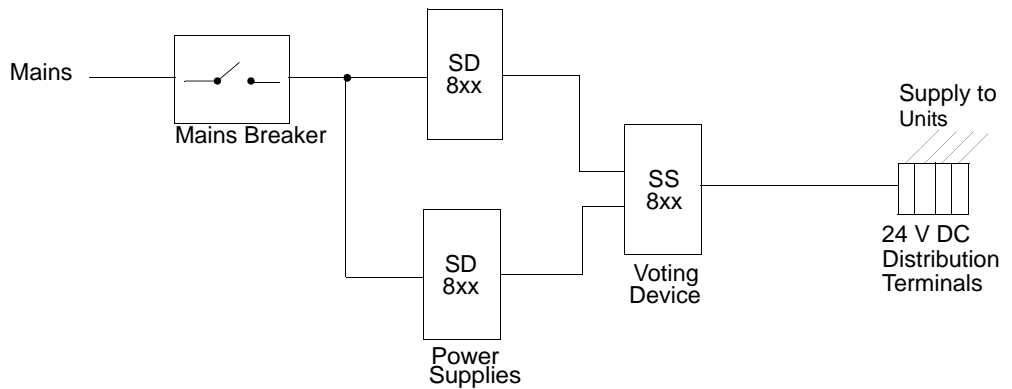


For redundant power supplies to the AC 800M controller and associated units, always derive connections from the SS8xx voting device. See [Figure 3.9 on page 166](#).

Single Power Supply



Redundant Power Supplies



Redundant Mains Power Supplies

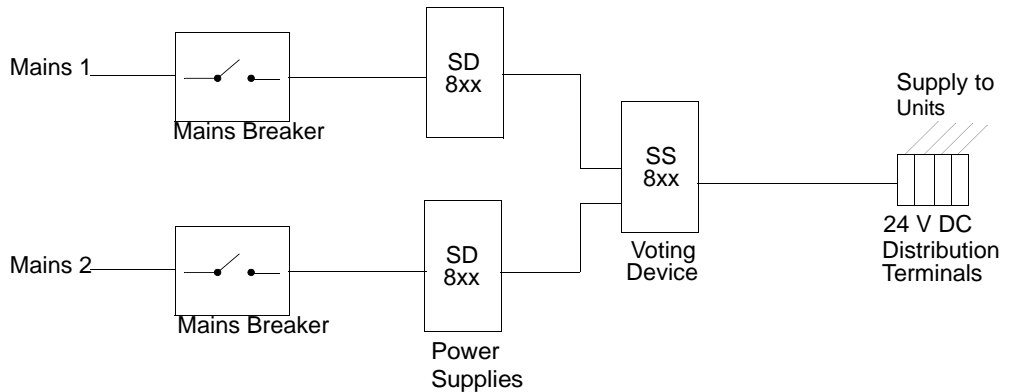


Figure 3.9: Power Supply Options for AC 800M Units

Powering Field Equipment

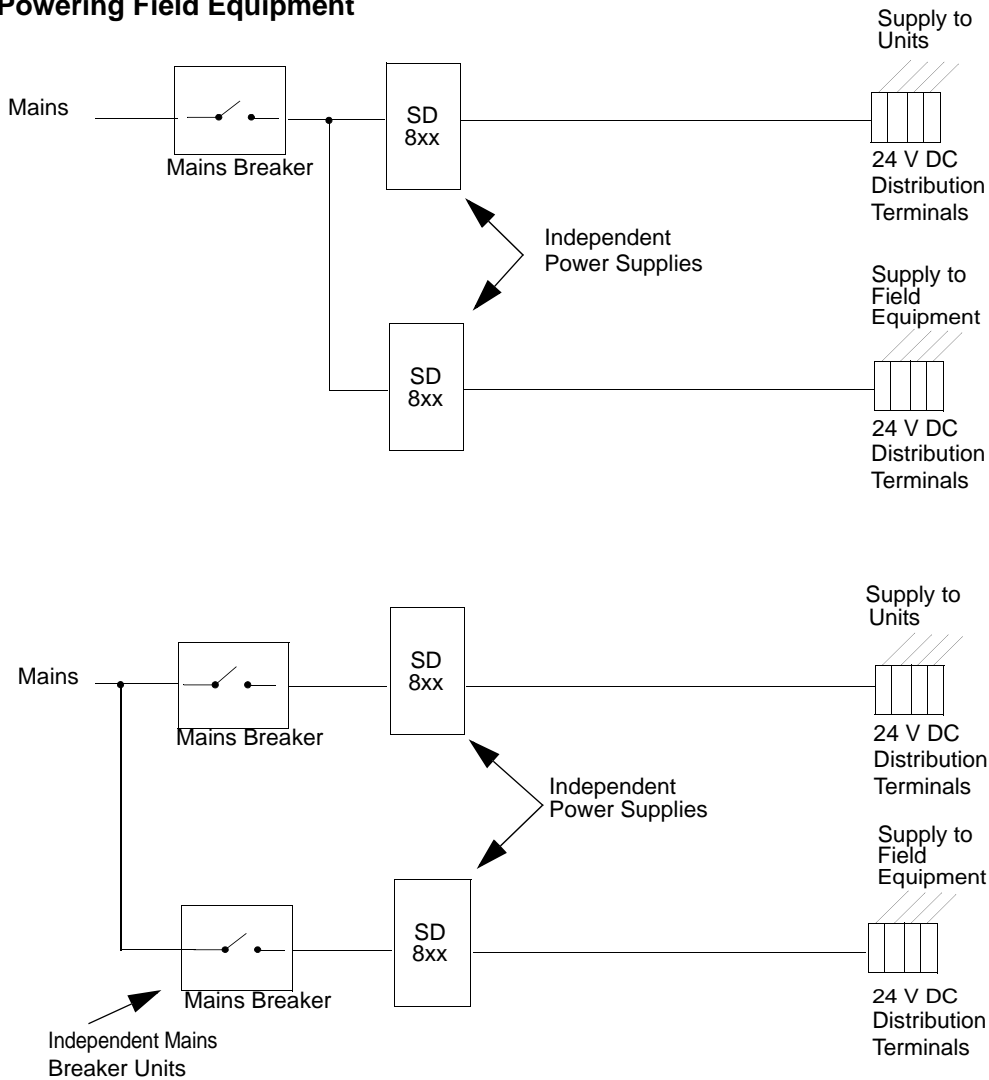


Figure 3.10: Powering Field Equipment

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](#).

4.1 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.

4.1.1 LED Indicators

See [Figure 1.2 on page 38](#), for description of placement.

Table 4.1: PM8xx – LED Indicators

Marking	Color	Function
F(ault)	Red	Normal state – OFF Re-start (INIT) temporarily lit F(ault). May also be operated by software during special states such as for instance FW-upgrade.
R(un)	Green	Normal state – ON (When application is executing) Cold Restart (Short INIT) temporarily extinguishes R(un). Controller Reset (Long INIT, 3 sec. or more) R(un) flashes until INIT push button is released.

4 Operation

4.1 AC 800M Controller (PM8xx)

*Table 4.1: PM8xx – LED Indicators
(Continued)*

Marking	Color	Function
P(ower)	Green	Normal state – ON When lit, indicates that the CPU DC/DC converter is generating valid +5 V and +3.3 V DC supply voltages. No software control.
B(attery)	Green	Normal state – ON Lit when internal or external battery voltage is above 3.1 V. The LED is controlled by a software battery voltage test ¹ .
Tx	Yellow Green ²	Data Transmission ⁽⁴⁾ , CN1 + CN2 and COM3 ³ + COM4 Flashes in synchronization with Tx traffic
Rx	Yellow Green(2)	Data Reception ⁴ , CN1 + CN2 and COM3 ⁽³⁾ + COM4 Flashes in synchronization with Rx traffic or is permanently lit
Valid for PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891		
PRIM(ary)	Yellow	Lit in single and redundant configuration. 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.

4.1.2 Switches and Push buttons

Table 4.2: PM8xx – Switches and Push buttons

Marking	Type	Function
INIT	Manual Push button	Initiates 1. Cold Restart if INIT is held less than 2.5 seconds. 2. Controller Reset if INIT is held more than 3 seconds. If INIT is pushed on the Primary CPU in redundant configuration a switchover to the backup CPU will be initiated.

4.1.3 Connectors

Table 4.3: PM8xx/TP830 and PM891 – Connectors

Marking	Function
L+	External Power Supply Connection +24 V DC supply 0 V Redundant Power Supply monitoring input Redundant Power Supply monitoring input
L–	
SA	
SB	
SH	External Battery Connection Shield (Screw Connector) Battery Positive (Screw Connector) Battery Negative (Screw Connector)
B+	
B–	
Tx	ModuleBus Connection Data Transmission Port (Optical) Data Reception Port (Optical) Note – Duplex or Simplex optical cables may be used.
Rx	
MODULEBUS ¹	Provides expansion of I/O unit capability.
CEX-BUS	Provides extension of on-board communication ports.
Valid for PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867	

Table 4.3: PM8xx/TP830 and PM891 – Connectors
(Continued)

Marking	Function
RCU Link Connector	Provides information and data transfer between Primary and Backup CPU in redundant configuration.
Valid for PM891	
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.

4.2 Start-up

Refer to relevant document for information on:

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

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

The redundant configuration using CEX bus and CEX modules is supported along with the processor modules PM857, PM858, PM861, PM862, PM863, PM864, PM865, PM866, PM867 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.

4.3 Start Modes

4.3.1 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.

4.3.2 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).

4.3.3 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.

4.3.4 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.

4.3.5 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.

4.4 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.

4.5 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 4.4 on page 175](#).

4.5.1 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 191](#).

4 Operation

4.5 Verification of Satisfactory AC 800M Operation

Table 4.4: AC 800M Controller – Verification of Satisfactory System Operation

LED Indicator Status	AC 800M Controller Status
PM8xx Processor Unit	
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
BC810 CEX-Bus Interconnection Unit	
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
SM810/SM811/SM812	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI853 RS-232C Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI854/CI854A/CI854B PROFIBUS DP Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI855 Ethernet Interface Unit for MasterBus 300	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI856 S100 I/O Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK

4 Operation

4.5 Verification of Satisfactory AC 800M Operation

*Table 4.4: AC 800M Controller – Verification of Satisfactory System Operation
(Continued)*

LED Indicator Status	AC 800M Controller Status
C(omm. fail) Red LED must be OFF	OK
CI857 INSUM Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI858 DriveBus Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI860 FOUNDATION Fieldbus High Speed Ethernet Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI862 TRIO I/O Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI865 Satt I/O Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI867 Modbus TCP Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI868	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI869	
F(ault) Red LED must be OFF	OK

Table 4.4: AC 800M Controller – Verification of Satisfactory System Operation (Continued)

LED Indicator Status		AC 800M Controller Status
R(un) Green LED must be ON (steady)		OK
CI871		
F(ault) Red LED must be OFF		OK
R(un) Green LED must be ON (steady)		OK
CI872		
F(ault) Red LED must be OFF		OK
R(un) Green LED must be ON (steady)		OK
CI873		
F(ault) Red LED must be OFF		OK
R(un) Green LED must be ON (steady)		OK

4.5.2 Verification of Redundant CPU

Check, in redundant configuration, the following LED indicators on PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891 and, if used, SM810/SM811/SM812 (see [Table 4.5 on page 177](#)).

Table 4.5: AC 800M Controller (PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891/SM810/SM811/SM812) – 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
Primary SM810/SM811/SM812	Back-up SM810/SM811/SM812	

4 Operation

4.5 Verification of Satisfactory AC 800M Operation

*Table 4.5: AC 800M Controller (PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891/SM810/SM811/SM812) – Verification of Satisfactory System Operation in Redundant configuration
(Continued)*

LED Indicator Status		AC 800M Controller Status
Primary CPU	Back-up CPU	
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 4.4 on page 175](#).

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.

5.1 Preventive Maintenance Frequency Schedule

Table 5.1: 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">• Physical damage and deterioration• Secure attachment• Condition of connectors and wiring• LED function Correct any defects.
2 Years	PM8xx Internal Battery (if fitted)	Change battery See Internal Battery on page 180

Table 5.1: Preventive Maintenance Frequency Schedule
(Continued)

Frequency	Equipment	Procedure
5 Years	SB821 External Battery (if fitted)	Change battery See SB821 External Battery Unit on page 183
3 years or 400 discharge cycles	SB822 Rechargeable External Battery (if fitted)	Change battery See SB822 Rechargeable External Battery Unit on page 184

5.2 Replacing the Battery

5.2.1 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 5.1 on page 181](#) and [Figure 5.2 on page 182](#)).

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.

5 Maintenance

5.2 Replacing the Battery

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.

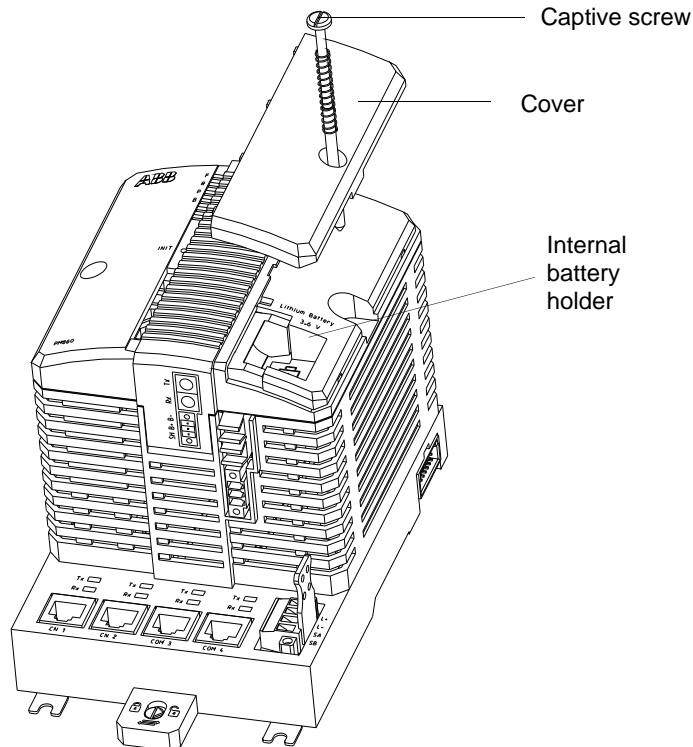


Figure 5.1: Right-hand Cover Removal – here shown with PM860

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.

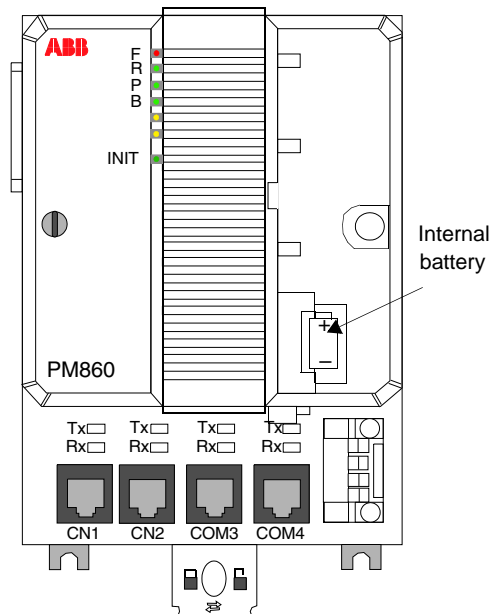


Figure 5.2: Internal Battery Location – here shown with PM860

5.2.2 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 5.3 on page 184](#)). 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 389](#).
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.

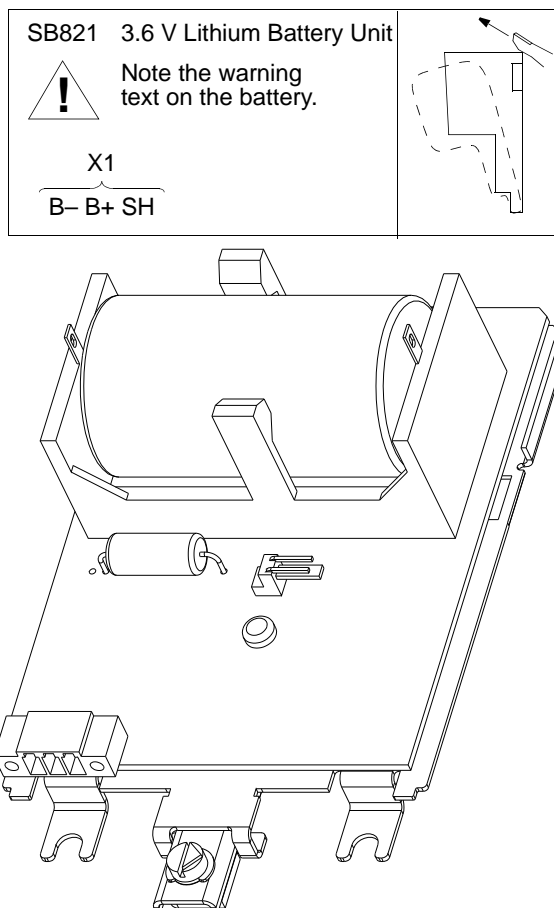


Figure 5.3: SB821 External Battery Unit – Cover Removed

5.2.3 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.

5.3 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).

Table 5.2: Online Replacement support by unit

CEX-Bus Communication interfaces (CI8xx)	Can be removed or replaced online. Restrictions apply, refer to the installation section for each interface and to Appendix A, Hardware Units .
Baseplates for CI8xx (TP8xx)	Must not be replaced online.
ModuleBus S800 I/O units	Can be removed or replaced online.

Table 5.2: Online Replacement support by unit
(Continued)

Module Terminal Units (MTUs)	Must not be replaced online
Redundant CPUs Processor unit	Can be removed or replaced online (see the next following pages)
RCU Link Cables	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 Exchanging Defect RCU Link Cables Online on page 189 .



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.

5.4 Exchange of CPU in Redundant Configuration without BC810/BC820



For PM85x/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 Defect RCU Link Cables Online on page 189](#).

3. If PM85x/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 55](#). 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.

5.5 Exchange of CPU in Redundant Configuration with BC810/BC820



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

If the BC810/BC820 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.



Removing the RCU link cable from the primary CPU in some rare cases might cause the CPU to stop. Hence, the recommendation is to remove the RCU link cable from the processor unit to be exchanged.

3. Disconnect the Control Network cables.
4. Rotate the locking device to the **SLIDE** position (2) on the unit baseplate, see [Figure 2.2 on page 71](#).
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 2.8 on page 76](#)).

7. Mount the new unit (which already has the correct firmware installed). See [Mounting AC 800M Units onto DIN-Rail on page 68](#). 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 55](#). 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.

5.6 Exchanging Defect RCU Link Cables Online

5.6.1 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 refer to the Release Notes (see [Released User Manuals and Release Notes on page 33](#)) for detailed information.

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

5.6.2 In Configuration with BC820



Do not replace the optical cable online in a previous version than 5.0. The support for online replacement also depends on hardware Product Revision levels. Please refer to the Release Notes (see [Released User Manuals and Release Notes on page 33](#)) for detailed information.

If online change proves to be supported, after the above caution has been considered, and the BC820s are externally supplied with 24V the same steps as in configuration without BC820 can be followed.

5.6.3 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. During this step the **FAIL** and **PRIM** LEDs will alternate.
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.

5.6.4 Exchanging Defect BC820 TK857V0003 Cable

Any disconnection of BC820 cables, that is, TK857V0003, the gigabit cross-over cable and the optical 50/125µm OM3 fiber is only allowed to take place at the backup end of a running controller.



Exchange of faulty TK857V0003 is allowed only when both the CPU and the BC820 are OFF.

To exchange a TK857V0003 cable in a redundant CPU configuration, perform the following steps:

1. Switch OFF or disconnect Power for the backup CPU.
2. Switch OFF or disconnect Power for the BC820, if external power is connected.
3. Disconnect the cable from the backup CPU.
4. Disconnect the cable from the BC820.
5. Attach the new cable to the backup CPU
6. Attach the other end of the cable to the BC820.
7. Switch ON or reconnect the Power to the backup CPU and the BC820.

5.7 Corrective Maintenance Procedures

5.7.1 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.

5.8 Fault-Finding Procedures

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

5.8.1 PM8xx Processor Unit in Single CPU Configuration

Table 5.3: 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"> • Wait for Controller restart to finalize. Missing firmware. <ul style="list-style-type: none"> • Upgrade firmware. Firmware upgrade in progress. <ul style="list-style-type: none"> • Wait for FW upgrade to finalize. Firmware upgrade failure. <ul style="list-style-type: none"> • Use serial FW upgrade. Missing TB852 <ul style="list-style-type: none"> • Check TB852 connection (PM857, PM858, PM861, PM862, PM863, PM864, PM865, PM866 and PM867). Other <ul style="list-style-type: none"> • Check controller log.
F(ault) LED is flashing	Firmware upgrade in progress: <ul style="list-style-type: none"> • Wait for FW upgrade to finalize. Other <ul style="list-style-type: none"> • Check controller log.
R(un) LED is OFF	No application loaded in the Controller. <ul style="list-style-type: none"> • Download application. Controller application failed. <ul style="list-style-type: none"> • Restart Controller (INIT push button). • Download application.
B(attery) LED is flashing	Battery voltage (Internal or External) is below 3.1 V or non-existent. <ul style="list-style-type: none"> • Install new battery. External battery cable disconnected. <ul style="list-style-type: none"> • Connect external battery cable. See Fault-Finding Table 5.8 on page 196 .

5.8.2 PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891 Unit in Redundant Configuration

Table 5.4: PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867/PM891 Redundant Configuration – Fault-Finding Procedure

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

5.8.3 CEX-Bus Interconnection Unit - BC810

Table 5.5: BC810 – Fault-Finding Procedure

Fault	Possible Cause and Corrective Action
Fault LED is ON	<p>No 3.3 V caused by internal short circuit or overvoltage from power supply</p> <ul style="list-style-type: none"> Check external 24 V voltage with voltmeter. Send unit for repair.
Run LED is OFF	<p>Hardware error.</p> <ul style="list-style-type: none"> Send unit for repair. <p>Internal fuse blown (BC810)</p> <p>External fuse blown (TP857)</p>
EPOK LED is OFF when external power is connected	<p>Hardware error.</p> <p>External fuse blown (TP857)</p> <ul style="list-style-type: none"> Send unit for repair.
C1 LED OFF C2 LED OFF on Primary side	<p>No CEX-Bus activity</p> <p>Backup side is not connected or inactive</p> <p>C2 is always OFF on backup side.</p>

5.8.4 CEX-Bus Interconnection Unit - BC820

Table 5.6: BC820 – Fault-Finding Procedure

Fault	Possible Cause and Corrective Action
Fault LED is ON	The red Fault LED indicates that the FPGA doesn't work. <ul style="list-style-type: none"> • Check external 24 V voltage with voltmeter. • Send unit for repair.
Run LED is OFF	Hardware error. <ul style="list-style-type: none"> • Send unit for repair. Internal fuse blown (BC820) External fuse blown (TP850)
EPOK LED is OFF when external power is connected	Hardware error. External fuse blown (TP850) <ul style="list-style-type: none"> • Send unit for repair.
C1 or C2 LED OFF despite accessing CEX-units	CEX-Bus units using no interrupt, no action is needed.
RCU Yellow LED	The yellow LED serves two functions. Normal: indicates that there is RCU service data traffic flowing in both directions between the RCUs in the PMs. Fault: indicate problem with UPPER/LOWER switches, that RCU data link (fibre optical) is down or that RCU control link is down. When there is no fault condition the LED will show if RCU service data is flowing or not. If there is one or more of the fault conditions above the LED will change behavior and blink a number of times to indicate the fault. This is done in three seconds intervals with one interval for each fault. This persists while any fault remains. <ul style="list-style-type: none"> - 1 blink = up/lo switches in same position - 2 blinks = RCU data link down (opto link) - 3 blinks = RCU control link down

5.8.5 SM810/SM811/SM812

Table 5.7: SM810/SM811/SM812 – Fault-Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	<p>The SM810/SM811/SM812 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"> • Check the Log File • Check the CEX-Bus fuse inside the CPU unit. • Initiate a reset signal (INIT) from the CPU unit. • Replace the SM810/SM811/SM812 unit.
F(ault) LED is ON	Unit error. Replace the SM810/SM811/SM812 unit.
PRIM LED is flashing	Unit error. Replace the SM810/SM811/SM812 unit.
PRIM LED is OFF in single configuration.	Unit error. Replace the SM810/SM811/SM812 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/SM812 is ready for acknowledgment of SIL3 hot insert, see SM811 and TP868 on page 283 and see SM812 and TP868 on page 289. If the condition persists for a longer time, replace the SM811/SM812 unit.</p>

5.8.6 Internal Battery / SB821 External Battery/SB822 Rechargeable External Battery



The PM891 unit does not contain internal battery.

Table 5.8: Internal / SB821/SB822 External Battery/– Fault-Finding

Fault	Possible Cause and Corrective Action
B(attery) LED indicator on PM8xx processor unit is flashing	<p>Internal battery</p> <ul style="list-style-type: none"> • Renew the PM8xx internal battery <p>SB821:</p> <ul style="list-style-type: none"> • Check external battery connections. <p>If condition persists:</p> <ul style="list-style-type: none"> • Renew the External battery, see SB821 External Battery Unit on page 183. <p>SB822:</p> <ul style="list-style-type: none"> • Check external battery connections. <p>If Charge LED and or Power LED on SB822 are turned off:</p> <ul style="list-style-type: none"> • Check 24V supply connections. <p>If condition persists:</p> <ul style="list-style-type: none"> • Renew the Li-Ion battery package, see SB822 Rechargeable External Battery Unit on page 184.
The system time is incorrect following a power failure	Renew the External Battery.

5.8.7 On-board RS-232C Channels – CI853

Table 5.9: 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"> • Check that the communication interface cable is connected. • Check the hand-shake signals.
<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"> • Check that the baud rate, parity, and number of data and stop bits are as specified for the connected device. • Check that the handshake procedures are as specified at both ends. • Check that the driver routines are adequate, both in the controller and the connected device. • Disconnect power to the controller, wait a moment and then power-up again. • Halt the program and initiate a reset signal (INIT) from the PM8xx processor unit.



CI853 supports hot swap.

5.8.8 PROFIBUS DP – CI854/CI854A/CI854B

Table 5.10: PROFIBUS DP CI854/CI854A/CI854B – Fault-Finding

Indication	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LED's are ON	<p>The CI854/CI854A/CI854B 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"> • Check that a valid HW configuration including the CI854 is downloaded to the controller. • Check the CEX-bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI854/CI854A/CI854B unit.
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/CI854B 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/CI854B unit.</p>
RxA LED is OFF	<p>No communication on Line A.</p> <ul style="list-style-type: none"> • Check that slaves are configured and connected to this line. • 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. • Check all cables and connectors for damage and loose or poor connections.

Table 5.10: PROFIBUS DP CI854/CI854A/CI854B – Fault-Finding
(Continued)

Indication	Possible Cause and Corrective Action
RxB LED is OFF	No communication on Line B. <ul style="list-style-type: none">• Check that slaves are configured and connected to this line.• 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.• Check all cables and connectors for damage and loose or poor connections.
DUAL LED is OFF on both modules (CI854A only)	The CI854A board is in the process of being restarted or configured. Allow time for this to finalize. Check that the redundancy for this module is set within CBM and the configuration is downloaded.



CI854A/CI854B supports hot swap.

5.8.9 MasterBus 300 Interface – CI855

Table 5.11: 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"> • Check the CB for a failure message.
Rx1 LED is ON (not flashing)	<p>The unit is not receiving data.</p> <ul style="list-style-type: none"> • Check all cables and connections.



CI855 supports hot swap.

5.8.10 S100 I/O Interface – CI856

Table 5.12: S100 I/O CI856 – Fault Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LED's are ON	The CI856 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: <ul style="list-style-type: none">• Check that a valid HW configuration including the CI856 is downloaded to the controller.• Check the CEX-Bus fuse inside the PM8xx processor unit• Initiate a reset signal (INIT) from the PM8xx processor unit• Replace the CI856 unit
F(ault) LED is ON	The CI856 unit is in the process of being restarted. Allow time for this to finalize. Replace unit if the condition persists.



CI856 supports hot swap.

5.8.11 INSUM Interface – CI857

Table 5.13: 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"> • Check that a valid HW configuration including the CI857 is downloaded to the controller. • Check the CEX-Bus fuse inside the processor unit. • Initiate a reset signal (INIT) from the processor unit. • Replace the CI857 unit.
F(ault) LED is ON	<p>Check all cables and connectors for damage and loose or poor connections. Repair as necessary.</p>
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"> • Halt the application program and initiate a restart. • Replace the CI857 board.
Tx1 LED is ON (not flashing)	<p>The unit is not transmitting data.</p> <ul style="list-style-type: none"> • Check the CB for a failure message.
Rx1 LED is ON (not flashing)	<p>The unit is not receiving data.</p> <ul style="list-style-type: none"> • Check all cables and connections.



CI857 supports hot swap.

5.8.12 DriveBus Interface - CI858

Table 5.14: 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"> • Check that a valid HW configuration including the CI858 is downloaded to the controller. • Check the CEX-Bus fuse inside the processor unit. • Initiate a reset signal (INIT) from the processor unit. • Replace the CI858 unit.
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"> • Repair as necessary.
Dbus;Rx1 LED is ON (not flashing)	<p>The unit is not receiving data.</p> <ul style="list-style-type: none"> • Check all cables and connections. • Replace the CI858 unit.
Dbus;Rx1 LED is OFF	<p>No signals are sent to the unit or unit error.</p> <ul style="list-style-type: none"> • Check all cables and connections. • Replace the CI858 unit.
Dbus;Tx1 LED is ON (not flashing)	<p>The unit is not transmitting data.</p> <ul style="list-style-type: none"> • Check the CB for a failure message. • If there is no failure message in the CB replace the CI858 unit.
Dbus;Tx1 LED is OFF	<p>The unit is not properly configured or unit error.</p> <ul style="list-style-type: none"> • Check the CB for a failure message. • If there is no failure message replace the CI858 unit.

*Table 5.14: DriveBus CI858 – Fault-Finding
 (Continued)*

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



CI858 supports hot swap.

5.8.13 FOUNDATION Fieldbus High Speed Ethernet - CI860

Table 5.15: 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"> • Check that a valid HW configuration including the CI860 is downloaded to the controller. • Check the Log File • Check the CEX-Bus fuse inside the CPU unit. • Initiate a reset signal (INIT) from the CPU unit. • Replace the CI860 unit.
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"> • Stop the application program and initiate a restart. • Check the Log File • Replace the CI860 board.
100Mbit/s is ON	<p>If RxTx LED is flashing: A valid connection with 100 MBit/s is established.</p>
100Mbit/s is OFF	<p>If RxTx LED is flashing: A valid connection with 10 MBit/s is established.</p>
RxTx LED is ON	<p>A link to the corresponding ethernet device is established. No Ethernet packages are sent/received.</p>

Table 5.15: FOUNDATION Fieldbus High Speed Ethernet CI860 – Fault-Finding

(Continued)

Fault	Possible Cause and Corrective Action
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">• Check the Log File• Check the ethernet cable to the corresponding ethernet device.• Check the corresponding ethernet device.• Check CI860 unit.
PRIM	A yellow LED for indicating the primary unit in redundant configuration.
DUAL	The yellow LED indicates the redundant configuration.



CI860 supports hot swap.

5.8.14 TRIO Interface - CI862

Table 5.16: 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"> • Check that a valid HW configuration including the CI862 is downloaded to the controller. • Check the CEX-bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI862.
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 μ 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.

5.8.15 Satt I/O Interface – CI865

Table 5.17: 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"> • Check that a valid HW configuration including the CI865 is downloaded to the controller. • Check the CEX-Bus fuse inside the PM8xx processor unit • Initiate a reset signal (INIT) from the PM8xx processor unit • Replace the CI865 unit
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.

5.8.16 Modbus TCP Interface – CI867

Table 5.18: 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"> • Check that a valid HW configuration including the CI867 is downloaded to the controller. • Check the CEX-Bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI867 unit.
F(ault) LED is ON	<p>The CI867 unit is in the process of being restarted. Allow time for this to finalize. Replace unit if the condition persists.</p>
RxTx1/RxTx2 LED is OFF	<p>No Receive or transmit activity for respective Ethernet channels.</p>
Tx1/Tx2 LED is flashing Rx1/Rx2 LED is flashing or permanently lit	<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"> • This module is not started by the application. <p>In redundant mode:</p> <ul style="list-style-type: none"> • This module is not started by the application or this module act as backup interface.

*Table 5.18: Modbus TCP Interface CI867 - Fault Finding
 (Continued)*

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



CI867 supports hot swap.

