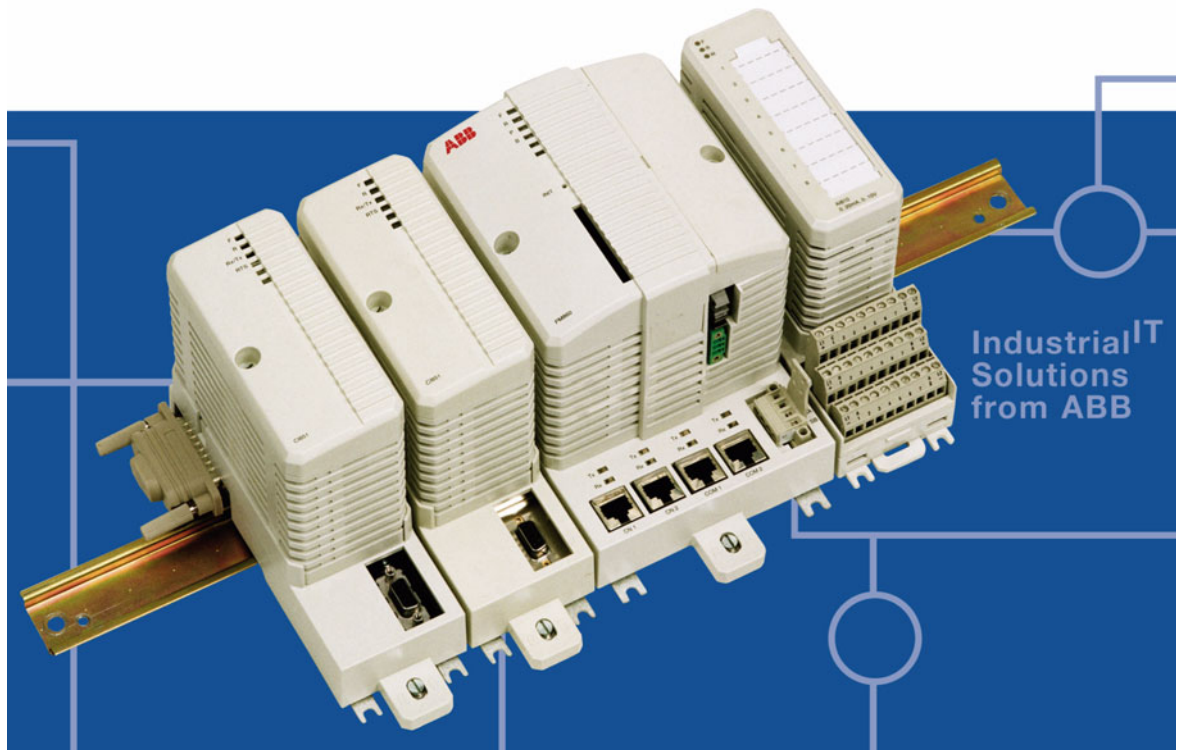


Control^{IT}
AC 800M

Version 2.1

Controller Hardware

Hardware and Operation



ABB

Control^{IT}
AC 800M
Version 2.1

Controller Hardware

Hardware and Operation

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About This Book

General

This book describes the hardware platform AC 800M, together with the controllers and associated units that are used in the AC 800M Controller. It also describes in detail how to install, configure, operate and perform the necessary maintenance on all equipment making up the AC 800M Controller.

The Control Builder M is used to configure and program the AC 800M controller, and is referred to in this manual as Control Builder or CB.

For information on the controller software, see [Related Documentation](#) on page 17.

How to Use This Book

Section 1, Introduction

Provides an overview of the hardware platform AC 800M together with information on related documents. Also provided is a list of product versions, conventions, and a short glossary of related terms and acronyms.

Section 2, Installation

A guide to the various installation activities such as:

Planning the installation (including site selection)

- Building requirements
- Environmental considerations concerning hazardous locations
- Grounding requirements
- Mounting dimensions.

Section 3, Configuration

Provides information on the hardware configuration for the AC 800M Controller.

Section 4, Operation

Includes information on start-up and shut-down procedures together with verification procedures for the AC 800M Controller.

Section 5, Maintenance

Contains information relating to the AC 800M maintenance requirements. It is intended to provide system and unit troubleshooting procedures together with unit-specific maintenance procedures. The information contained in this chapter is aimed at the Maintenance/Service Engineer level.

Appendix A, Hardware Units – Appendix F, Environmental Data

These appendices provide important information relating to:

- Safety Instructions
- Unit/Component Technical Data Sheets
- Current Consumption/Heat Dissipation
- Commercially Available Components
- Standards
- EMC/LVD Directives.

Information relating to Load Calculation, Memory Calculation, Halt Codes and System Messages can be found in the Control Software documentation.

Use of Warning, Caution, Information, and Tip Icons

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



Electrical warning icon indicates the presence of a hazard which could result in *electrical shock*.



Warning icon indicates the presence of a hazard which could result in *personal injury*.



Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property*.



Information icon alerts the reader to pertinent facts and conditions.



Tip icon indicates advice on, for example, how to design your project or how to use a certain function.

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

Document Conventions

The following conventions are used throughout this document for the presentation of material:

- In a syntax rule statement or example, a word in **boldface** represents a reserved keyword or string.
- References to other documents are in *italic*.
- Control Builder M is normally called just Control Builder or CB in this book.

Terminology

The following is a list of terms and acronyms used in this document.

Table 1. Terminology

Term/Acronym	Description
AC 800M	A hardware platform comprising units and units that may be configured to provide a controller that fulfills specific requirements.
AC 800M Controller	Any controller constructed from the units and units connected to the AC 800M hardware platform.
Cabinet	The outer case of a piece of equipment (a packaging option), for example the Controller cabinet.
CB, Control Builder	Control Builder M, an engineering tool used to configure and program the AC 800M controller.
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).
Controller	Computer-based unit for digital and/or analog control.
CPU	Central Processing Unit. A functioning unit consisting primarily of a microprocessor and memory.

Table 1. Terminology (Continued)

Term/Acronym	Description
DIN-rail	Industry standard 'Top Hat' type mounting rail.
EMC	Electro-Magnetic Compatibility.
Ethernet	Network cabling system according to IEEE802.3.
Ethernet Address	The same as Media Access Control (Ex. MAC layer in IEEE802.3 = transceiver + cable).
FCI	Fieldbus Communication Interface.
FF	FOUNDATION Fieldbus - Standard based on IEC 1158-2.
IEC	International Electrotechnical Commission.
IEEE	Institute of Electrical and Electronic Engineers.
INSUM	INtegrated System for User optimized Motor control.
LED	Light Emitting Diode.
LVD	Low Voltage Directive.
MAC address	See Ethernet Address.
Unit	A hardware unit, with or without accommodated software.
Node	A computer communicating on a network, e.g. the Internet, Plant, Control or IO network. Each node typically has a unique node address with a format depending on the network it is connected to.
PELV	Protected Extra Low Voltage (power supply).
PROFIBUS DP	Open, vendor-independent fieldbus for time-critical communication between controllers and distributed peripherals.
PROFIBUS DP-V1	See PROFIBUS DP.
PROM	Programmable Read-Only Memory.

Table 1. Terminology (Continued)

Term/Acronym	Description
RAM	Random Access Memory, normally a read/write memory of random access type is assumed.
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.
Redundancy	The existence of more than one capability of an item (system, equipment or component) to perform its intended function.
Remote I/O	Input/Output units connected to a controller via a fieldbus.
SELV	Safety Extra Low Voltage (power supply).

Applicable Specifications

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

EUROPEAN UNION DIRECTIVE COMPLIANCE

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

UL LISTING

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

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

The applied standard is UL508, Industrial Control Equipment. Units approved for use at hazardous locations also comply with the standard UL1604. To fulfill the UL requirements for hazardous locations, the instructions in [Appendix E, Standards](#) must be followed.

Related Documentation

[Table 2](#) on page 17 details the documentation and media applicable to the AC 800M Controller. [Table 3](#) on page 19 details the media associated with the AC 800M Controller.

Table 2. Related Documentation

Category	Title	Description
Hardware	S800 I/O General Information and Installation User's Guide	Describes the general installation and configuration for S800 I/O.
	S800 I/O Units and Termination Units User's Guide	Describes the standard I/O units and termination units for S800 I/O.
	S800 I/O Units and Termination Units, with Intrinsic Safety Interface User's Guide	Describes I/O units and termination units with I.S. interface within S800 I/O.
	S800 I/O Fieldbus Communication, Interface for PROFIBUS DP User's Guide	Describes the PROFIBUS DP FCI within the S800 I/O system.
	AC 800M/C PROFIBUS DP User's Guide Wiring and Installation	Describes how to install and wire a PROFIBUS DP I/O System.

Table 2. Related Documentation (Continued)

Category	Title	Description
Hardware (contd.)	FOUNDATION Fieldbus, Wiring and Installation	Describes how to install and wire a FOUNDATION Fieldbus H1.
	S200 I/O Hardware and Installation User's Guide	Describes the hardware, installation and configuration for S200 I/O.
	S200L I/O Hardware and Installation, Version 1.0, User's Guide	Describes the hardware, installation and configuration for S200L I/O.
	Terminal Diagrams AC 800M	Gives information about the inputs/outputs of the AC 800M units. The diagrams can be used as templates for a connection diagram.
	Terminal Diagrams S800 I/O	Gives information about the inputs/outputs of the S800 I/O units. The diagrams can be used as templates for an I/O connection diagram.
Software	Control IT for AC 800M/C Release Notes	Gives release-related information about Control IT for AC 800M/C 3.1, including new/changed features and how to upgrade from previous versions.
	Control Builder M Getting Started, Introduction and Installation	Installation and start-up of the various software packages contained on the Control ^{IT} for AC 800M/C Products CD. This manual also provides a tutorial on how to create applications.
	AC 800M/C Communication, Protocols and Design	Describes design principles and protocols used in the Control Network. Focuses on planning and design issues, not with wiring or installation.

Table 2. Related Documentation (Continued)

Category	Title	Description
Software (contd.)	AC 800M/C Application Programming, Strategy and Design	A handbook for technicians who intend to program Control IT for AC 800M/C products using the programming tool, Control Builder M. It gives strategic hints and directions in project design, different programming languages, organizing code, and practical hints when programming and commissioning.
	AC 800M/C FOUNDATION Fieldbus	Details how the FOUNDATION Fieldbus I/O system is integrated with controllers.
	AC 800M/C PROFIBUS DP User's Guide Functional Description	Details how the PROFIBUS I/O system is integrated with controllers.

Table 3. Related Media

Category	Title	Description
Internet	PROFIBUS Web Site	Standard, commercially available PROFIBUS DP documentation.
	FOUNDATION Fieldbus Web Site (Fieldbus Online)	Standard, commercially available FOUNDATION Fieldbus documentation.
Media	Control ^{IT} for AC 800M/C Products	Control Builder, Functions and Firmware on CD.
	Control ^{IT} for AC 800M/C Documentation	User documentation manuals and online help.
	Control Builder Online Help	User documentation and information online.

Safety Summary

General

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



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

Warnings and Information Symbols in the Text Margin

Observe the symbols for warnings and information located in other Chapters and Appendices of this book. The symbols are placed in the left-hand margin, adjacent to paragraphs requiring special attention. For an explanation of the symbols, see [About This Book – Use of Warning, Caution, Information, and Tip Icons](#) on page 13.

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 intimate 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
- The AC 800M Controller system must be shut down before carrying out the above.
- 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.

The level of safety can be improved considerably by taking steps to bring the process to a safe state should 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.

Machine 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 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 I/O Units



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

Removing or replacing I/O 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 I/O units takes place

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.

Section 1 Introduction

Product Overview

AC 800M – General

AC 800M can be defined as a hardware platform to which individual hardware units may be connected and which, depending on the specific unit configuration and operating system selected, can be programmed to perform multiple functions.

Once configured, the AC 800M hardware platform effectively becomes the AC 800M Controller.

The hardware units that form the AC 800M Controller are:

- Processor units (including baseplate)
(PM856/PM860/PM861/PM864)
- Communication interfaces for different protocols (including baseplates)
(CI851/852/853/854/855/856/857)
- Power supply units, providing various power output levels
(SD821/822/823)
- Battery back-up unit
(SB821)

When equipped with the specified Control Software, the AC 800M Controller will act 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 PROFIBUS DP-V1.

The AC 800M is delivered without Control Software. To provide the controller with Control Software it will first be necessary to load the firmware and 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, the power supplies and communication interfaces, as well as to the external buses and systems.

The AC 800M Controller is designed to be a cost-effective, low-maintenance solution for applications ranging from small Programmable Logic Controller (PLC) to advanced Distributed Control Systems (DCS) control applications.

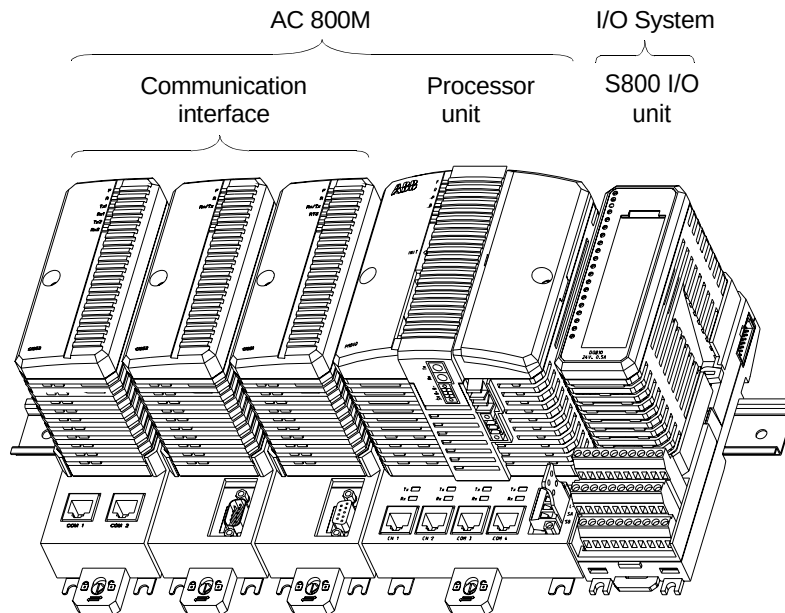


Figure 1. Example of an AC 800M Controller with an S800 I/O Unit

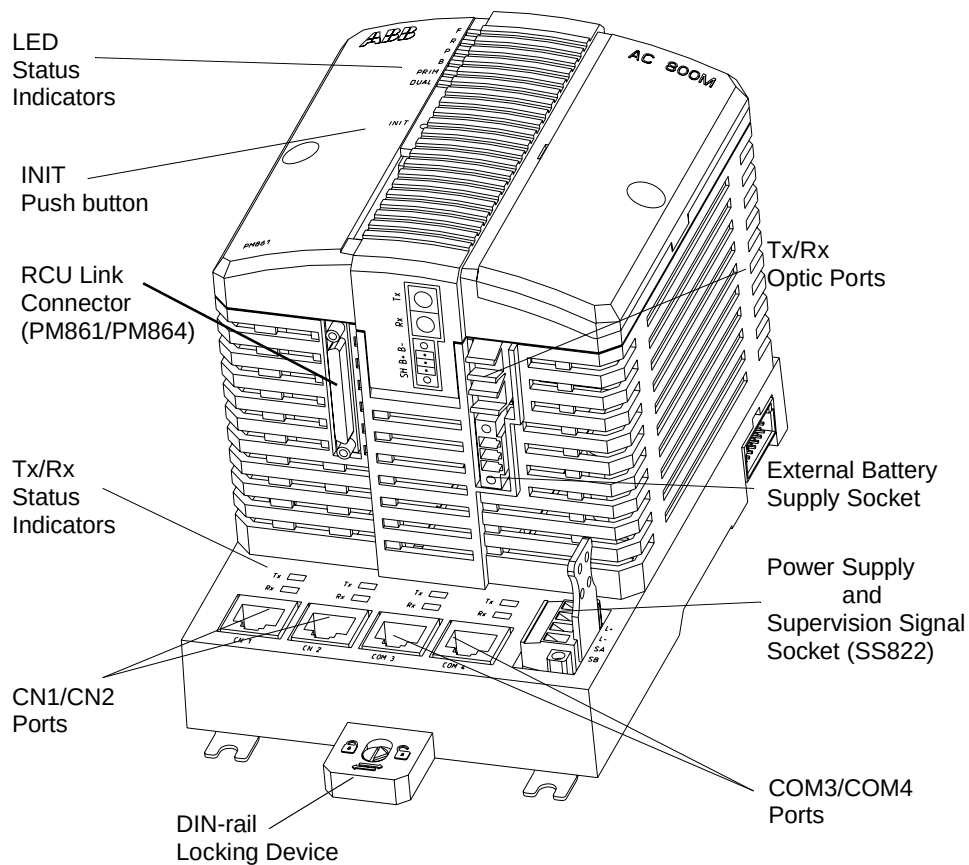


Figure 2. Processor Unit – General View (here shown with PM861)

PM8xx/TP830 Processor Unit – General

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

- Processor Unit (PM856/PM860/PM861/PM864) with processor and Power Supply boards
- Baseplate (TP830), housing the unit termination board

See [Figure 4](#) on page 32 and [Figure 5](#) on page 33, Functional Block Diagram. 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 CompactFlash interface (CompactFlash is not connected in this release and intended for future use).

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 RS232-C 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 take place. 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.

24 V DC, connected to the TP830 Baseplate, power all 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 units. PROFIBUS DP, FOUNDATION Fieldbus and dual RS232-C ports are some examples of unit types available for connection to the CEX-bus.