5.8.17 IEC 61850 Interface – CI868

Table 5.19: IEC 61850 Interface CI868 - Fault Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LED's are ON	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: <ul style="list-style-type: none"> • Check that a valid HW configuration including the CI868 is downloaded to the controller. • Check the CEX-Bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI868 unit. • None application is downloaded.
F(ault) LED is ON	The CI868 unit is in the process of being restarted. Allow time for this to finalize. Replace unit if the condition persists.
RxTx1/RxTx2 ¹ LED is OFF	No Receive or transmit activity for respective Ethernet channels.
Tx1/Tx2 ¹ LED is flashing Rx1/Rx2 ¹ LED is flashing or permanently lit	Receive or transmit activity for respective Ethernet channels is normal.

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



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



CI868 supports hot swap.

5.8.18 AF 100 Interface - CI869

The *Mast* LED in the CI869 module is not used. [Table 5.20](#) lists the other indications.

Table 5.20: AF 100 Interface, CI869 - Indications and Fault Finding

Indication	Possible Cause and Corrective Action (for faults)
<p>Both R(un) and F(ault) LED's are OFF</p>	<p>Possible Cause 1: The CI869 module is connected to the controller, but the configuration is not downloaded to the controller for that position.</p> <p>Corrective Action 1: 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>Possible Cause 2: The CI869 module is just powered up or it is being configured and downloaded.</p> <p>Corrective Action 2: Allow time for the module to initialize.</p>
	<p>Corrective Action 3: 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"> • Remove and insert the CI869 module to the CEX-Bus and allow time for it to initialize. • 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"> - Initiate a reset signal (INIT) from the PM8xx processor unit. - Check the CEX-Bus fuse inside the PM8xx processor Unit
	<p>Corrective Action 4: If the indication still persists after performing the corrective actions 1 to 3, replace the CI869 module.</p>

Table 5.20: AF 100 Interface, CI869 - Indications and Fault Finding
(Continued)

Indication	Possible Cause and Corrective Action (for faults)
F(ault) LED is ON	<p>Possible Cause 1: The CI869 module is in the process of upgrading the firmware (if the upgrade is in progress). Corrective Action 1: Wait for the firmware to be upgraded.</p>
	<p>Possible Cause 2: Fault in the CI869 module. Corrective Action 2: Hot remove and hot insert the CI869 module.</p>
	<p>Corrective Action 3: 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>Possible Cause 1: The twisted wire pair (TWP) is not connected or it is not connected properly to the 4-pin contact. Corrective action 1: Check the TWP connections.</p>
Rx LED is flashing with 50% more frequency than when the TWP is not connected	<p>Possible Cause 1: The configuration is not downloaded from the Hardware Tree (in the Control Builder) to the controller. Corrective Action 1: 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>Possible Cause: At least one of the configured DSPs does not respond when polled. Corrective Action: Configure the DSPs correctly.</p>
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. Note: 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.

5.8.19 PROFINET IO Interface - CI871

Table 5.21: PROFINET IO Interface, CI871 - Indications and Fault Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	The CI871 unit is in the process of configuration. If the condition persist, and no other unit LED on the CEX-Bus is ON: <ul style="list-style-type: none"> • Check that a valid hardware configuration including the CI871 is downloaded to the controller. • Check the CEX-Bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI871 unit.
F(ault) LED is ON	The CI871 unit is in the process of being restarted. Wait until the restart operation is complete. Replace unit if the condition persists.
RxTx1/RxTx2 LED is OFF	Reception and transmission of I/O data does not occur at the respective Ethernet channels.
Tx1/Tx2 LED is flashing Rx1/Rx2 LED is flashing or permanently lit	Reception and transmission of I/O data occurs normally at the respective Ethernet channels.

Table 5.21: PROFINET IO Interface, CI871 - Indications and Fault Finding (Continued)

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



CI871 supports hot swap.

5.8.20 MOD5 Interface - CI872

Table 5.22 provides the indications and possible causes, and the corrective actions for the faults, appearing in the MOD5 communication interface, type - CI872.

Table 5.22: 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>Possible Cause 1: The CI872 module is connected to the controller and the configuration is not downloaded to the controller for that position.</p> <p>Corrective Action 1: 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>Possible Cause 2: The CI872 module is just powered up or it is being configured and downloaded.</p> <p>Corrective Action 2: Allow time for the module to initialize.</p> <p>Corrective Action 3: 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"> • Remove and insert the CI872 module to the CEX-Bus and allow time for it to initialize. • 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 PM85x/PM86x Processor Unit. <p>Corrective Action 4: If the indication still persists after performing the corrective actions 1 to 3, replace the CI872 module.</p>
F(ault) LED is ON	<p>Possible Cause 1: The CI872 module is in the process of upgrading the firmware (if the upgrade is in progress).</p> <p>Corrective Action 1: Wait for the firmware to be upgraded.</p> <p>Possible Cause 2: Fault in the CI872 module.</p> <p>Corrective Action 2: Hot remove and hot insert the CI872 module.</p> <p>Corrective Action 3: 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.

Table 5.22: MOD5 Communication Interface, Type CI872 - Indications and Fault Finding
 (Continued)

Indication	Possible Causes, and Corrective Actions (for faults)
Rx/Tx1, Rx/Tx2, Rx/Tx3 LED is OFF	<p>Possible Cause 1: The fiber optic cable is not connected or it is not connected properly to the port.</p> <p>Corrective action 1: Do any of the following:</p> <ul style="list-style-type: none"> • 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. • Check the Network Controller Board (NCB) on the MOD5 Controller connected to that particular port. <p>Possible Cause 2: The configuration is not downloaded from the Hardware Tree (in the Control Builder) to the controller.</p> <p>Corrective Action 2: Ensure that the module is configured in the Hardware Tree for the correct position and the configuration is downloaded to controller.</p>
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>Note: 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"> • CI872 is run in single configuration. • CI872 is run in redundant configuration, but it acts as a backup module.

Table 5.22: MOD5 Communication Interface, Type CI872 - Indications and Fault Finding
 (Continued)

Indication	Possible Causes, and Corrective Actions (for faults)
All LED's are OFF	<p>Possible Cause 1: 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>Corrective Action 1: 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>Possible Cause 2: The CI872 module is hot inserted and the configuration is not downloaded to the controller.</p> <p>Corrective Action 2: 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>Possible Cause 3: The CI872 is just hot inserted and it is in the process of configuration.</p> <p>Corrective Action 3: Allow time for the module to initialize.</p>
Rx/Tx LED's are flashing, but there is no communication	<p>Possible Cause 1: MTMConnect and/or MTMReadCyc and/or MTMDefCyc are disabled.</p> <p>Corrective Action 1: Enable MTMConnect, MTMReadCyc, and MTMDefCyc function blocks.</p>
	<p>Possible Cause 2: MTMConnect and/or MTMReadCyc and/or MTMDefCyc function blocks show a bad status.</p> <p>Corrective Action 2: 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>Possible Cause 3: 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>Corrective Action 3: 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>Corrective Action 4: 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.

5.8.21 EtherNet/IP Interface - CI873

Table 5.23: EtherNet/IP Communication Interface CI873 - Indications and Fault Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	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: <ul style="list-style-type: none"> • Check the CEX-Bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI873 unit.
F(ault) LED is ON	The CI873 unit is in the process of being restarted. Wait until the restart operation is complete. Replace unit if the condition persists.
RxTx1/RxTx2 ¹ LED is OFF	No Receive or transmit activity for respective Ethernet channels.
Tx1/Tx2 ¹ LED is flashing Rx1/Rx2 ¹ LED is flashing or permanently lit	Receive or transmit activity for respective Ethernet channels is normal.

Table 5.23: EtherNet/IP Communication Interface CI873 - Indications and Fault Finding (Continued)

Fault	Possible Cause and Corrective Action
Dual LED is ON	The CI873 module is run in redundant configuration.
Prim(ary) LED is ON	The CI873 module is run in redundant configuration, and it functions as the primary module. Note: 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.

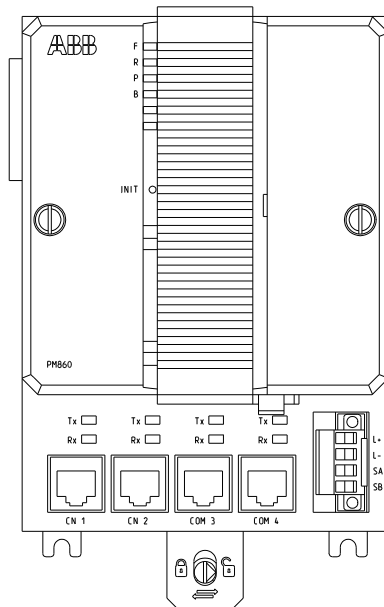
1. LED can be switched off by disabling CH2 channel.



CI873 supports hot swap.

Appendix A Hardware Units

A.1 PM851/PM856/PM860 and TP830 – Processor Unit



A.1.1 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 226](#).

- Compact Flash interface which supports loading of application and cold retain data storage.

A.1.2 Technical Data

Technical data for PM851/PM856/PM860 and TP830 is described in [Table A.1 on page 222](#).

Table A.1: PM851/PM856/PM860 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 2 MB flash PROM (firmware storage). • 8 MB of SDRAM.
Power Dissipation	5 W typical 10 W typical (incl. full supply to ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
Current Consumption	180 mA typical (300 mA max.) (excl. supply of ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
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.

*Table A.1: PM851/PM856/PM860 and TP830 – Technical data
(Continued)*

Item	Value
Redundant Power Supply Status Inputs	Inputs designated SA, SB <ul style="list-style-type: none"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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.
Weight	<ul style="list-style-type: none"> • 1100 g (2.4 lb) (package PM856K01 with PM856, TP830 and bus terminations). • 1100 g (2.4 lb) (package PM860K01 with PM860, TP830 and bus terminations).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in.) 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 A.2 on page 223](#).

Table A.2: PM851/PM856/PM860 and TP830 Interfaces – Technical data

Item	Value
CN1 and CN2 Ethernet Communication¹	
Communication speed	10 Mbit/s (half duplex)
Signal levels	IEEE802.3, 10Base-T
Connector	RJ45
COM3 Serial Communication	

Table A.2: PM851/PM856/PM860 and TP830 Interfaces – Technical data
(Continued)

Item	Value
Communication speed	Selectable in steps from 75 to 19200 baud. 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud. Protocol specific restrictions apply.
Signal levels	RS-232C
Connector	RJ45
Modem support	Yes
COM4 Serial Communication	
Communication speed	9600 baud
Signal levels	RS-232C
Connector	RJ45
Modem support	No
Electrical ModuleBus	
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"> • Max 24 V – 1.0 A (short circuit proof, fuse 2 A fast) • Max 5 V – 1.5 A (short circuit proof)
Supply voltage variation	24 V – follows the input power at L+
Optical ModuleBus²	
I/O capacity	up to 7 x S800 I/O clusters each with 12 units
Connector	<ul style="list-style-type: none"> • Duplex Fiber Optic Cable • Simplex Fiber Optic Cable
CEX-Bus³	
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 A.3 on page 225](#).



The figures given in [Table A.3 on page 225](#) are valid if the batteries are installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table A.3: 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 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 100 hours when fully charged

[Table A.4 on page 225](#) shows Internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Table A.4: PM851/PM856/PM860 and TP830 – Internal battery data

Item	Value
Internal battery	
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 4.1 on page 169](#).

A.1.3 Performance Data

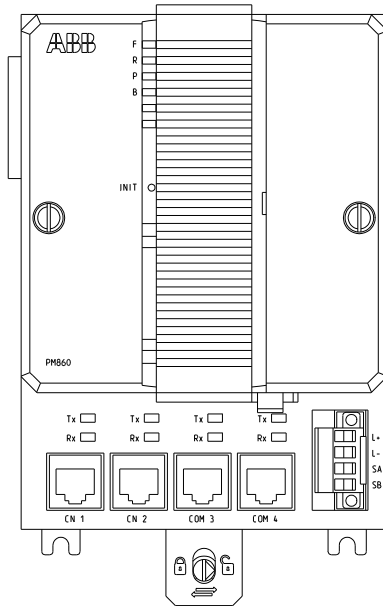
The PM851/PM856/PM860 differ in performance when executing an application program.

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**.

A.2 PM851A/PM856A/PM860A and TP830 – Processor Unit



A.2.1 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 226](#).

- Compact Flash interface which supports loading of application and cold retain data storage.

A.2.2 Technical Data

Technical data for PM851A/PM856A/PM860A and TP830 is described in [Table A.5](#).

Table A.5: PM851A/PM856A/PM860A and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 2 MB flash PROM (firmware storage). • 12 MB of SDRAM for PM851A. • 16 MB of SDRAM for PM856A and PM860A.
Power Dissipation	5 W typical 10 W typical (incl. full supply to ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
Current Consumption	180 mA typical (300 mA max.) (excl. supply of ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V These inputs are status inputs. The threshold levels are logical “0” or “1” input limits, not power fail limits.

*Table A.5: PM851A/PM856A/PM860A and TP830 – Technical data
(Continued)*

Item	Value
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.
Weight	<ul style="list-style-type: none"> • 1100 g (2.4 lb) (package PM851AK01 with PM851A, TP830 and bus terminations). • 1100 g (2.4 lb) (package PM856AK01 with PM856A, TP830 and bus terminations). • 1100 g (2.4 lb) (package PM860AK01 with PM860A, TP830 and bus terminations).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in.) 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 A.6](#).

Table A.6: PM851A/PM856A/PM860A and TP830 Interfaces – Technical data

Item	Value
CN1 and CN2 Ethernet Communication¹	
Communication speed	10 Mbit/s (half duplex)
Signal levels	IEEE802.3, 10Base-T
Connector	RJ45
COM3 Serial Communication	
Communication speed	Selectable in steps from 75 to 19200 baud. 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud. Protocol specific restrictions apply.
Signal levels	RS-232C
Connector	RJ45

Table A.6: PM851A/PM856A/PM860A and TP830 Interfaces – Technical data
(Continued)

Item	Value
Modem support	Yes
COM4 Serial Communication	
Communication speed	9600 baud
Signal levels	RS-232C
Connector	RJ45
Modem support	No
Electrical ModuleBus	
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"> • Max 24 V – 1.0 A (short circuit proof, fuse 2 A fast) • Max 5 V – 1.5 A (short circuit proof)
Supply voltage variation	24 V – follows the input power at L+
Optical ModuleBus²	
I/O capacity	up to 7 x S800 I/O clusters each with 12 units
Connector	<ul style="list-style-type: none"> • Duplex Fiber Optic Cable • Simplex Fiber Optic Cable
CEX-Bus³	
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 A.7](#) .



The figures given in [Table A.7](#) are valid if the batteries are installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table A.7: 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 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 4 weeks when fully charged

[Table A.8](#) shows Internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Table A.8: PM851A/PM856A/PM860A and TP830 – Internal battery data

Item	Value
Internal battery	
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 4.1 on page 169](#).

A.2.3 Performance Data

The PM851A/PM856A/PM860A differ in performance when executing an application program.

A Hardware Units

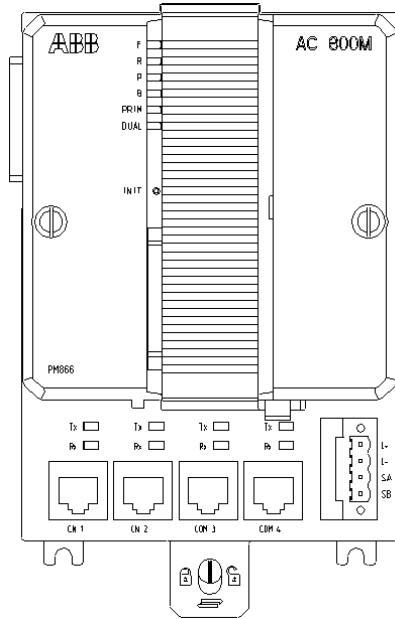
A.2 PM851A/PM856A/PM860A and TP830 – Processor Unit

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**.

A.3 PM857 and TP830 – Processor Unit



A.3.1 Key Features

- MPC866 Microprocessor running at 133 MHz.
- 32 MB RAM with internal or external battery backup facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus, but limited to 128 I/O channels.
- 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.

- High Integrity Controller (with SM812 and certified software)
 - Overvoltage protection
 - Internal voltage supervision
 - Runs application code in non-SIL and SIL1-3 applications
- Supports S800 I/O High Integrity.

A.3.2 Technical Data

For technical data on PM857 and TP830, see [Table A.9 on page 234](#).

Table A.9: PM857 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Power Dissipation	5.1 W typical 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.) (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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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 A.9: PM857 and TP830 – Technical data
(Continued)

Item	Value
Weight	<ul style="list-style-type: none">• 1200 g (2.6 lb) (package PM857K01).• 2800 g (6.1 lb) (package PM857K02).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) 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 A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.10 on page 235](#).



The figures in [Table A.10 on page 235](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.10: Back-up time for PM857

Source	Back-up time for PM857
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822	Minimum 16 days when fully charged

Note: Recharge time for an empty battery is approximately 7 hours.

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM857/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

See [Table 4.1 on page 169](#).

A.3.3 Performance Data

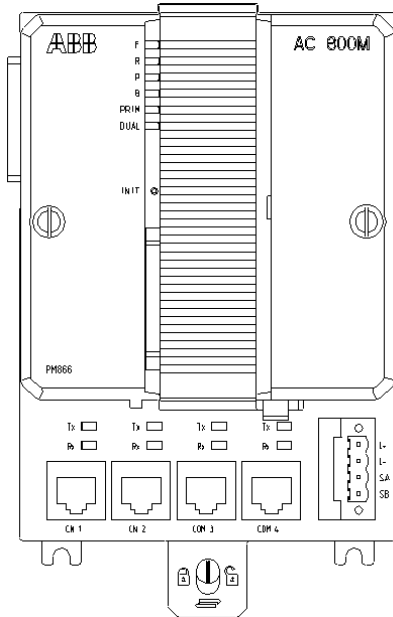
The PM857 processor unit has performance data which is approximately half the performance of PM867. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.



PM857 is designed for use in a High Integrity Controller.

A.4 PM858 and TP830 – Processor Unit



A.4.1 Key Features

- MPC866 Microprocessor running at 133 MHz.
- 16 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.

A.4.2 Technical Data

For technical data on PM858 and TP830, see [Table A.11 on page 238](#).

Table A.11: PM858 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 16 MB of SDRAM.
Power Dissipation	<p>5.1 W typical 8.6 W typical (incl. full supply to ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
Current Consumption	<p>210 mA typical (360 mA max.) (excl. supply of ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
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	<p>Inputs designated SA, SB</p> <ul style="list-style-type: none"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V <p>These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits.</p>
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.
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM858K01). • 2800 g (6.1 lb) (package PM858K02).
Dimensions	<p>W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.</p>

Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.12 on page 239](#).



The figures in [Table A.12 on page 239](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.12: Back-up time for PM858

Source	Back-up time for PM858
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 16 days when fully charged

[Table A.12 on page 239](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM858/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

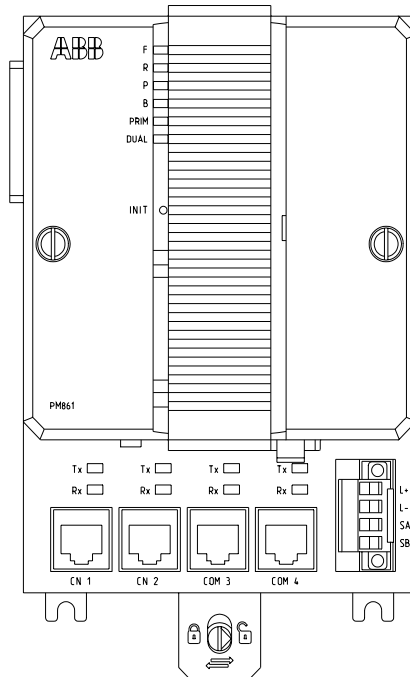
See [Table 4.1 on page 169](#).

A.4.3 Performance Data

The PM858 processor unit has performance data which is approximately 0.5 times the performance of PM862. 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.

A.5 PM861/PM861A and TP830 – Processor Unit



A.5.1 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.

A.5.2 Technical Data

For technical data on PM861 and TP830, see [Table A.13 on page 242](#).

Table A.13: PM861 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 2 MB flash PROM (firmware storage). • 16 MB of SDRAM.
Power Dissipation	<p>6 W typical 11 W typical (incl. full supply to ModuleBus and CEX-Bus, see Appendix B, Power Consumption).</p>
Current Consumption	<p>250 mA typical (430 mA max.) (excl. supply of ModuleBus and CEX-Bus, see Appendix B, Power Consumption).</p>
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	<p>Inputs designated SA, SB</p> <ul style="list-style-type: none"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V <p>These inputs are status inputs. The threshold levels are logical “0” or “1” input limits, not power fail limits.</p>
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.
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM861K01). • 2800 g (6.1 lb) (package PM861K02).
Dimensions	<p>W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.</p>

Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table A.14 on page 243](#).



The figures in [Table A.14 on page 243](#) 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 A.14: 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 A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#)

Electro-magnetic Compatibility and Electrical Safety

PM861/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

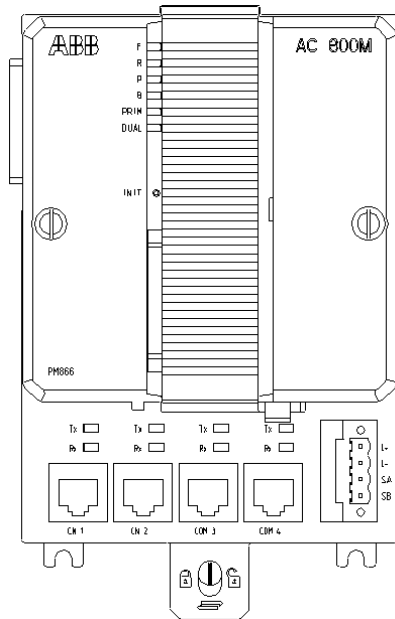
See [Table 4.1 on page 169](#).

A.5.3 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.

A.6 PM862 and TP830 – Processor Unit



A.6.1 Key Features

- MPC866 Microprocessor running at 133 MHz.
- 32 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.

A.6.2 Technical Data

For technical data on PM862 and TP830, see [Table A.15 on page 246](#).

Table A.15: PM862 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Power Dissipation	<p>5.1 W typical</p> <p>8.6 W typical (incl. full supply to ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
Current Consumption	<p>210 mA typical (360 mA max.)</p> <p>(excl. supply of ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
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	<p>Inputs designated SA, SB</p> <ul style="list-style-type: none"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V <p>These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits.</p>
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.
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM862K01). • 2800 g (6.1 lb) (package PM862K02).
Dimensions	<p>W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)</p> <p>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.</p>

Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.16 on page 247](#).



The figures in [Table A.16 on page 247](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.16: Back-up time for PM862

Source	Back-up time for PM862
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 16 days when fully charged

[Table A.16 on page 247](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM862/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

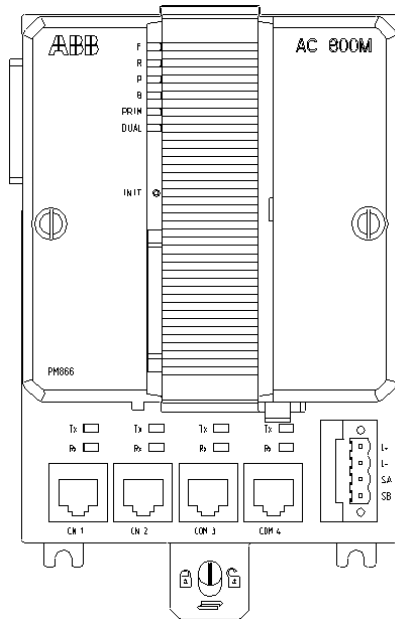
See [Table 4.1 on page 169](#).

A.6.3 Performance Data

The PM862 processor unit has performance data which is approximately 0.7 times the performance of PM864A. 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.

A.7 PM863 and TP830 – Processor Unit



A.7.1 Key Features

- MPC866 Microprocessor running at 133 MHz.
- 32 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.

- High Integrity Controller (with SM812 and certified software)
 - Overvoltage protection
 - Internal voltage supervision
 - Runs application code in non-SIL and SIL1-3 applications
- Supports S800 I/O High Integrity.

A.7.2 Technical Data

For technical data on PM863 and TP830, see [Table A.17 on page 250](#).

Table A.17: PM863 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Power Dissipation	5.1 W typical 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.) (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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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 A.17: PM863 and TP830 – Technical data
(Continued)*

Item	Value
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM863K01). • 2800 g (6.1 lb) (package PM863K02).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) 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 A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.18 on page 251](#).



The figures in [Table A.18 on page 251](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.18: Back-up time for PM863

Source	Back-up time for PM863
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822	Minimum 16 days when fully charged
Note: Recharge time for an empty battery is approximately 7 hours.	

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM863/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

See [Table 4.1 on page 169](#).

A.7.3 Performance Data

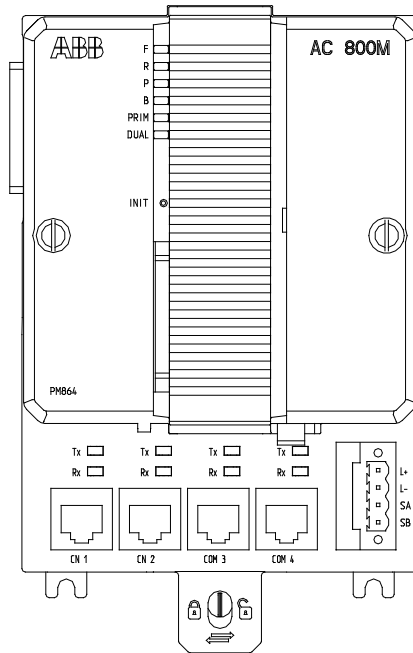
The PM863 processor unit has performance data which is approximately half the performance of PM867. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.



PM863 is designed for use in a High Integrity Controller.

A.8 PM864/PM864A and TP830 – Processor Unit



A.8.1 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.

A.8.2 Technical Data

For technical data on PM864 and TP830, see [Table A.19 on page 254](#).

Table A.19: PM864 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 2 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Power Dissipation	6.9 W typical 11.9 W typical (incl. full supply to ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
Current Consumption	287 mA typical (487 mA max.) (excl. supply of ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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.
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM864K01). • 2800 g (6.1 lb) (package PM864K02).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) 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 A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table A.20 on page 255](#).



The figures in [Table A.20 on page 255](#) 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 A.20: 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 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 85 hours when fully charged	Minimum 3 weeks when fully charged

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM864/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

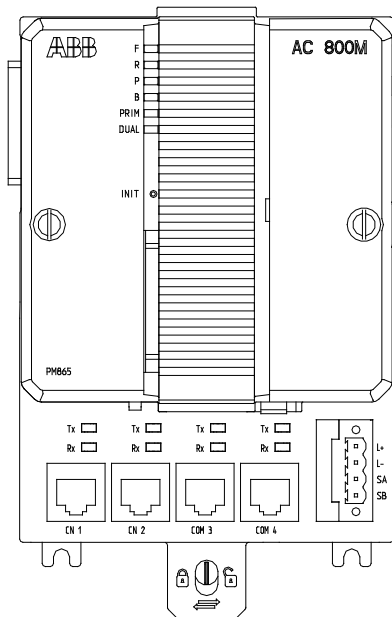
See [Table 4.1 on page 169](#).

A.8.3 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.

A.9 PM865 and TP830 – Processor Unit



A.9.1 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/SM811 and certified software)
 - Overvoltage protection
 - Internal voltage supervision
 - Runs application code in non-SIL and SIL1-3 applications
 - Supports S800 I/O High Integrity.

A.9.2 Technical Data

For technical data on PM865 and TP830, see [Table A.21 on page 258](#).

Table A.21: PM865 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Power Dissipation	6.9 W typical 11.9 W typical (incl. full supply to ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
Current Consumption	287 mA typical (487 mA max.) (excl. supply of ModuleBus and CEX-Bus, see Appendix B, Power Consumption).
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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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 A.21: PM865 and TP830 – Technical data
(Continued)*

Item	Value
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM865K01). • 2800 g (6.1 lb) (package PM865K02).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) 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 A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table A.22 on page 259](#).



The figures in [Table A.22 on page 259](#) 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 A.22: Back-up times for PM865

Source	Back-up time
Internal battery	Minimum 235 hours
External battery SB821	Minimum 24 weeks
External battery SB822 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 3 weeks when fully charged

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM865/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

See [Table 4.1 on page 169](#).

A.9.3 Performance Data

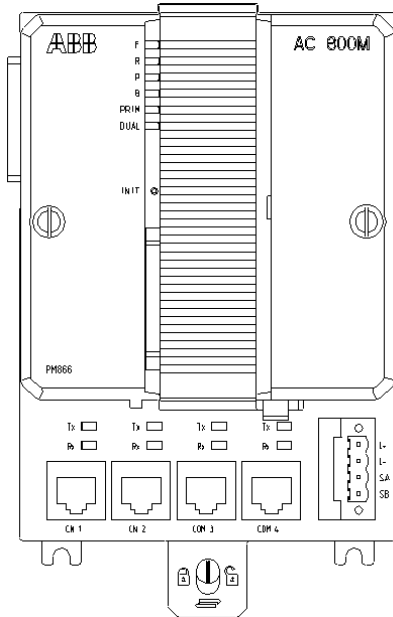
The PM865 processor unit, in single configuration, has performance data which theoretically peaks at twice the performance compared to the PM860. The useful sustained performance improvement is, however, a bit lower and somewhat dependent on the actual application program but can be expected to be 10 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 PA controller, its performance will be the same as stated above, while performance will be lower while using HI controller.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.

A.10 PM866/PM866A and TP830 – Processor Unit



A.10.1 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.

A.10.2 Technical Data

For technical data on PM866/PM866A and TP830, see [Table A.23 on page 262](#).

Table A.23: PM866/PM866A and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> 4 MB flash PROM (firmware storage). 64 MB of SDRAM.
Power Dissipation	<p>5.1 W typical</p> <p>8.6 W typical (incl. full supply to ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
Current Consumption	<p>210 mA typical (360 mA max.)</p> <p>(excl. supply of ModuleBus and CEX-Bus. For details, refer to 3BSE036351R, AC 800M - Controller Hardware, Hardware and Operation).</p>
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	<p>Inputs designated SA, SB</p> <ul style="list-style-type: none"> Max input voltage 30 V Min. input voltage for high level 15 V Max input voltage for low level 8 V <p>These inputs are status inputs. The threshold levels are logical "0" or "1" input limits, not power fail limits.</p>
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.
Weight	<ul style="list-style-type: none"> 1200 g (2.6 lb) (package PM866K01/PM866AK01). 2800 g (6.1 lb) (package PM866K02/PM866AK02).
Dimensions	<p>W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in)</p> <p>Width is measured along the DIN-rail, depth from the wall, and height vertically, including lock mechanism.</p>

Communication Ports and Interfaces

Technical data for communication ports and interfaces is described in [Table A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.24 on page 263](#).



The figures in [Table A.24 on page 263](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.24: Back-up time for PM866/PM866A

Source	Back-up time for PM866
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822 Note: Recharge time for an empty battery is approximately 7 hours.	Minimum 16 days when fully charged

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM866/PM866A/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

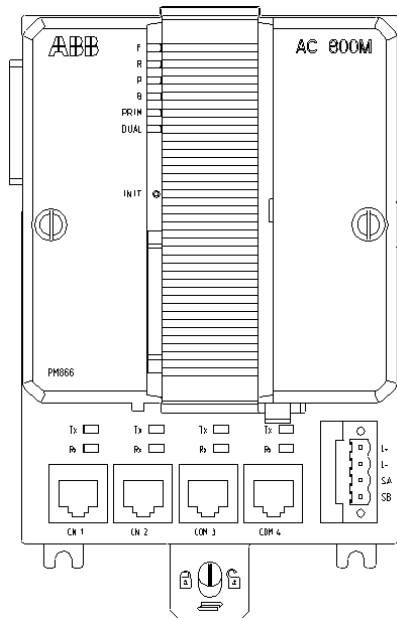
See [Table 4.1 on page 169](#).

A.10.3 Performance Data

The PM866/PM866A 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.

A.11 PM867 and TP830 – Processor Unit



A.11.1 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.

- High Integrity Controller (with SM812 and certified software)
 - Overvoltage protection
 - Internal voltage supervision
 - Runs application code in non-SIL and SIL1-3 applications
- Supports S800 I/O High Integrity.

A.11.2 Technical Data

For technical data on PM867 and TP830, see [Table A.25 on page 266](#).

Table A.25: PM867 and TP830 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 64 MB of SDRAM.
Power Dissipation	5.1 W typical 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.) (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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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 A.25: PM867 and TP830 – Technical data
(Continued)*

Item	Value
Weight	<ul style="list-style-type: none"> • 1200 g (2.6 lb) (package PM867K01). • 2800 g (6.1 lb) (package PM867K02).
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in) 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 A.2 on page 223](#).

Battery

The memory content is backed up with either an internal or external battery unit (SB821 or SB822). For backup time see [Table A.26 on page 267](#).