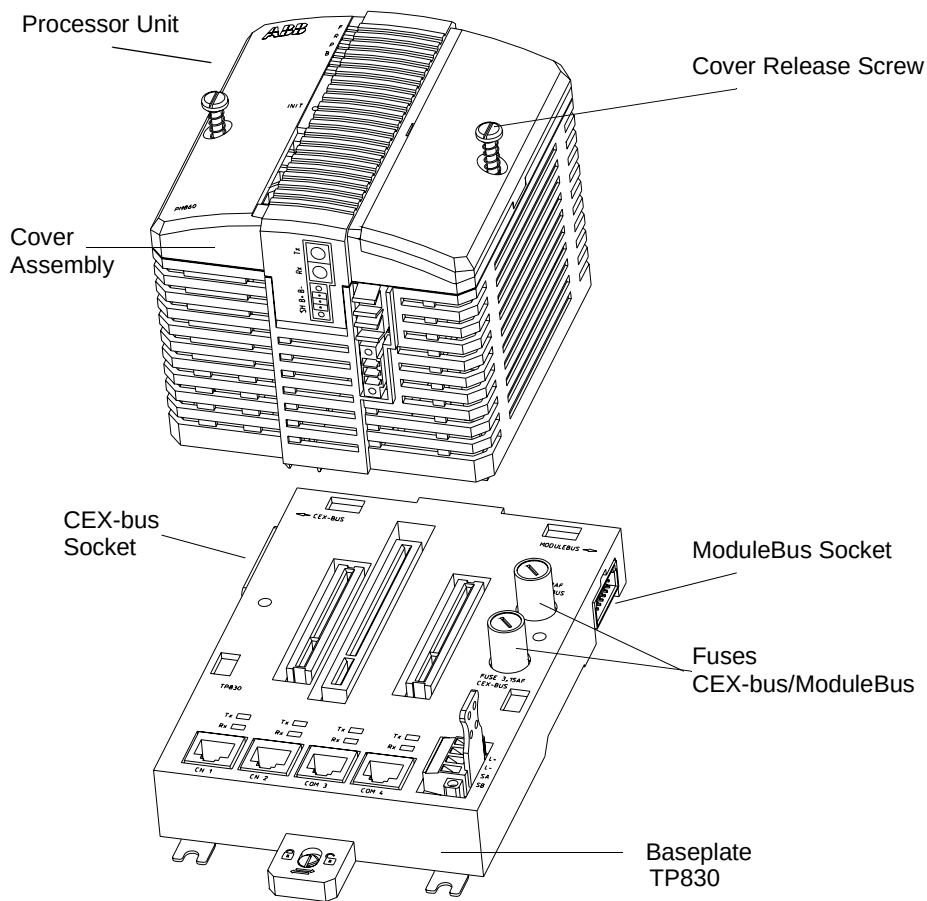


Figure 3. Processor Unit Assembly – General View
(here shown with PM860/TP830)

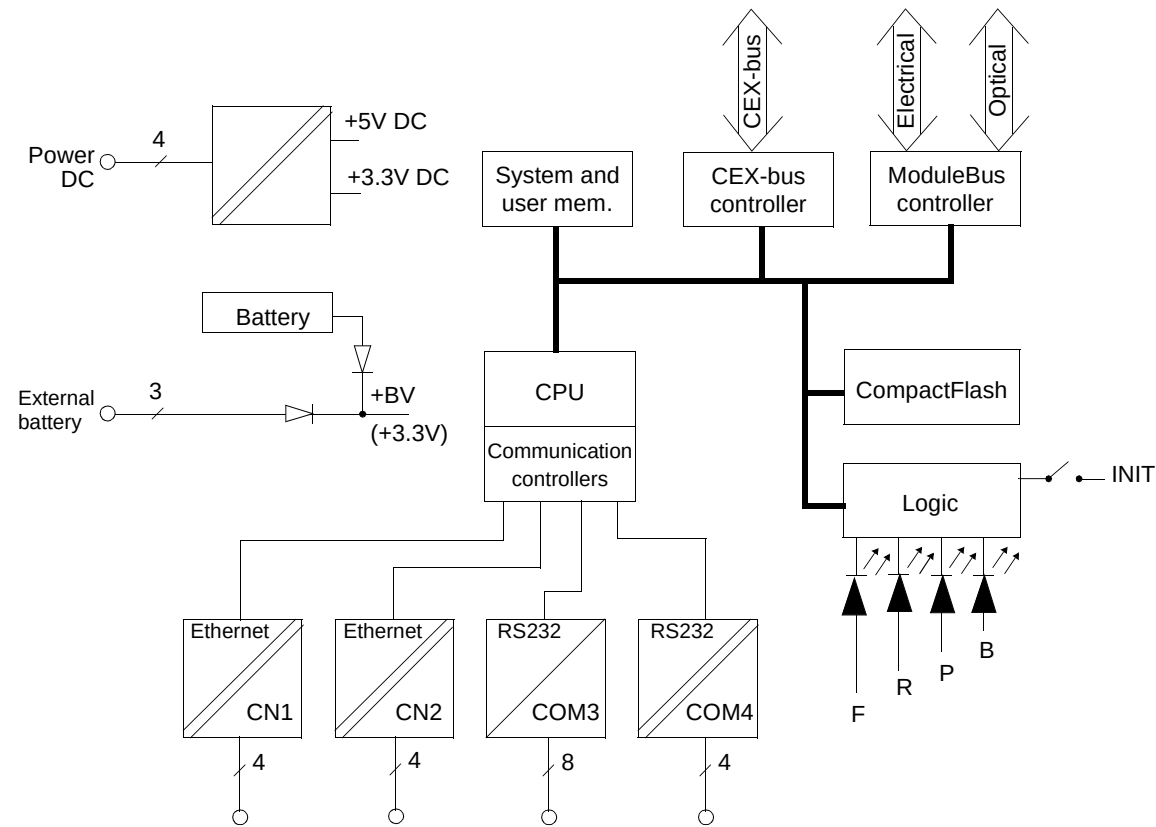


Figure 4. PM856/PM860 – Functional Block Diagram

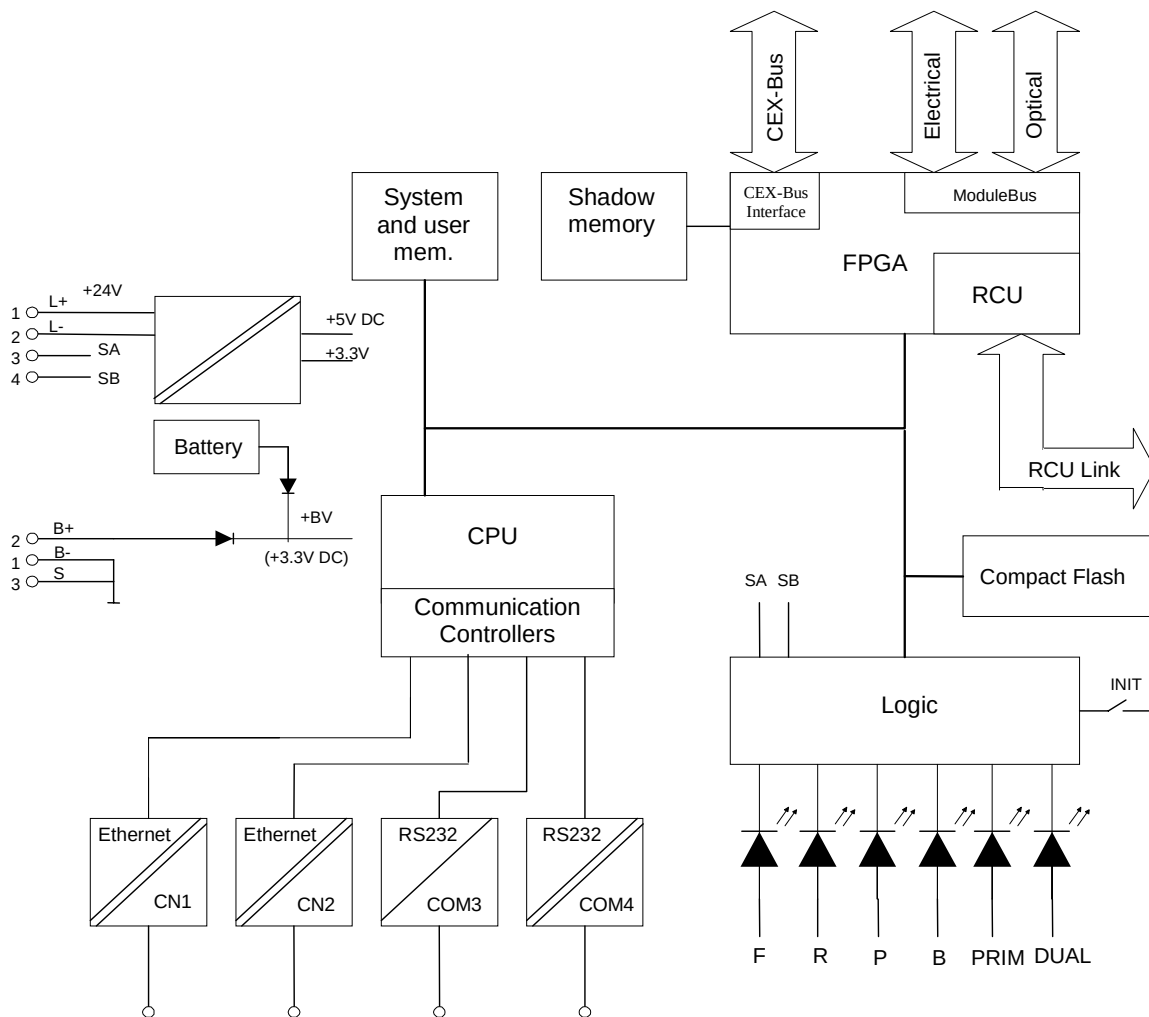


Figure 5. PM861/PM864 – Functional Block Diagram

[Figure 6](#) on page 35 provides examples of various ways to connect the S800 I/O units. It can be seen, at the top right-hand area of [Figure 6](#) on page 35, 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.

To the left on [Figure 6](#) on page 35, 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 CI830), connected to the PROFIBUS DP network. The use of FCI units allows the selection of units from several I/O families.

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

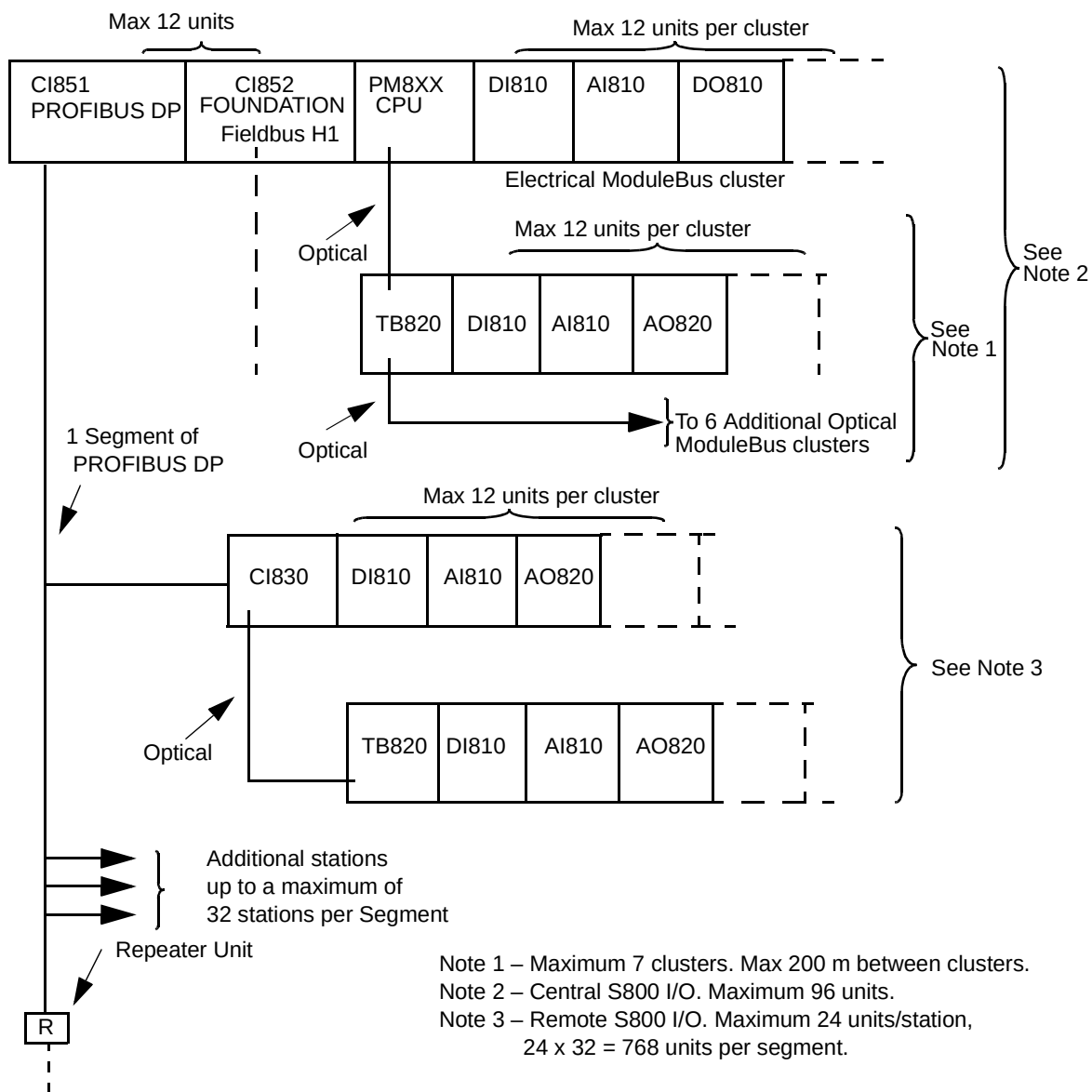


Figure 6. Example of AC 800M/S800 I/O Interconnection in Single CPU Configuration

PM861/PM864/TP830 Processor Unit – Redundancy

Processor unit redundancy is available. 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 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.

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

The PM861/PM864 has an RCU Link Connector for connecting the RCU Link Cable (see [Figure 2](#) on page 29). In a redundant system the two processor units are linked together with the RCU Link Cable. Both processor units are also connected to the same CEX-bus and either of the two can control the expansion units (see [Figure 16](#) on page 66).

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 29](#) on page 98). The built-in electrical ModuleBus on the TP830 baseplate cannot be used for connecting S800 I/O in a redundant system.

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 "Shadow-memory" function for detection of arbitrary bit errors in the memory.

- All memory updates are written to both the primary memory and to the "shadow" 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 "shadow" memory handling is done in hardware and without any delay to the memory cycle time.

Control Software

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

- hardware functions (supervision, communication buses, I/O buses)
- firmware functions loaded into the controller (real time executive system, real time clock, redundant communication)
- application programs loaded into the controller (library functions, communication protocols)

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

Ethernet Address

Each TB830 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 7](#) on page 39 for label location details.

See [Related Documentation](#) on page 17 for details on loading the software and using Ethernet address.

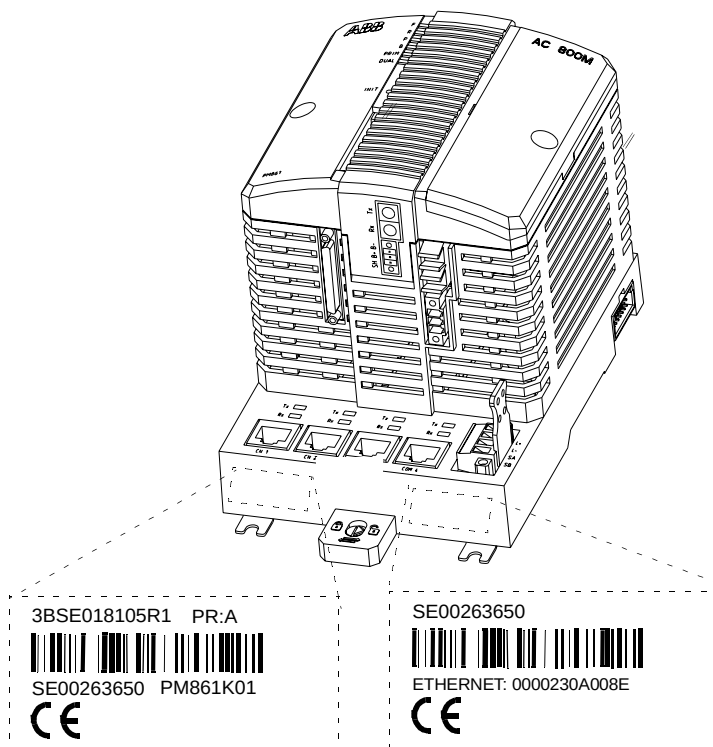


Figure 7. Identification Labels

AC 800M Controller – Key Features

- Flexibility. The AC 800M Controller can be ordered housed in ABB cabinets, or as individual units that may be custom-mounted
- 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)
- 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
- Allows connecting a large number of I/Os, via PROFIBUS DP and PROFIBUS DP-V1
- The AC 800M can be used as an FF Linking Device
- Allows connecting custom protocols of a large amount of Serial communication RS232-C ports
- Connecting to MasterBus 300 Networks
- Connection to INSUM via Gateway (Ethernet/LON)
- Connection to ABB Drives is available
- Built-in battery back-up of memory
- External battery back-up option available
- CPU Redundancy (PM861/PM864)

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 4](#) on page 41 for the product version release history of AC 800M.

Table 4. AC 800M Release History

Version	Description	User Doc
2.1	PM864 is added	3BSE 027 941R301
2.1	CI855 and CI856 are added.	3BSE 027 941R101
2.0	PM861and CI854/CI857 are added.	3BSE 026 020R101
1.1	PM856 and CI852 are added.	3BSE 019 193R201
1.0	Initial AC 800M release.	3BSE 019 193R101

Section 2 Installation

This section contains guidelines for planning the installation of an AC 800M controller system (see [Site Selection and Building Requirements](#) on page 43). A complete list of measures to be taken with respect to the environment and other on-site conditions is not given here.

The equipment should be adapted to the actual application by means of a thorough and correctly scoped system definition, ordering procedures and design requirements. This section also describes practical on-site installation procedures specific to AC 800M units (see [Mounting AC 800M Units onto DIN-Rail](#) on page 49).

Site Planning

Site Selection and Building Requirements

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

Most applications require no special arrangements regarding the environment, and so 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.

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

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

Electro-Magnetic Compatibility

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

Cables

Laying Field Cables

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

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

Type of Field Cable

Always use shielded cables for the following applications:

- Communications
- High-frequency pulse transmission
- Low level analog signals, for example Pt100 and thermocouples
- Analog applications with a system accuracy of 12 bits or more.

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

Lightning Protection

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

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

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

Power Supply

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

Mains Net Filter

It is not necessary to use mains net filters when using the SD821/822/823 power supply units.

Safety Switch

A safety switch 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 safety switch is to provide a means of isolating the power supply completely during maintenance.

The safety switch must be installed in a location where it is both easily accessible and clearly visible, i.e., outside any enclosure or cabinet.

Protective Ground

Always install a protective ground connection on equipment connected to a 230 V AC supply.

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 5](#) on page 47.

Table 5. External Mains Supply – Fuse Rating

Fuse Rating	Fuse Type
10 A	Slow to Rupture

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 SD82x series of power supply units comfortably handle the short power interruptions (<20 ms) that y occur normally within an industrial environment. Despite this, it is sometimes necessary to protect certain applications against brief voltage failures by the installation of an Uninterruptable Power Supply (UPS) device.

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

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

Enclosures

The AC 800M and S800 I/O units hold protection class IP20, with each unit being individually CE-marked. Although these units can be used without an additional enclosure, it is recommended, within a normal industrial environment, to use a protection class higher than IP20 by adding a suitable enclosure.