The figures in [Table A.26 on page 267](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.26: Back-up time for PM867

Source	Back-up time for PM867
Internal battery	Minimum 158 hours
External battery SB821	Minimum 15 weeks
External battery SB822	Minimum 16 days when fully charged
Note: Recharge time for an empty battery is approximately 7 hours.	

[Table A.4 on page 225](#) shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up on page 389](#) and [SB822 Rechargeable External Battery – AC 800M Memory Back-up on page 391](#).

Electro-magnetic Compatibility and Electrical Safety

PM867/TP830 meets the requirements specified in EMC Directive EMCD 2004/108/EC.

For more information regarding electrical safety, see [Appendix D, Directive Considerations](#).

LED Indicators

See [Table 4.1 on page 169](#).

A.11.3 Performance Data

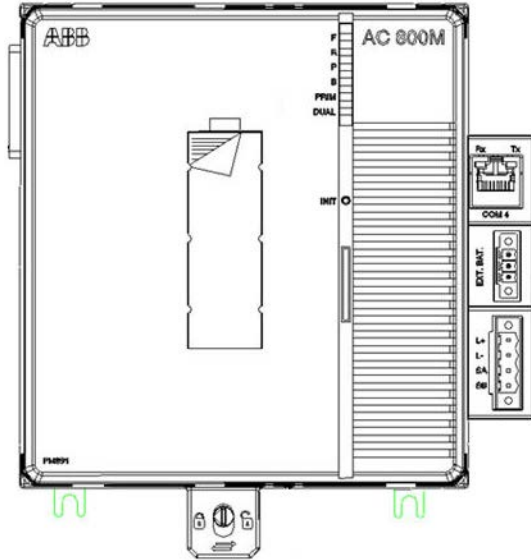
The PM867 processor unit has performance data which is approximately 2 times the performance of PM865. In redundant configuration the execution performance is somewhat lower than in single configuration.

Switch over time from Primary CPU to Backup CPU, in redundant configuration, is less than 10 ms.



PM867 is designed for use in a High Integrity Controller.

A.12 PM891– Processor Unit



A.12.1 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.

A.12.2 Technical Data

For technical data on PM891, see [Table A.27](#).

Table A.27: PM891 – Technical data

Item	Value
Memory	<ul style="list-style-type: none"> • 16 MB flash PROM (firmware storage). • 256 MB of DDR2 SDRAM with integrity check.
Power Dissipation	15.8 W typical 19.5 W typical (incl. full supply to ModuleBus and CEX-Bus).
Current Consumption	660 mA typical (750 mA max.) (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"> • Max input voltage 30 V • Min. input voltage for high level 15 V • Max input voltage for low level 8 V 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) 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 269](#)

Battery

The memory content is backed up with an external battery unit (SB822). For backup time, see [Table A.28](#).



The figures in [Table A.28](#) are valid if the batteries have been installed after a normal CPU power-up, allowing for the memory backup function to be activated.

Table A.28: Backup time for PM891

Source	Back-up time for PM891
External battery SB822 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](#).

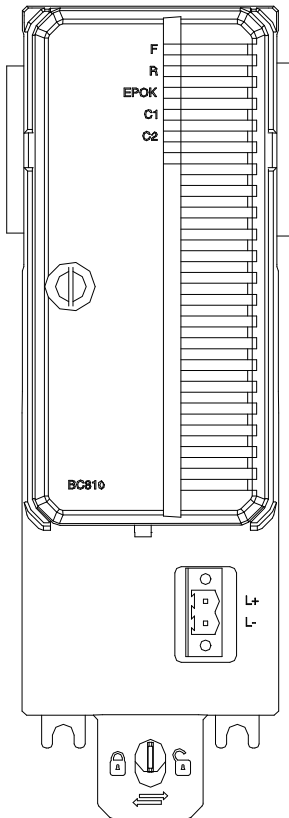
LED Indicators

See [Table 4.1 on page 169](#).

A.12.3 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.

A.13 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.

A.13.1 Functional Block Diagram

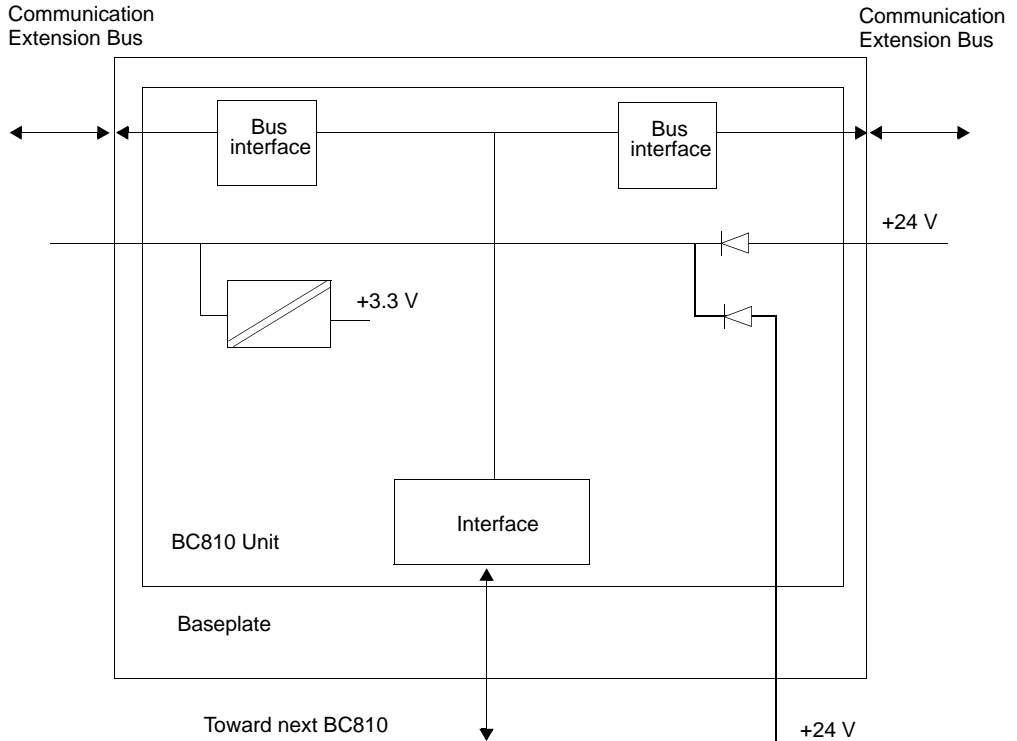


Figure A.1: Block Diagram – BC810

A.13.2 Indicators

Table A.29: BC810 – CEX-Bus Interconnection Unit LED Indicators

Designation/Color	Function
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.

*Table A.29: BC810 – CEX-Bus Interconnection Unit LED Indicators
(Continued)*

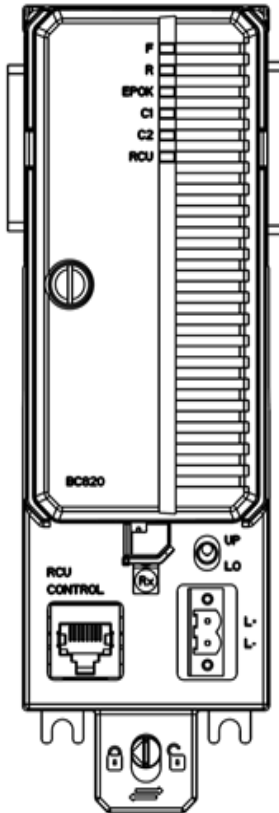
Designation/Color	Function
C1 /Yellow	Indicates traffic on the directly connected CEX-segment.
C2 /Yellow	Indicates traffic on the interconnected CEX-segment.

A.13.3 Technical Data

Table A.30: BC810 – CEX-Bus Interconnection Unit Specifications

Item	Value
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 (W 2.9 x H 7.3 x D 5.0 in)

A.14 BC820 and TP850 - CEX-Bus Interconnection Unit



Key Features

- Supports RCU-link for PM858, PM862, PM866 and PM866A for redundant controller feature.
- Supports CEX-bus with up to 6 modules with each BC820.
- Supports redundant communication interface units.
- Supports extension of RCU-link and CEX-bus.
- Supports on-line replacement of the CPU.
- External DC-power supply.

Description

The BC820 unit consists of two basic parts: baseplate (TP850) 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 BC820 and primary/backup CPU pair, the BC820 support online replacement of the CPU baseplate without disturbing the CEX traffic. If one BC820 has to be replaced it is necessary to power off both the adjacent Controller CPU and the external DC-supply for the BC820.

BC820 transmits the RCU-Link and extends the CEX-Bus and RCU-Link cable length up to 200 m.

A.14.1 Functional Block Diagram

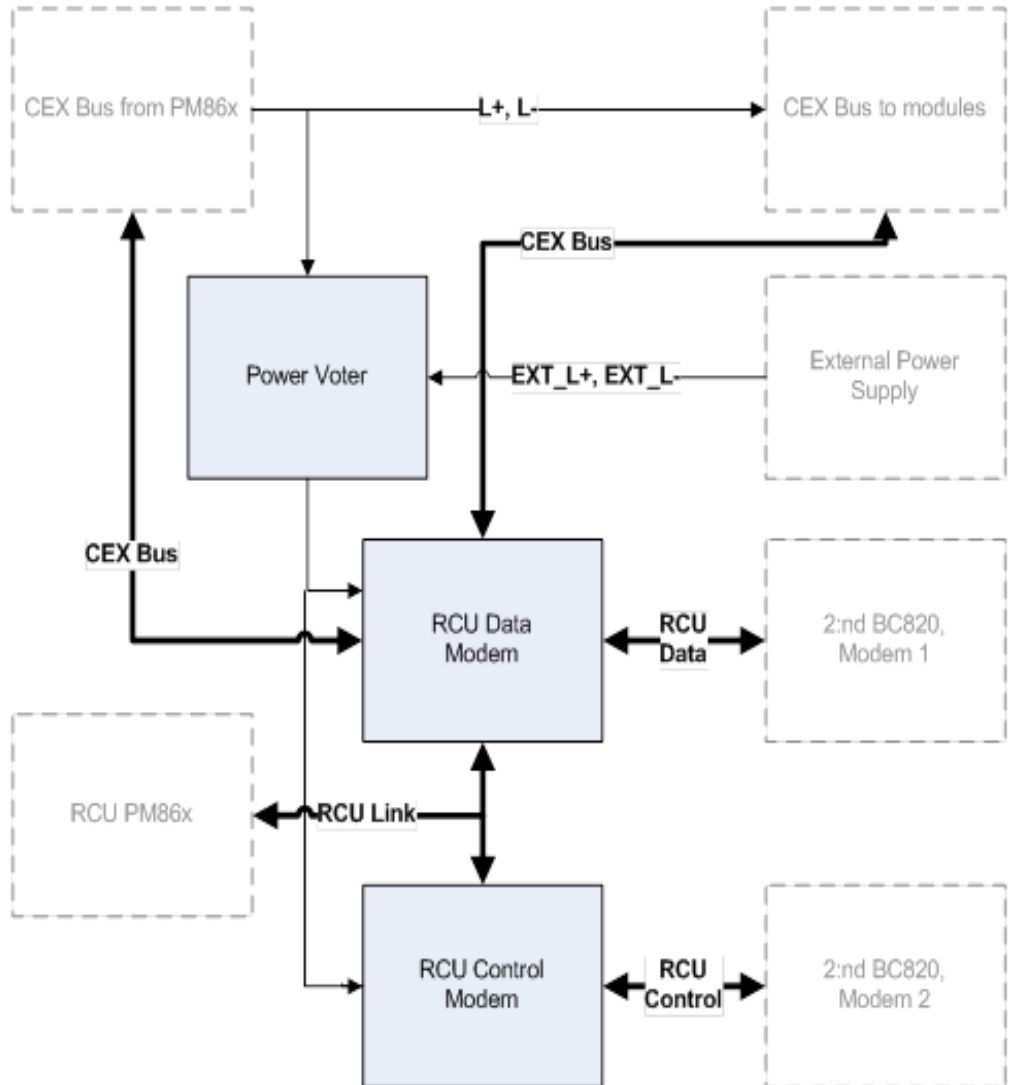


Figure A.2: Block Diagram – BC820

A.14.2 Indicators

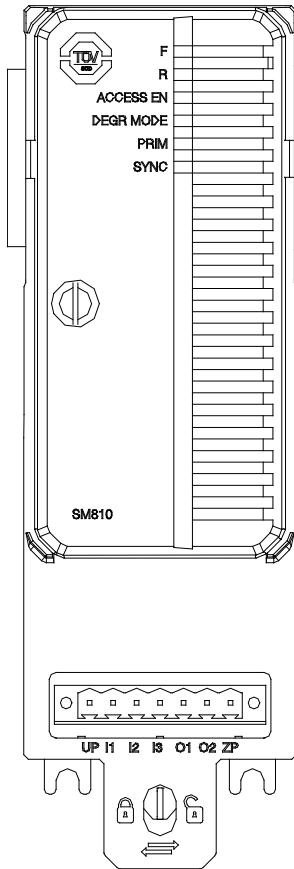
Table A.31: BC820 – CEX-Bus Interconnection Unit LED Indicators

Designation/Color	Function
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.
RCU /Yellow	<p>The yellow LED serves two functions.</p> <p>Normal: indicates that there is RCU service data traffic flowing in both directions between the RCUs in the PMs.</p> <p>Fault: indicate problem with UPPER/LOWER switches, that RCU data link (fibre optical) is down or that RCU control link is down.</p> <p>When there is no fault condition the LED will show if RCU service data is flowing or not. If there is one or more of the fault conditions above the LED will change behavior and blink a number of times to indicate the fault. This is done in three seconds intervals with one interval for each fault. This persists while any fault remains.</p> <ul style="list-style-type: none"> - 1 blink = up/lo switches in same position - 2 blinks = RCU data link down (opto link) - 3 blinks = RCU control link down

A.14.3 Technical Data*Table A.32: BC820 – CEX-Bus Interconnection Unit Specifications*

Item	Value
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	120 mA typical (200 mA max).
Power Dissipation	2,9 W typical
Protection Rating	IP20 according to EN60529, IEC 529
Weight	700 g (1.5 lb) (BC820 and TP850)
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.15 SM810 and TP855



Key Features

- MPC862P Microprocessor running at 96 MHz.
- 32 MB RAM
- Provides supervision of the PM865 controller during SIL 1-2 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.

A.15.1 Functional Block Diagram

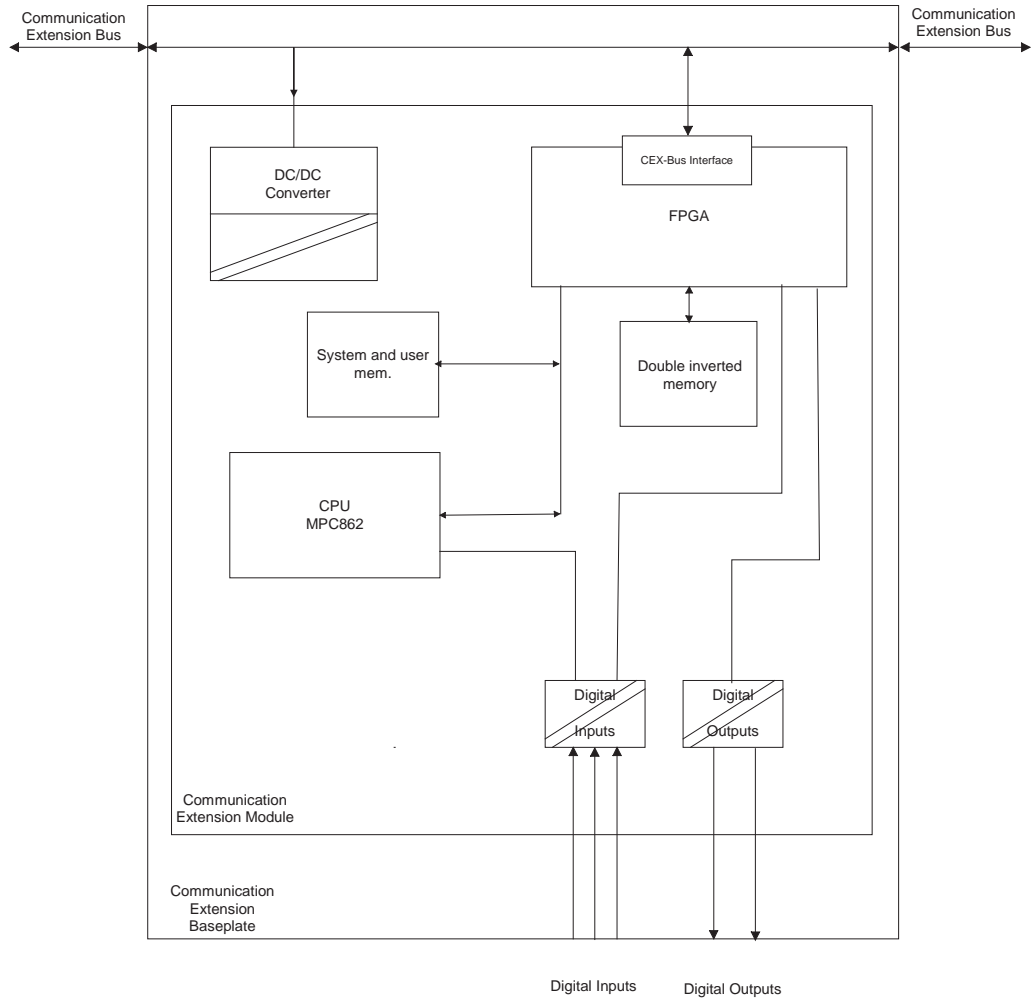


Figure A.3: Block Diagram – SM810

A.15.2 Indicators

Table A.33: 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.

A.15.3 Technical Data

Table A.34: SM810 Specifications

Item	Value
Memory	<ul style="list-style-type: none"> • 4 MB flash PROM (firmware storage). • 32 MB of SDRAM.
Galvanic isolation	Yes
Connector	One 7 pin screw connector
Current consumption (from CEX-Bus 24 V DC)	160 mA typical (250 mA max)
Power dissipation	3.8 W typical
Weight	700 g (1.5 lb) (package SM810K01 with SM810 and TP855).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

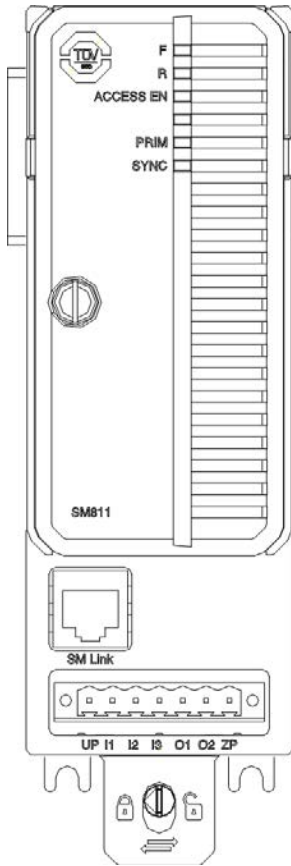
Table A.35: SM810 - Digital Input Specifications

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 ($U_L = \text{logic 0}$, $U_H = \text{logic 1}$)	- 30 V < U_L < 5 V 15 V < U_H < 30 V
Nominal current	12 mA
Current limits	- 22 mA < I_L < 2 mA 6 mA < I_H < 18 mA
Input impedance	1.8 kOhm

Table A.36: SM810 - 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 V < UA \leq <u>UP</u>
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

A.16 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.

A.16.1 Functional Block Diagram

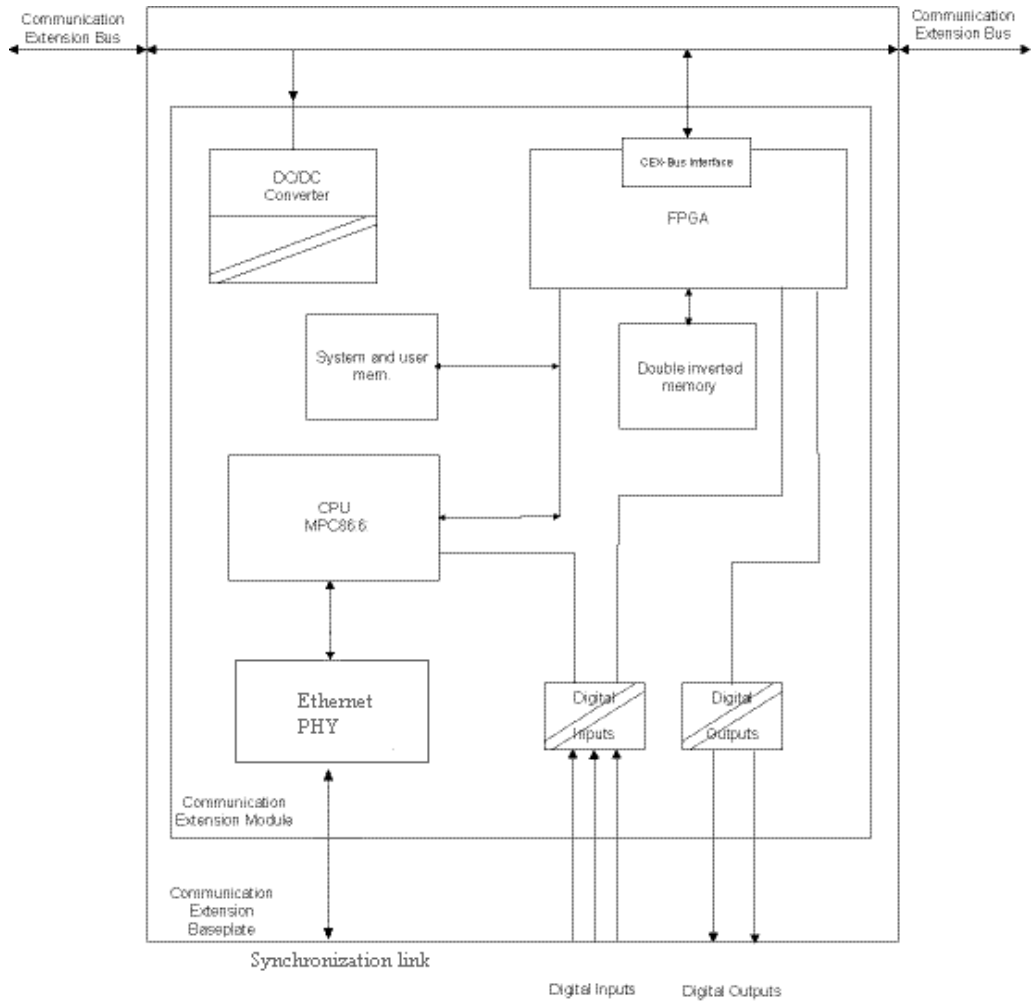


Figure A.4: Block Diagram – SM811

A.16.2 Indicators

Table A.37: 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.

A.16.3 Technical Data

Table A.38: SM811 Specifications

Item	Value
Memory	<ul style="list-style-type: none"> 4 MB flash PROM (firmware storage). 32 MB of SDRAM.
Galvanic isolation	Yes
Connectors	<ul style="list-style-type: none"> One 7 pin screw connector One RJ45 connector (SM Link)
Current consumption (from CEX-Bus 24 V DC)	160 mA typical (250 mA max)
Power dissipation	3.8 W typical
Weight	700 g (1.5 lb) (package SM811K01 with SM811 and TP868).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

Table A.39: 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 ($U_L = \text{logic 0}$, $U_H = \text{logic 1}$)	$-30 \text{ V} < U_L < 5 \text{ V}$ $15 \text{ V} < U_H < 30 \text{ V}$
Nominal current	12 mA
Current limits	$-22 \text{ mA} < I_L < 2 \text{ mA}$ $6 \text{ mA} < I_H < 18 \text{ mA}$
Input impedance	1.8 kOhm

Table A.40: 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 an 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.



Hot-insert will not be completed until all tasks have executed one scan.



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.

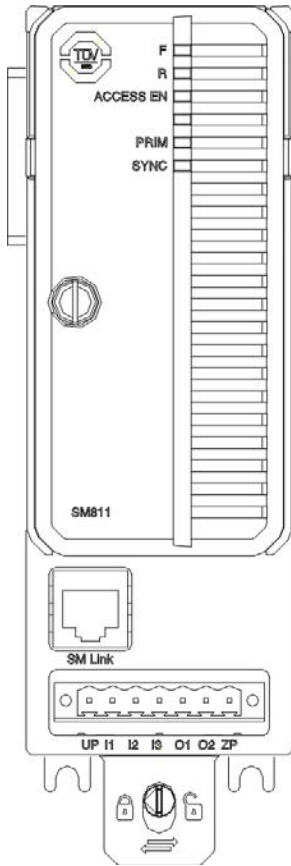
Non-SIL and SIL1-2 applications are not affected by synchronization of SM811. They continue to execute as normal throughout the entire synchronization without being interrupted.



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.

A.17 SM812 and TP868



Key Features

- MPC866 Microprocessor running at 133 MHz.
- 64 MB RAM
- Provides supervision of the PM857/PM863/PM867 controller during SIL1-2 operations and together with the PM857/PM863/PM867 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 SM812 Unit consists of two parts: Termination Plate (TP868) and SM812.

The SM812 contains two pc-boards. The main board contains the MPC866, 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.

A.17.1 Functional Block Diagram

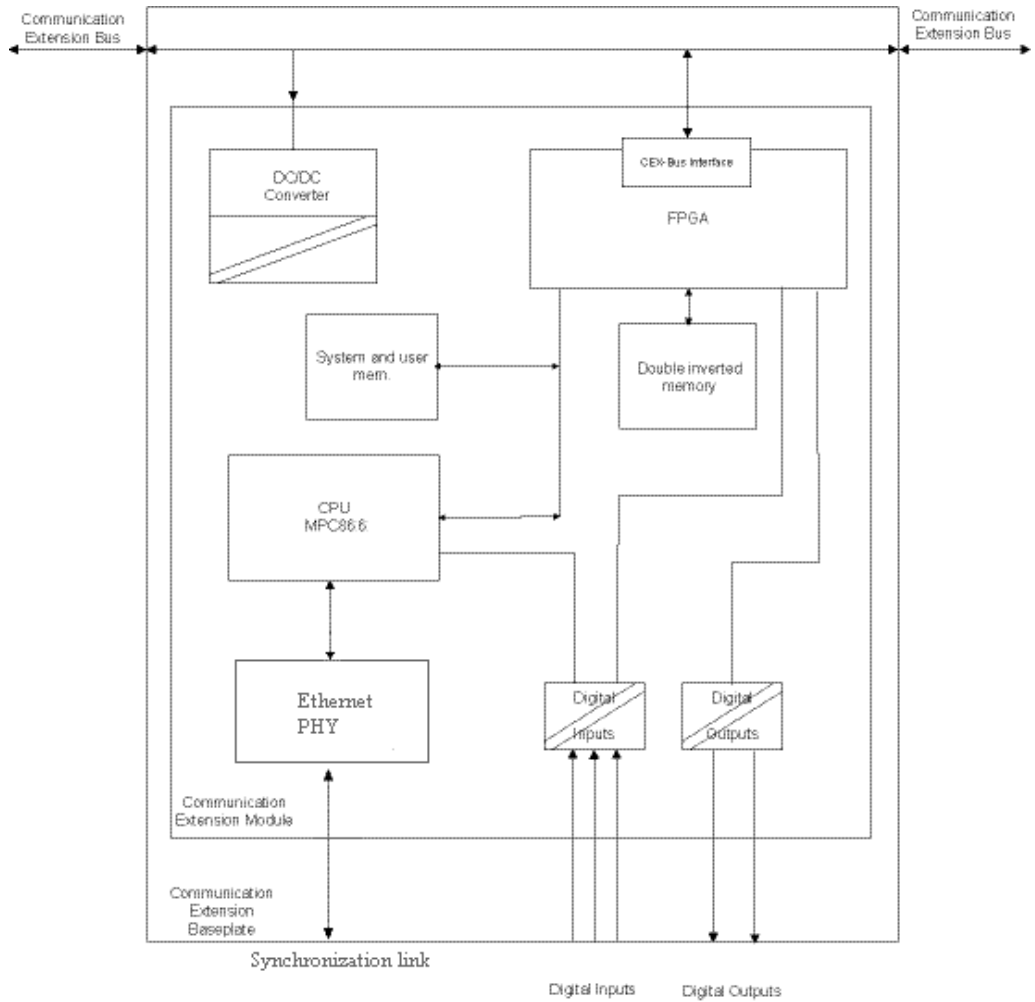


Figure A.5: Block Diagram – SM812

A.17.2 Indicators

Table A.41: SM812 – 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 SM812.
SYNC(hronized) /Yellow	Indicates that the SM812 is synchronized. Flashes during SM812 synchronization.

A.17.3 Technical Data

Table A.42: SM812 Specifications

Item	Value
Memory	<ul style="list-style-type: none"> 4 MB flash PROM (firmware storage). 64 MB of SDRAM.
Galvanic isolation	Yes
Connectors	<ul style="list-style-type: none"> One 7 pin screw connector One RJ45 connector (SM Link)
Current consumption (from CEX-Bus 24 V DC)	160 mA typical (250 mA max)
Power dissipation	3.8 W typical
Weight	700 g (1.5 lb) (package SM812K01 with SM812 and TP868).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

Table A.43: SM812 - 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 ($U_L = \text{logic 0}$, $U_H = \text{logic 1}$)	$-30 \text{ V} < U_L < 5 \text{ V}$ $15 \text{ V} < U_H < 30 \text{ V}$
Nominal current	12 mA
Current limits	$-22 \text{ mA} < I_L < 2 \text{ mA}$ $6 \text{ mA} < I_H < 18 \text{ mA}$
Input impedance	1.8 kOhm

Table A.44: SM812 - 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 SM812.

Performing a Hot swap or inserting an additional/replacement SM812 into a running system affects SIL3 applications.



For performing the hot swap of SM812 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 SM812. The user must acknowledge the application stop by creating an 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 SM812 will shut down. To recover, a new hot insert needs to be initiated i.e. the SM812 has to be removed and inserted again.

Synchronization of the SM812 includes:

1. Make sure that the synchronization link between the SM812s is in place, that is, the enclosed TK852V010 cable is properly connected into both SM Link connectors respectively.
2. Insert the SM812 in its position.
3. When the SM812 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.



Hot-insert will not be completed until all tasks have executed one scan.



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.

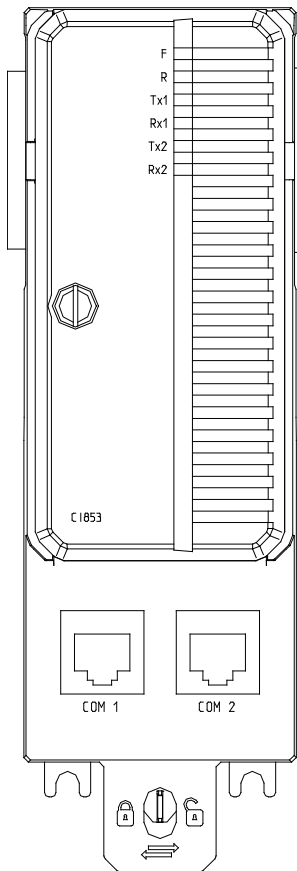
Non-SIL and SIL1-2 applications are not affected by synchronization of SM812. They continue to execute as normal throughout the entire synchronization without being interrupted.



A Hot Swap of SM812 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.

A.18 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 2.2 on page 76](#), 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.

A.18.1 Functional Block Diagram

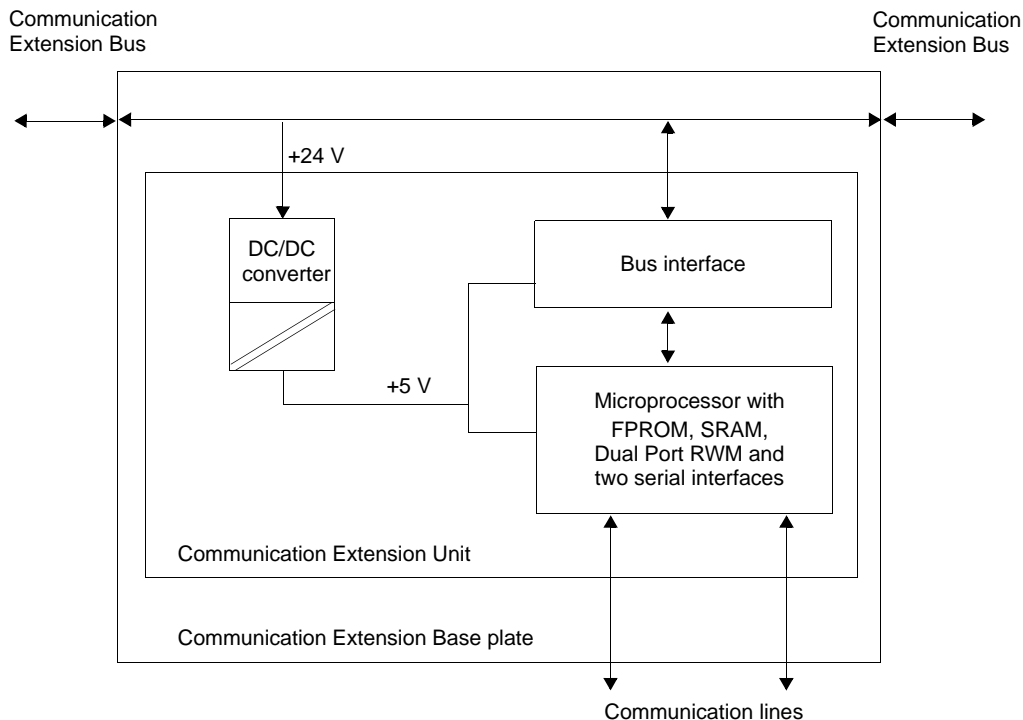


Figure A.6: Block Diagram – CI853

A.18.2 Indicators

Table A.45: CI853 RS-232C – LED Indications

Indication/ Color	Function
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.