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

Enclosure Mounting

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

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

ABB Cabinets

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

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

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

Mounting AC 800M Units onto DIN-Rail

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

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

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

The DIN-rail must be firmly attached to a suitable conductive mounting surface, by means of suitable screws positioned at exact intervals of 100 mm (4 in) along the full length of the rail.



The AC 800M Controller and associated units must be electrically isolated before being mounted onto a DIN-rail!

Mounting Procedure for PM8xx and CI8xx Units, Complete with Baseplates

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 8](#) on page 51.

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

1. Rotate the locking device to the **OPEN** position (1), hook the upper lip 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), gently 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 9](#) on page 51.

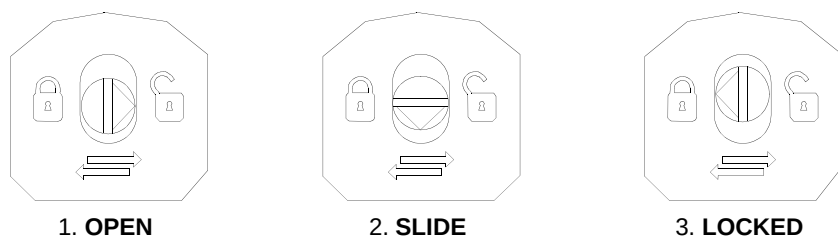


Figure 8. Baseplate Locking Device

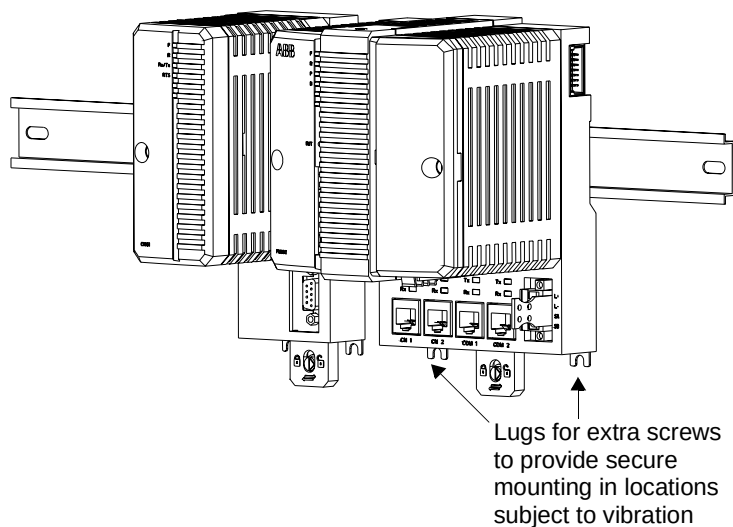


Figure 9. DIN-rail Mounting of AC 800M Units

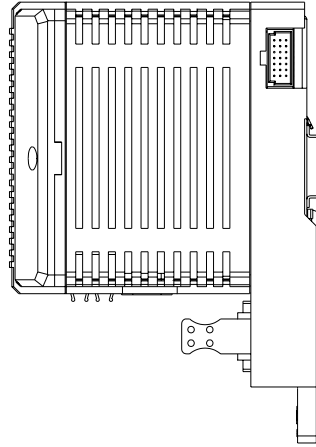


Figure 10. AC 800M Controller – Side View

Removing Units Complete with Baseplates



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

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

1. Isolate 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 8](#) on page 51.



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 unit baseplates are easily disconnected from each other by gently prying them apart with a blade screwdriver (see [Figure 11](#) on page 53).

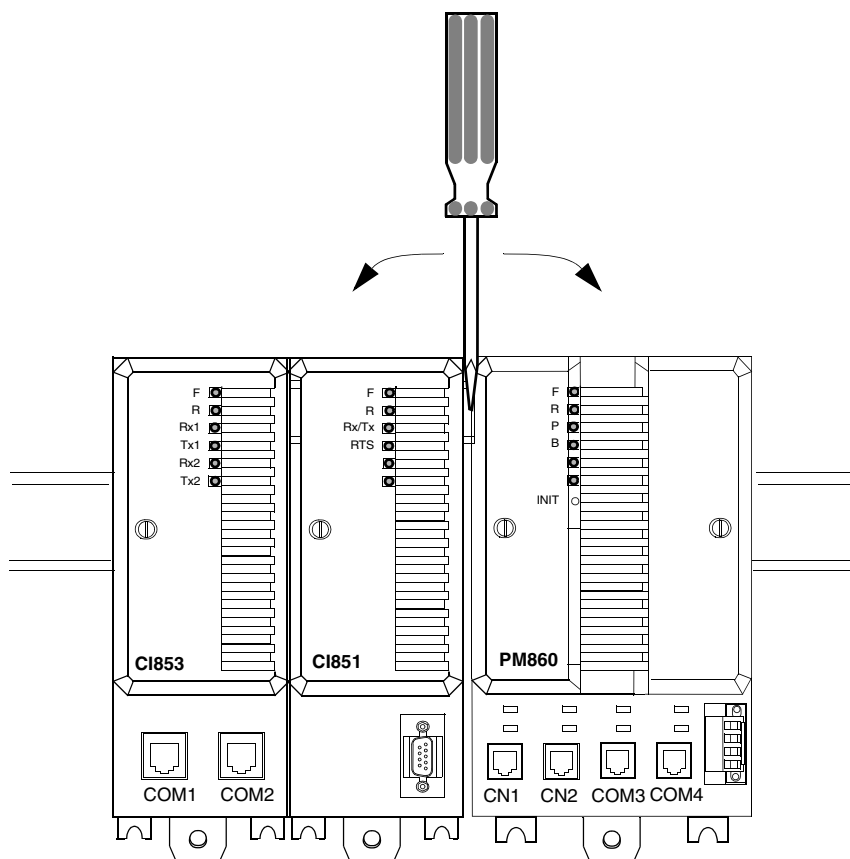


Figure 11. Separating the Baseplates

Unit to Baseplate Alpha Code Lock

Since the units are very similar in design, baseplates have been given a two-part, pre-set Alpha code locking device that prevents the installation of an incompatible type of unit onto the baseplate should the Alpha codes not agree. 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 6](#) on page 54).

Table 6. Factory Pre-set Alpha Codes

Unit	Key Position 1	Key Position 2
CI851 PROFIBUS DP Interface	A	A
CI852 FOUNDATION Fieldbus H1 Interface	A	B
CI853 RS232-C Interface	A	C
CI854 PROFIBUS DP-V1 Interface	A	D
CI855 Ethernet interface for MasterBus 300	A	E
CI856 S100 interface	A	F
CI857 INSUM Interface	B	A
S800 I/O Units	Various – see S800 I/O Product/User’s Guide	Various – see S800 I/O Product/User’s Guide

For further details on pre-set Alpha codes, refer to the relevant unit documentation (see [Related Documentation](#) on page 17).

Care must be taken to ensure that the correct unit is matched with the correct baseplate, or damage to the equipment will occur. Care must be taken to ensure that the correct unit is matched with the correct baseplate, or damage to the equipment

will occur. If difficulty is experienced with installing a unit onto a baseplate, this is a positive indication that the Alpha code lock/unit compatibility is incorrect.

See [Figure 12](#) on page 55 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.

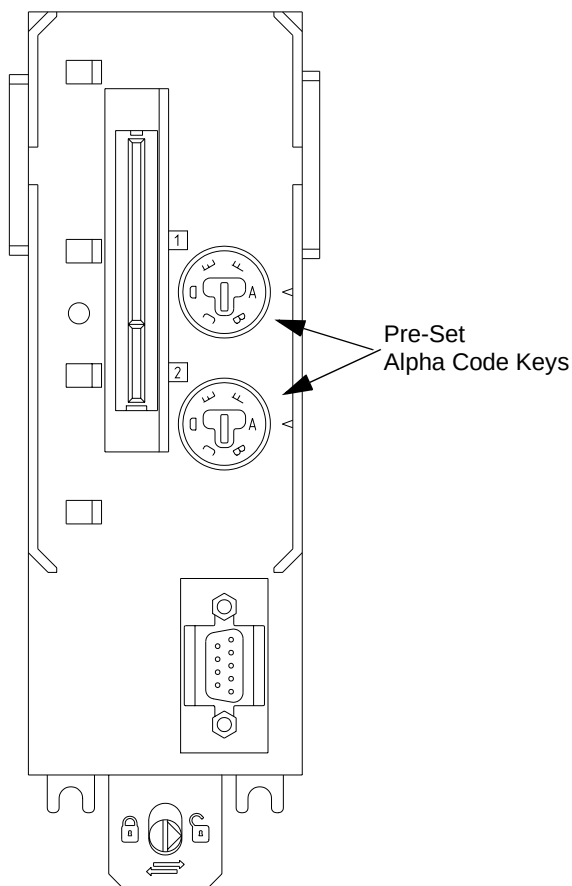


Figure 12. Unit Baseplate – Alpha Code Lock Arrangement

Installing the PM8xx/TP830 Processor Unit in Single Configuration

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

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



For PM861/PM864 insert the RCU Link Termination plug TB852, at the RCU Link connector. The termination plug must always be used for PM861/PM864 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 on the CEX-bus to the left of the processor unit and the S800 I/O units 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 13](#) on page 58 and [Figure 14](#) on page 59. 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 (see [Related Documentation](#) on page 17). If no units are used on the ModuleBus, no bus termination is required.
5. TP830 Baseplate cable connections:
 - a. Connect the power leads and, if applicable, power supervision signals from SS822 to screw terminals SA and SB (see [Figure 15](#) on page 60).
 - b. Connect the Control Network cables to CN1 (single connection) or CN1 + CN2 (redundant connection).
 - c. Connect the serial protocol to COM3.

- d. Connect the Control Builder to COM4 with cable TK212 (if required for changing an IP address etc). Otherwise connect the Control Builder to the Control Network.
6. Connect the optical ModuleBus to the optical contacts on the processor unit (see [Figure 2](#) on page 29 and [Figure 17](#) on page 77). Information regarding optical cable selection and cable length is provided in the S800 I/O documentation (see [Related Documentation](#) on page 17).



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 28](#) on page 97.)

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 33](#) on page 121). When the external SB821 battery unit is to be used, install it according to the instructions in [Installing the SB821 External Battery Unit](#) on page 85.



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. If no normal power supply is connected to the processor unit with the battery in place, then the CPU memory will immediately start to consume battery power.



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

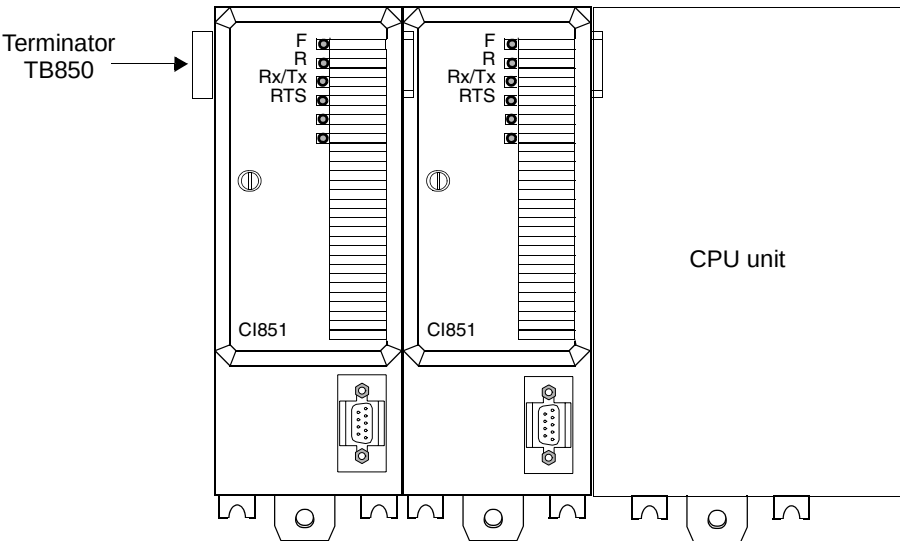


Figure 13. TB850 Terminator for CEX-bus (male)



A TB850 male CEX-bus termination unit is supplied with each package (PM856K01, PM860K01, PM861K01 and PM864K01) of the PM8xx/TP830 processor unit.

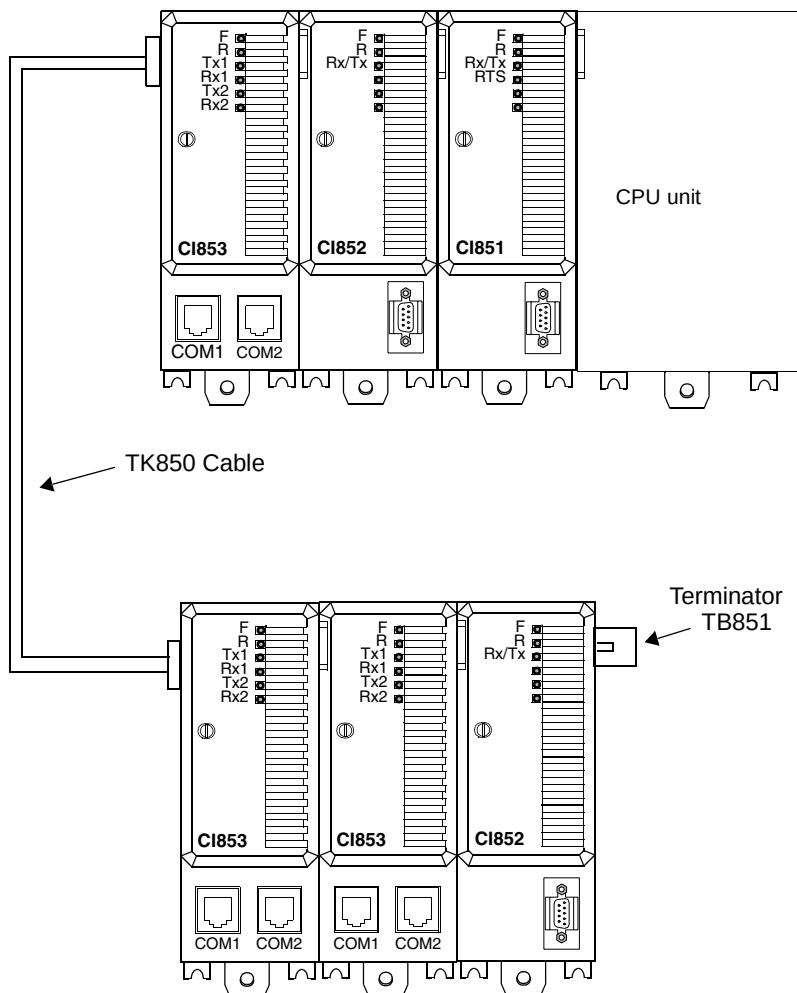


Figure 14. TB851 Terminator for CEX-bus (female)

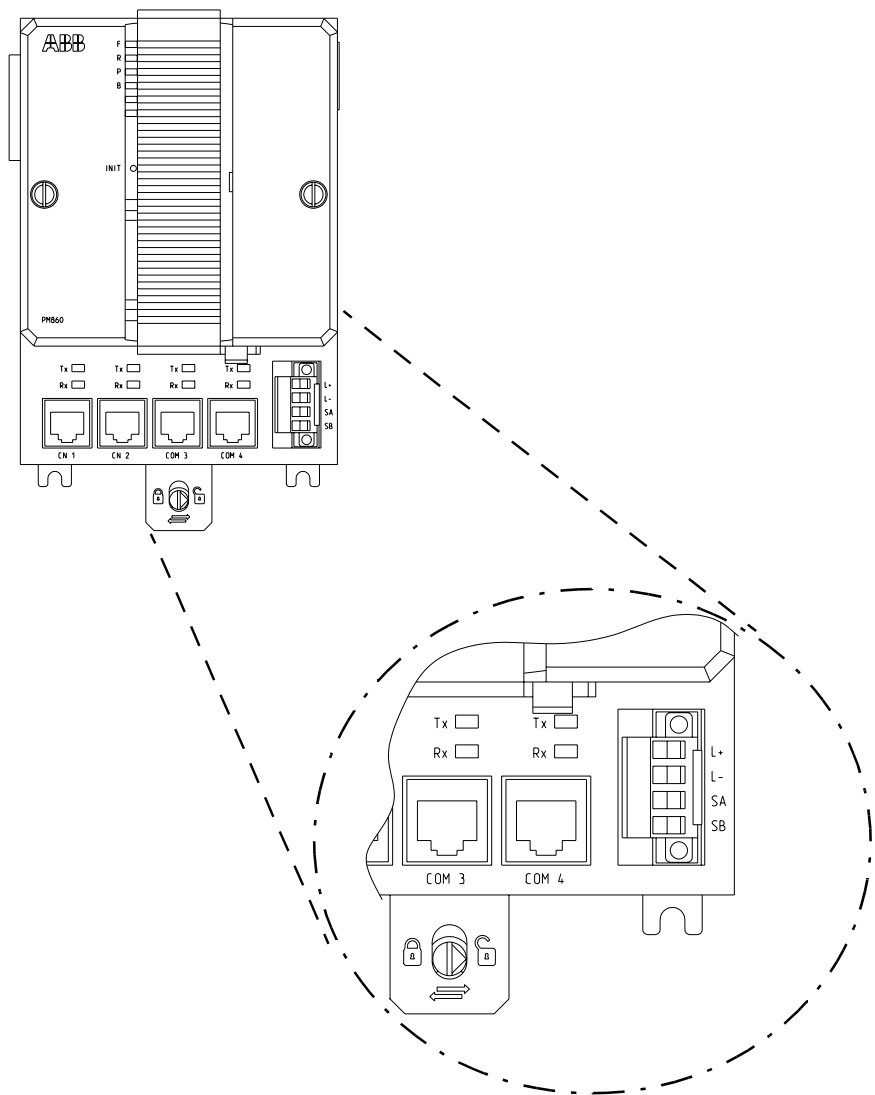


Figure 15. SA/SB Connectors for Supervision Signals

Communication Ports

CN1 and CN2

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

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



The IEEE standard language is a class 5 cable 10/100 Base-T/TX max 100 m (110 yd). The STP is suitable only in non-industrial (office) environments. Only use STP in a protected environment to connect to Commercial Off-The-Shelf (COTS) Ethernet components, (HUBS/Transceivers/and so forth), that convert to optical fiber. ABB recommends the use of optical fiber in an industrial environment, for example 62.5/125 100 Base-FX, max. distance 1500 m (1600 yd)

Table 7. 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

COM3 Port

The COM3 is an RS232-C port with modem signals. This port is used for serial protocols such as Modbus, Siemens 3964R, COMLI or custom-design.