*Table A.45: CI853 RS-232C – LED Indications
(Continued)*

Indication/ Color	Function
Tx2 /Yellow	Flashes if transmission from the COM2 port.
Rx2 /Yellow	Flashes if receiving from the COM2 port.

A.18.3 Technical Data

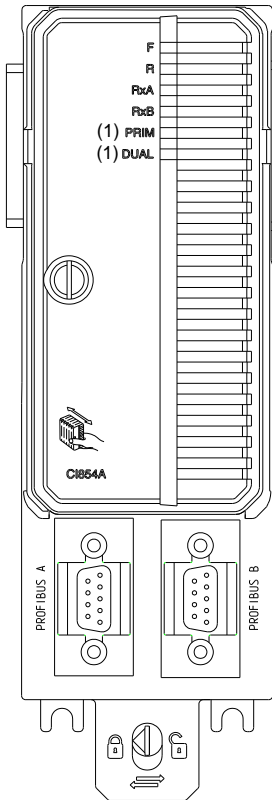
Table A.46: CI853 – RS-232C Communication Interface Specifications

Item	Description
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. 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200 baud. Protocol specific restrictions apply.
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 (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.

*Table A.46: CI853 – RS-232C Communication Interface Specifications
(Continued)*

Item	Description
Weight	700 g (1.5 lb) (package CI853K01with CI853 and TP853)
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in) For further information see Mounting Dimensions for Proper Ventilation on page 144 .

A.19 CI854/CI854A and TP854 – PROFIBUS DP Interface



(1) CI854A only

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).

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 2.2 on page 76](#), 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.

A.19.1 Functional Block Diagram

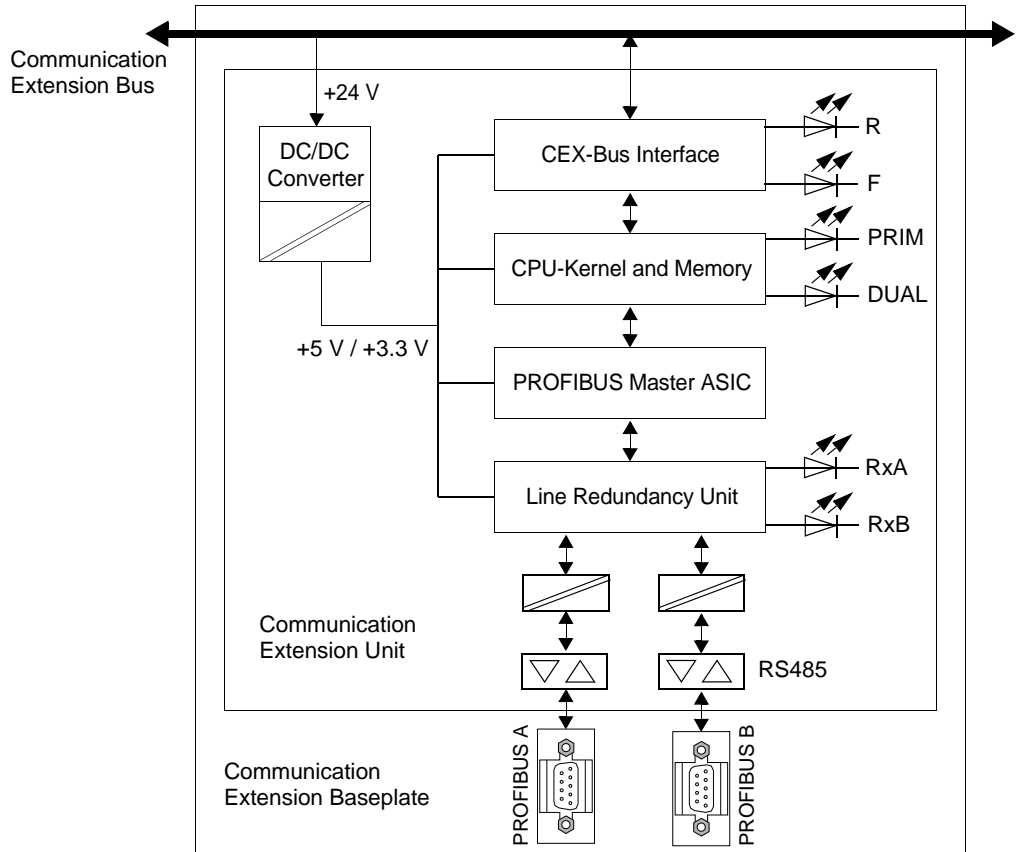


Figure A.7: Block Diagram – CI854A (CI854, same diagram without PRIM/DUAL LEDs)

A.19.2 Indicators

Table A.47: 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.

A.19.3 Technical Data

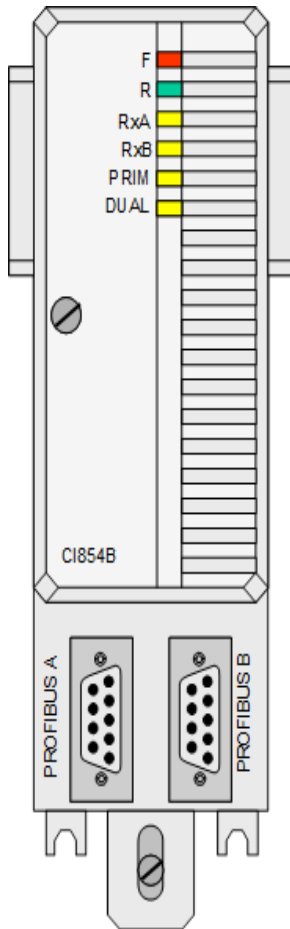
Table A.48: CI854/CI854A PROFIBUS DP Interface Specifications

Item	Value
Type	DP Master Class 1 and 2 for DP Services 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
Galvanic isolation	Yes

*Table A.48: CI854/CI854A PROFIBUS DP Interface Specifications
(Continued)*

Item	Value
Status indicators	Running normally: Green. Exceptional fault: Red. Two traffic indicators - RxA and RxB - controlled by traffic pace: Flashing yellow. Running as primary: Yellow. Running in a redundant configuration: Yellow.
Connectors	Two DB9, female on TP854.
Current consumption (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, IEC 529.
Weight	700 g (1.5 lb) (package CI854K01 with CI854 and TP854). 700 g (1.5 lb) (package CI854AK01 with CI854A and TP854).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.20 CI854B and TP854 – PROFIBUS DP Interface



Key Features

- PROFIBUS-DP Master implemented in a separate FPGA having a soft core NIOS processor with own DDR2RAM and serial flash.
- Simple DIN-rail mounting.
- The CI854B module connects a PROFIBUS-DP with line redundancy to the controller AC800M. The connection between CI854 and AC800M is done through the CEX-Bus. The CI854B supports also PROFIBUS slave and master redundancy.
- For PROFIBUS-DP the maximum number of stations (masters and slaves) in a segment is 32. Using repeaters the maximum number of stations can be extended up to 126.
- Supports hot swap.

Description

The Its purpose is to connect a PROFIBUS-DP with line redundancy to the controller AC800M. The connection between CI854B and AC800M is done through the CEX-Bus.

The Communication Expansion Unit (CEU) consists of two basic parts: the Communication Expansion Baseplate (CEB) TP854 and the removable Communication Expansion Module (CEM) CI854B. Baseplate and CEM are connected via an 80-pin edge connector.

The Baseplate contains only passive elements. It holds the input and output connectors for the CEX-Bus, a slot for the CEM and the PROFIBUS-connectors.

The CEM contains the MPC880 CPU with Flash memory, RAM, LED indicators, power supply, CEX-Bus interface with dual port memory, PROFIBUS FPGA and line redundancy unit.

The CEM can be removed from the Baseplate without disturbing the communication to other modules on the CEX-Bus.

A.20.1 Functional Block Diagram

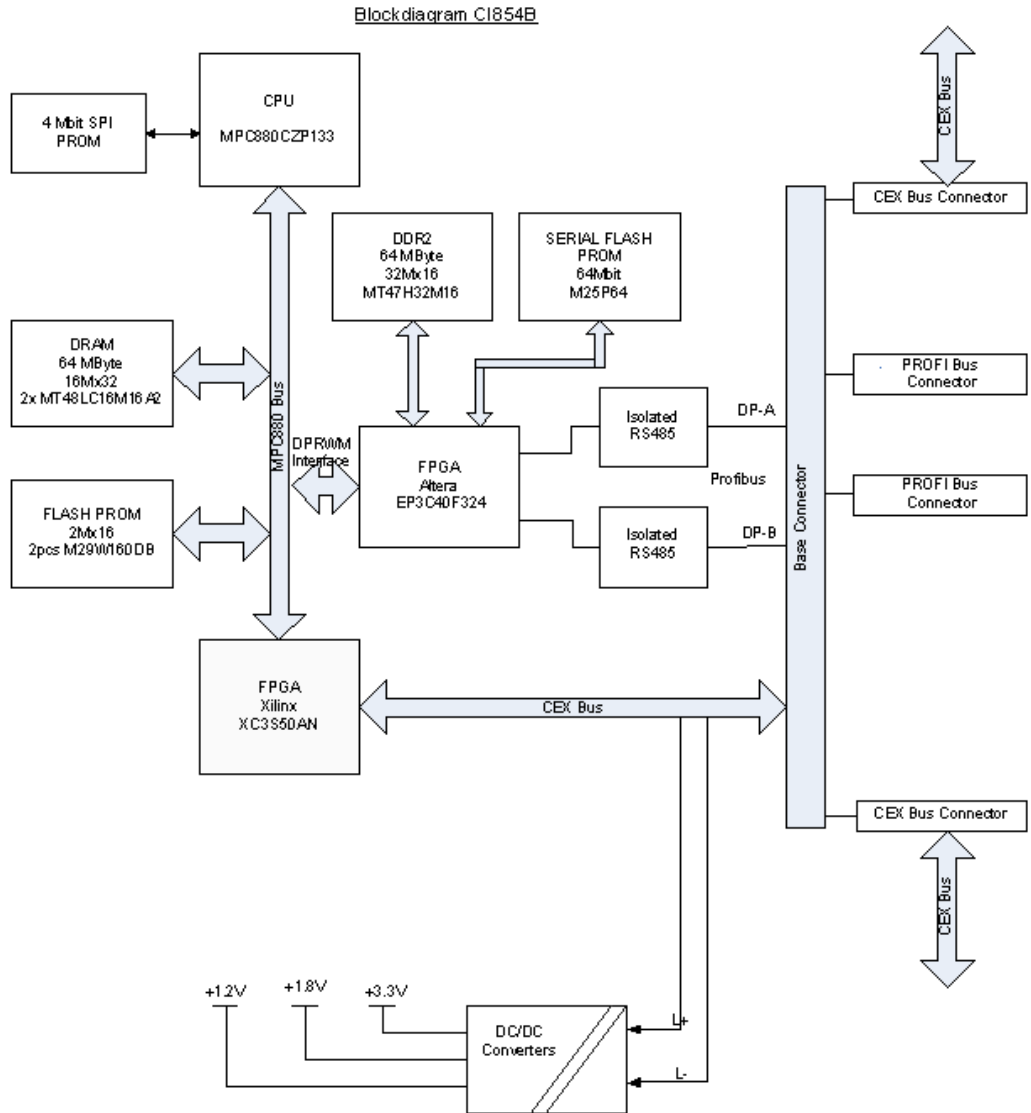


Figure A.8: Block Diagram – CI854B.

A.20.2 Indicators

Table A.49: CI854B – 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	This LED is on in single and redundant configuration. Indicates Primary CI854B in redundant configuration.
DUAL /Yellow	This LED is on when CI854B is running in redundant configuration.

A.20.3 Technical Data

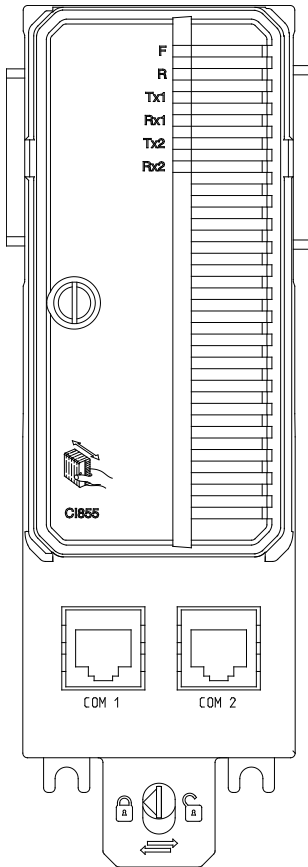
Table A.50: CI854B PROFIBUS DP Interface Specifications

Item	Value
Type	DP Master Class 1 and 2 for DP Services 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
Galvanic isolation	Yes

*Table A.50: CI854B PROFIBUS DP Interface Specifications
(Continued)*

Item	Value
Status indicators	Running normally: Green. Exceptional fault: Red. Two traffic indicators - RxA and RxB - controlled by traffic pace: Flashing yellow. Running as primary: Yellow. Running in a redundant configuration: Yellow.
Connectors	Two DB9, female on TP854.
Current consumption (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, IEC 529.
Weight	700 g (1.5 lb) (package CI854BK01 with CI854B and TP854).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.21 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 2.2 on page 76](#), 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.

A.21.1 Functional Block Diagram

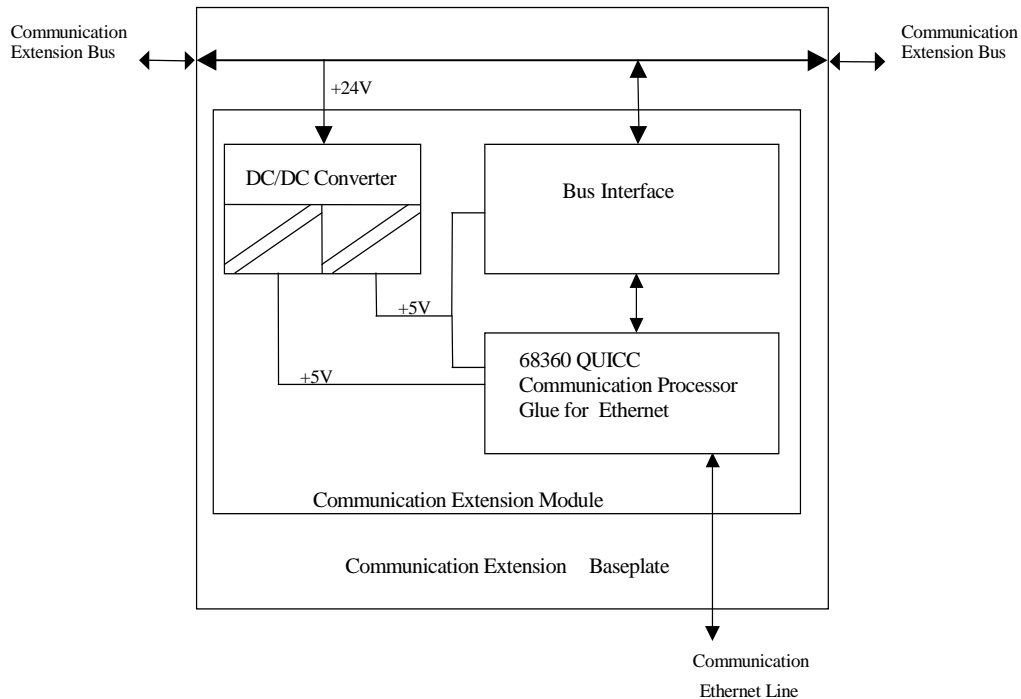


Figure A.9: Block Diagram – CI855

A.21.2 Indicators

Table A.51: 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.

*Table A.51: CI855 – MasterBus 300 LED Indicators
(Continued)*

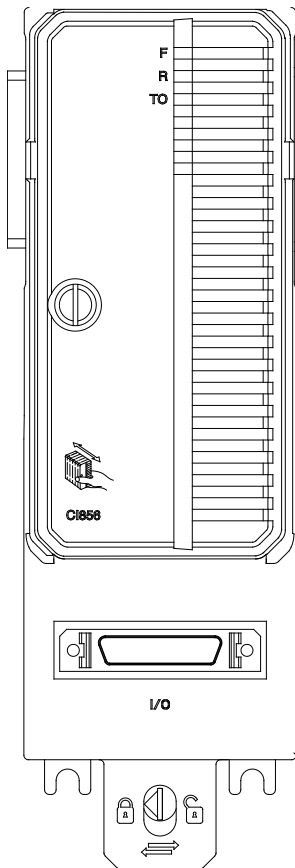
Designation/Color	Function
Rx1 /Yellow flashing	A yellow LED flashes when data is being received from the COM1 port.
Tx2 /Yellow flashing	A yellow LED indicating transmission from the communication unit COM2 port.
Rx2 /Yellow flashing	A yellow LED flashes when data is being received from the COM2 port.

A.21.3 Technical Data

Table A.52: 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
Current consumption (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 (W 2.9 x H 7.3 x D 5.0 in)

A.22 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 2.2 on page 76](#), 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.

A.22.1 Functional Block Diagram

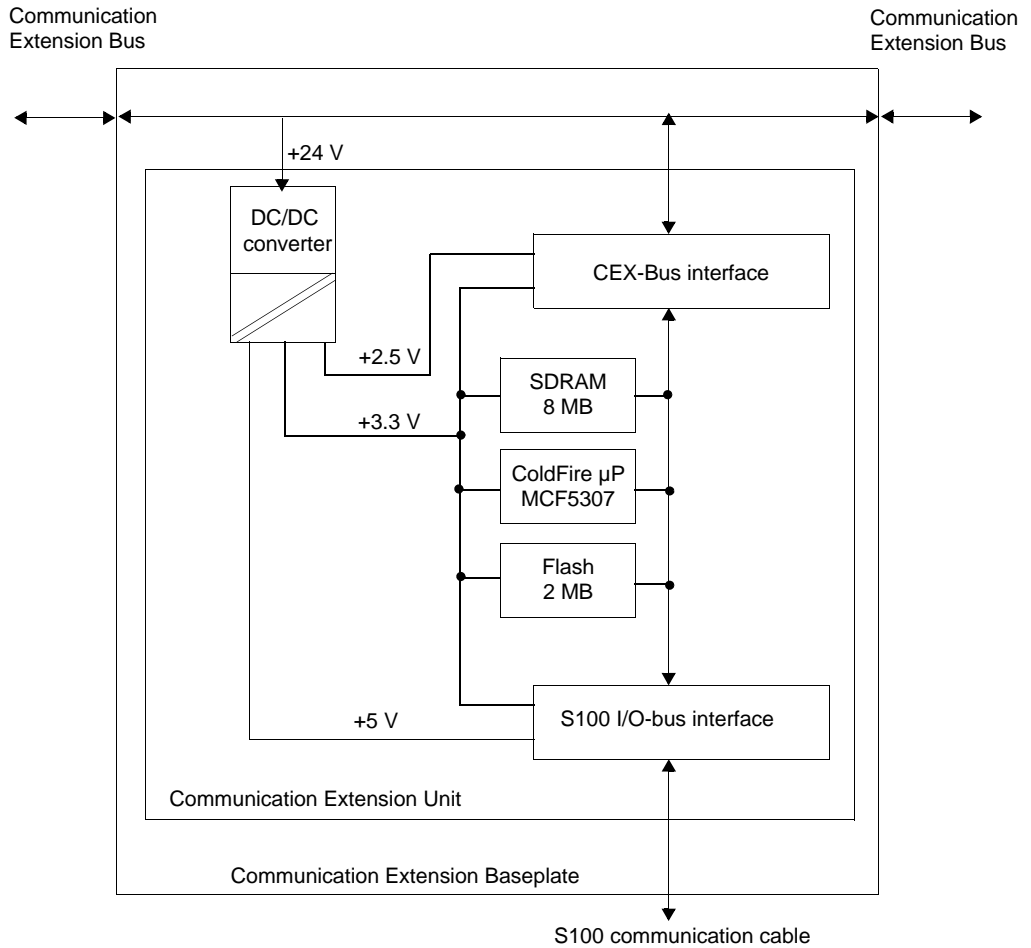


Figure A.10: Block Diagram – CI856

A.22.2 Indicators

Table A.53: CI856 – S100 I/O LED Indicators

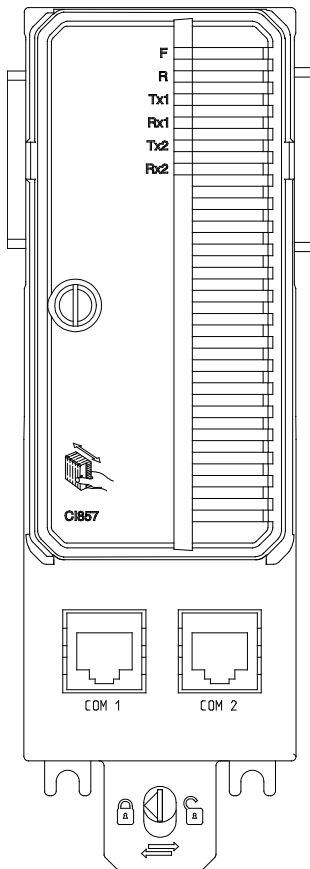
Designation/Color	Function
F(ault) /Red	Unit error detected. Controlled by CI856 Software. Set by the Hardware during controller Reset. Cleared by the CI856 Software after successful startup.
R(un) /Green	Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.
TO /Yellow	Flashes at S100 I/O access time-outs.

A.22.3 Technical Data

Table A.54: 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 (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
Weight	700 g (1.5 lb) (package CI856K01 with CI856 and TP856)
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.23 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 2.2 on page 76](#), 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.

A.23.1 Functional Block Diagram

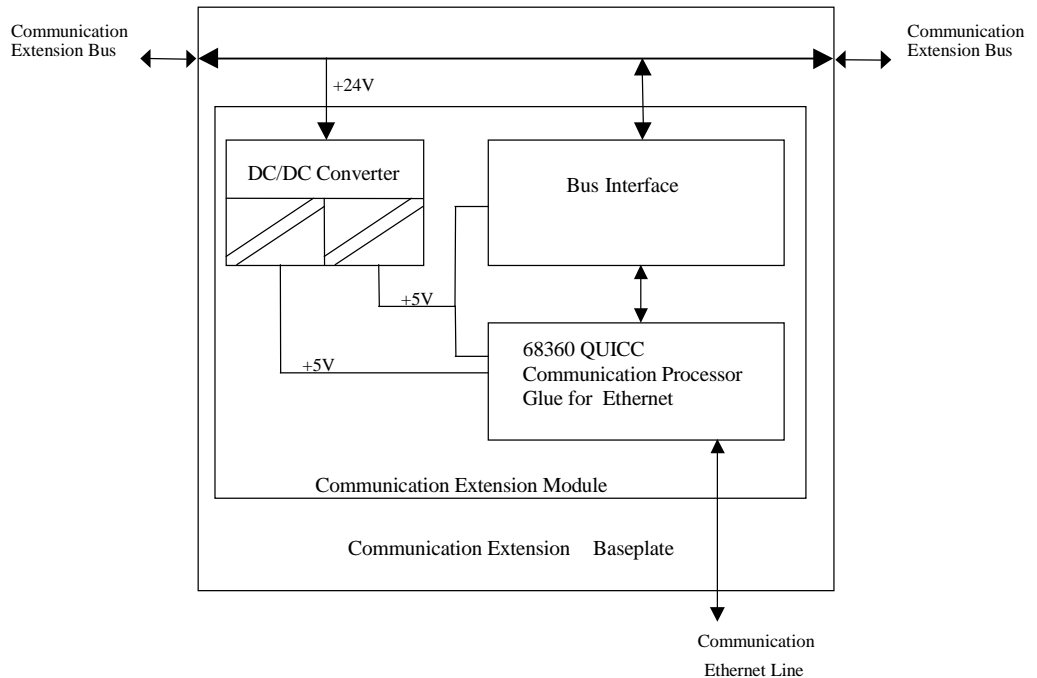


Figure A.11: Block Diagram – CI857

A.23.2 Indicators

Table A.55: 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.

*Table A.55: CI857 – INSUM Interface LED Indicators
(Continued)*

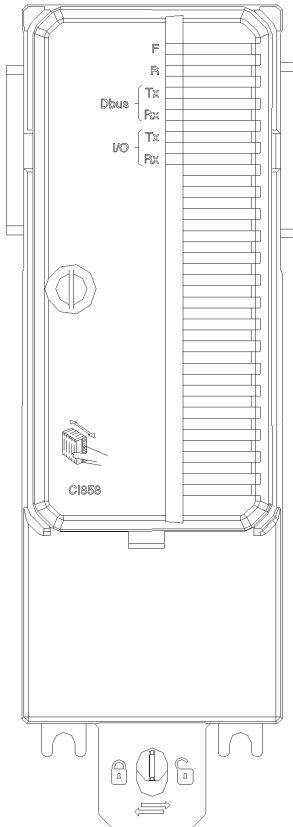
Designation/Color	Function
Tx2 OFF	Not used.
Rx2 OFF	Not used.

A.23.3 Technical Data

Table A.56: 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).
Current consumption (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 CI857K01with CI857 and TP853).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.24 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 158](#). Special I/O connection, see [I/O Systems on page 150](#). 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 2.2 on page 76](#), 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.

A.24.1 Functional Block Diagram

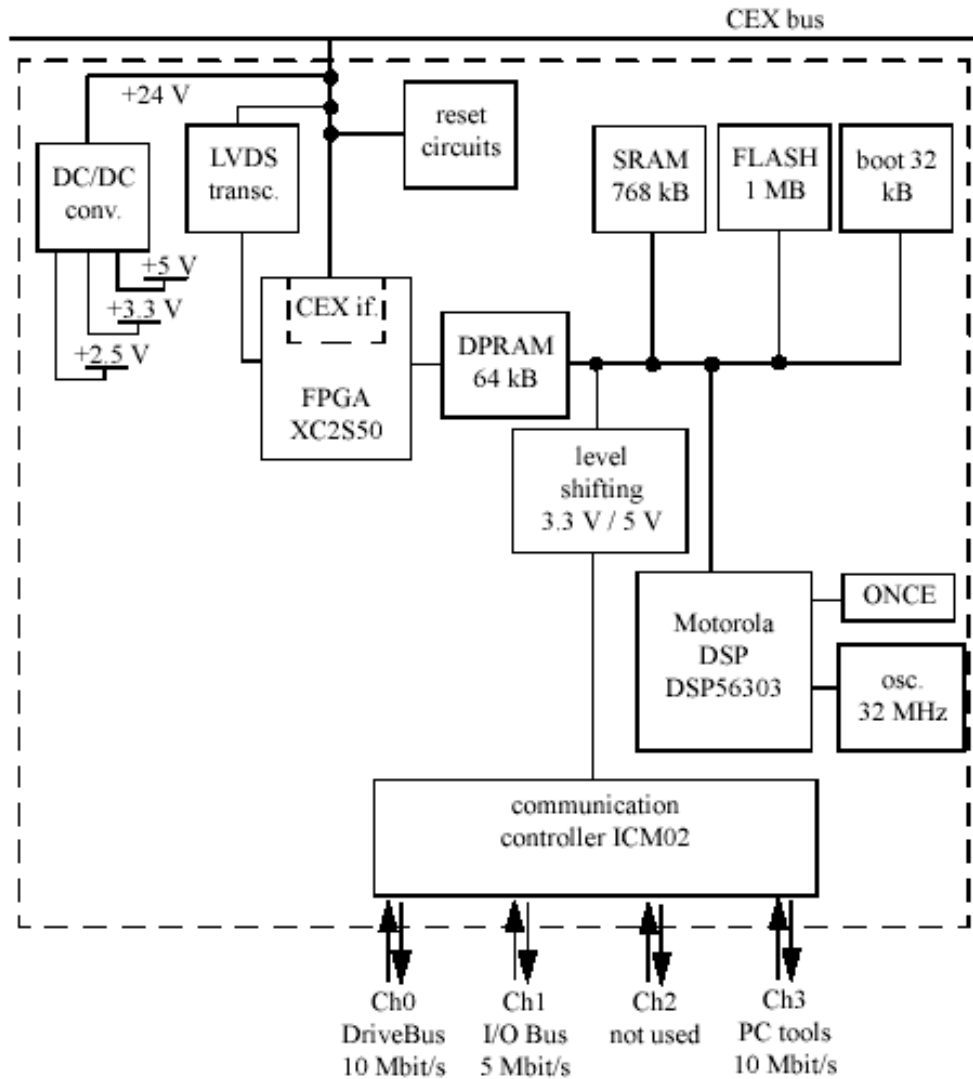


Figure A.12: Block Diagram – CI858

A.24.2 Indicators

Table A.57: 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 ¹ .
Tools /Yellow	TRANSMIT LED indicating transmission of data frames on the PC Tool Bus(1).

1. This LED is not visible in the front of the unit. It can be seen through the ventilation holes in the plastic housing.

A.24.3 Technical Data

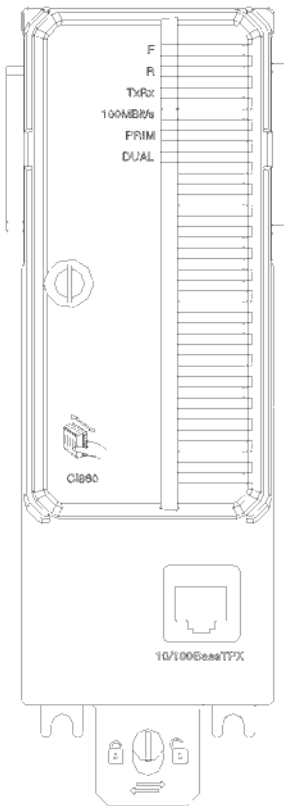
Table A.58: CI858 – DriveBus Specifications

Item	Value
Communication speed	4 Mbit/s
Connectors	Three optical connectors
Current consumption (from CEX-Bus 24 V DC)	200 mA max.
External supply voltage	17 V minimum 25 V typical 30 V max

*Table A.58: CI858 – DriveBus Specifications
(Continued)*

Item	Value
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.

A.25 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 2.2 on page 76](#), 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.

A.25.1 Functional Block Diagram

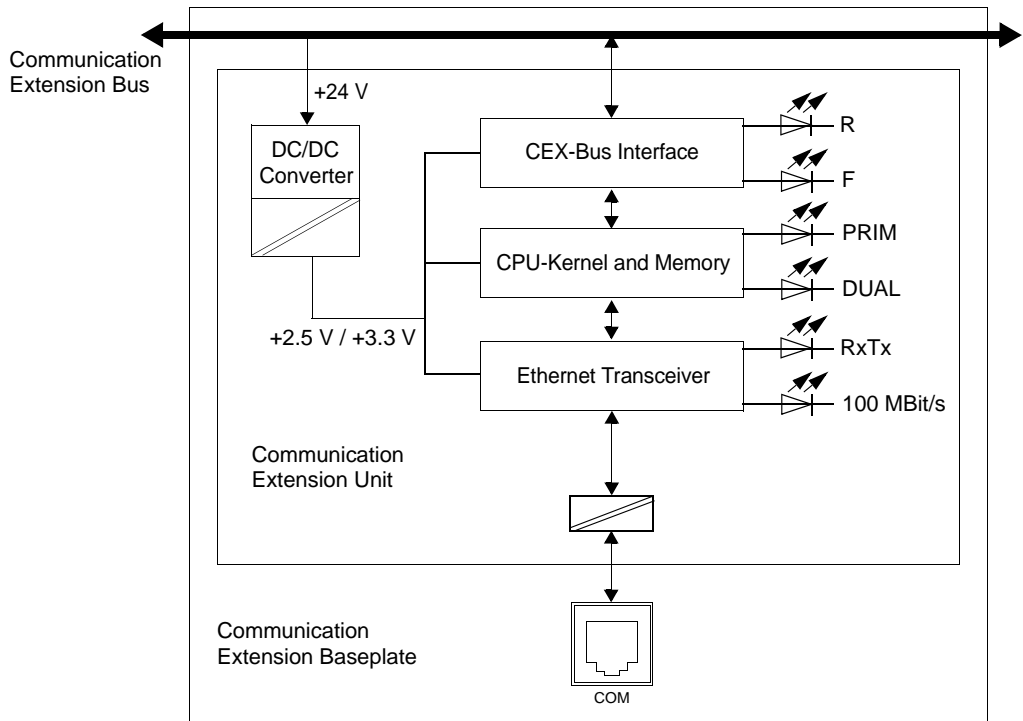


Figure A.13: Block Diagram – CI860

A.25.2 Indicators

Table A.59: CI860 – FOUNDATION Fieldbus High Speed Ethernet 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.
100MBit/s is ON	A valid connection with 100 MBit/s is established when Rx Tx/Yellow is flashing.

*Table A.59: CI860 – FOUNDATION Fieldbus High Speed Ethernet Interface LED Indicators
(Continued)*

Designation/Color	Function
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.

A.25.3 Technical Data

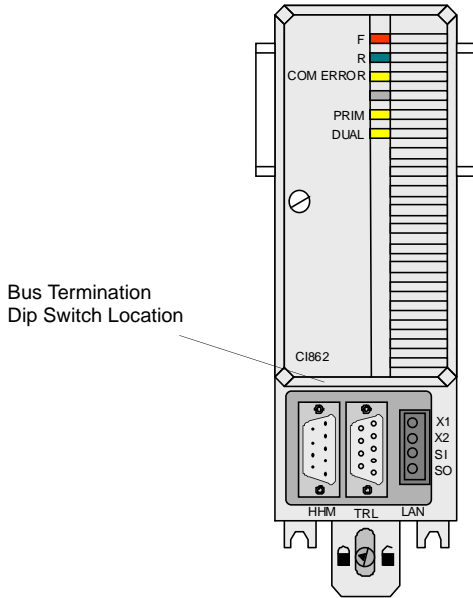
Table A.60: CI860 – FOUNDATION Fieldbus High Speed Ethernet Specifications

Item	Value
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. Exceptional fault: Red. One traffic indicator - RxTx - controlled by traffic pace.
Connector	RJ45
Current consumption (from CEX-Bus 24 V DC)	100 mA typical (150 mA max.).
Power dissipation	2.4 W typical.

*Table A.60: CI860 – FOUNDATION Fieldbus High Speed Ethernet Specifications
(Continued)*

Item	Value
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 (W 2.9 x H 7.3 x D 5.0 in)

A.26 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

PM857/PM858/PM862/PM863/PM866/PM866A/PM867, only the TK850 CEX-bus extension cable shall be used for interconnection between the PM866 modules. The BC810/BC820 shall not be used.

b. If the CI862 is used with other redundant processor modules (PM861A/PM864A/PM865), either BC810/BC820 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.

A.26.1 Description

CI862 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.

TRIO blocks, [Figure A.14](#), 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 A.61](#).

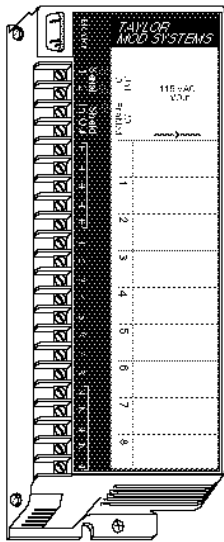


Figure A.14: TRIO block.

Table A.61: 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
CSANAINP	Current Source Input	Analog	6 Input	Yes

Table A.61: TRIO block types.
(Continued)

Unit	Name	Type	Description	Can be BSM
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
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

A.26.2 Functional Block Diagram

A complete CI862K01 unit consists of a TP862 baseplate, a CI862 communication interface board, and their mechanics, [Figure A.15](#). All electronic devices and all functions are located on the board which also includes the μ 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.

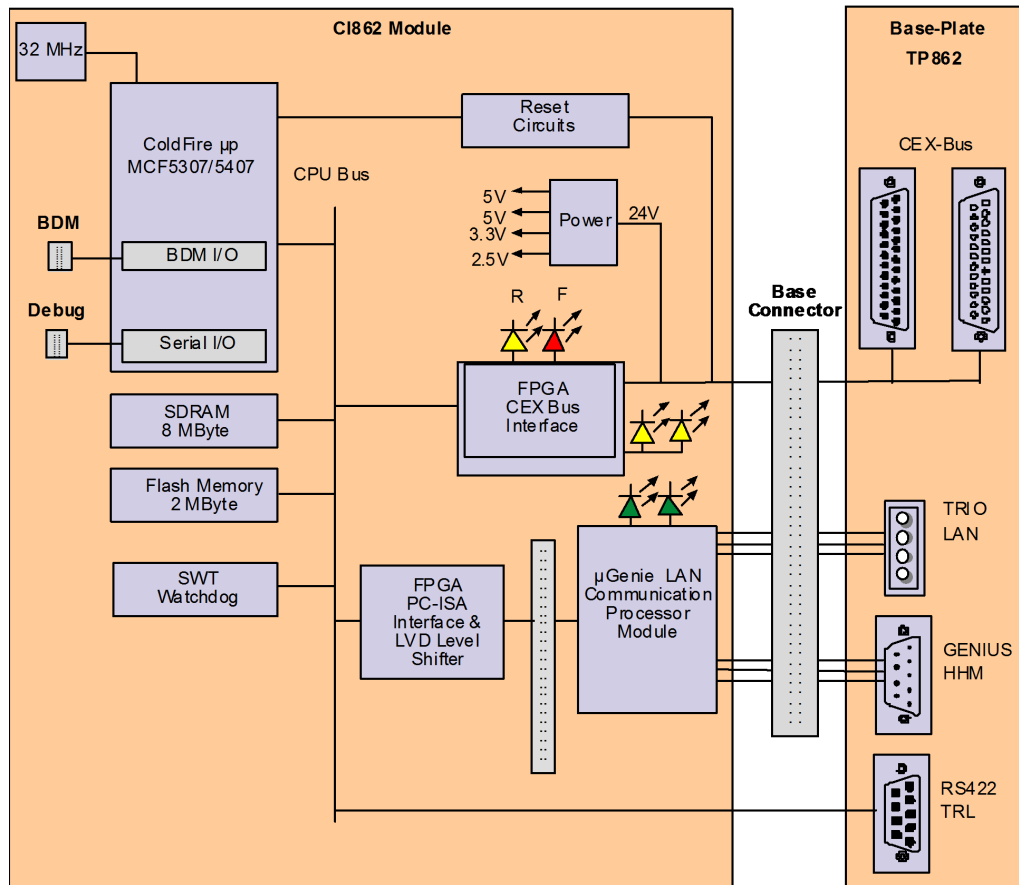


Figure A.15: CI862 functionality

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 μ Genie Communication Module. The μ 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.

A.26.3 Indicators

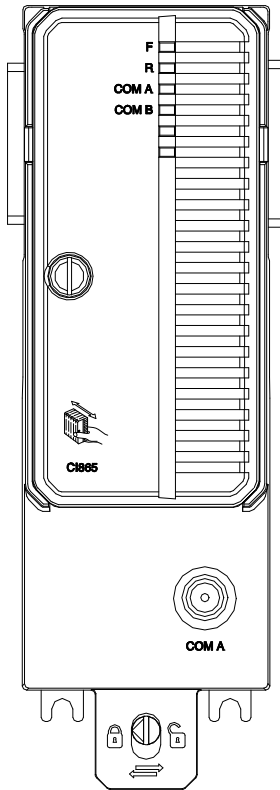
LED indicators for R(un), F(ault), Communication Error, Primary (Bus Master), and Dual (redundancy)

A.26.4 Technical Data

Table A.62: 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 Green LED for run Yellow LED for traffic Yellow LED for primary Yellow LED for dual mode
Connector	one 4 pin (connects TRIO FIELD BUS) one DB9S (male) (connects Hand-held Monitor) one DB9, female (connects CEX expansion bus)
Current Consumption from CEX-Bus 24 V d.c.	Typical 190 mA (max. 200 mA)
Dimensions	W 58 x H 165 x D 122 mm (W 2.3 x H 6.4x D 4.81 inches)
Hot swap	Supported

A.27 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 2.2 on page 76](#), 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.

A.27.1 Functional Block Diagram

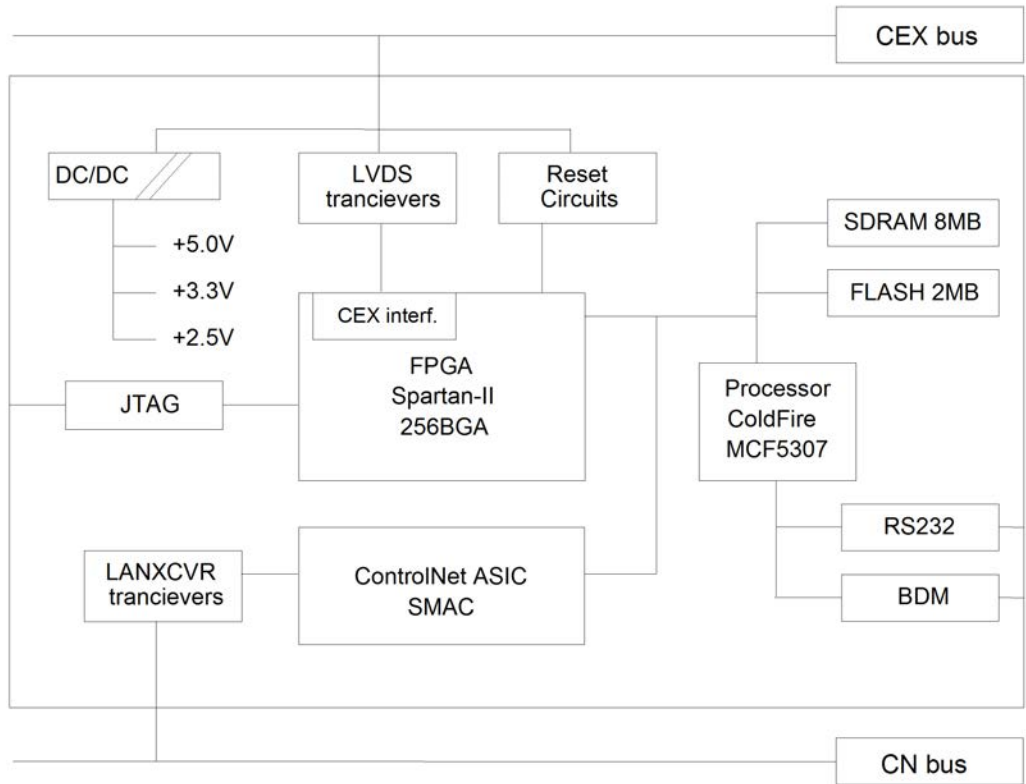


Figure A.16: Block Diagram – CI865

A.27.2 Indicators

Table A.63: Satt I/O CI865 – Fault Finding

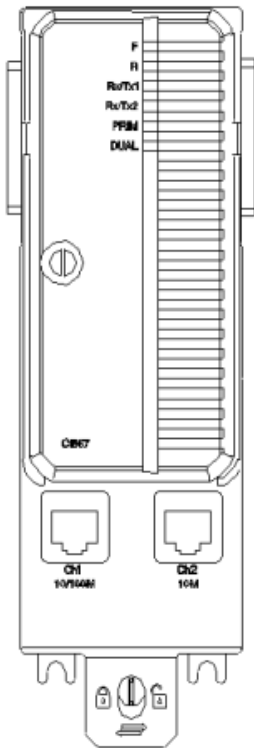
Designation/Color	Function
Neither R(un) nor F(ault) LED's are ON	The CI865 unit is in the process of being configured. Allow time for this to finalize. If the condition persists, and no other unit LED on the CEX-Bus is lit: <ul style="list-style-type: none"> • Check the CEX-Bus fuse inside the PM8xx processor unit • Initiate a reset signal (INIT) from the PM8xx processor unit • Replace the CI865 unit
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

A.27.3 Technical Data

Table A.64: Satt I/O CI865 Interface Specifications

Item	Value
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 (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 (W 2.9 x H 7.3 x D 5.0 in)

A.28 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 2.2 on page 76](#)) 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.

A.28.1 Functional Block Diagram

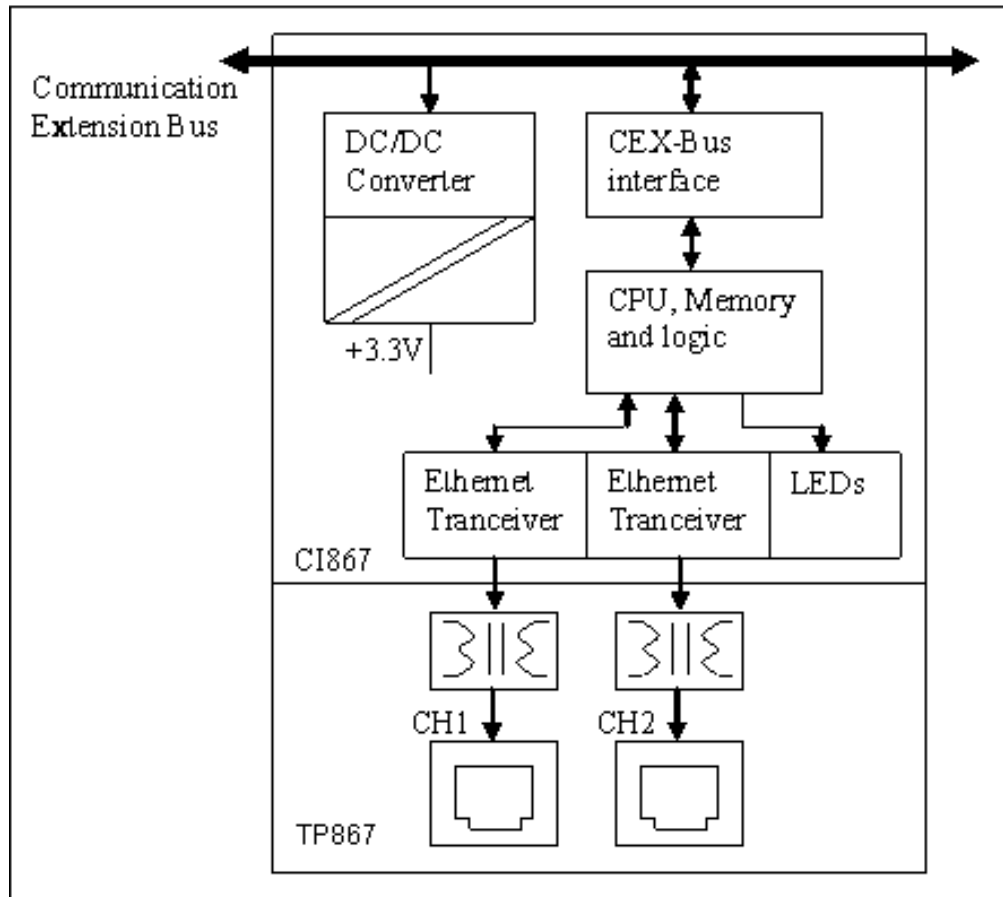


Figure A.17: Block Diagram – CI867

A.28.2 Indicators

Table A.65: Modbus TCP Interface CI867 - LED indicators

Designation/Color	Function
F(ault) / Red	Unit error detected. Set by the Hardware during Controller Reset. Controlled by Control Software after Reset.

*Table A.65: Modbus TCP Interface CI867 - LED indicators
(Continued)*

R(un) / Green	Operating. Cleared by the Hardware during Controller Reset. Controlled by Control Software after Reset.
RxTx1 / Yellow	When flashing or permanently lit, see Modbus TCP Interface – CI867 . Ethernet packages are sent/received at CH 1.
RxTx2 / Yellow	When flashing or permanently lit, see Modbus TCP Interface – CI867 . 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.

A.28.3 Technical Data

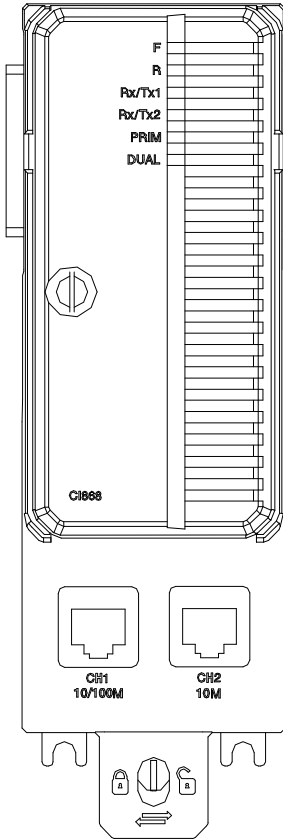
Table A.66: Modbus TCP Interface CI867 - Technical Specification

Item	Value
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
Status indicators	Running normally: Green. Exceptional fault: Red. Two traffic indicators – RxTx1 and RxTx2 -- controlled by traffic pace: Flashing Yellow Traffic indicator CH2 – RxTx2 - controlled by traffic pace. Running as primary: Yellow. 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

*Table A.66: Modbus TCP Interface CI867 - Technical Specification
(Continued)*

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 (W 2.9 x H 7.3 x D 5.0 in)

A.29 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 TP867 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 2.2 on page 76](#)) 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.

A.29.1 Functional Block Diagram

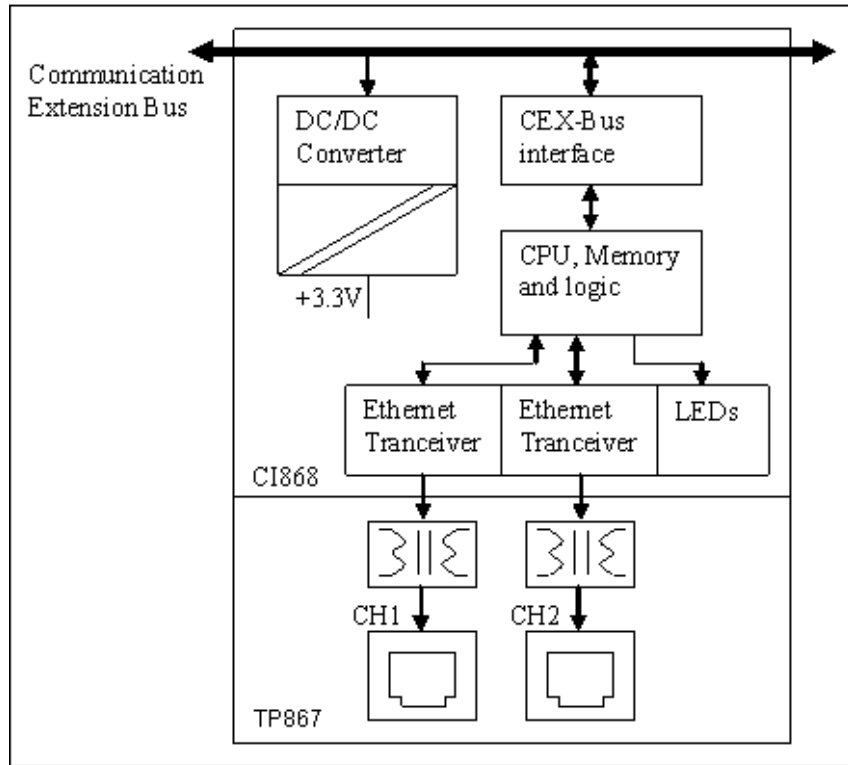


Figure A.18: Block Diagram – CI868

A.29.2 Indicators

There are six LED indicators on the front panel of CI868 that indicate various states and conditions on the CI868.

Table A.67: 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.

*Table A.67: IEC 61850 Interface CI868 - LED indicators
(Continued)*

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, see IEC 61850 Interface – CI868 . 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), see IEC 61850 Interface – CI868 . The LED is controlled by Ethernet PHY. It is turned off by reset.
PRIM(ary)	The PRIM and DUAL LEDs are not enabled when the module is used in a single configuration (CI868 does not support redundant configuration).

A.29.3 Technical Data

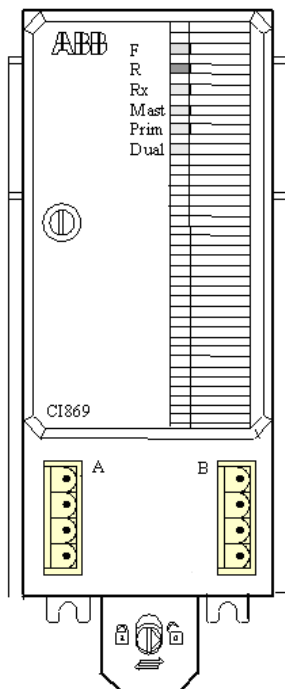
Table A.68: IEC 61850 Interface CI868 - Technical Specification

Item	Value
Type	Ethernet unit
Protocol	IEC 61850
Communication speed CH1	10 Mbit/s / 100 Mbit/s defined in IEEE 802.3u 10/100Base-Tx
Status indicators	Running normally: Green. Exceptional fault: Red. Two traffic indicators – RxTx1 and RxTx2(LED will always be switched off) -- controlled by traffic pace: Flashing Yellow Running as primary: Yellow. 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)

*Table A.68: IEC 61850 Interface CI868 - Technical Specification
(Continued)*

Protection Rating	IP20 according to EN60529, IEC 529.
Weight	500 g (700g with package) (package CI868K01 with CI868 and TP867).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

A.30 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 2.2 on page 76](#)) that prevents the installation of an incorrect type of unit onto the TP869 Baseplate.

A.30.1 Functional Block Diagram

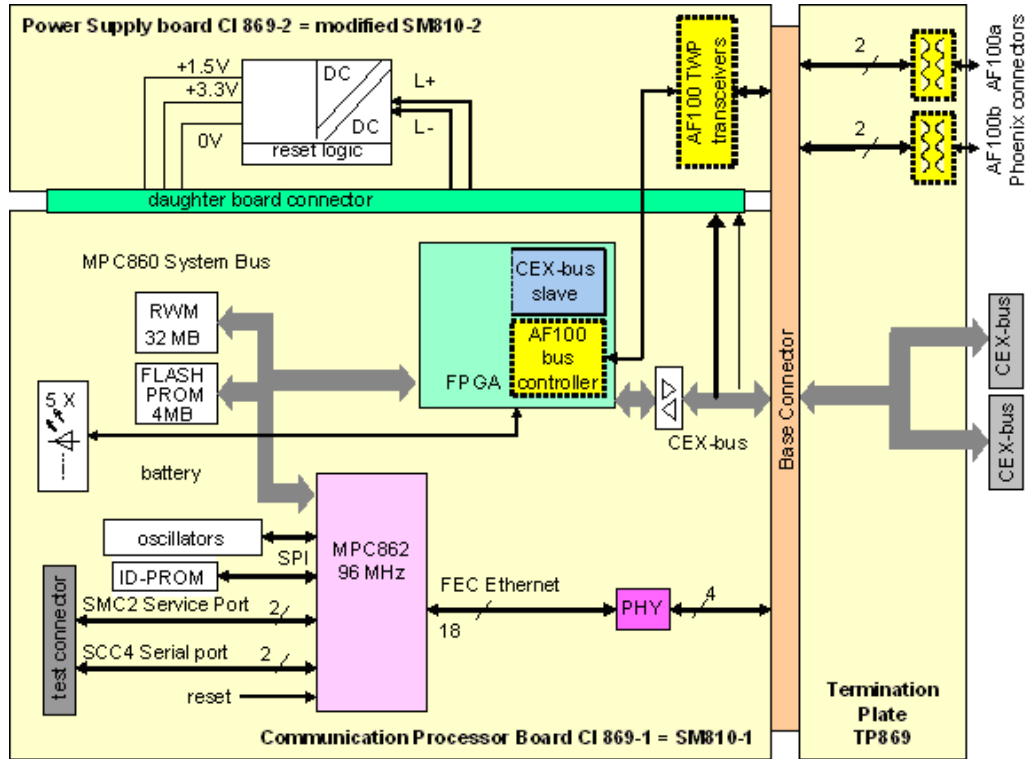


Figure A.19: Block Diagram - CI869

A.30.2 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 A.69: 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.

*Table A.69: AF 100 Interface, CI869 - LED indicators
(Continued)*

Rx / Yellow	The yellow Rx LED indicates that the CI869 receives traffic. The Rx LED is ON, without flashing, when traffic is normal. 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. 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.

A.30.3 Technical Data

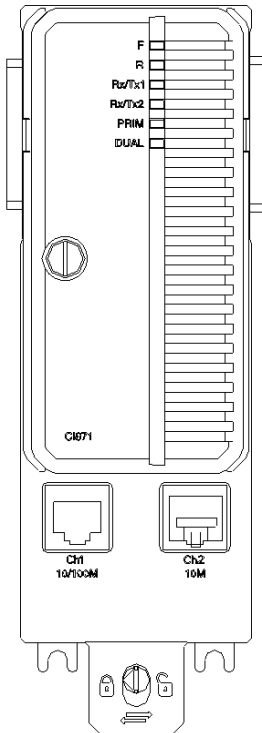
Table A.70: AF100 Interface CI869 - Technical Specification

Item	Value
Type	AF 100 Communication Interface
Protocol	Advant Fieldbus 100
Communication speed TWP	1.5 Mbit/s
Status indicators	Running normally: Green. Exceptional fault: Red. Traffic indicator – Rx -- controlled by traffic pace: Flashing Yellow Running as primary: Yellow. Running in a redundant configuration: Yellow.
Connectors	Twisted Pair (TWP)
Current consumption (from CEX-Bus 24VDC)	160 mA typical (250 mA max)

*Table A.70: AF100 Interface CI869 - Technical Specification
(Continued)*

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 (W 2.9 x H 7.3 x D 5.0 in)

A.31 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 2.2 on page 76](#)), 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.

A.31.1 Functional Block Diagram

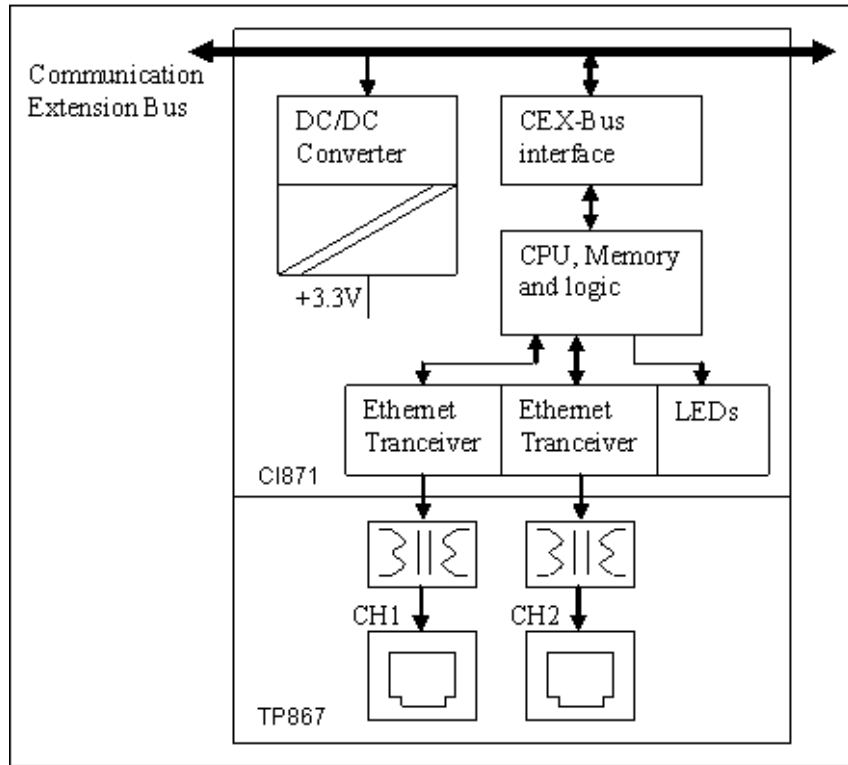


Figure A.20: Block Diagram – CI871

A.31.2 Indicators

There are six LED indicators on the front panel of CI871 to indicate various states and conditions of CI871.

Table A.71: PROFINET IO Interface CI871 - LED indicators

Designation/Color	Function
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.

*Table A.71: PROFINET IO Interface CI871 - LED indicators
(Continued)*

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, see PROFINET IO Interface - CI871 . 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, see PROFINET IO Interface - CI871 . 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.

A.31.3 Technical Data

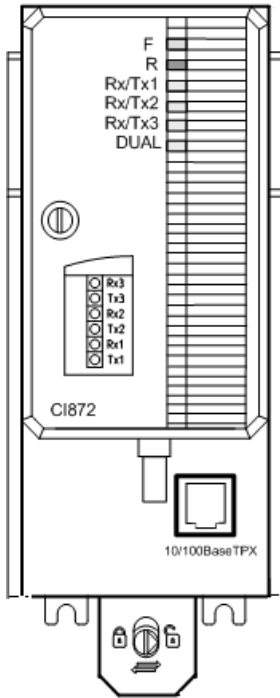
Table A.72: PROFINET IO Interface CI871 - Technical Specification

Item	Value
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. Exceptional fault: Red. Two traffic indicators – RxTx1 and RxTx2(LED is always switched off) controlled by traffic pace: Flashing Yellow. Running as primary: Yellow. Running in a redundant configuration: Yellow.
Connectors	RJ45
Current consumption (from CEX-Bus 24VDC)	160 mA typical (250 mA max).

*Table A.72: PROFINET IO Interface CI871 - Technical Specification
(Continued)*

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. (W 2.9 x H 7.3 x D 5.0 in).

A.32 CI872 and TP858 - MOD5 Interface



Key Features

- CEX-Bus Module
- Simple DIN rail mounting
- Supports communication interface redundancy
- Three full duplex fiberoptic 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.

A.32.1 Functional Block Diagram

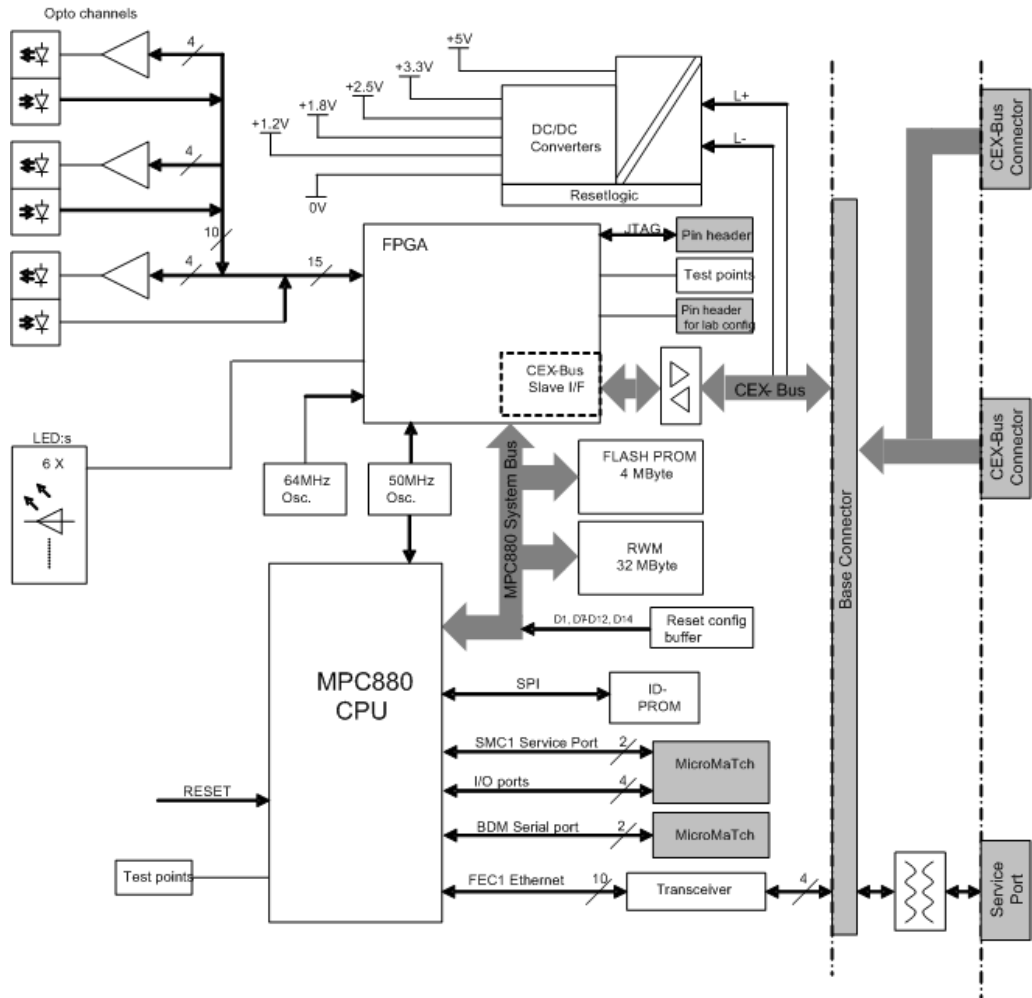


Figure A.21: Block Diagram – CI872

A.32.2 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 A.73: MOD5 Interface CI872 - LED indicators

Designation/Color	Function
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.