Table 8. 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
7	DCD	In	Data Carrier Detect
8	CTS	In	Clear To Send
Housing	Shield	-	Shield

COM4 Port

The COM4 port is an RS232-C 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 9. TP830 COM4 Connections (RJ45 connector)

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

Installing the PM861/PM864/TP830 Processor Unit in Redundant Configuration

In redundant configuration two PM861/PM864 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. Mount the communication interfaces on the CEX-bus to the left of the processor unit. All interfaces can be mounted on the same CPU or divided between the two.
2. Press them gently together and make sure that the CEX-bus is correctly connected, via the connectors on the baseplates.
3. 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 16](#) on page 66).
4. Connect the RCU Link Cable TK851 to both CPUs.



Note that the RCU Link Cable TK851 must be used and can not be replaced by a similar cable. Using another cable will disable the identification of the CPUs in the CB and Operator Station.

When running in single configuration the RCU Link Cable TK851 performs the function of a termination plug.



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

5. TP830 Baseplates cable connections:

- a. Connect the power leads to both CPUs and the power supervision signals from SS822 to screw terminals SA and SB (see [Figure 15](#) on page 60).



Both CPUs must be powered from the same supply (single or redundant). For redundant power supply, see [Figure 20](#) on page 82.

- 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.

6. Connect the optical ModuleBus to the optical contacts on the processor units (see [Figure 2](#) on page 29 and [Figure 17](#) on page 77). Information regarding optical cable selection and cable length is provided in the S800 I/O documentation, (see [Related Documentation](#) on page 17).



Connection to the optical ModuleBus is identical to that for the processor unit and for the FCI in S800 I/O ([Figure 29](#) on page 98).

7. The CPUs are supplied with internal back-up batteries. When the batteries are to be used, place them in the Internal Battery Holder ([Figure 33](#) on page 121). When the external SB821 battery units are to be used, install them according to the instructions in [Installing the SB821 External Battery Unit](#) on page 85.



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. If no normal power supply is connected to the processor unit with the battery in place, then the CPU memory will immediately start to consume battery power.



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

Communication Ports

Same as for single configuration (see [Table 7](#) on page 61, [Table 8](#) on page 62 and [Table 9](#) on page 63).

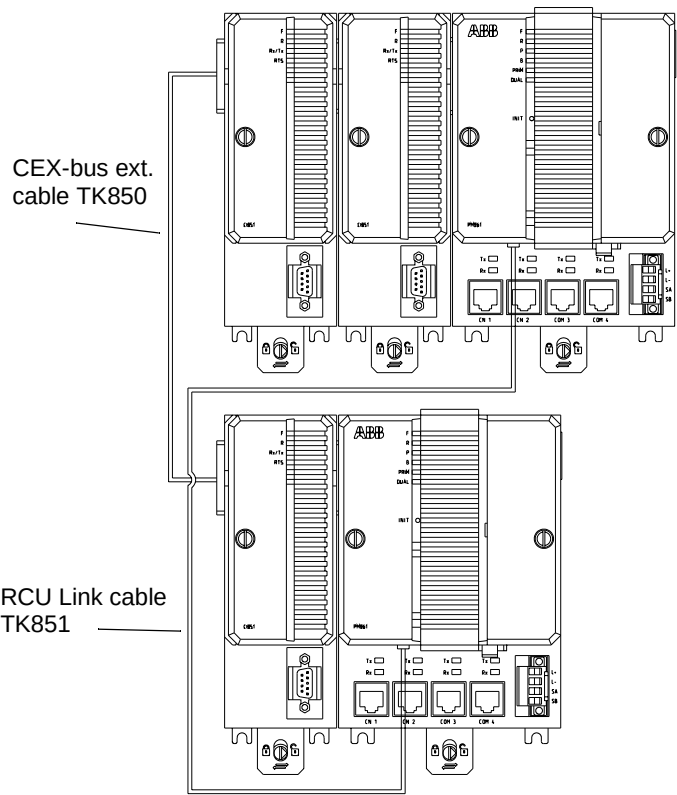


Figure 16. Connection of CPU redundancy

Installing the PROFIBUS DP Interface, CI851/TP851

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

Use the following procedure to install the CI851/TP851:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Install a connector on the PROFIBUS DP cable. Connect the cable screen to the ground terminal within the connector to ground the screen via CI581. A connector with a switchable built-in bus termination is recommended.
3. Connect the PROFIBUS DP cable to the contact on the baseplate.
4. If this is at the end of the PROFIBUS DP cable, switch the bus termination ON. Otherwise leave the bus termination switched OFF.

PROFIBUS DP Connection

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

Installation of PROFIBUS DP

Table 10. CI851 - PROFIBUS DP Connector

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

For installation of the fieldbus and recommended certified fieldbus devices and components, see [Related Documentation](#) on page 17 and [Appendix C, Recommended Components](#). The PROFIBUS DP must be connected with shielded twisted pair cables.



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

Installing the FOUNDATION Fieldbus H1 Interface, CI852/TP852

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

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

Use the following procedure to install the CI852/TP852:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Install a connector on the FOUNDATION Fieldbus cable. Connect the cable screen to the ground terminal within the connector to ground the screen via CI582.
3. Connect the FOUNDATION Fieldbus cable to the contact on the baseplate.

FOUNDATION Fieldbus H1 Connection

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

Table 11. CI852 and TP852 FOUNDATION Fieldbus Connector

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

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

For additional information on designing a fieldbus (connectors, cables and devices), see [Related Documentation](#) on page 17.

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

Powering Field Devices

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

Do not use SD82x power supply units for this purpose.

Installing the RS232-C 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 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Connect the cable (maximum 15 m [16.4 yd]) to one of the contacts on the baseplate. Connect the cable screen to the ground terminal within the connector to ground the screen via CI583.
3. If cables longer than 15 m (16.4 yd.) are required, then a short distance modem TC562 must be used. In this case mount the modem onto a DIN-rail in a suitable position, connect a 24 V DC power supply to the modem and connect cable TK853 from CI853 to the TC562 modem input terminals
4. Connect the TC562 modem output terminals to the outgoing cable.

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

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

Connectors

Connect the RS232-C channels to the RJ45 connectors marked COM1 and COM2 on the TP853 Baseplate.

Table 12. CI853 RS23-C Interface – COM1 and COM2 Connectors

Pin	Designation	Direction	Description
1–9	–	–	See COM3 on TP830, Table 8 on page 62.

Installing the PROFIBUS DP-V1 Interface, CI854/TP854

The CI854 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/TP854:

1. Mount the unit onto the DIN-rail, see [Mounting AC 800M Units onto DIN-Rail](#) on page 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Install a connector on the PROFIBUS DP-V1 cable. Connect the cable screen to the ground terminal within the connector to ground the screen via CI854. A connector with a switchable built-in bus termination is recommended.
3. Connect the PROFIBUS DP-V1 cable to one of the contacts PROFIBUS A or PROFIBUS B on the baseplate. For support of Line Redundancy connect a second PROFIBUS DP-V1 cable to the other contact.
4. If the CI854 is at the end of the PROFIBUS DP-V1 cable, switch the bus termination ON. Otherwise leave the bus termination switched OFF.

PROFIBUS DP-V1 Connection

The PROFIBUS DP-V1 cable is connected via the 9-pin female D-type connector located on TP854.

Installation of PROFIBUS DP-V1*Table 13. CI854 – PROFIBUS DP-V1 Connector*

PIN	Designation	Description
1	Shield	Shield/protective ground
2	–	Not Used
3	RxD/TxD-P	Receive/Transmit Data P-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
9	DGND	Digital Ground

For installation of the fieldbus and recommended certified fieldbus devices and components, see [Related Documentation](#) on page 17 and [Appendix C, Recommended Components](#). The PROFIBUS DP-V1 must be connected with shielded twisted pair cables.



Additional information on PROFIBUS DP-V1 and other suitable components is available, on the Internet, at the PROFIBUS User Organization web site.

Installing the Ethernet Interface for MasterBus 300, 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 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Connect the Ethernet twisted pair cable to the contact on the baseplate.
3. Connect the other end of the Ethernet cable to a HUB.



If the Ethernet cable has a transceiver, the connector from the transceiver must be converted to RJ45. The communication unit, CI855, can not provide power to the transceiver, therefore a separate power source must be used.

Ethernet twisted pair Connection

The Ethernet twisted pair is connected via the 10 Base-T RJ45 connector located on TP853. For a description of the connector, see [Table 8](#) on page 62.

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 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Connect the S100 I/O cable, TK575/TK580, to the contact on the baseplate. A bus extender, DSBC174/DSBC176/DSBC173A, must be used.

S100 I/O Connection and Installation

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

Installation of S100 I/O

For installation of the S100 I/O-related components, see [Related Documentation](#) on page 17.

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 49 and [Installing the PM8xx/TP830 Processor Unit in Single Configuration](#) on page 56.
2. Connect the Ethernet twisted pair cable to the COM1 connector on the baseplate (COM2 is not used for connection to INSUM).
3. Connect the other end of the Ethernet cable to the INSUM equipment via Ethernet/LON Gateway.

Ethernet Twisted Pair Connection

The Ethernet twisted pair is connected via the 10 Base-T RJ45 connector located on TP853. For a description of the connector see [Table 8](#) on page 62.

Installing the CEX-bus

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 13](#) on page 58. 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 14](#) on page 59, then a TB851 female CEX-bus termination unit is required and must be fitted to the last baseplate in the sequence. A TB851 female CEX-bus termination unit is supplied with each TK850 extension cable.

TK850 CEX-bus Extension Cable

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

Installing the ModuleBus

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 17](#) on page 77 provides details of the fiber optic connectors, together with the PM8xx optical ModuleBus ports.

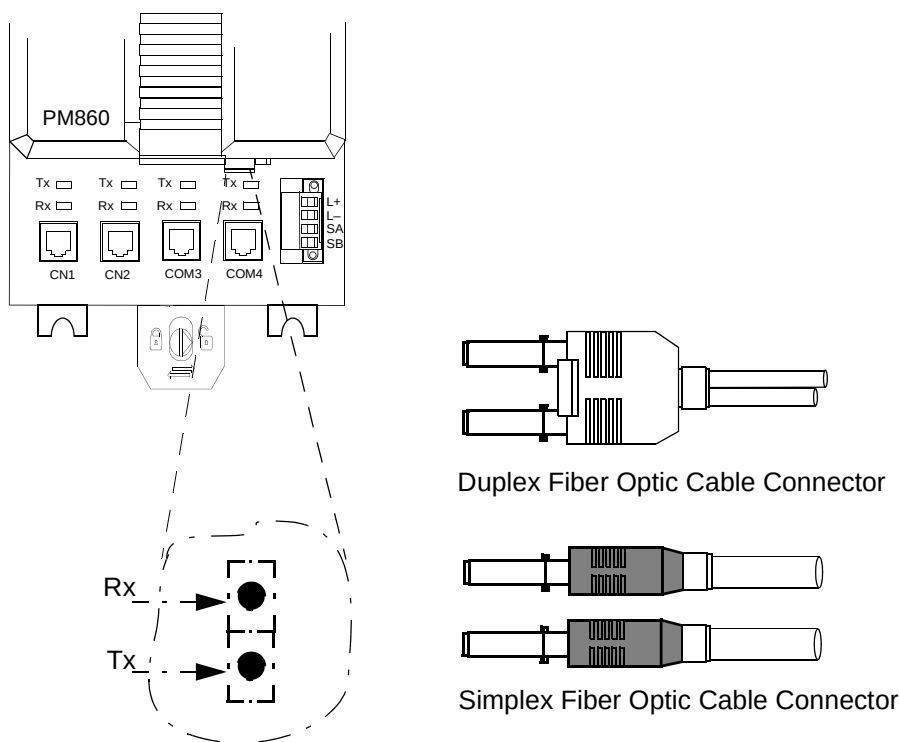


Figure 17. PM8xx Connectors for Optical ModuleBus

Installing the SD82x Power Supply

Use the following procedure to install the SD821, SD822 and SD823 power supply units.

1. Mount the selected unit onto the DIN-rail at the required position.
2. Set the mains switch on the front of the power supply unit to the required voltage:
 - a. 115 V for 110–120 V AC
 - b. 230 V for 220–240 V AC (default position on delivery).
3. Connect the mains supply to the L(ive) and N(eutral) terminals.
4. Connect the protective ground to the PE terminal.
5. Connect the output cable to terminals L+ (+24 V) and L– (0 V).



The power supply unit's L– output (0 V) can be used without being grounded. If grounding is required, the power supply unit's L– output (0 V) can be grounded directly or via a suitable resistor.



All terminals marked L+ are internally connected within the power supply unit. The same applies for terminals marked L–.

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, but for the sake of simplicity, the installation described covers the redundant power supplies/independent power supplies option. See [Figure 31](#) on page 106 and [Figure 32](#) on page 107.

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 18](#) on page 80).
 - 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 18](#) on page 80.
3. Install the two required links (7), fuse holders (8) and jumpers (9) onto the distribution terminals. Fit the required fuses into the fuse holders, (glass tube type, 5 x 20 mm (0.2 x 0.8 in)).

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

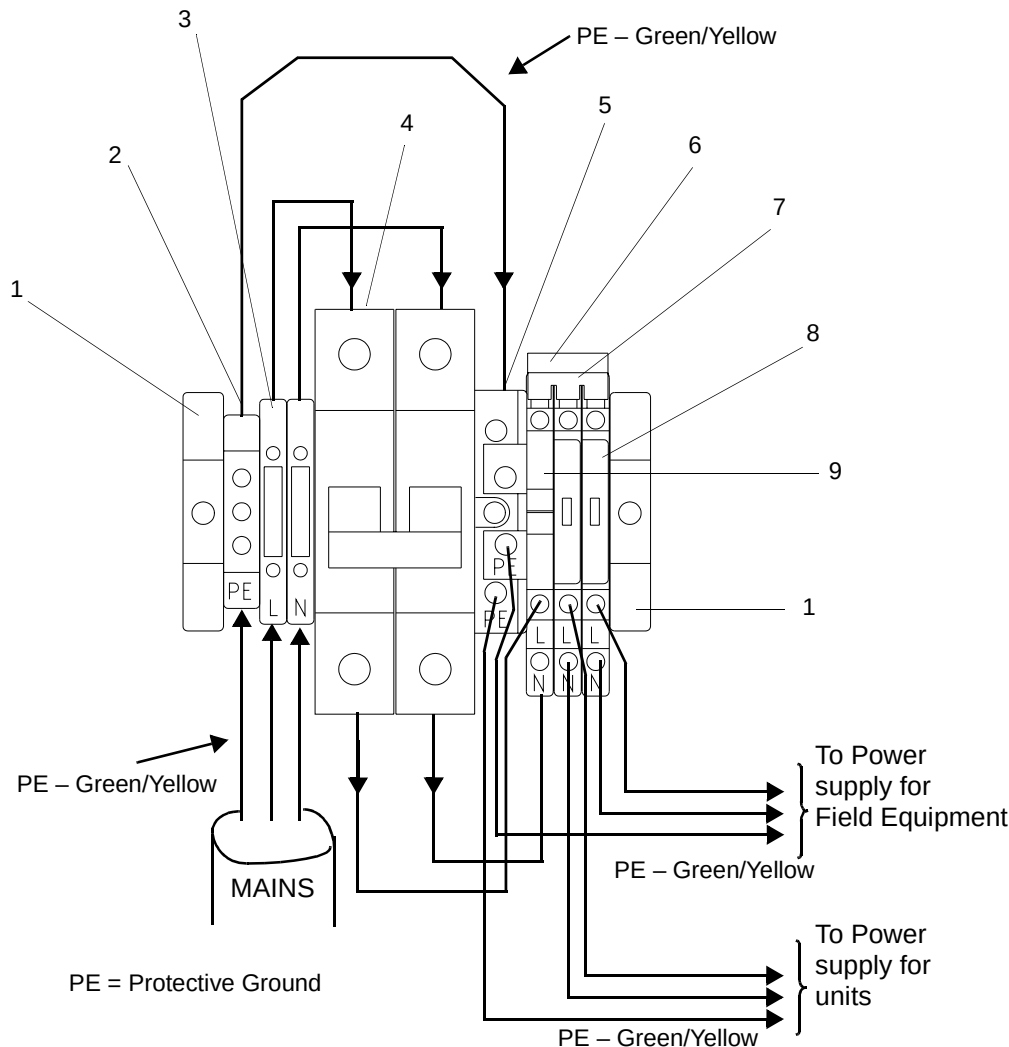


Figure 18. Installation of Mains Breaker Assembly

Installing the SS822 Voting Unit

The SS822 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 19](#) on page 81.

Use the following procedure to install the voting unit SS822:

1. Mount the voting unit SS822 onto the DIN-rail, adjacent to the power supplies.
2. Connect the voting unit to the selected SD821/822/823 power supply units, in required configuration. See [Figure 19](#) on page 81.

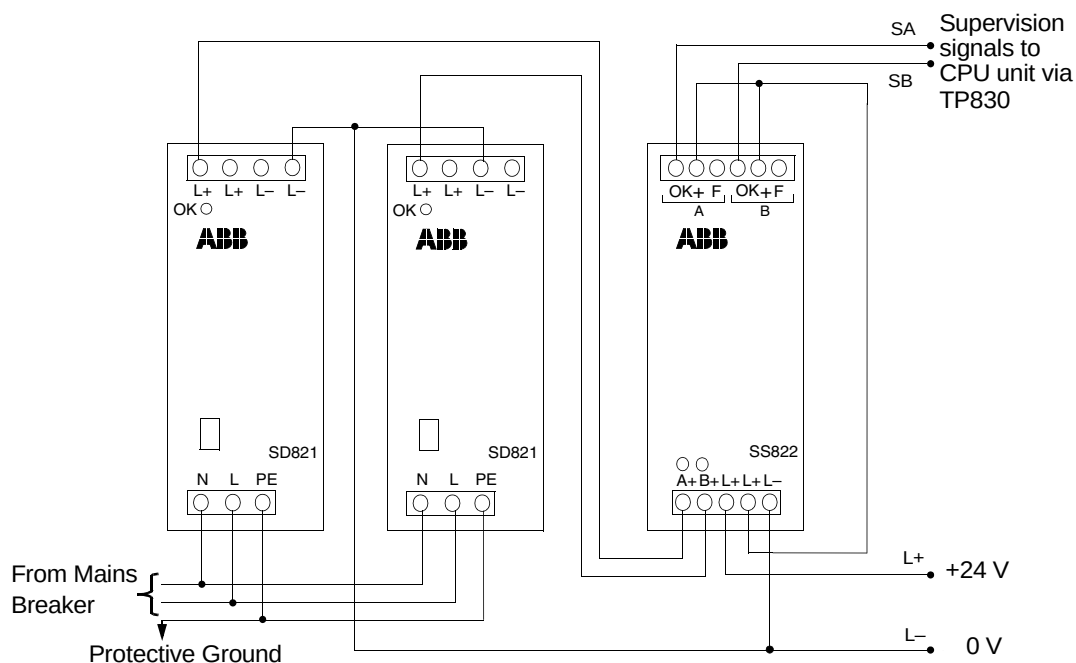


Figure 19. Redundant Power Supply

3. Connect the SS822 voting unit to the processor unit. [Figure 20](#) on page 82 shows the connection to PM861/PM864 in redundant configuration.