A.32.3 Technical Data

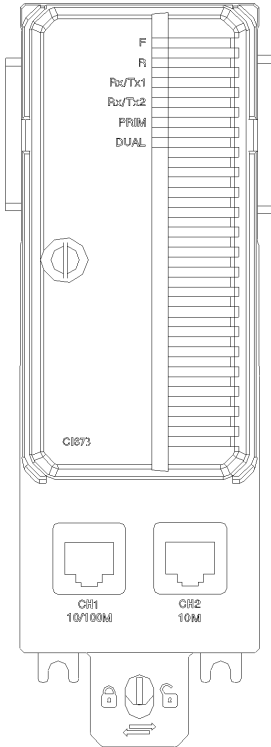
Table A.74: MOD5 Interface CI872 - Technical Specification

Item	Value
Type	Fiber optic connection.
Protocol	MOD5-to-MOD5.
Communication speed	Full duplex at a speed of 500 Kbps.
Status indicators	Running normally: Green. Exceptional fault: Red. Three traffic indicators – RxTx1, RxTx2 and RxTx3 - controlled by traffic pace: Flashing Yellow. Running in a redundant configuration: Yellow.
Connectors	Wavelength: 820 nm. Fiber size: 62.5/125 µm multimode glass fiber. Connector type: ST - non threaded. Max nominal fiber damping including connectors: 11 dB.
Current consumption (from CEX-bus 24VDC)	Max 124 mA.

*Table A.74: MOD5 Interface CI872 - Technical Specification
(Continued)*

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. (W 2.9 x H 7.3 x D 5.0 in).

A.33 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).
- Supports hot swap.

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.

A.33.1 Functional Block Diagram

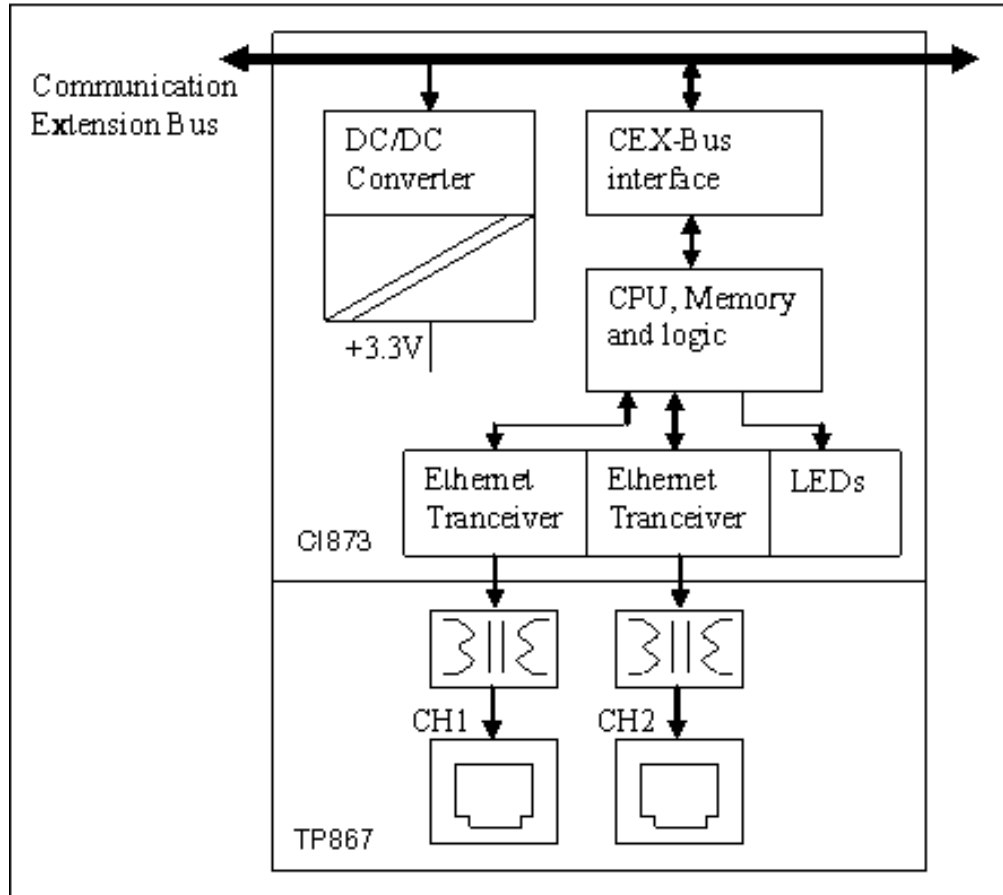


Figure A.22: Block Diagram – CI873

A.33.2 Indicators

There are six LED indicators on the front panel of CI873 that indicate the various states and conditions on the CI873.

Table A.75: EtherNet/IP Interface CI873 - LED indicators

Designation/Color	Function
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, see EtherNet/IP Interface - CI873 . 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), see EtherNet/IP Interface - CI873 . 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.

A.33.3 Technical Data

Table A.76: 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. Exceptional fault: Red. Two traffic indicators – RxTx1 and RxTx2(LED will always be switched off) -- controlled by traffic pace: Flashing Yellow Running as primary: Yellow.

*Table A.76: EtherNet/IP Interface CI873 - Technical Specification
(Continued)*

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 CI873K01 with CI873 and TP867).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in).

A.34 Power Supply Units – Types SD821, SD822 and SD823

A.34.1 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

A.34.2 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.

A.34.3 Protection Rating

IP20 according to EN 60529, IEC 529

Protective Class I according to EN 50718; 3.56

A Hardware Units

A.34 Power Supply Units – Types SD821, SD822 and SD823

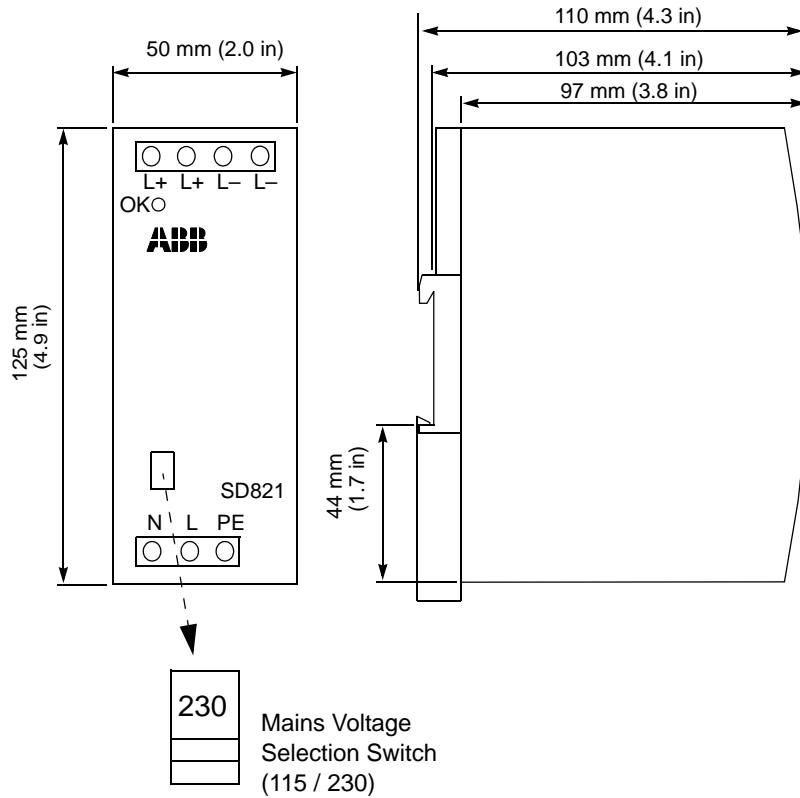


Figure A.23: SD821 Connections for 2.5 A Power Supply

A Hardware Units

A.34 Power Supply Units – Types SD821, SD822 and SD823

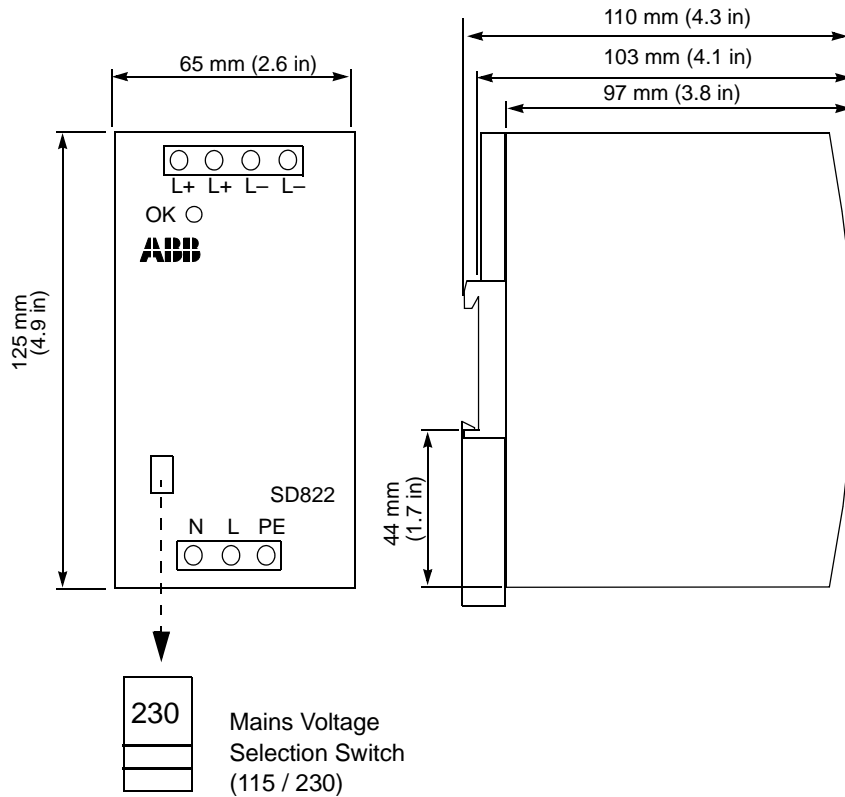


Figure A.24: SD822 Connections for 5 A Power Supply

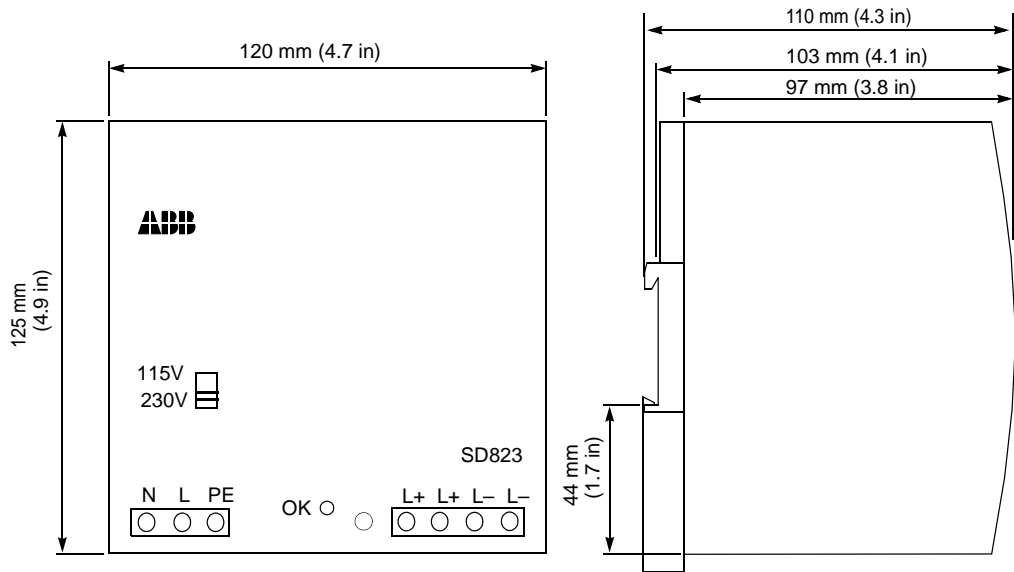


Figure A.25: SD823 Connections for 10 A Power Supply

A.34.4 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.

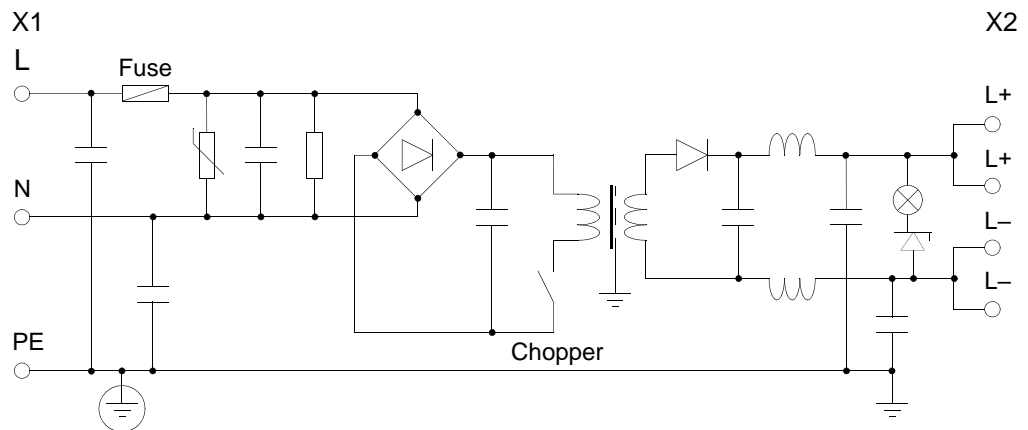


Figure A.26: PSU's SD821, 822 and 823 – Block Diagram

A.34.5 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).

A.34.6 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 A.77: 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 ¹	10 A ⁽¹⁾	10 A ⁽¹⁾	10 A ⁽¹⁾
Secondary: Short circuit	<5 A	<10 A	<20 A
Secondary: Over-load protection	3 A > I I < 5 A	6 A < I I < 10 A	12 A < I I < 20 A
Secondary: Over-Voltage protection	32 V typ	29 V typ	35 V typ

1. Microcircuit Breaker (MCB), Characteristic B

A.34.7 Technical Data

Table A.78: 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 70 W	280 VA 135 W	690 VA 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

*Table A.78: PSU's SD821, 822 and 823 – Technical Data
(Continued)*

Parameter	SD821 Converter	SD822 Converter	SD823 Converter
Absolute maximum supply voltage (short term), max. a.c.	138/275 V AC 375 V DC	138/275 V AC 375 V DC	138/275 V AC 375 V DC
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 A.79: PSU's SD821, 822 and 823 – Mounting Dimensions

Parameter	SD821 Converter	SD822 Converter	SD823 Converter
Dimensions, Width HxD = 125 x 110 mm (4.9" x 4.3")	50 mm (2.0 in)	65 mm (2.6 in)	120 mm (4.7 in)
Mounting spacing W mm	10 mm (0.4 in)	15 mm (0.6 in)	15 mm (0.6 in)
Mounting spacing 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)

A.35 Power Supply Units - Types SD831, SD832, SD833, and SD834

A.35.1 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.

A.35.2 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.

A.35.3 Ingress Protection

IP20 according to EN 60529, IEC 60529

Protective Class I according to EN 50718; 3.56

A.35.4 Dimensions and Connections

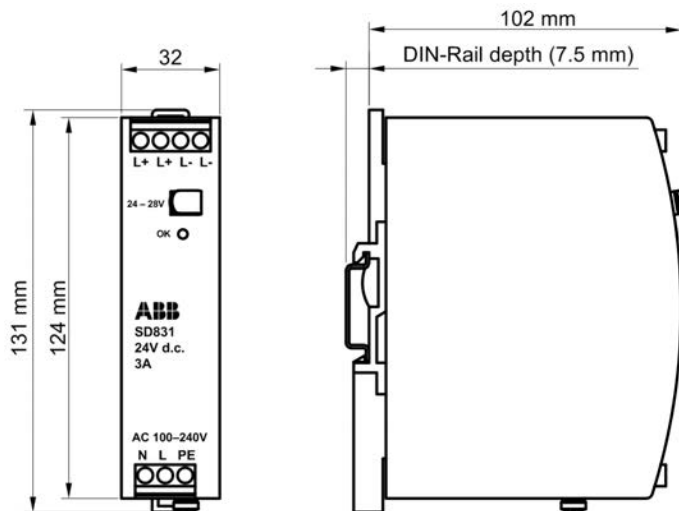


Figure A.27: SD831 Dimension and Connections for 3 A Power Supply

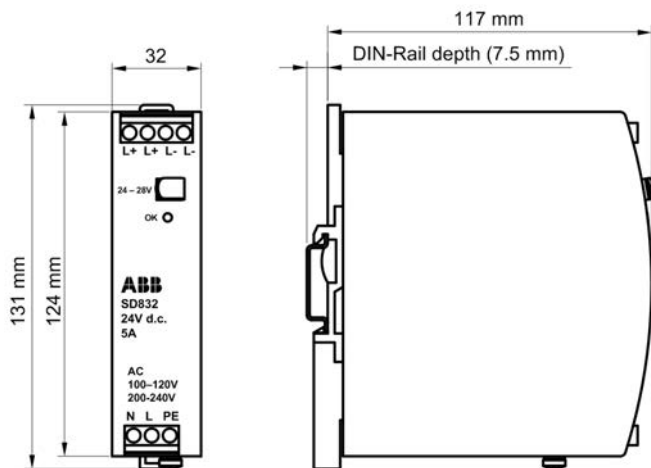


Figure A.28: SD832 Dimensions and Connections for 5 A Power Supply

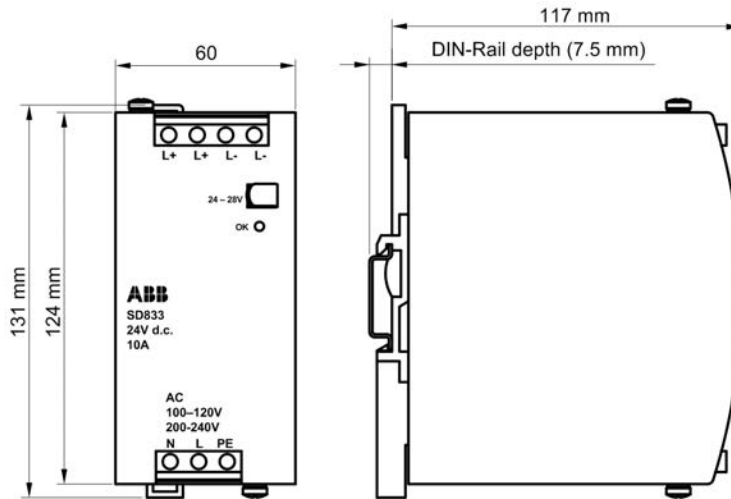


Figure A.29: SD833 Connections for 10 A Power Supply

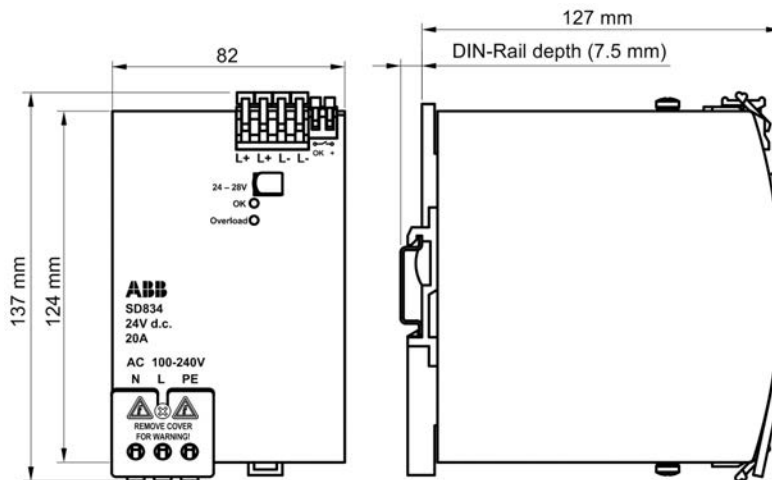


Figure A.30: SD834 Connections for 20 A Power Supply

A.35.5 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.

A Hardware Units

A.35 Power Supply Units - Types SD831, SD832, SD833, and SD834

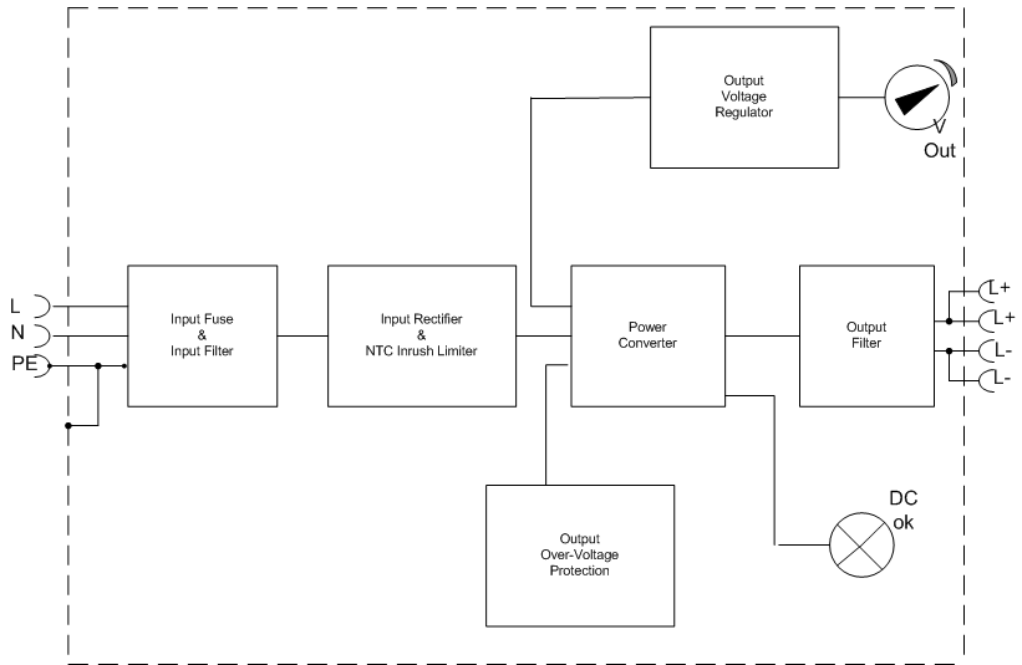


Figure A.31: Functional Diagram SD831 for a 3 A Power Supply

A Hardware Units

A.35 Power Supply Units - Types SD831, SD832, SD833, and SD834

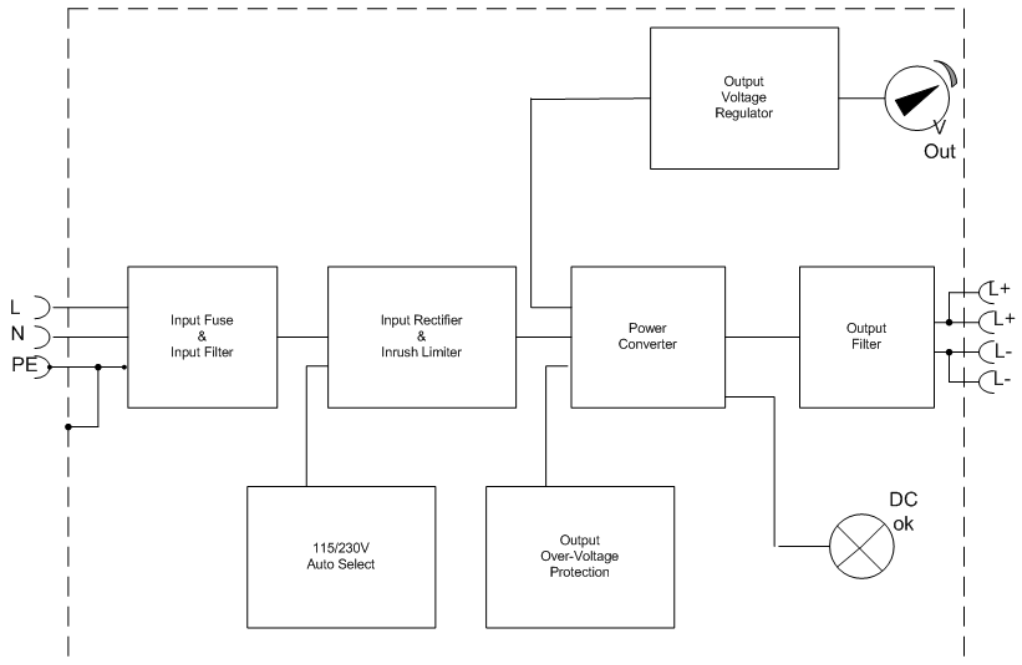


Figure A.32: Functional Diagram SD832/SD833 for a 5 A/ 10 A Power Supply

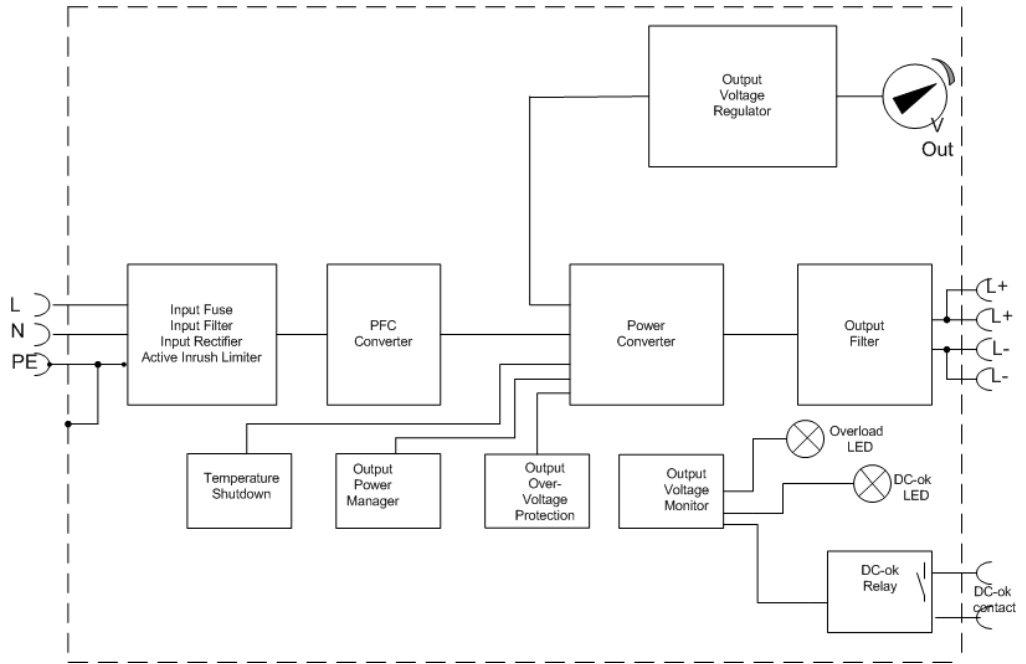


Figure A.33: Functional Diagram SD834 for a 20 A Power Supply

A.35.6 Dielectric strength

Basic with protective conductor. The primary circuit is separated from all other live circuits by reinforced insulation.

Table A.80: 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: Use appropriate test equipment which applies the voltage with a slow ramp. Connect L and N together as well as all output poles.			

A.35.7 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.

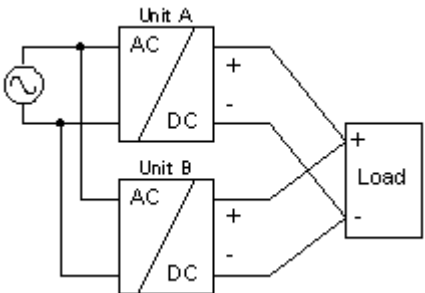
Contact ratings: max 60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A resistive load

Min. >1mA, >5 V over open contact.

Isolation voltage:Field test: a.c. 2000 V to input. a.c. 500 V to output.

A.35.8 SD834 in parallel to increase output power

Table A.81: 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 ($\pm 500\text{mV}$). 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>

A.35.9 Fuses and Protective Devices

Recommended primary external fuse:

Table A.82: Power Supply Units - Fuses and Protective Devices Power Supply Units Types SD83x

Fuse	SD831	SD832	SD833	SD834
Primary: Recommended external fuse ¹ min/max	10 - 20A	10 - 20A	10 - 20A	10 - 20A
Primary: Recommended external fuse ² min/max	6 - 20A	6 - 20A	6 - 20A	10 - 20A

Table A.82: Power Supply Units - Fuses and Protective Devices Power Supply Units Types SD83x (Continued)

Fuse	SD831	SD832	SD833	SD834
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

A.35.10 Technical Data

Table A.83: 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 a.c. 120/230 V	134/143 VA 82/80 W	240/283 VA 134/133 W	447/514 VA 264/262 W	547/568 VA 519/511 W
Mains/input voltage, nominal. a.c. 47-63Hz	a.c. 100-240 V d.c. 110-300 V	a.c. 100-120 V a.c. 200-240 V Auto-select input	a.c. 100-120 V a.c. 200-240 V Auto-select input	a.c. 100-240 V d.c. 110-300 V
Mains voltage variation allowed	a.c. 90-264 V d.c. 88-375 V	a.c. 90-132 V a.c. 180-264 V	a.c. 90-132 V a.c. 180-264 V	a.c. 85-276 V 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 power on at a.c.120/230V	<2.8 A / <5.4 A	<10 A	<10 A	<13 A
Power Factor (at rated output power) a.c. 120/230V typ	0.61/0.56	0.56/0.47	0.59/0.51	0.95/0.90

Table A.83: Technical Data PSU's SD831, 832, 833 and 834
(Continued)

Parameter	SD831 Converter	SD832 Converter	SD833 Converter	SD834 Converter
Heat dissipation a.c. 120/230 V	10/8 W	14/13 W	24/22 W	39.6/31.4 W
Efficiency factor 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 /< 100 mV	< 70 mV /< 100 mV	< 70 mV /< 100 mV	< 10mV /< 100mV
Ripple (peak to peak)	< 50 mV	< 50 mV	< 50 mV	< 100mV
Holdup time at mains blackout a.c. 120/230 V typ	29/120 ms	80/78 ms	46/47 ms	32/51 ms
Maximum output current	3.3 A	6 A At ambient temp < 45 °C	12 A At ambient temp < 45 °C	30 A < 4 s
Maximum ambient temperature ¹	55 °C	55 °C	55 °C	55 °C
Acceptable wire sizes Power connection terminals	Solid: 0.5 – 6 mm ² Stranded wire: 0.5 – 4 mm ² , 20 – 10 AWG Recommended torque: 0.8 Nm			
Acceptable wire sizes DC-OK-signal terminals				Solid: 0.3 - 4 mm ² Stranded wire: 0.3 - 2.5 mm ² , 26 - 12 AWG

1. Mounting on a horizontal DIN rail.

A.36 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 A.84](#) for the selection of voting unit based on the type of power supply.

Table A.84: Selection of Voting Unit

	SS822	SS832	SS823
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.

A.36.1 SS822

For SS822 Block diagram and Dimensions see [Figure A.34](#) and [Figure A.35](#). [Table A.85](#) and [Table A.86](#) shows the supervision data and the technical data respectively. For connection of SS822 in a redundant configuration see [Figure A.36](#).

A Hardware Units

A.36 SS822/SS823/SS832 Voting Unit (for Redundant Power Supply)

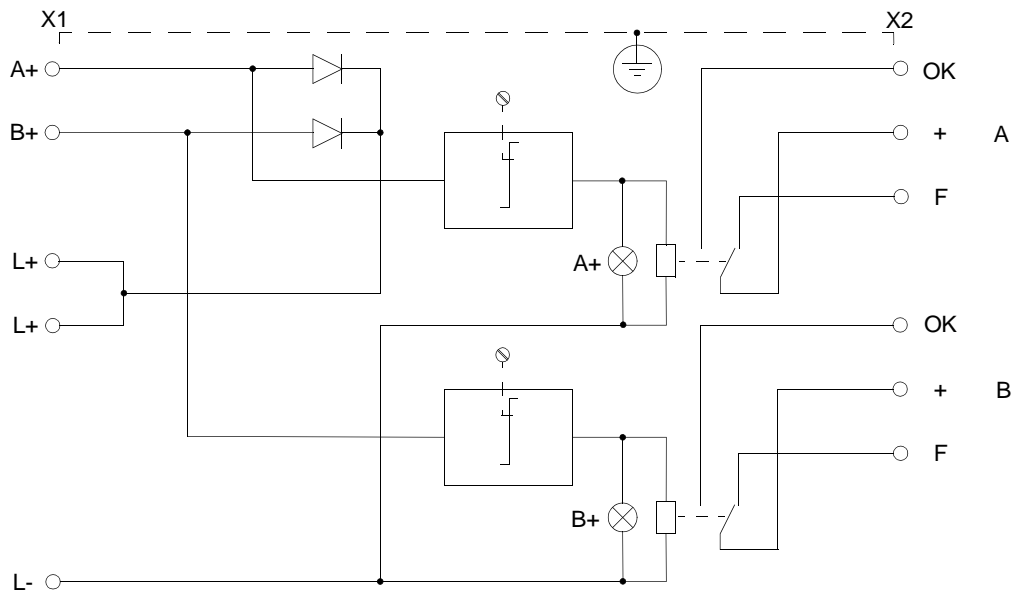


Figure A.34: SS822 Block Diagram

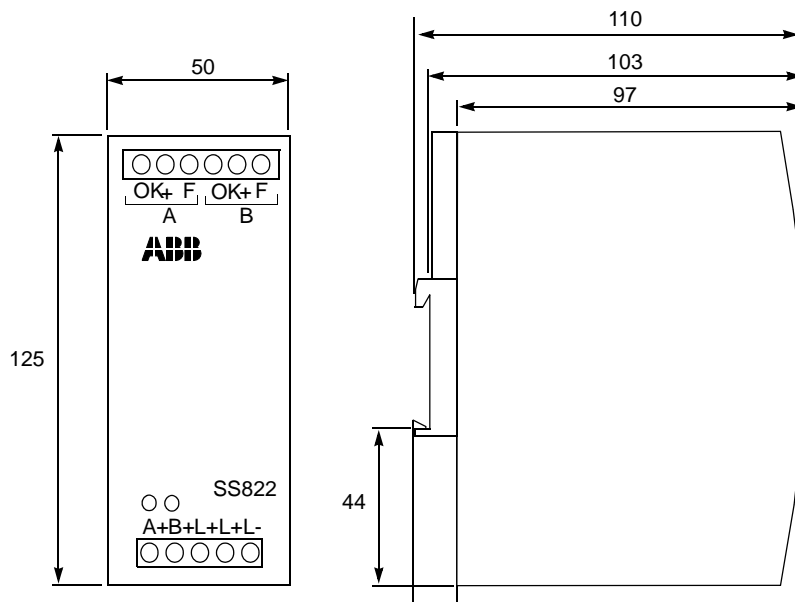


Figure A.35: SS822 Voting Unit Connections

Table A.85: SS822 Voting Unit - Supervision Data

Supervision Data	SS822 ¹
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; min. 1 mA, recommended min. 5 mA

1. SS822Z is G3 compliant version according to ISA-S71.04.

Table A.86: 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	55oC ¹
Acceptable wire sizes	Solid: 0.5 - 6 mm ²
Input/output terminals	Stranded: 0.5 - 4mm ² , 20 - 10 AWG Recommended torque: 0.8 Nm

Table A.86: SS822 - Technical Data and Mounting Dimensions
(Continued)

Parameter	SS822 Voter
Acceptable wire sizes	Solid: 0.2 - 1.5 mm ²
Supervision output terminals	Stranded: 0.2 - 1.5 mm ² , 22 - 14 AWG Recommended torque: 0.8 Nm
Dimensions, Width HxD = 125 x 110 mm (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

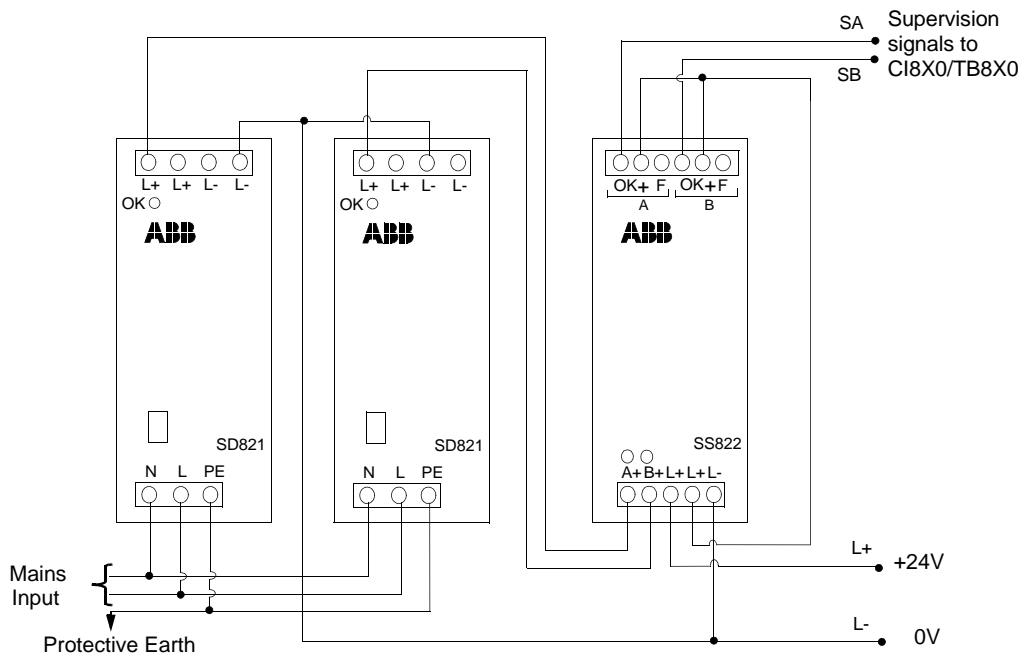


Figure A.36: SS822 - Used in Redundant SD821 Configuration

A.36.2 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 A.87](#).



Two SS823 can never be configured in parallel to achieve more current.

Block diagram and dimensions for SS823 see [Figure A.37](#) and [Figure A.38](#). [Table A.87](#) and [Table A.88](#) shows supervision data and technical data for SS823. For connection of SS823 in a redundant configuration see [Figure A.39](#).

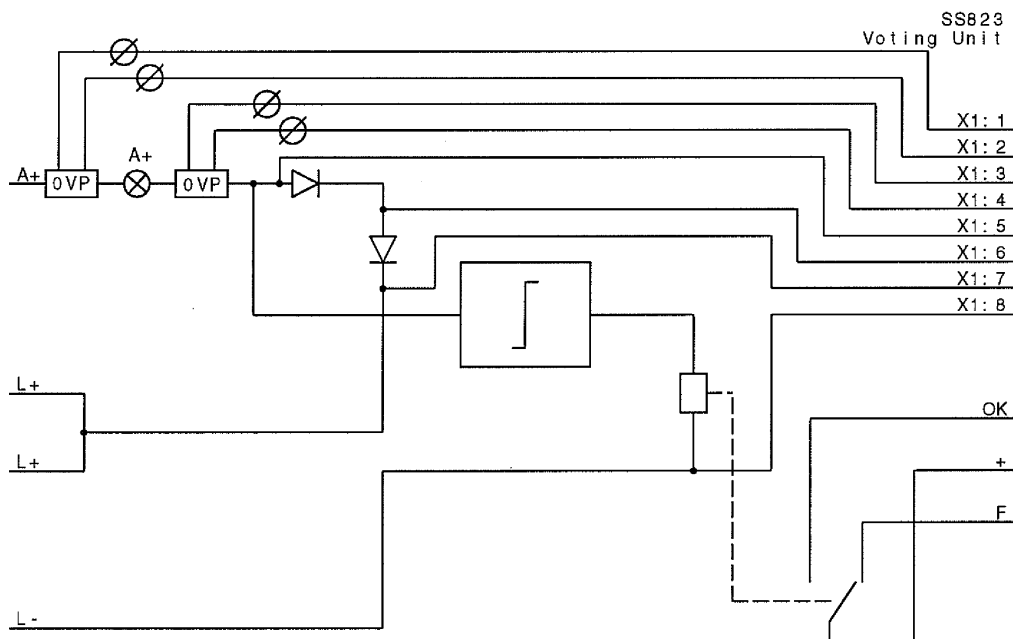


Figure A.37: SS823 Block Diagram

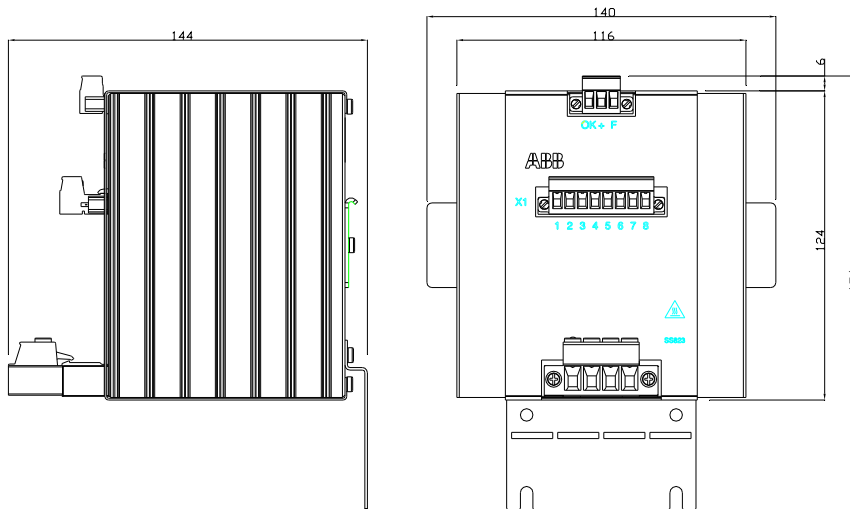


Figure A.38: SS823 Power Voter Unit Connections

Table A.87: 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; min. 1 mA, recommended min. 5 mA

Table A.88: 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

*Table A.88: SS823 - Technical Data and Mounting Dimensions
(Continued)*

Parameter	SS823 Voter
Mains/input voltage, nominal	24 V d.c.
Mains/input voltage, max	30 V d.c. ¹
Dual level OVP (Overvoltage protection)	Trip 32.0 V nominal 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 μ s typical
Ingress Protection	IP20 according to EN60529, IEC 60529.
Max ambient temperature	55°C ²
Acceptable wire sizes Connector X1 and OK+F	0.2 - 2.5 mm ² , 24 - 12 AWG Recommended torque: 0.5 - 0.6 Nm
Acceptable wire sizes Connector A+, L+, L-	0.2 - 6 mm ² , 24 - 10 AWG 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

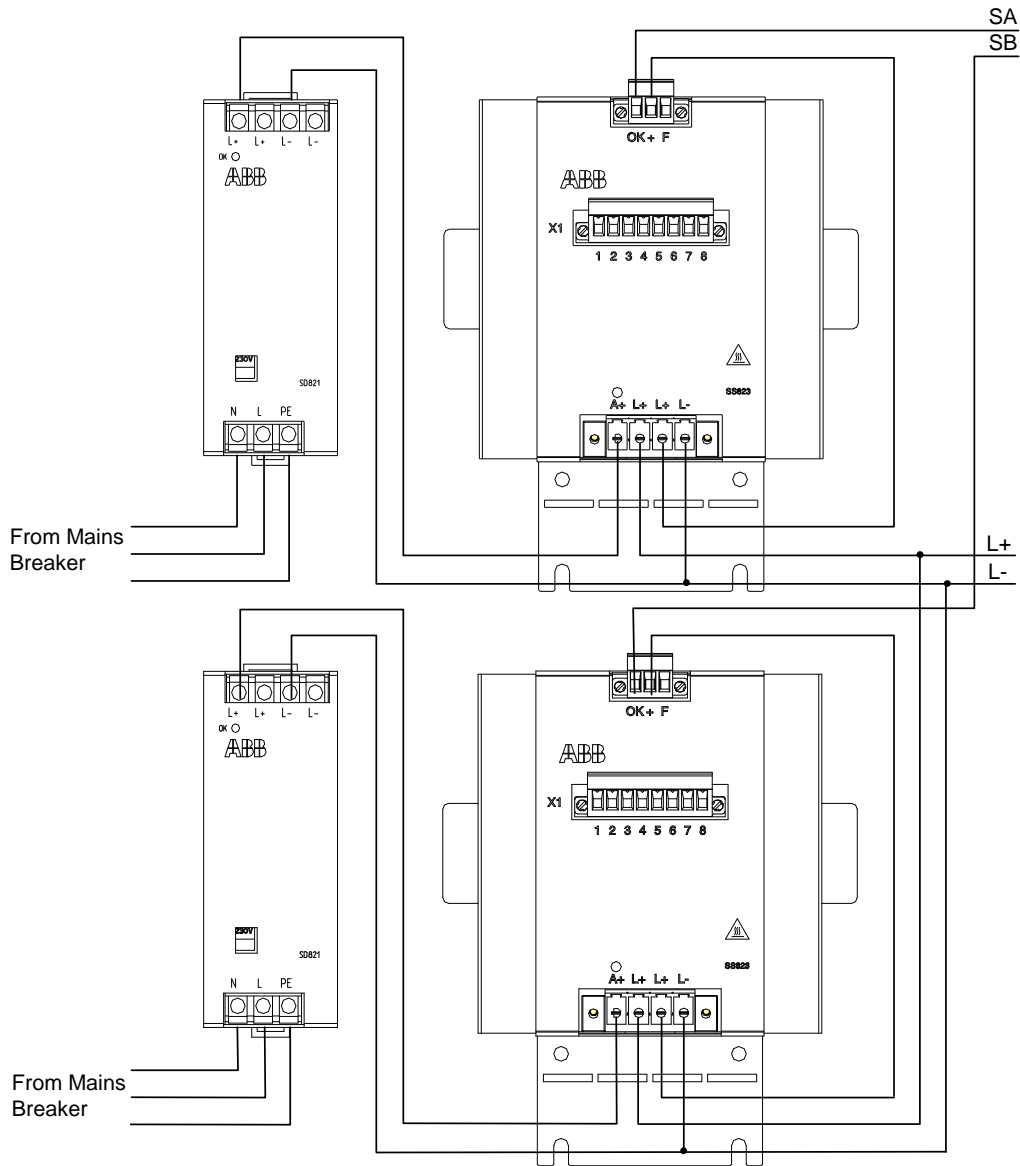


Figure A.39: SS823 - Used in Redundant SD821 Configuration

A.36.3 SS832

SS832 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 A.41](#) and [Figure A.42](#).

For Block diagram and connections of SS832 see [Figure A.40](#) and [Figure A.43](#). [Table A.89](#) and [Table A.90](#) shows supervision data and technical data respectively. [Figure A.44](#) shows connection of SS832 in redundant configuration with maximum 10 A load, see [Figure A.45](#) for load up to 20 A.

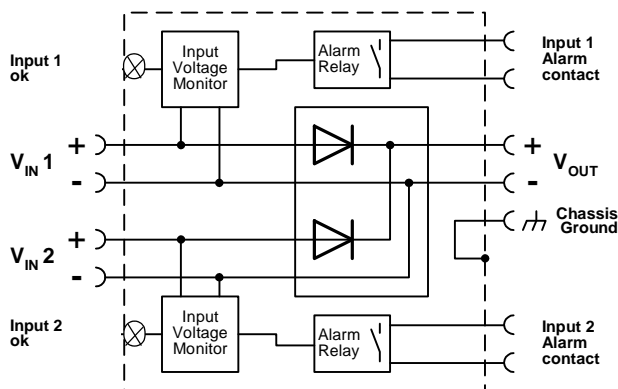


Figure A.40: SS832 Block Diagram

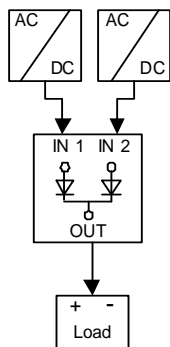


Figure A.41: SS832 up to 10 A

A Hardware Units

A.36 SS822/SS823/SS832 Voting Unit (for Redundant Power Supply)

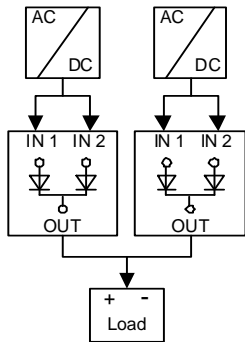


Figure A.42: SS832 up to 20 A

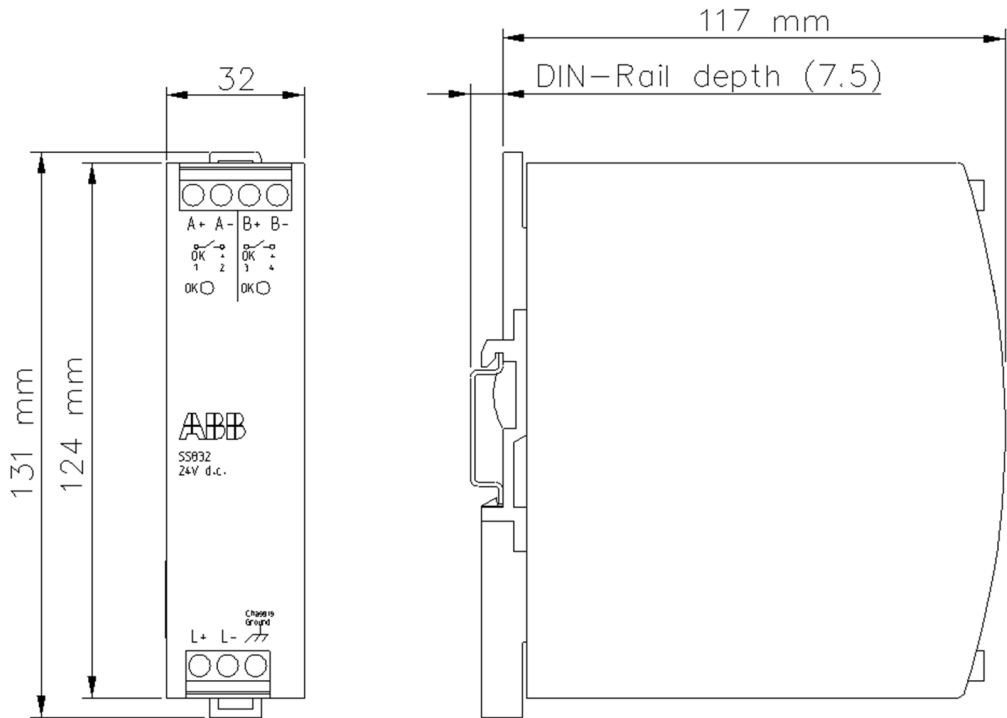


Figure A.43: SS832 Voting Unit Dimensions and Connections

Table A.89: 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
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 resistive load min. 1 mA at 5 V d.c.
Acceptable wire sizes	0.2 -1.5 mm ² , 22 - 14 AWG Recommended torque: 0.4 Nm

Table A.90: 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	55oC ¹
Acceptable wire sizes	Solid: 0.5 - 6 mm ² , 20 - 10 AWG Stranded: 0.5 - 4 mm ² , 20 - 10 AWG Recommended torque: 0.8 Nm
Dimensions	32 mm (1.26")
Width	117 mm (4.6")
Depth	124 mm (4.9")
Height	

Table A.90: Technical Data and Mounting Dimensions
(Continued)

Parameter	SS832 Voter
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

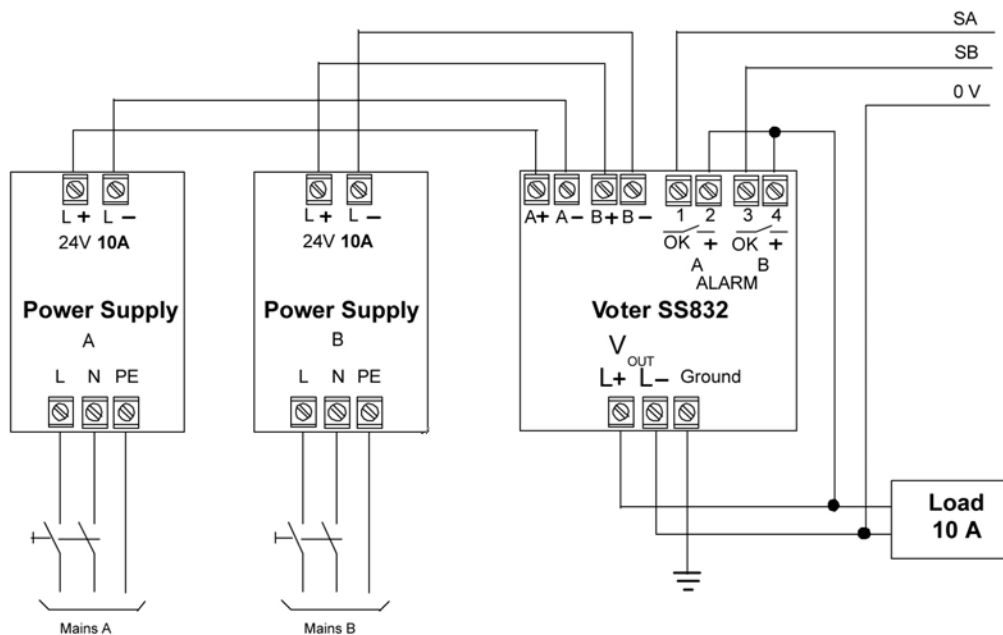


Figure A.44: SS832 Redundant Configuration up to 10 A

A Hardware Units

A.36 SS822/SS823/SS832 Voting Unit (for Redundant Power Supply)

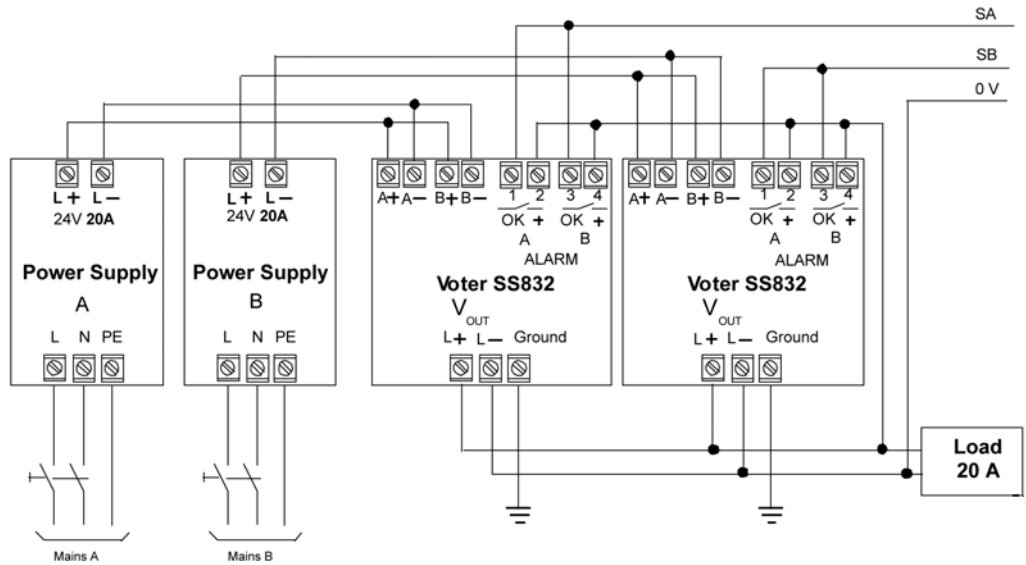


Figure A.45: SS832 Redundant Configuration up to 20 A

A.37 TC562 Modem Unit – (Westermo MD-12DC)

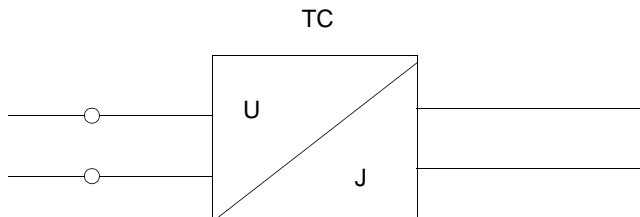


Figure A.46: TC562 (MD-12DC) Modem

A.37.1 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 mm² 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.

A.37.2 Technical Data

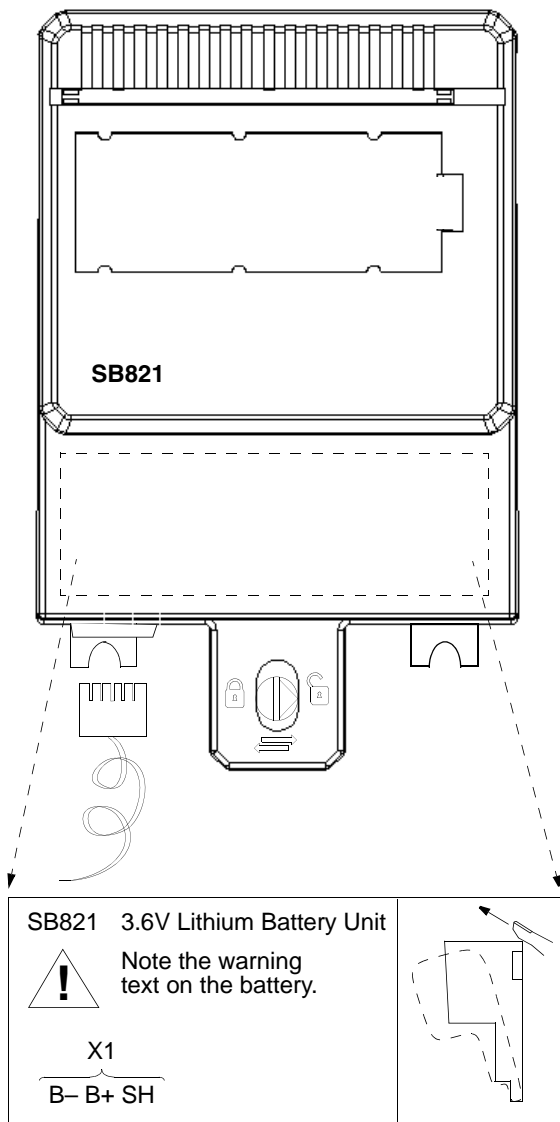
Table A.91: TC562 – Technical Data

Type	TC562 – Short Distance Modem 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 A.92: Transfer Distance (Cable 0.3 mm²/42 pF/m)

Meters (yd.)	bit/s
1000 (1094)	19200
2500 (2734)	9600
5000 (5468)	4800
8000 (8749)	2400
12000 (13123)	1200
18000 (19685)	600

A.38 SB821 External Battery – AC 800M Memory Back-up



A.38.1 Description

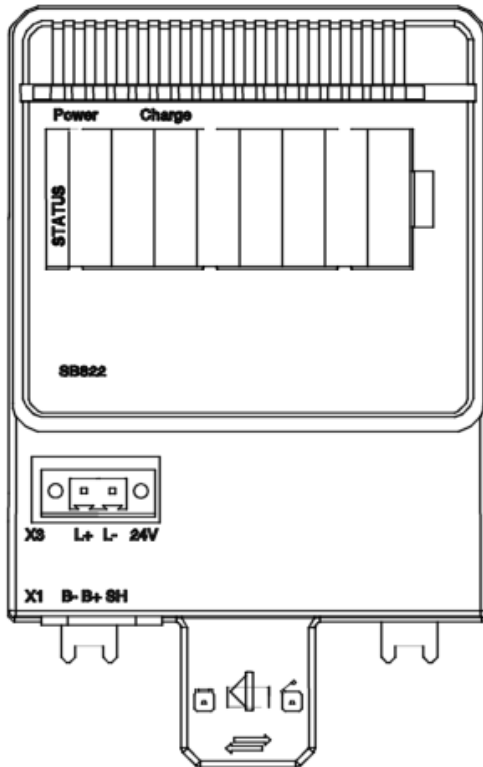
The SB821 battery unit is used as an external power supply to provide extended memory back-up for the AC 800M Controller. The unit is DIN-rail mounted and provided with a separate connecting cable (TK821V020), 2 m (2.2 yd.) in length.

A.38.2 Technical Data

Table A.93: SB821 – External battery data

Item	Value
Battery Type	Low rate lithium, 3.6 V, 16 Ah
Size	ANSI size D 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 (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

A.39 SB822 Rechargeable External Battery – AC 800M Memory Back-up



A.39.1 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.

A.39.2 Technical Data

Table A.94: SB822 – Rechargeable External battery data

Item	Value
Battery type	Rechargeable Lithium-Ion 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 (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.

A.40 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).

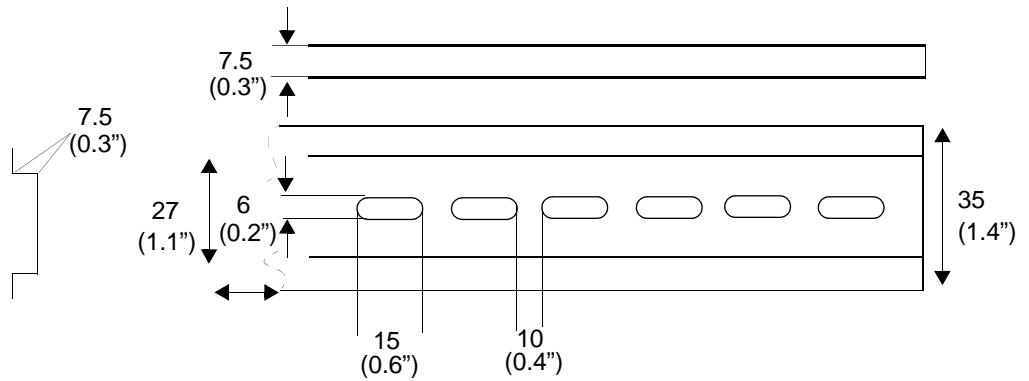


Figure A.47: DIN-rail TS 35/7.5 – Dimensions

A.41 Miscellaneous Equipment

A.41.1 TB850 Terminator for CEX-Bus (Male)

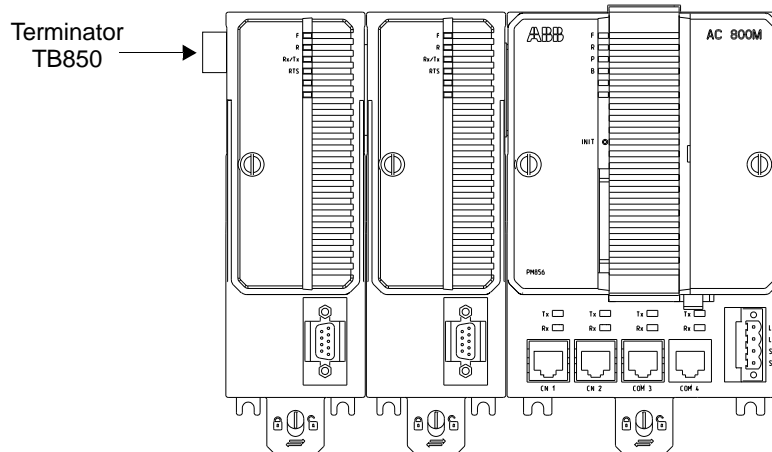


Figure A.48: TB850 Terminator for CEX (male)

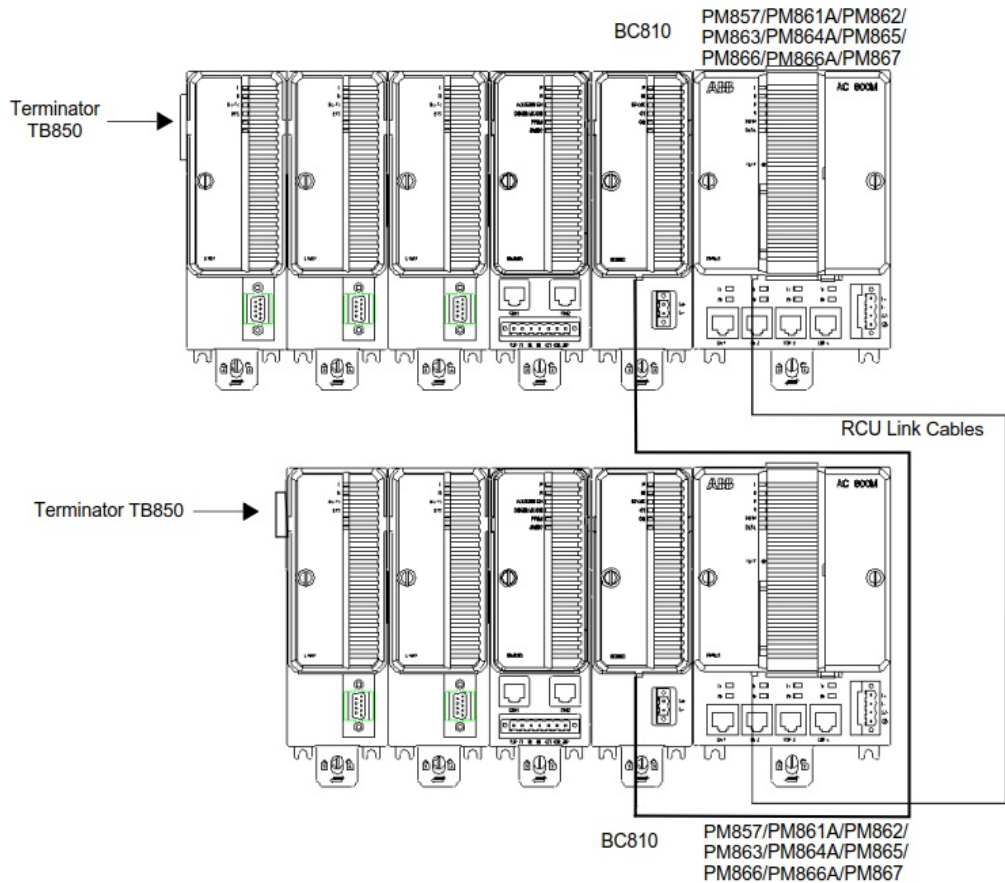


Figure A.49: CEX-Bus Terminator when using Redundant Communication Interface Units (with BC810) and Controllers

A.41.2 TB851 Terminator for CEX-Bus (Female)

A TB851 (female) Terminator for CEX-Bus is required when a TK850 extension cable is used.