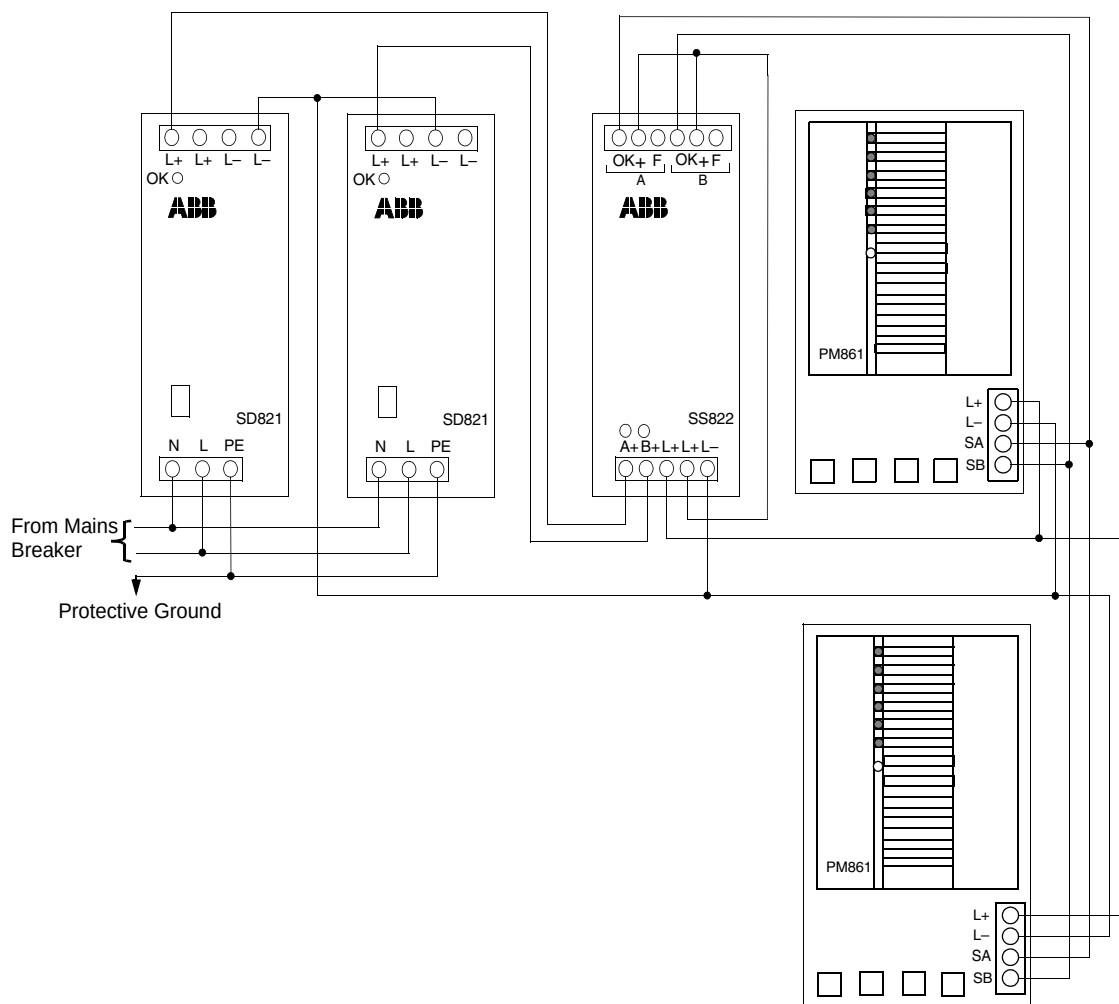


Figure 20. Redundant Power Supply Powering Redundant CPUs

Power Supply Supervision

The status of power supplies in redundant configuration can be supervised via the SS822 voting unit. The supervision signals SA and SB from the SS822 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 19](#) on page 81, [Figure 20](#) on page 82, [Figure 21](#) on page 83 and [Figure 22](#) on page 84.

[Figure 19](#) on page 81 and [Figure 20](#) on page 82 show redundant power supplies powering AC 800M units. Here the SA/SB signals also indicate physical power supplies.

[Figure 22](#) on page 84 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 21](#) on page 83.

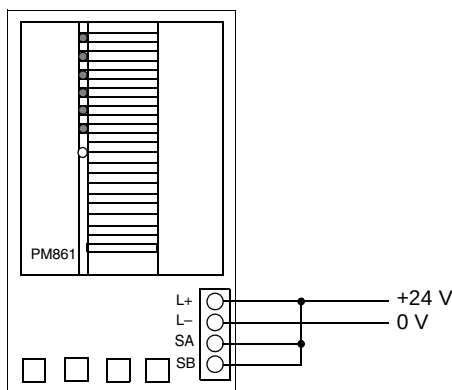


Figure 21. Connection of SA/SB using Single Power Supply

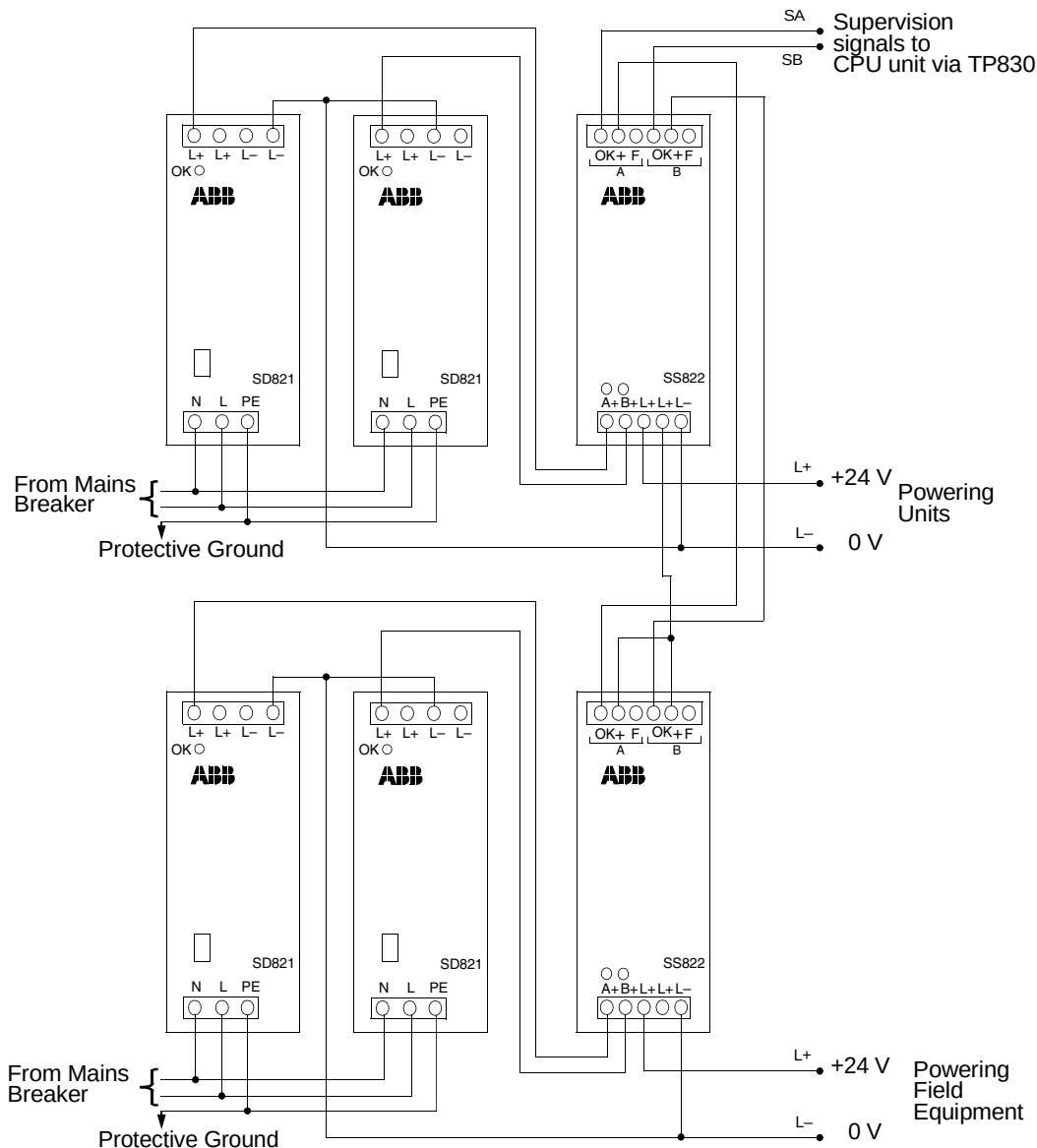


Figure 22. Redundant Power Supply Powering Units and Field Equipment

Installing the SB821 External Battery Unit

Use the following procedure to connect the external battery unit:

1. Mount the SB821 external battery unit at a suitable position on the DIN-rail.
2. For connecting the SB821 external battery unit, use the 2 m (2.2 yd) cable TK821V020. Plug one end into the battery unit and the other into the external battery supply socket of the PM8xx processor unit (see [Figure 2](#) on page 29).
3. In redundant CPU configuration containing two PM861/PM864 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. If no normal power supply is connected to the PM8xx processor unit, the CPU memory will immediately start to consume battery power when the cable is connected.



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

Installation of I/O Units

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

Installation in Cabinets

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

- [Figure 23](#) on page 87: Wall Cabinet – Single Power Supply Arrangement
- [Figure 24](#) on page 88: Wall Cabinet – Dual Power Supply (Local/Field) Arrangement
- [Figure 25](#) on page 89: Floor Mounted Cabinet – Unit Arrangement (Redundant PSU)

The DIN-rails are using the supporting Al-profile to ensure rigidity. See [Figure 54](#) on page 200.

The cabinets shown in the figures are ABB manufactured cabinets:

- RE820: Wall Cabinet
- RM550: Floor Cabinet

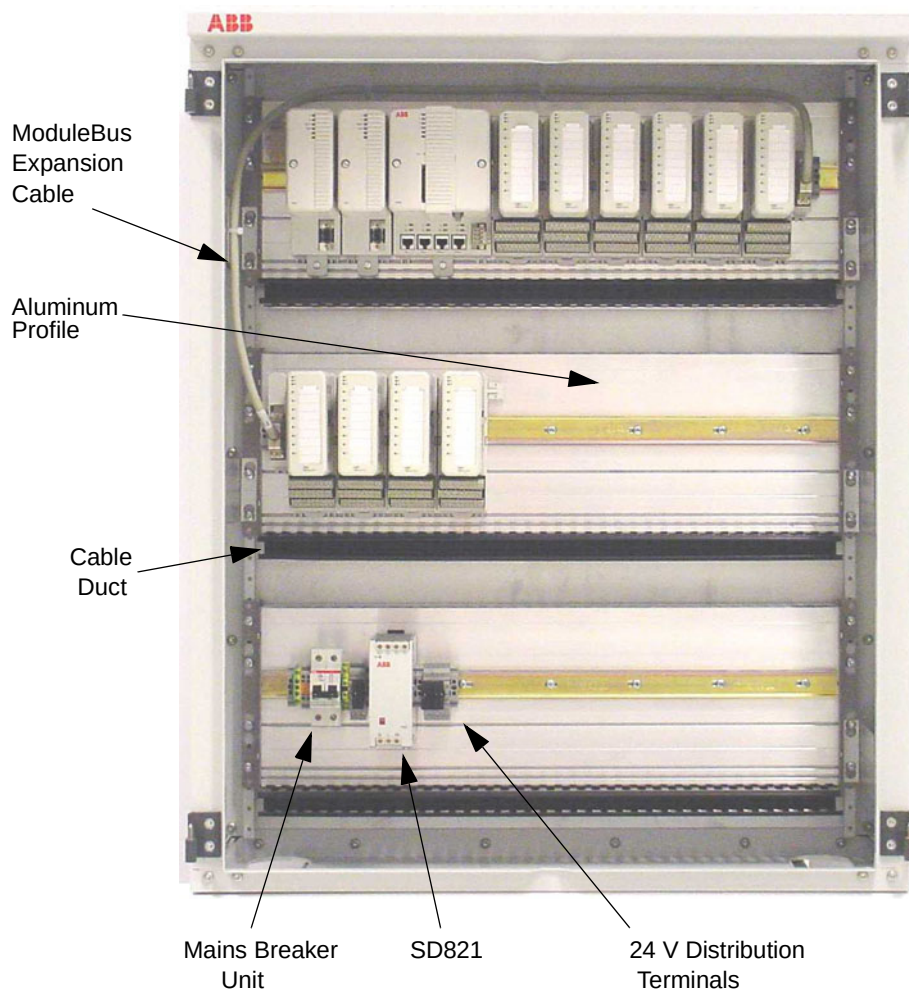


Figure 23. Wall Cabinet – Single Power Supply Arrangement

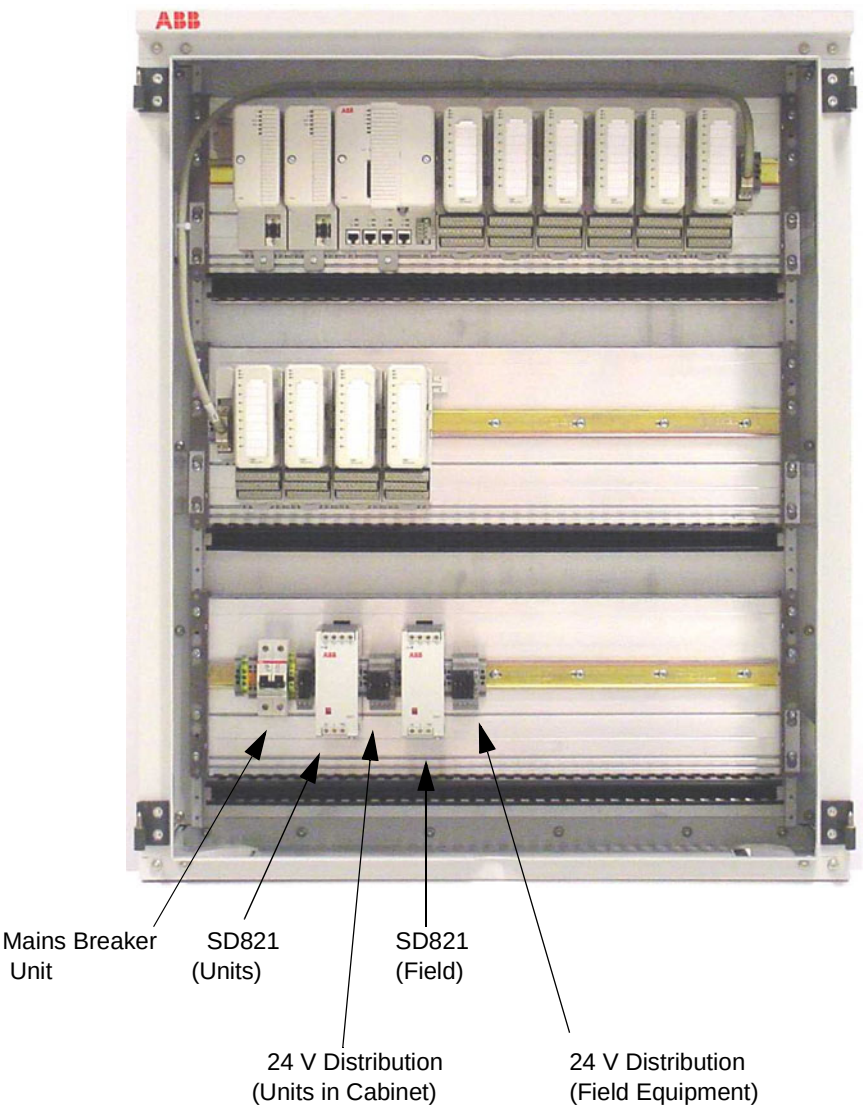


Figure 24. Wall Cabinet – Dual Power Supply (Local/Field) Arrangement

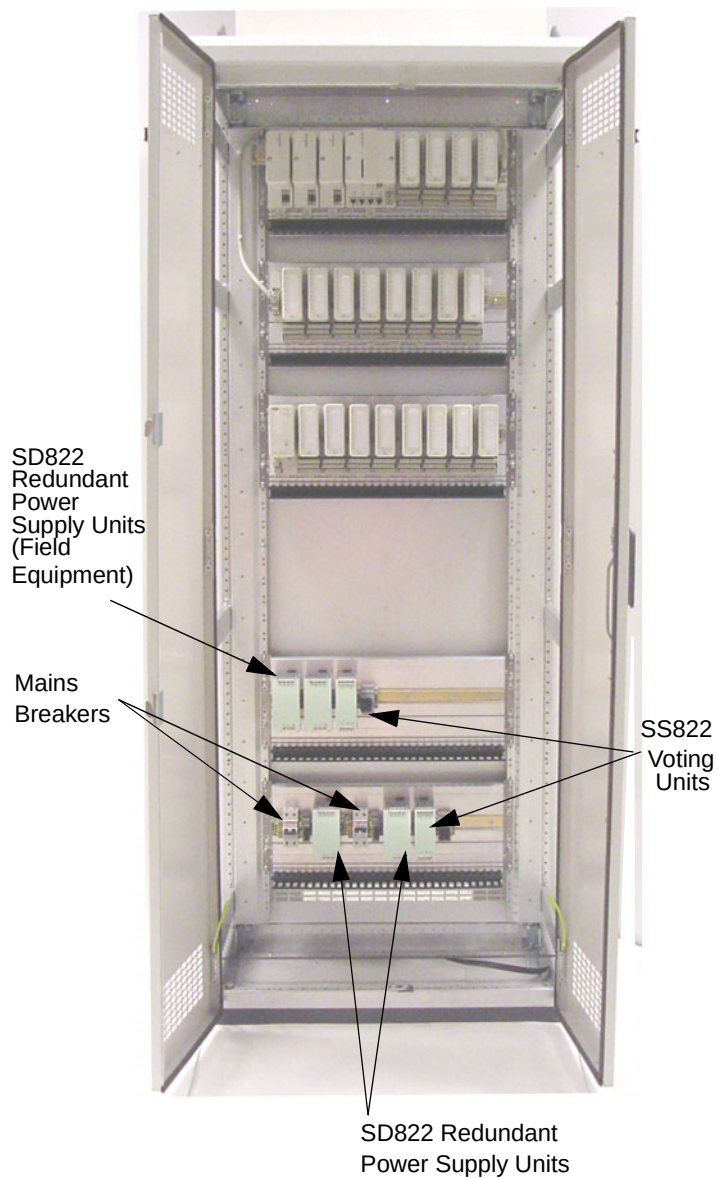


Figure 25. Floor Mounted Cabinet (Horizontal Unit Arrangement)

Mounting Dimensions for proper Ventilation

To maintain adequate cooling airflow through the AC 800M Controller units, there must be no obstruction within 50 mm (2 in) above and 25 mm (1 in) below the units, as shown in [Figure 26](#) on page 90. **Note** that the CPU and Communication Interfaces must be mounted on a **horizontal** DIN-rail.

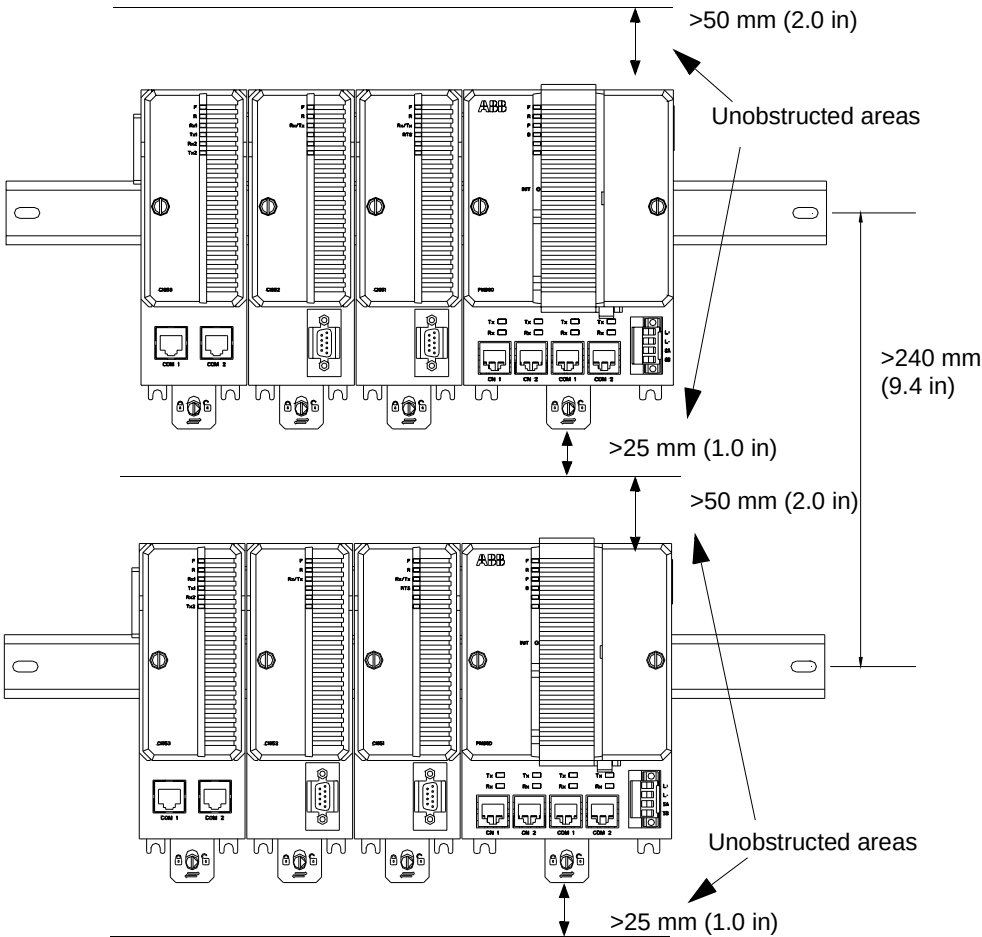


Figure 26. Ventilation Requirements – Minimum Mounting Dimensions

Section 3 Configuration

General Information

Using the engineering tool Control Builder, it is possible to configure hardware (I/O and communication units) and make application programs with control languages according to IEC 61131-3. Programs can be compiled and run off-line as an aid to process simulation before finally downloading an application to the controller. The Control Builder offers a set of options, each with its own set of properties. Simply select the option that is closest to system requirements. For further information, see [Related Documentation](#) on page 17.

- Control Builder M Documentation – for configuration information
- Control Software Documentation – for available functionality.

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

Connecting Control Builder M

The Control Builder installed in a PC is normally connected to the AC 800M Controller via the Control Network and the CN1 or CN2 ports on the controller (see [Figure 27](#) on page 92).

Alternatively the Control Builder may be connected via the COM4 port (RS232-C) 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 CB can not be accessed by the Backup CPU.



Note that if the firmware in the AC 800M is not running correctly, then it is likely that the CN1 and CN2 ports will not be usable. However, the connection via the COM4 port is always available.

Connection to a Control Network

The 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.

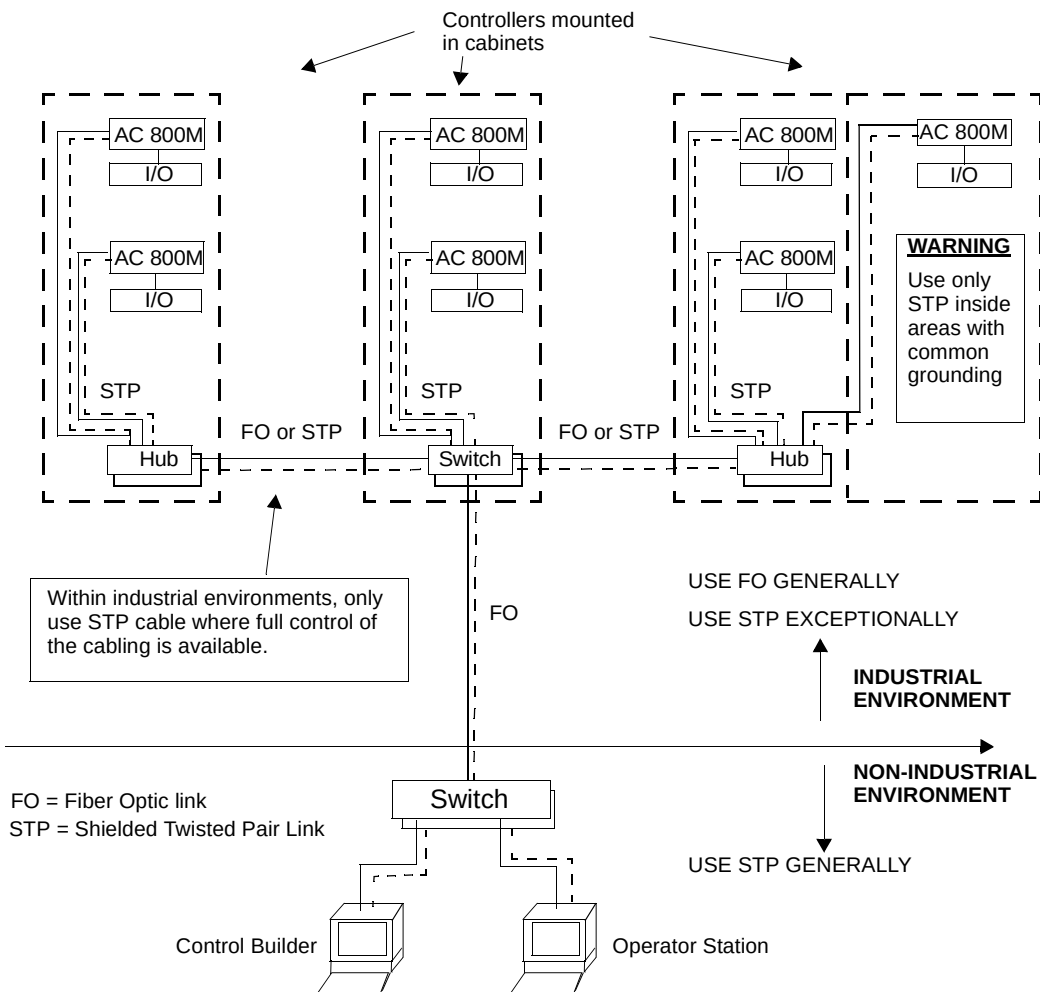


Figure 27. Example of AC 800M Controllers Connected to a Control Network

The network can utilize different and mixed link implementations such as Fast Ethernet and PPP. It provides for full redundancy 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 a Switch/Hub having both optical and electrical ports. See [Figure 27](#) on page 92.

For more information on the Control Network, see [Related Documentation](#) on page 17.

Communication Possibilities

Located on the processor unit (PM8xx/TP830), the following communication ports are available for 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 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 are connected to the primary network and all CN2 to the secondary network.

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

- COM3 is an RJ45 port for RS232-C with modem signals. Examples of protocols are Modbus, Siemens 3964R, COMLI or custom-design. For more details, see [Related Documentation](#) on page 17.
- COM4 is an RJ45 port for connection of service tools (see [Connecting Control Builder M](#) on page 91). 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 14](#) on page 94.

Table 14. Interfaces Available on the CEX-bus

Interface	Number of Interfaces on CEX-bus		Number of ports per Interface
	Maximum	Total	
CI851 (PROFIBUS DP)	12	12	1
CI852 (FOUNDATION Fieldbus)	12		1
CI853 (RS232-C)	12		2
CI854 (PROFIBUS DP-V1)	12		2
CI855 (Ethernet for MasterBus 300)	12		2
CI856 (S100)	12		1
CI857 (INSUM)	12		1

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

Controller IP Addresses

Before a redundant hardware installation you have to consider the following.



Remember that the Backup controller IP Addresses must be set in the primary Processor Unit. This can only be done through the IPConfig tool.

There are three alternatives:

- Disable interface.
- Use default rule.
- Specify an address of your own.

Use Default rule if not in conflict with any other IP-address on the network.



In the case you need to set an IP address to a redundant CPU, the backup CPU needs to be turned off (powered down). Otherwise the backup CPU takes over and you will not be connected.

Setting CPU as Redundant in Control Builder M

The redundant PM861/PM864 must be set as redundant in the Control Builder M Project Explorer. Also see Hardware Configuration and Redundancy in the Control Builder M online help.

I/O Systems

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

- ModuleBus for the S800 I/O units only.
- Via CI856 for connection of S100 I/O.
- PROFIBUS DP and PROFIBUS DP-V1 for all I/O systems and units equipped with an adapter suitable for PROFIBUS DP or PROFIBUS DP-V1 connections.



S800 I/O units can also be connected to PROFIBUS DP and DP-V1.

For more information on supported I/O systems and units, see [Related Documentation](#) on page 17.

ModuleBus

The ModuleBus in the AC 800M controller consists of one electrical and one optical unit:

- Electrical ModuleBus, (see [Figure 28](#) on page 97) – 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 AC800M is running in single CPU configuration.

- Optical ModuleBus (see [Figure 28](#) on page 97) – 7 clusters (groups), with maximum $7 \times 12 = 84$ S800 I/O units connected.

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.

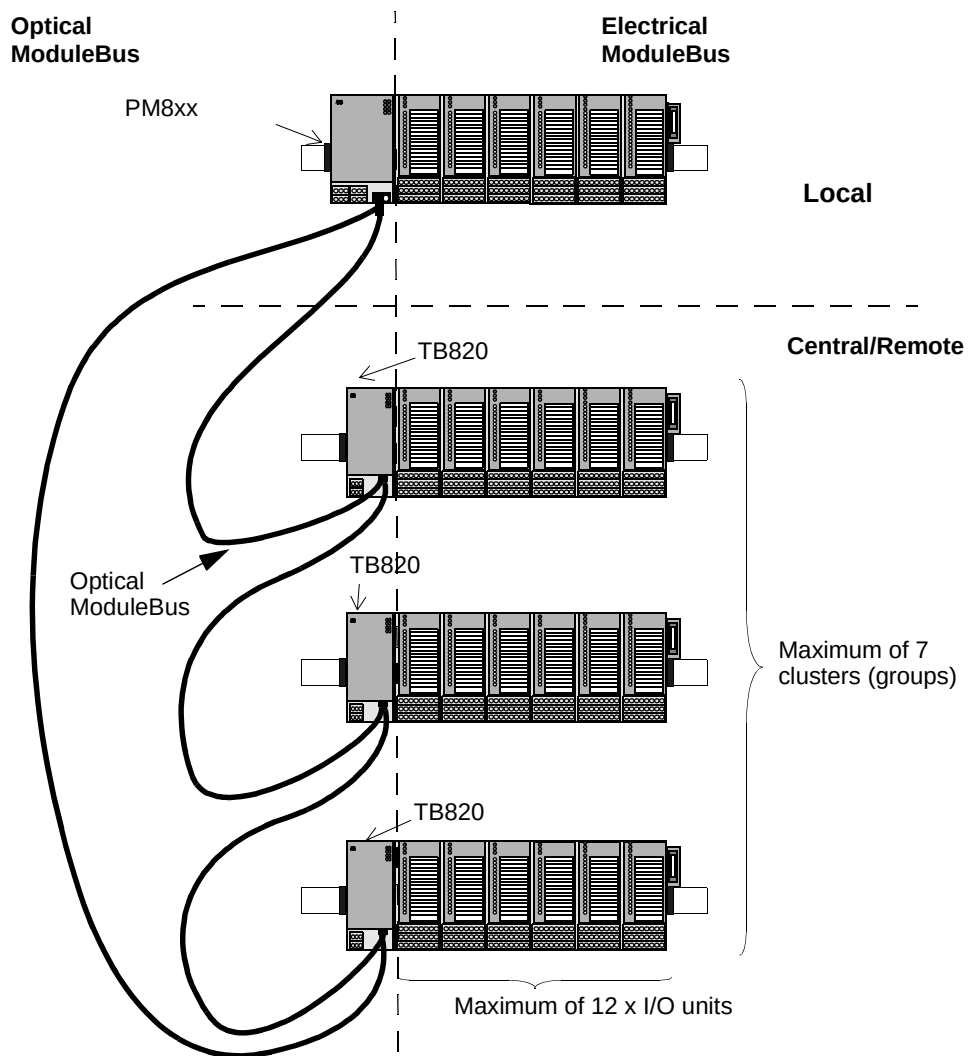


Figure 28. Electrical and Optical ModuleBus Configuration

In redundant CPU configuration, connection of S800 I/O is carried out through the optical ModuleBus. Each CPU is connected to one TB840 on each cluster (see [Figure 29](#) on page 98).

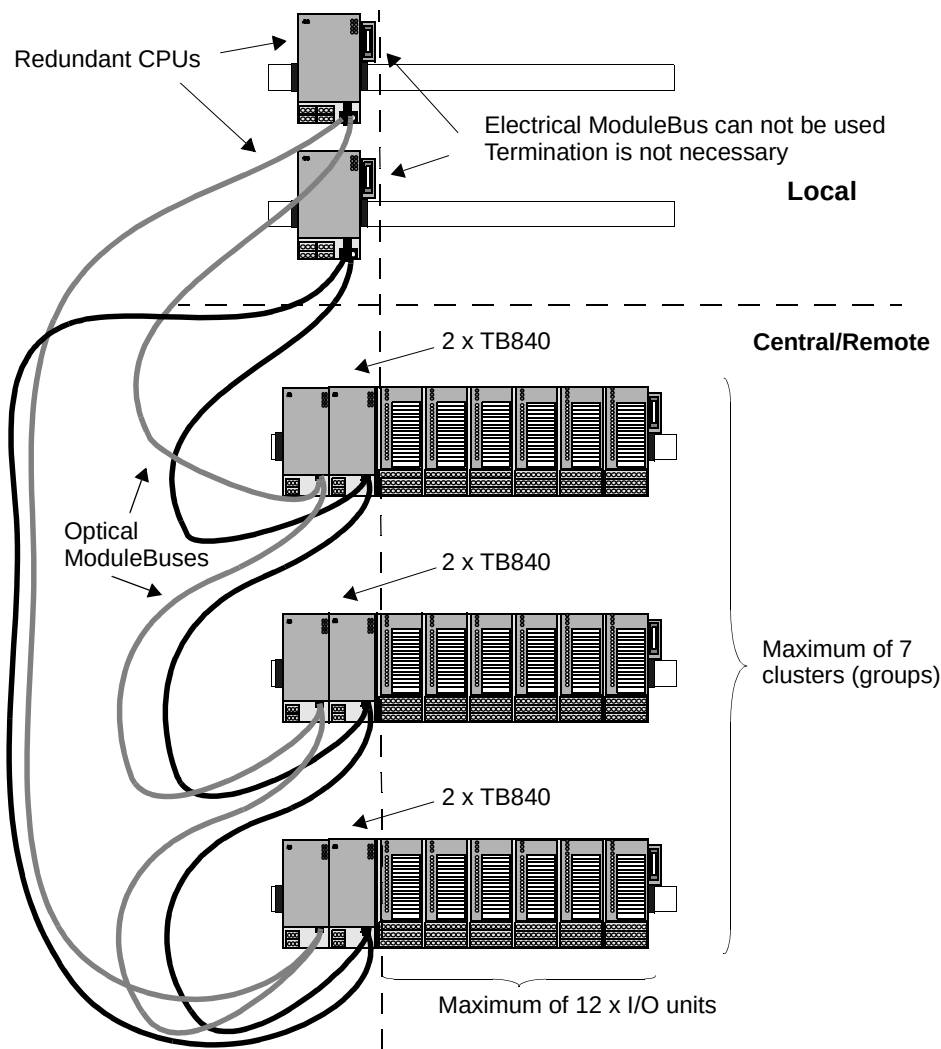


Figure 29. Optical ModuleBus connection in redundant CPU configuration

PROFIBUS DP and PROFIBUS DP-V1

A PROFIBUS DP/DP-V1 segment, capable of providing up to 32 nodes, can be directly connected to a PROFIBUS DP Interface unit type CI851/TP851, or a PROFIBUS DP-V1 Interface unit, type CI854/TP854. This segment can be further extended using repeater units.

PROFIBUS PA can be connected to PROFIBUS DP/DP-V1 via a gateway. 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 and PROFIBUS DP-V1:

- S800 I/O and/or S800L I/O via FCI – refer to S800 I/O documentation (see [Related Documentation](#) on page 17).
- S200 I/O and/or S200L I/O via Fieldbus Adapter 200-APB12 – refer to S200 I/O documentation (see [Related Documentation](#) on page 17).
- Other I/O systems can also be connected to PROFIBUS DP and PROFIBUS DP-V1. 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 [Related Documentation](#) on page 17.