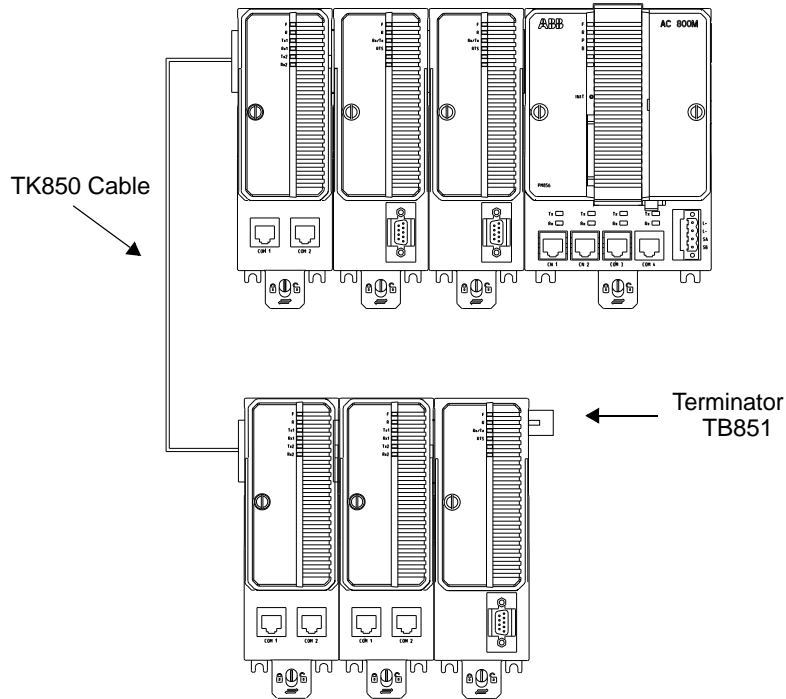


Figure A.50: TB851 Terminator for CEX-Bus (female)

A.41.3 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.

A.41.4 TB852 RCU Link Terminator Plug

The TB852 RCU Link Terminator Plug is required when the PM857/PM858/PM861/PM862/PM863/PM864/PM865/PM866/PM867 processor unit operates in single configuration.

A.41.5 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.

A.41.6 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.

A.41.7 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.

A.41.8 TK853

Technical Data

Table A.95: TK853 – Technical Data

Item	Value
Connectors	<ul style="list-style-type: none"> One 9-pole male D-sub (DE9P) One 8-pole RJ45 plug
Weight	100 g (0.2 lb) (TK853V02)
Length	2.0 m (6.56') (TK853V02)

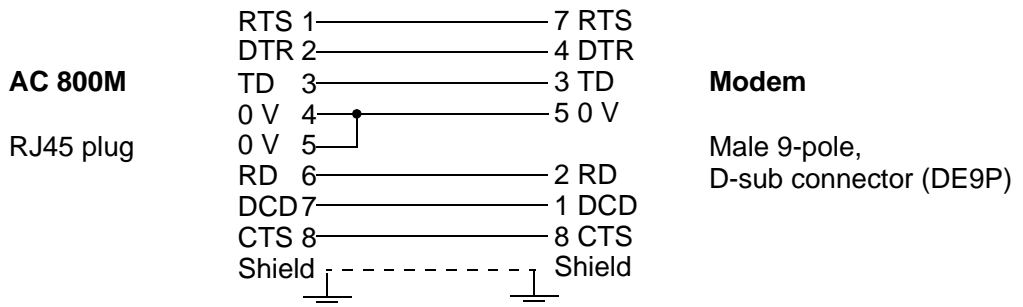


Figure A.51: TK853 – Cable Characteristics

A.41.9 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.

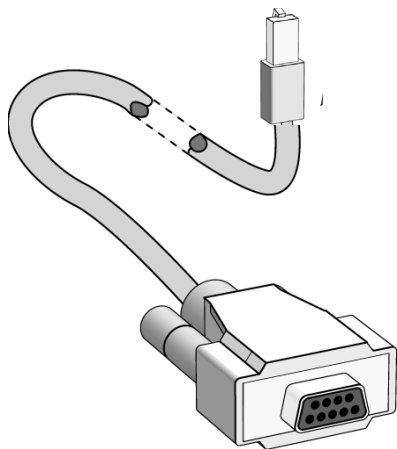
A.41.10 TK856 RCU Control Link Cable

The TK856 Redundant Control Unit Control Link Cable, connected between redundant PM891 units, provides role selection and CPU identity assignment (UPPER/LOWER).

A.41.11 TK857 RCU-Link Cable for BC820

Cable between the controller CPU and BC820.

A.41.12 TK212A Tool Cable



Technical Data

Table A.96: TK212A Tool Cable – Technical Data

Item	Value
Connectors	<ul style="list-style-type: none">• One 9-pole female D-type• One 8-pole RJ45 plug
Weight	125 g (0.3 lb)
Length	3.0 m (9.84')

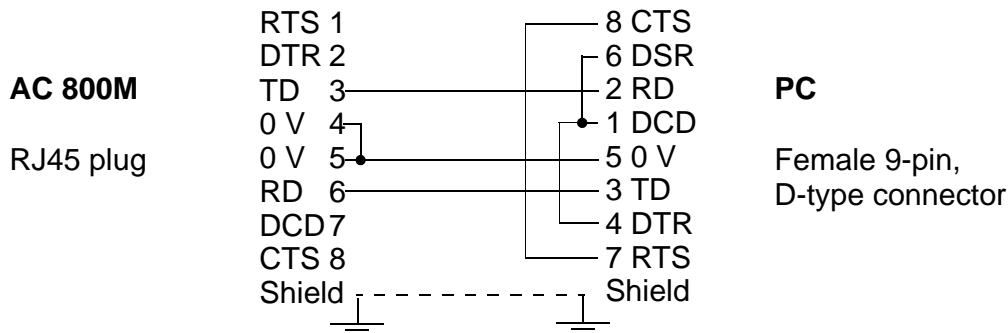


Figure A.52: TK212A – Cable Characteristics

A.41.13 AI-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 A1-profile, specifically designed for supporting DIN-rails (see [Figure A.53 on page 400](#) and [Figure A.54 on page 401](#)).

Key features of the A1-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 2.3 on page 72](#).
- Rigid construction.
- Easy-fit, press-in cable-retaining duct.

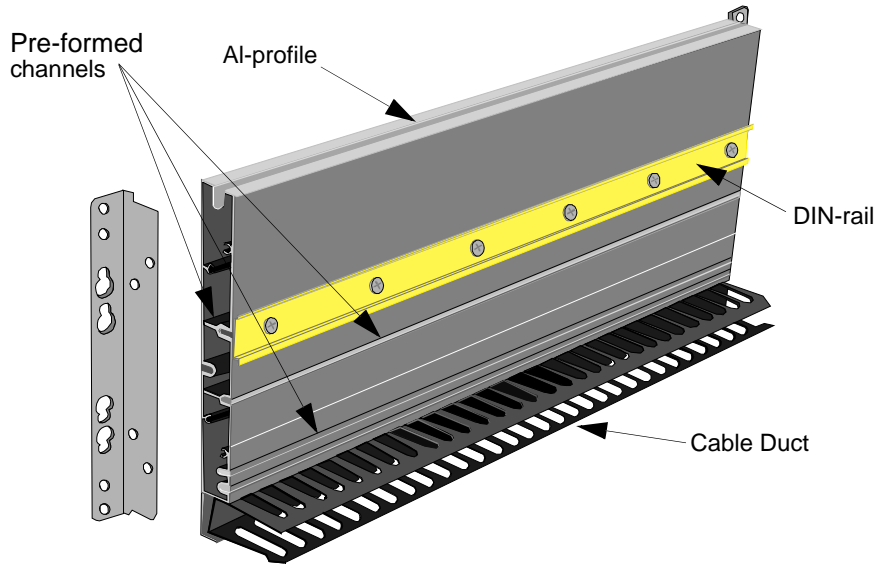


Figure A.53: Al-Profile for DIN-rail Support

A Hardware Units
A.41 Miscellaneous Equipment

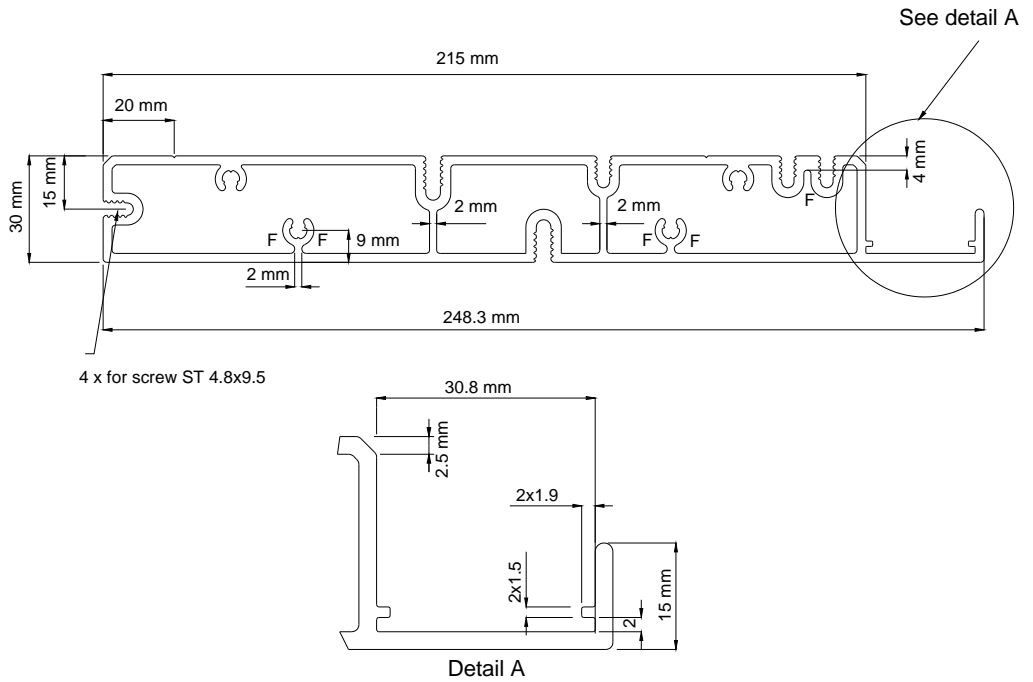


Figure A.54: AI-Profile for DIN-rail - Dimension Drawing

Appendix B Power Consumption

B.1 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 B.1: 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.

B.2 Current Consumption and Power Dissipation

See [Table B.2 on page 404](#) for typical current consumption and power dissipation data for AC 800M units.

Table B.2: 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	4.32 W	7.2 W	1
PM856	180 mA	300 mA	4.32 W	7.2 W	1
PM860	180 mA	300 mA	4.32 W	7.2 W	1
PM851A	180 mA	300 mA	4.32 W	7.2 W	1
PM856A	180 mA	300 mA	4.32 W	7.2 W	1
PM857	210 mA	360 mA	5.1 W	8.6 W	1
PM858	210 mA	360 mA	5.1 W	8.6 W	1
PM860A	180 mA	300 mA	4.32 W	7.2 W	1
PM861	250 mA	430 mA	6.0 W	10.3 W	1
PM862	210 mA	360 mA	5.1 W	8.6 W	1
PM863	210 mA	360 mA	5.1 W	8.6 W	1
PM861A	250 mA	430 mA	6.0 W	10.3 W	1
PM864	290 mA	487 mA	6.9 W	11.4 W	1
PM864A	290 mA	487 mA	6.9 W	11.4 W	1
PM865	290 mA	487 mA	6.9 W	11.4 W	1
PM866	210 mA	360 mA	5.1 W	8.6 W	1
PM866A	210 mA	360 mA	5.1 W	8.6 W	1
PM867	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	
BC820	150 mA	200 mA	3.6 W	4.8 W	

B Power Consumption
 B.2 Current Consumption and Power Dissipation

*Table B.2: Current Consumption and Power Dissipation Data for AC 800M Units
 (Continued)*

Unit	Current at 24 V		Power Dissipation		Remarks
	Typical	Max	Typical	Max	
SM810	160 mA	250 mA	3.8 W	6.0 W	
SM811	160 mA	250 mA	3.8 W	6.0 W	
SM812	100 mA	150 mA	2.4 W	3.6 W	
CI853	100 mA	150 mA	2.4 W	3.6 W	
CI854/854A/854B	190 mA	240 mA	4.6 W	5.8 W	
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	200 mA	3.8 W	4.8 W	
CI871	160 mA	250 mA	3.8 W	6.0 W	
CI872	100 mA	130 mA	2.4 W	3.2 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 B.3 on page 406](#). 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 B.2 on page 404](#).

The CPU supplies current, via TP830, to units on the CEX-Bus and ModuleBus, see [Table B.3 on page 406](#).

B Power Consumption
 B.2 Current Consumption and Power Dissipation

Table B.3: CPU Current Supply to CEX-Bus and ModuleBus

Bus	+5 V	+24 V
ModuleBus ¹	max. 1.5 A ²	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 B.4 on page 406](#):

Table B.4: Maximum Current Supply to CPU incl. ModuleBus and CEX-Bus (24 V)

CPU	Maximum Supply Current
PM851	2.2 A
PM856	4.2 A
PM860	4.2 A
PM851A	2.2 A
PM856A	4.2 A
PM857 (single)	4.2 A
PM857 (redundant pair)	3.2 A
PM858 (single)	4.2 A
PM858 (redundant pair)	3.2 A
PM860A	4.2 A
PM861 (single)	4.3 A
PM861 (redundant pair)	3.3 A (no ModuleBus)
PM861A	4.3 A
PM862 (single)	4.2 A
PM862 (redundant pair)	3.2 A
PM863 (single)	4.2 A
PM863 (redundant pair)	3.2 A
PM864 (single)	4.4 A

*Table B.4: Maximum Current Supply to CPU incl. ModuleBus and CEX-Bus (24 V)
 (Continued)*

CPU	Maximum Supply Current
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)
PM866A (single)	4.2 A
PM866A (redundant pair)	3.2 A (no ModuleBus)
PM867 (single)	4.2 A
PM867 (redundant pair)	3.2 A
PM891(single)	3.2 A (no ModuleBus)
PM891 (redundant pair)	3.9 A (no ModuleBus)

B.2.1 Calculations

1. Calculate the current requirements for each bus (ModuleBus and CEX-Bus). Be sure not to exceed the limits given in [Table B.3 on page 406](#). 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:

$$I_{tot} = I_{m1} + I_{m2} + \dots + I_{units\ Table\ B.2} + I_{CI801s} + I_{CI840s} + I_{TB820s} + I_{TB840s}$$

If redundant CPUs are used, current for both CPUs must be included.

Appendix C Recommended Components

C.1 Recommended Components

All recommended components listed below were successfully utilized during exhaustive tests made by ABB, prior to launching the AC 800M Controller.

Table C.1: Recommended Components – PROFIBUS DP

Component	Description
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. For further details refer to PROFIBUS DP Web Site.

Table C.1: 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"> • Potential separation between the PROFIBUS DP and the PROFIBUS PA • Conversion of the RS 485 physical arrangement of the PROFIBUS DP to the physical arrangement based on IEC 61158-2 of the PROFIBUS PA. • Adapting the PROFIBUS DP transfer rate to the PROFIBUS PA transfer rate of 31.25 kBd. • Power supply of PROFIBUS PA stations over the bus line. • Diagnostics via LEDs. • Ensuring intrinsic safety if the PL 890 power link module with an intrinsically safe interface is used. <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> <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"> • No configuration of the Linking Device is required • PROFIBUS PA slaves can be treated like PROFIBUS DP slaves • There is no PROFIBUS DP address setting on the Linking Device • 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. <p>See Figure C.1 on page 411 for LD 800P Interface. For more information see fieldbus documentation.</p>

C Recommended Components
 C.1 Recommended Components

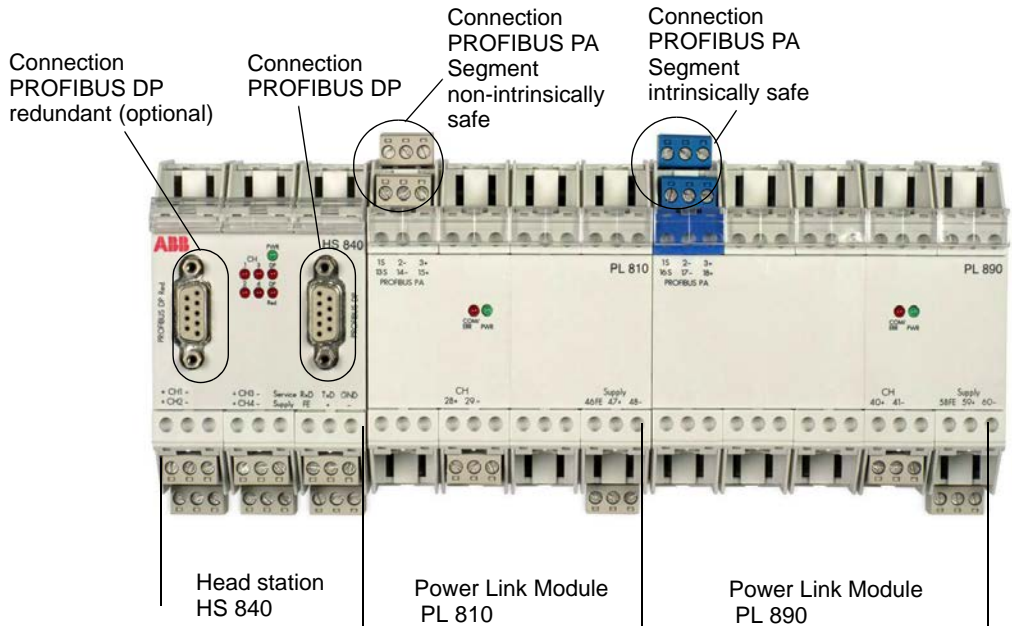


Figure C.1: LD 800P Interface

Table C.2: 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.
UMC100.3	UMC100.3 is a motor control starter that can be used in PROFINET IO network. It delivers all the functions for control, protection and monitoring of a motor. It is interfaced via PNQ22 to PROFINET IO which can serve up to 4 UMC100.3.

C Recommended Components
C.1 Recommended Components

Table C.3: 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 C.4: Recommended Components – FOUNDATION Fieldbus

Component	Description
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">• FOUNDATION Fieldbus filters.• FOUNDATION Fieldbus bus spur distribution terminals.• FOUNDATION Fieldbus termination. <p>For further details refer to FOUNDATION Fieldbus documentation and the FOUNDATION Fieldbus Web Site.</p>

Table C.5: 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>System data High Speed Ethernet (HSE)</p> <p>Max. devices: Has IP addressing, which can support unlimited nodes</p> <p>Max. baudrate: 100 Mbit/s</p> <p>Typical max. extension: 100m at 100Mbit/s on twisted pair, 2000m at 100Mbit/s on fibre</p> <p>Vendor specific restrictions apply.</p> <p>Physical Media: Twisted pair, fibre</p> <p>Network Topology: Star</p>
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"> • 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. • Identification of the devices connected to the H1 links. • Configuration of the connected H1 devices by System Management and Network Management via HSE. • Access to the function blocks of the connected H1 devices via HSE. • Republishing of process data from one H1 link into another. • Republishing of process data from H1 to HSE and vice versa. <p>See Figure C.2 on page 414 for LD 800HSE Interface. For more information see fieldbus documentation.</p>

C Recommended Components
 C.1 Recommended Components

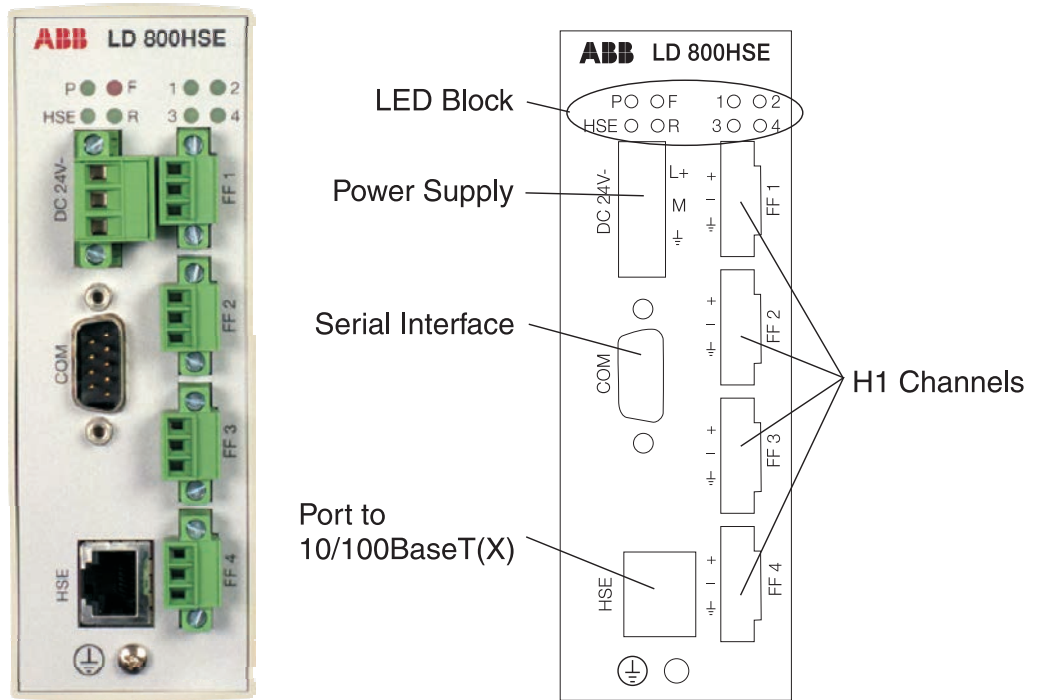


Figure C.2: LD 800HSE Interface

Table C.6: Recommended Components for Control Networks

Component	Description
HUBS (For Non-Industrial Environments)	3Com Hub, 8/TPO – (8 ports, RJ45) BayStack, 350/24 – (24 port, Star topology, RJ45)
HUBS (Industrial Environments)	Hirschmann Rail Hub RH1-TP– (4 ports, RJ45)
SWITCHES (Industrial Environments)	Hirschmann Rail Switch RS2 (8 ports, Ring, Bus or Star topology RJ45) On-Time Switch (FSU100 series, FSU200 series, FSU208, FSR208, FST208)
CABLES	Electrical – Class 5, or higher, STP Optical – As recommended by Manufacturer of HUBS and SWITCHES

C Recommended Components
 C.1 Recommended Components

Table C.7: Recommended Components – Miscellaneous

Component	Description
DIN-rail	Phoenix: <ul style="list-style-type: none"> • TS 35/7.5 • Steel, yellow chromated with holes • DIN 46 277, EN 50 022
DIN-rail Accessories	DIN-rail end support device Phoenix: UK 4-TG+ST-BE (Standard commercially available components)
Cabinets	ABB Automation Technology Products, LV systems Wall cabinet RE820 <ul style="list-style-type: none"> • For 3 DIN-rails • W 800 x H 1200 x D 330 mm (31.5 x 40.1 x 13.0 in) • IP54 Floor cabinet RM550 <ul style="list-style-type: none"> • For 6 DIN-rails • W 840 x H 2125 x D 512 mm (33.1 x 83.7 x 20.2 in) • IP54 See Figure 2.40 on page 141 , Figure 2.41 on page 142 and Figure 2.42 on page 143 .

Table C.8: Recommended Components – Process Cables

Component	Description
Mains	Various Manufacturers, to Standard; <ul style="list-style-type: none"> • RKFk 3x1.5 mm²
RS-232C	Unitronic <ul style="list-style-type: none"> • CY 3 x 0.25 mm² • CY 7x 0.25 mm² Belden <ul style="list-style-type: none"> • Belden 8723 2 pair (0.34 mm²) • Belden 9729 2 pair (0.22 mm²) • Belden 9730 3 pair (0.34 mm²)

Table C.8: Recommended Components – Process Cables
 (Continued)

Component	Description
FOUNDATION Fieldbus	Unitronic <ul style="list-style-type: none"> Suitable Commercially Available Cable. Belden <ul style="list-style-type: none"> Suitable Commercially Available Cable.
FOUNDATION Fieldbus High Speed Ethernet	<ul style="list-style-type: none"> All cables must correspond to ISO / IEC 11801 2nd edition. Use in minimum cable of category 5 / link class D (UTP cables). Max. length 100 m from CI860 to next Ethernet device (Twisted pair).
PROFIBUS DP	Unitronic <ul style="list-style-type: none"> Twisted pair, 0.34 mm² Unitronic-Bus L2/F.I.P Belden <ul style="list-style-type: none"> Twisted pair, 0.34 mm² Belden 3079A
PROFINET IO Interface CI871	<ul style="list-style-type: none"> Use in a minimum Ethernet cable type AWG 22. For more information, refer to <i>Automation System Network Design and Configuration (3BSE034463*)</i> .
TRIO Fieldbus CI862	<ul style="list-style-type: none"> See Table C.9
Modbus TCP Interface CI867	<ul style="list-style-type: none"> Use in minimum cable of category 5 (STP cables). Max. length 30 m from CI867 to next Ethernet device.
IEC 61850 Interface CI868	<ul style="list-style-type: none"> Use in minimum cable of category 5 (STP cables). Max. length 30 m from CI868 to next Ethernet device.
AF 100 Interface CI869	<ul style="list-style-type: none"> Twisted pair cable according to IEC 1158-2 fieldbus standard. Max. 750m per segment.
EtherNet/IP Interface CI873	<ul style="list-style-type: none"> Use in minimum cable of category 5 (STP cables). Max. length 30 m from CI873 to next Ethernet device.

C Recommended Components
 C.1 Recommended Components

Table C.9: Cables for the CI862 TRIO Field Bus

Cable	Outer Diameter in (mm)	Terminating Resistor (Ω)	Indoor Installation	Conductors / AWG	DiElectric Voltage	Ambient Temp. Rating (°C)	NEC Rating
Taylor 6201C	.35 (8.89)	150	in conduit	2 / #22	30	60	CL2 ¹
B3078F ²	.385 (9.78)	150	cable tray ³	2 / #22	300	75	PLTC/CM
A9823C ⁴	.35 (8.89)	150	in conduit	2 / #22	30	60	CL2
C4596 ⁵	.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 ⁶	in conduit	2 / #20	300	75	CM
B89207	.267 (6.78)	100 ⁽⁶⁾	in plenum	2 / #20	150	200	CMP
A4794	.282 (7.16)	100 ⁽⁶⁾	in plenum	2 / #20	150	200	
B9815	.33 (8.38)	100 ⁽⁶⁾	direct burial	2 / #20		80	NONE
B9855	.270 (6.86)	100 ⁽⁶⁾	in conduit	4 / #22	150	60	CM/MP
B89696	.264 (6.71)	100 ⁽⁶⁾	in plenum	4 / #22	150	200	CMP/MPP
B89855	.240 (6.10)	100 ⁽⁶⁾	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 121](#)).

Appendix D Directive Considerations

Relevant products comply with EMC Directive EMCD 2004/108/EC, Low Voltage Directive LVD 2006/95/EC and RoHS Directive 2011/65/EU. The products are provided with a CE marking.

D.1 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.

D.2 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 357](#) and [Power Supply Units - Types SD831, SD832, SD833, and SD834 on page 364](#).



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.

D.3 Restriction of Hazardous Substances (RoHS)

Modules mentioned in this document, for which the product or packing is CE marked, are approved according to the Directive 2002/95/EC, originated in the European Union.

RoHS restricts the use of specific hazardous materials in Electrical and Electronic Equipment. From the 22nd of July 2017 it will be prohibited to put new control systems on the European market if the equipment isn't RoHS compliant. (RoHS 2 2011/65/EU)

Appendix E Standards

The information below is applicable to products approved for hazardous locations according to CSA and/or UL standard UL60079-15 (2017).

E.1 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 nA IIC, hazardous locations is suitable for use in Class I, Zone 2, AEx nA IIC, or non-hazardous locations only.
- Equipment labeled with reference to Class I, Zone 2, AEx nA IIC, hazardous locations and is to be mounted in Class I, Zone 2, AEx nA 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 nA IIC, hazardous locations and is to be mounted in Class I, Zone 2, AEx nA 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

F.1 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.

F.1.1 Climatic and Mechanical Environmental Conditions

Industrial Environment

Table F.1: Industrial Environment

Environmental Specification				Compliance with Standard
	Environment Factor	Transportation and Storage	Operative Range	
Climatic Conditions	Temperature	-40 to +70°C -40 to +60°C	Cabinets ¹ : +5 to +40°C Units ² : +5 to +55°C +10 to +40°C ³	EN 61131-2
	Temp. change	Min. 3 min within temp. range	3°C/min.	EN 61131-2
	Humidity	RH=5–95% RH=20–80% ⁽³⁾ non-condensation	RH=5–95% RH=20–80% ⁽³⁾ max 29 g/m ³ non-condensation	EN 61131-2
	Altitude	3000 m	2000 m	EN 61131-2
	Pollution degree	Degree 2		IEC 60664
	Corrosion	Copper corrosion of 2000 Angstrom over 28 days	Copper corrosion of 2000 Angstrom over 28 days	ISA 71.04 class G3

Table F.1: Industrial Environment
 (Continued)

Environmental Specification			Compliance with Standard
Environment Factor	Transportation and Storage	Operative Range	
Mechanical Conditions	Vibration	10 < f < 50 Hz, Continuous: 0.0375 mm amplitude (Occasional: 0.075 mm amplitude) 50 < f < 150 Hz, Continuous: 0.5 g acceleration (Occasional: 1.0 g acceleration)	
	Emitted noise	–	<55dB (A)
	Shock, no package	5 > f < 8.4 Hz, Continuous: 1.75 mm displacement (Occasional 3.5 mm displacement). 8.4 > f < 150 Hz, Continuous 0.5 g acceleration (Occasional 1.0 g acceleration).	
	Fall in package	<10 kg: 1 m 10–40 kg: 0.5 m >40 kg: 0.25 m >100 kg: 0.025 m	

1. Cabinets = Enclosures, Cases, Consoles
2. Units = Subracks, plug-in units, printed circuit boards
3. Workstation, PC computers and peripherals, for example printers

F.1.2 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.

F.1.3 Electromagnetic Compatibility and Main Voltage Conditions

Table F.2: Electromagnetic Compatibility and Main Voltage Conditions

Environmental Specification			Compliance with Standard
	Environment Factor	Industrial Environment	
Electromagnetic Compatibility Conditions	Emission –Radiated –Conducted	Class A	EN 55011
	Immunity –Radiated RF field	10V/m 80M - 1000MHz 3V/m 1.4G - 2.0GHz 1V/m 2.0G - 2.7GHz	EN 61000-4-3
	Immunity –Conducted RF field	10 V	EN 61000-4-6
	Immunity –ESD (Electrical Discharge)	±4kV contact discharge ±8kV air discharge	EN 61000-4-2
	Immunity –EFT/B (Electrical Fast Transient/Burst)	±2kV power ports ±1kV other lines	EN 61000-4-4
	Immunity –Damped oscillatory wave	–	IEC 60255-22-1
	Immunity –Power frequency magnetic field	30 A/m, cont. 3 A/m for CRTs	EN 61000-4-8
	Immunity –Surge	±0.5kV common ±0.5kV differential	EN 61000-4-5

Table F.2: Electromagnetic Compatibility and Main Voltage Conditions
 (Continued)

Environmental Specification			Compliance with Standard
	Environment Factor	Industrial Environment	
Electromagnetic Compatibility Conditions	Main voltage a.c	Unom: –15% to +0%	
	Main voltage DC	–15% to 20% of rated value	
	Main frequency a.c.	47–63 Hz, ±5%	IEC 60255-6
	Main voltage interruption, a.c.	Max 10 ms	EN 61000-4-11
	Overvoltage Category –Permanently connected equipment	Class III	
	Overvoltage Category –Non-permanently connected equipment	Class II	

F.1.4 Installation Requirements

Installation regulations for all products are included in relevant product documentation. Some general installation rules and applications are given below.

F.1.5 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.

F.1.6 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.

F.1.7 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.

F.1.8 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.

F.1.9 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.

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 System Revision.

Revision History

The following table lists the revision history of this User Manual.

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