Drive System

ABB Standard (Std) and Engineered (Eng) Drives can be connected to AC 800M via the optical ModuleBus or via PROFIBUS DP and CI830.

ModuleBus

In single CPU configuration, ABB Drives can be connected to the processor unit via the optical ModuleBus. See [Figure 30](#) on page 101. The number of ABB Drives which can be connected to the optical ModuleBus, can be described by the following equation:

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

PROFIBUS DP and CI830

In single and redundant CPU configuration, ABB Drives can be connected via PROFIBUS DP and CI830. See [Figure 30](#) on page 101. Only Standard Drives can be connected to CI830. Fourteen (14) Standard Drives can be connected to each CI830 if there are no I/O units connected. For the number of Drives that can be connected to the same CI830, when both I/O units (TB820) and Standard Drives are connected, refer to documentation about FCI for PROFIBUS DP. See [Related Documentation](#) on page 17.

For more information about ABB Drives and its types (Std and Eng) refer to S800 I/O documentation, see [Related Documentation](#) on page 17.

For information about Branching Unit ([Figure 30](#) on page 101) see ABB Drive System documentation.

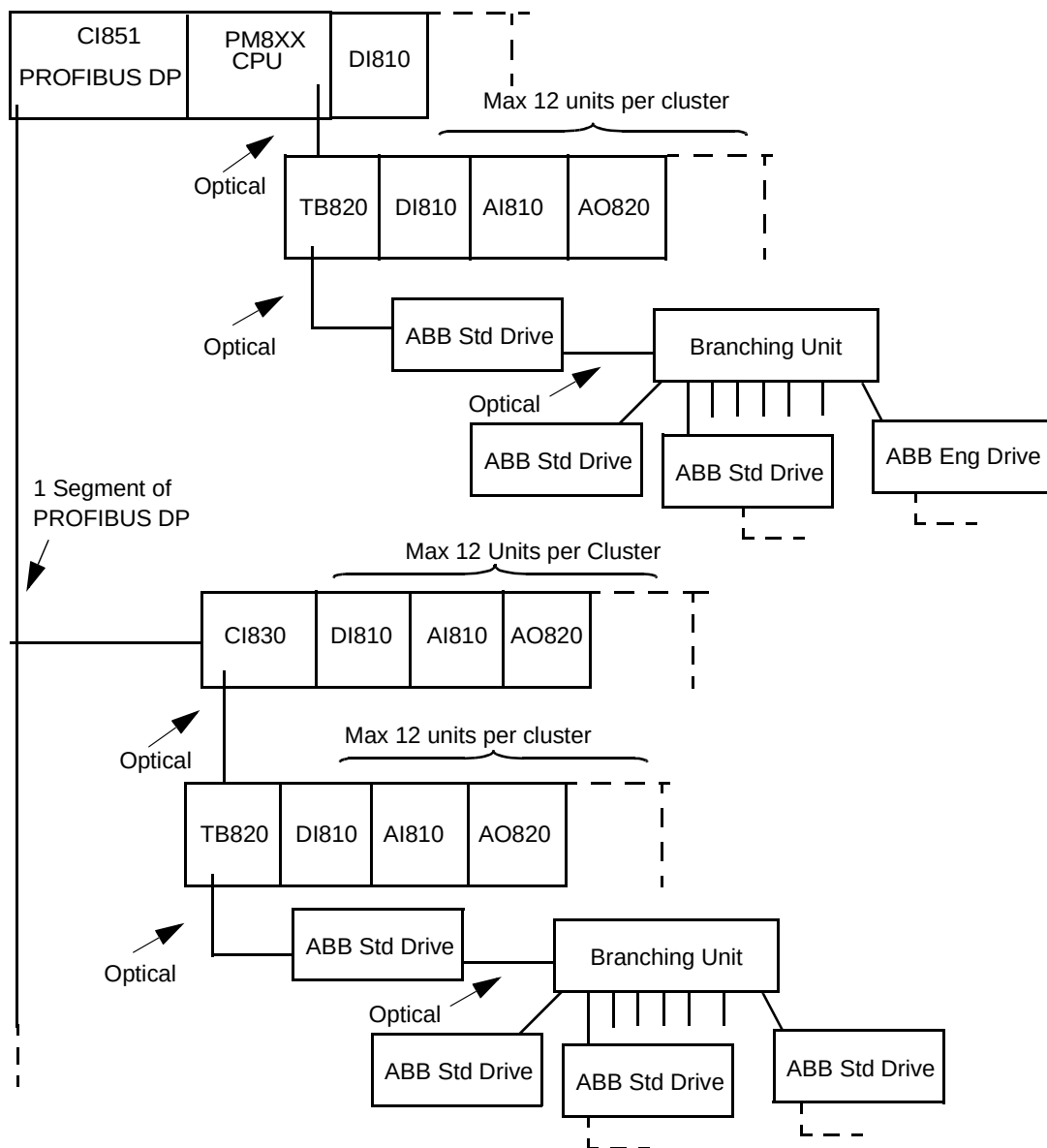


Figure 30. Example of Connection of ABB Drives in Single CPU Configuration

Power Supply System

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

Configurations

[Figure 31](#) on page 106 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 SS822 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 and PROFIBUS DP-V1.

Cabinet containing the 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 can power to the units be taken from another cabinet)
- use **separate** power supplies for Powering Units and Powering Field Equipment (see [Figure 24](#) on page 88 and [Figure 25](#) on page 89).

Cabinet containing I/O system

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

Powering Units in the Cabinet

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

- PM8xx, which also powers all communication interfaces (via the CEX-bus) and all S800 I/O units connected to its electrical ModuleBus.
- TB820V2/TB840 (optical modem for S800 I/O) which also powers all S800 I/O units connected to its electrical ModuleBus.
- CI830 (PROFIBUS DP interface for S800 I/O) which also powers all S800 I/O units connected to its electrical ModuleBus.
- PROFIBUS DP and PROFIBUS DP-V1 adapters for other I/O systems (depending on the supply arrangement for the I/O units, it may be necessary to connect power to each I/O unit).
- Communication modems located in the cabinet.

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

Powering Field Equipment outside the Cabinet

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

Interference

Powering field equipment from a power supply located in the AC 800M Controller cabinet often requires the use of long 24 V DC cables that can easily pick up local interference and direct it straight back to the power supply units. When installing the cables follow the Field Cables, given under [Cables](#) on page 45.

Short circuit at the power supply output

The SD82x 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 24](#) on page 88 and [Figure 25](#) on page 89).

Sectioning the 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 31](#) on page 106).

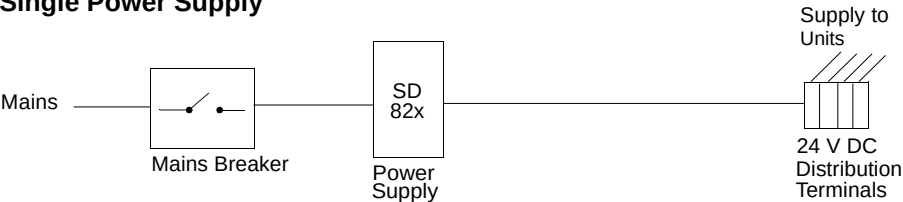
However, it should be noted that the same Mains Breaker Unit can be used to control and isolate both power supplies. Alternatively, independent Mains Breakers can be used on each spur (see [Figure 32](#) on page 107).

Powering from an External +24 V DC Source

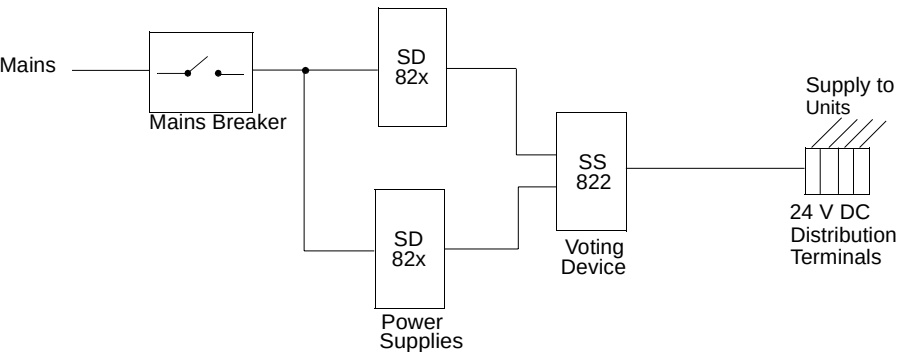
The AC 800M Controller can be powered from an external +24 V DC source. This source is often common for many different types of plant equipment, resulting in long power cables to the AC 800M Controller. Furthermore, heavy load changes can cause variations in controller supply voltage making it necessary 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 1ms, then an energy reservoir must be used for Powering Units. The recommended solution is to use a DC/DC converter in the controller cabinet. This converter can also provide isolation between the AC 800M supply and the external DC source and eliminate grounding problems between the controller and other parts connected to the same source.

Single Power Supply



Redundant Power Supplies



Redundant Mains Power Supplies

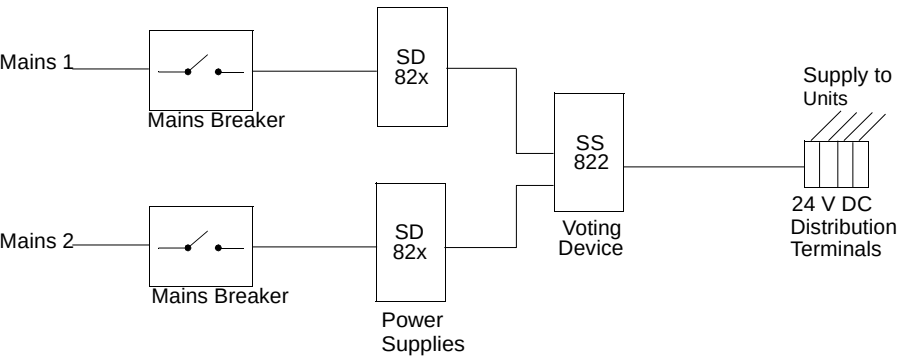
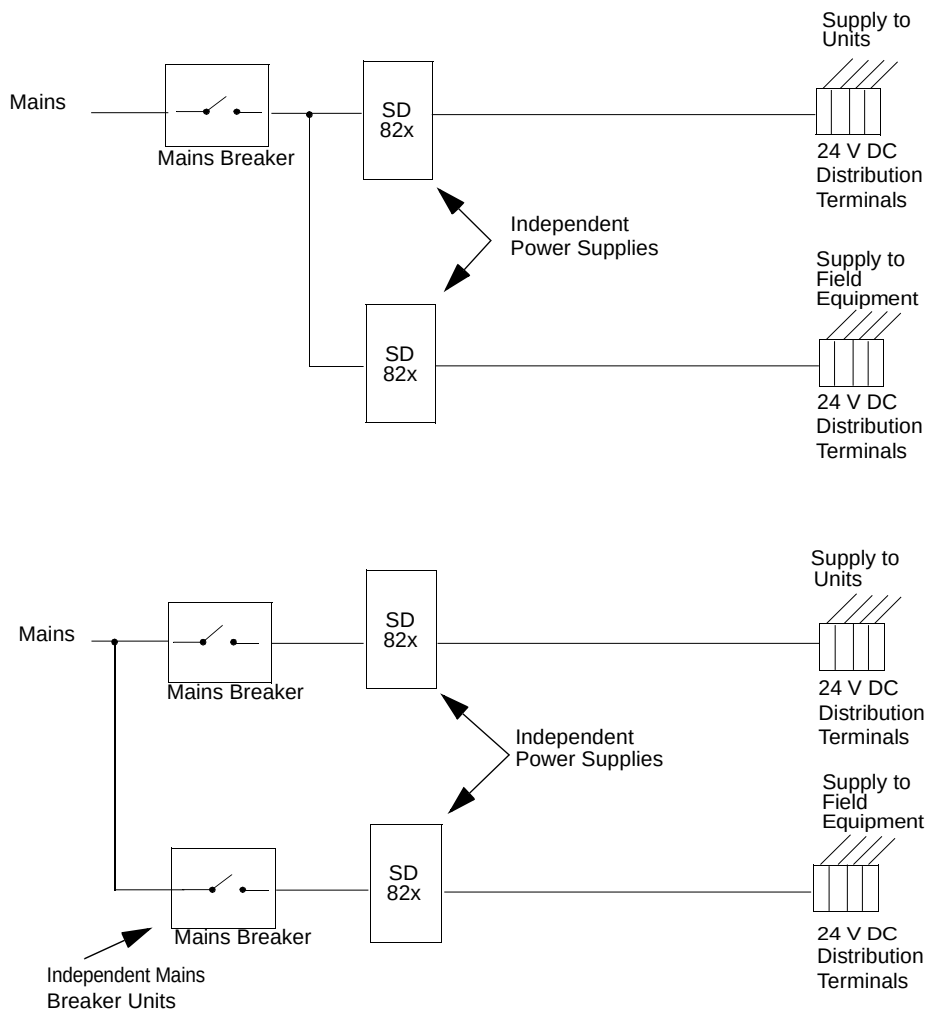


Figure 31. Power Supply Options for AC 800M Units

*Figure 32. Powering Field Equipment*

Section 4 Operation

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

AC 800M Controller (PM8xx)

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

LED Indicators

Table 15. 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 program.
R(un)	Green	Normal state – ON Re-start (INIT) temporarily extinguishes R(un). At restart press the (INIT) push button (3 sec. or more) until R(un) flashes. May also be operated by software program.
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.

Table 15. PM8xx – LED Indicators (Continued)

Marking	Color	Function
B(attery)	Green	Normal state – ON Lit when condition of internal or external battery is satisfactory. The LED is controlled by a software battery voltage test – BATTOK ⁽¹⁾ .
Tx	Yellow	Data Transmission CN1 + CN2 and COM3 + COM4 Flashes in synchronization with Tx traffic
Rx	Yellow	Data Reception CN1 + CN2 COM3 + COM4 Flashes in synchronization with Rx traffic
Valid for PM861/PM864		
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.

Switches and Push buttons

Table 16. PM8xx – Switches and Push buttons

Marking	Type	Function
INIT	Manual Push button	Initiates 1. <u>Cold Restart</u> if INIT is held less than 2.5 seconds. 2. <u>Controller Reset</u> 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.

Connectors

Table 17. PM8xx/TP830 – Connectors

Marking	Function
L+ L– SA SB	External Power Supply Connection +24 V DC supply 0 V Redundant Power Supply monitoring input Redundant Power Supply monitoring input
SH B+ B–	External Battery Connection Shield (Screw Connector) Battery Positive (Screw Connector) Battery Negative (Screw Connector)
Tx Rx	ModuleBus Connection Data Transmission Port (Optical) Data Reception Port (Optical) Note – Duplex or Simplex optical cables may be used.

Table 17. PM8xx/TP830 – Connectors (Continued)

Marking	Function
MODULEBUS	Provides expansion of I/O unit capability.
CEX-BUS	Provides extension of on-board communication ports.
Valid for PM861/PM864	
RCU Link Connector	Provides information and data transfer between Primary and Backup CPU in redundant configuration.

Start-up

Refer to relevant document (see [Related Documentation](#) on page 17) for information on:

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

Start Modes

Warm Start

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

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

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

Cold Restart

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

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

Cold Restart in Redundant Configuration

To restart CPUs running in redundant configuration:

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

Controller Reset

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

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

Controller Reset in Redundant Configuration

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

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

Automatic Switch-Over to Backup CPU

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

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



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

Verification of Satisfactory AC 800M Operation

To affirm, following start-up, that the AC 800M Controller and all associated units are operating correctly, see [Table 18](#) on page 115.

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 128.

Table 18. 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
CI851 PROFIBUS DP Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI852 FOUNDATION Fieldbus Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI853 RS232-C Interface Unit	
F(ault) Red LED must be OFF	OK
R(un) Green LED must be ON (steady)	OK
CI854 PROFIBUS DP-V1 Unit	

Table 18. AC 800M Controller – Verification of Satisfactory System Operation

LED Indicator Status	AC 800M Controller Status
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
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

Verification of Redundant CPU

Check, in redundant configuration, the following LED indicators on PM861/PM864 (see [Table 19](#) on page 117).

Table 19. AC 800M Controller (PM861/PM864) – 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

To check that the redundancy, i.e. the backup CPU, is working correctly, perform a manual switch-over from the Primary CPU to the Backup CPU. 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 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 18](#) on page 115.

Section 5 Maintenance

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



Warning. Before attempting maintenance or troubleshooting, read the [Safety Summary](#) on page 21. Failure to do so could lead to personal injury or damage to equipment.

Preventive Maintenance Frequency Schedule

Table 20. 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: • 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 120
5 Years	SB821 External Battery (if fitted)	Change battery See SB821 External Battery Unit on page 123

Changing the Battery

Internal Battery

The internal battery is mounted inside the PM8xx processor 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 details of correct battery polarity, remove the right-hand cover from the battery housing (see [Figure 33](#) on page 121 and [Figure 34](#) on page 122).

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. In addition, status monitoring is only provided for one battery.



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

The battery must be exchanged whenever:

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

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

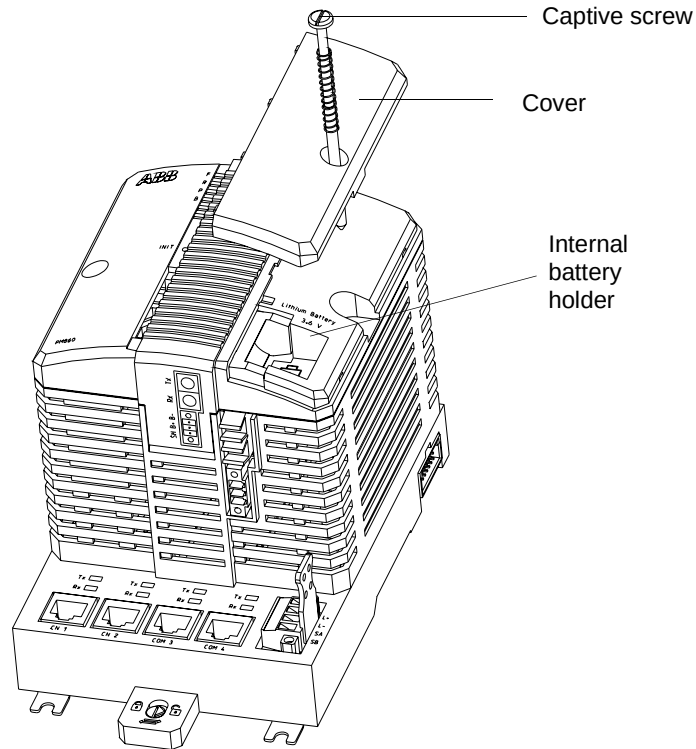


Figure 33. Right-hand Cover Removal – here shown with PM860

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.
3. Insert a serviceable battery and check that battery polarity and orientation are correct.
4. When power is re-established, ensure that the B(attery) LED is illuminated

5. Replace the PM8xx right-hand cover and tighten the screw.
6. Dispose of the run-down Lithium battery in an approved manner.

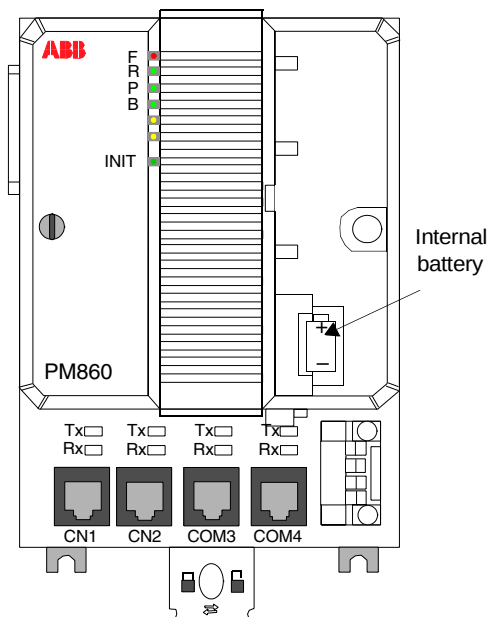


Figure 34. Internal Battery Location – here shown with PM860

SB821 External Battery Unit

The external battery is mounted inside the SB821 External Battery unit. Since the battery is not rechargeable, it is important to exchange it on a regular basis (refer to the Maintenance Frequency Schedule for further details). For access to the battery and housing, remove the cover (see [Figure 35](#) on page 125). 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. In addition, status monitoring is only provided for one 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.

Changing the Battery in an SB821 External Battery Unit

To change 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 193.
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.

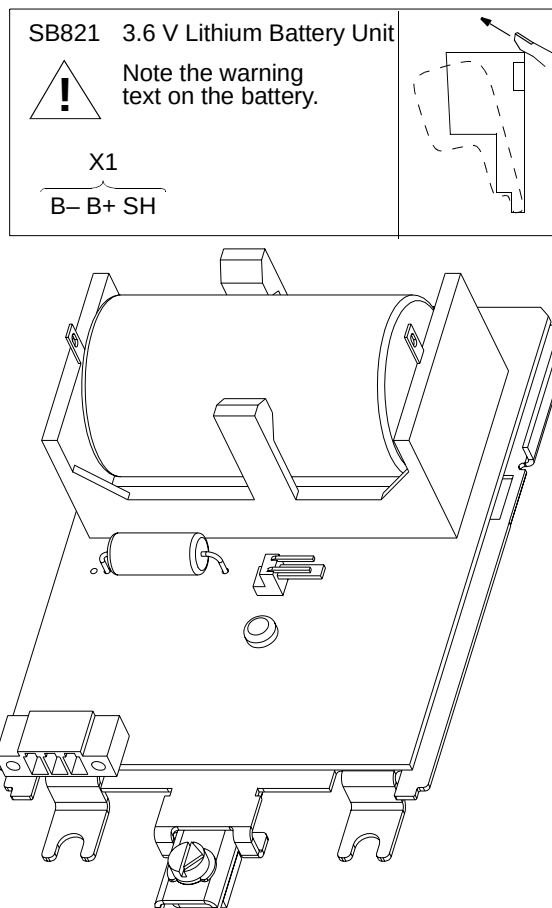


Figure 35. SB821 External Battery Unit – Cover Removed

Unit Change Online

Change 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).

CEX-bus

Communication interfaces

CI851/852/853/854/855/856 or CI857 Can be removed or replaced online¹

Baseplates for CI85x Must not be changed online

ModuleBus

S800 I/O units Can be removed or replaced online

Module Terminal Units (MTU:s) Must not be changed online

Redundant CPUs

processor unit Can be removed or replaced online
(see below)

Exchange of CPU in Redundant Configuration

To exchange a halted processor unit:

1. Disconnect the RCU Link Cable optical ModuleBus cable from the processor unit to be exchanged.
2. Disconnect the Power Supply Socket from the processor unit.
 Do not, under any circumstance, remove the RCU Link Cable from the primary CPU now running in single state. Removing the cable might cause the CPU to stop.
3. Using a blade screwdriver, release the two spring-loaded captive screws on the processor unit cover.
4. Carefully remove the processor unit.
5. Fit the new processor unit and tighten the screws.

1. To configure a replaced communication interface, a fast reset of the controller must be done. For I/O units connected to the communication interface, channels will be set to the predetermined value configured by the user (OSP values) until the communication interface is configured.

6. Reconnect the Power Supply Socket to the new processor unit.
7. Reconnect the optical ModuleBus and RCU Link Cable.
8. Press the INIT push button on the replaced processor unit. Observe the startup procedure and make sure that Dual mode is reached, that the Dual LED is lit on both processor units.



The just replaced (broken) CPU might still have the IP address of the primary CPU. If it, for example, is installed later on for testing on the same control network it might disturb the communication to the active system running the application. Therefore use the IP Config tool to modify the IP address of the just replaced CPU immediately.

Corrective Maintenance Procedures

Changing Fuses – ModuleBus and CEX-bus

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 2AF
 - Lower Fuse-holder – CEX-bus – fuse 3.15AF
4. Using a blade screwdriver, carefully unscrew the fuse-holder containing the defective fuse.
5. Remove the fuse.
6. Insert a new fuse and replace the fuse holder.
 - Upper Fuse-holder – ModuleBus – fuse 2AF
 - Lower Fuse-holder – CEX-bus – fuse 3.15AF
7. Replace the processor unit and tighten the cover screws.

8. Check that the relevant LED lights up.

Fault-Finding Procedures

PM8xx Processor Unit

Table 21. PM8xx – Fault-Finding Procedure

Fault	Possible Cause and Corrective Action
F(ault) LED is ON	Controller Re-start, (INIT), in progress. • Wait for Controller restart to finalize. If condition persists: • Check the CEX-bus fuse. • Check for a unit failure on the CEX-bus. See Fault-Finding, Table 24 on page 130, Table 25 on page 131, Table 26 on page 134, Table 27 on page 135 and Table 30 on page 138.
R(un) LED is OFF	No application loaded on the Controller. • Load application. • Restart Controller (INIT push button). Controller application failed. • Reload application. • Restart Controller (INIT push button).
B(attery) LED is flashing	Battery power (Internal or External) is below an acceptable level or non-existent. • Install new battery. External battery cable disconnected. • Connect external battery cable. See Fault-Finding Table 23 on page 129.

PM861/PM864 Processor Unit in Redundant Configuration

Table 22. PM861/PM864 Redundant Configuration – Fault-Finding Procedure

Fault	Possible Cause and Corrective Action
DUAL LED is OFF on both CPUs	The CPUs are in the process of being re-started or configured. Allow time for this to finalize. RCU Link Cable disconnected. • Connect the RCU Link Cable. Different Control Software in the two CPUs. • Upgrade the CPUs with the same control software.

Internal Battery / SB821 External Battery

Table 23. Internal / SB821 External Battery – Fault-Finding

Fault	Possible Cause and Corrective Action
B(attery) LED indicator on PM8xx processor unit is flashing	• Renew the PM8xx internal battery or, (if fitted) • Check external battery connections. If condition persists • Renew the External battery, see SB821 External Battery Unit on page 123.
The system time is incorrect following a power failure	• Ensure that the software installed supports the real-time clock. • Renew the External Battery, see SB821 External Battery Unit on page 123.

PROFIBUS DP – CI851

Table 24. PROFIBUS DP CI851 – Fault-Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	The CI851 board is in the process of being re-started or configured. Allow time for this to finalize. If the condition persists, and all other units on the CEX-bus have non-illuminated LEDs: • Check the CEX-bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI851 unit.
F(ault) LED is ON	Check all cables and connectors for damage, loose or incorrect terminations. • Repair as necessary.
R(un) LED is flashing	Check that the relevant units are sending data. Check if the CI851 board is in the process of being restarted or configured. If so, allow time for this finalize. If the condition persists: • Halt the application program and initiate a restart. • Replace the CI851 board.

FOUNDATION Fieldbus – CI852

Table 25. FOUNDATION Fieldbus CI852 – Fault-Finding

Fault	Possible Cause and Corrective Action
R(un) and F(ault) LEDs are not ON	The CI852 board is in the process of being restarted or configured. Allow time for this to finalize. If the condition persists, and all units on the CEX-bus have non-illuminated LEDs: • Check the CEX-bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI852 unit.
F(ault) LED is ON	Use the Control Builder software to demand status information from the CI852 unit and proceed accordingly: • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI852 unit.

Table 25. FOUNDATION Fieldbus CI852 – Fault-Finding (Continued)

Fault	Possible Cause and Corrective Action
One or more field devices appear to be slow to respond or completely dead	1. A device may be: • Incorrectly addressed. • Connected with incorrect polarity. • Faulty and causing breakdown or heavy loading of the network. 2. The fieldbus cable may: • Be damaged causing a short-circuit, breaks or grounding of the data wires, (possibly intermittent). • Be incorrectly terminated. • Contain sections having reversed polarity due to incorrect connections. • Cause supply voltage drops due to damage or bad connections. 3. The network power supply may be faulty. • Rectify the network power supply.
The network problem is proving very difficult to solve	Give consideration to possible activities within the plant, such as maintenance or repair work, which may be causing the problem. Having totally ruled this out, then proceed as follows: Check the DC supply voltage in powered networks by means of a digital voltmeter having an input capacitance of less than 1000 pF.

Table 25. FOUNDATION Fieldbus CI852 – Fault-Finding (Continued)

Fault	Possible Cause and Corrective Action
The network problem is proving very difficult to solve (continued).	Use an oscilloscope to check the communication signals for abnormalities. • The oscilloscope must be of differential or battery operated type. • Probes must have a minimum of 1 MOhm input resistance, and less than 1000 pF input capacitance. Disconnect sections of the network, including the Ethernet port via the PM8xx processor unit, until it is reduced to a size that functions correctly. • A hand-held fieldbus master unit should be used to make connections at different points in the network. • Locate the unserviceable section by reconnecting the sections one at a time. In the worst possible case, it may be necessary to remove devices one by one to identify the faulty item. • Cables can be checked using the ohmmeter (resistance) function of a digital voltmeter. Isolate the power supply and disconnect all other devices before making the check. • For large networks, a network analyzer should be employed. The analyzer must be suitable for use on FOUNDATION Fieldbus networks.

On-board RS232-C Channels – CI853

Table 26. On-board RS232-C Channels CI853 – Fault-Finding

Fault	Possible Cause and Corrective Action
The PM8xx is transmitting and the Tx1/Tx2 LEDs are flashing, but the connected device is not receiving data. OR The connected device is transmitting, but the Rx1/Rx2 LEDs are not flashing.	• Check that the communication interface cable is connected. • Check the hand-shake signals.
The Tx/Rx signals are flashing concurrently with transmission, but the messages are not being received correctly by the connected device.	• 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.

PROFIBUS DP-V1 – CI854

Table 27. PROFIBUS DP-V1 CI854 – Fault-Finding

Indication	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LED's are ON	The CI854 board is in the process of being restarted or configured. Allow time for this to finalize. If the condition persists, and no other unit LED on the CEX-bus is lit: • Check the CEX-bus fuse inside the PM8xx processor unit. • Initiate a reset signal (INIT) from the PM8xx processor unit. • Replace the CI854 unit.
F(ault) LED is ON	The CI854 board is in the process of being restarted, or a fatal error occurred. Allow time for this to finalize. If the status remains replace the CI854 unit.
RxA LED is OFF	No communication on Line A. • Check that slaves are connected to this line and configured. • Check all cables and connectors for damage and loose or poor connections.
RxB LED is OFF	No communication on Line B. • Check that slaves are connected to this line and configured. • Check all cables and connectors for damage and loose or poor connections.

MasterBus 300 Interface – CI855

Table 28. MasterBus 300 CI855 – Fault Finding

Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	The CI855 board is in the process of being restarted or configured. Allow time for this to finalize. If the condition persists, and no other unit LED on the CEX-bus is lit: • Check the CEX-bus fuse inside the processor unit • Initiate a reset signal (INIT) from the processor unit • Replace the CI855 unit
F(ault) LED is ON	Check all cables and connectors for damage and loose or poor connections. • Repair as necessary
R(un) LED is flashing	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. If the condition persists: • Halt the application program and initiate a restart. • Replace the CI855 board.

S100 I/O Interface – CI856

Table 29. 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: • 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.

INSUM Interface – CI857

Table 30. INSUM CI857 – Fault-Finding

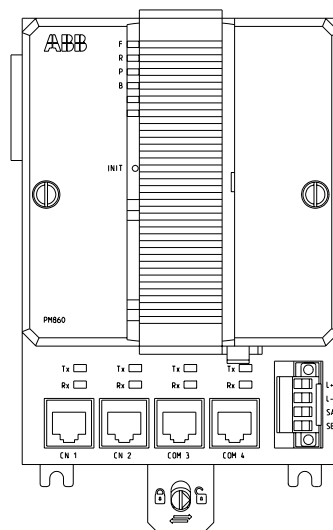
Fault	Possible Cause and Corrective Action
Neither R(un) nor F(ault) LEDs are ON	The CI857 board is in the process of being restarted or configured. Allow time for this to finalize If the condition persists, and no other unit LED on the CEX-bus is lit: • Check the CEX-bus fuse inside the processor unit. • Initiate a reset signal (INIT) from the processor unit. • Replace the CI857 unit.
F(ault) LED is ON	Check all cables and connectors for damage and loose or poor connections. • Repair as necessary.
R(un) LED is flashing	Check that the relevant units are sending data. Check if the CI857 board is in the process of being restarted or configured. If so, allow time for this to finalize. If the condition persists: • Halt the application program and initiate a restart. • Replace the CI857 board.
Tx1 LED is ON (not flashing)	The unit is not transmitting data. • Check the CB for a failure message.
Rx1 LED is ON (not flashing)	The unit is not receiving data. • Check all cables and connections.

Appendix A Hardware Units

PM856/PM860 and TP830 – Processor Unit

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, 10 Base-T)
 - COM3, serial port (RS232-C) with modem support
 - COM4, serial port (RS232-C) for service tool
- Basic communication is extendable by using additional communication interface units.



The data for PM856 is the same as for PM860 except for performance of application program execution, see [Performance Data](#) on page 144.

Technical Data

Technical data for PM856/PM860 and TP830 is described in [Table 31](#) on page 140.

Table 31. PM856/PM860 and TP830 – Technical data

Item	Value
Memory	2 MB flash PROM (firmware storage). 8 MB of SDRAM (5 MB available for application program and 3 MB used for executable firmware).
Power Dissipation	5W typical 10W 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 - Max input voltage 30V - Min. input voltage for high level 15V - Max input voltage for low level 8V 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 31. PM856/PM860 and TP830 – Technical data (Continued)

Item	Value
Weight	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 135mm (4.7 x 7.3 x 5.3in.) 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 32](#) on page 141.

Table 32. PM856/PM860 and TP830 Interfaces – Technical data

Item	Value
CN1 and CN2 Ethernet Communication	
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 115200 baud. 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200, 38400, 115200 baud. This range of transmission rates may be limited by the communication protocol used. Refer to the communication protocol documentation.
Signal levels	RS232-C
Connector	RJ45

Table 32. PM856/PM860 and TP830 Interfaces – Technical data (Continued)

Item	Value
Modem support	Yes
COM4 Serial Communication	
Communication speed	9600 baud
Signal levels	RS232-C
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	• Max 24 V – 1.0 A (short circuit proof, fuse 2A fast) • Max 5 V – 1.5 A (short circuit proof)
Supply voltage variation	24 V – follows the input power at L+
Optical ModuleBus	
I/O capacity	up to 7 x S800 I/O clusters each with 12 units
Connector	• Duplex Fiber Optic Cable • Simplex Fiber Optic Cable
CEX-bus	
Capacity	up to 12 communication interfaces
Supply current	Max 24 V – 2.4 A (fuse 3.15 A fast)

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 33](#) on page 143.



The figures given in [Table 33](#) on page 143 are valid if the batteries are installed after a normal CPU power-up, allowing for the memory back-up function to be activated.

Table 33. Back-up times for PM856/860

Source	Back-up time
Internal battery	Minimum 48 hours
External battery	Minimum 1 month

[Table 34](#) on page 143 shows Internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 193.

Table 34. PM856/PM860 and TP830 – Internal battery data

Item	Value
Internal battery	
Battery Type	Low rate lithium, 3.6V, 950 mAh
Size	ANSI size 1/2 AA, IEC size 1/2 R6
Lithium content	0.3 g

Electro-magnetic Compatibility and Electrical Safety

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 15](#) on page 109.

Performance Data

The PM856 and PM860 processor units have the same internal design. They differ only in performance when executing an application program.

Using the same application program in PM856 and PM860, the difference in execution time can be expressed as:

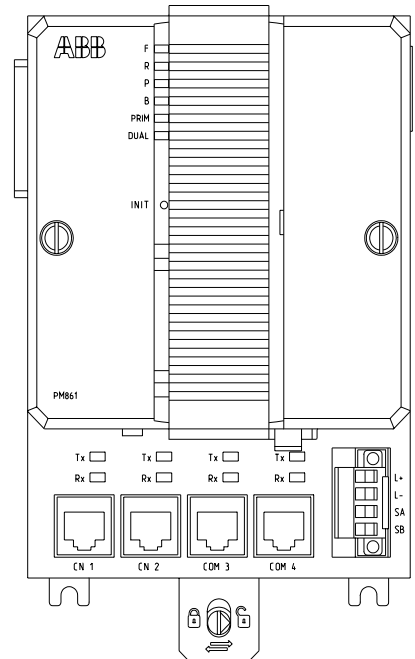
Execution time in PM856 = 2 *Execution time in PM860

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 PM856**.

PM861 and TP830 – Processor Unit

Key Features

- MPC860 Microprocessor running at 48 MHz.
- 16 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
 - CN1 + CN2, Ethernet ports (IEEE 802.3, 10 Base T)
 - COM3, serial port (RS232-C) with modem support
 - COM4, serial port (RS232-C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundancy configuration.



Technical Data

For technical data on PM861 and TP830, see [Table 35](#) on page 146.

Table 35. PM861 and TP830 – Technical data

Item	Value
Memory	2 MB flash PROM (firmware storage). 16 MB of SDRAM (11 MB available for application program and 5 MB used for executable firmware).
Power Dissipation	6W typical 11W typical (incl. full supply to ModuleBus and CEX-bus, see Appendix B, Power Consumption).
Current Consumption	250 mA typical (430 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 - 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 35. PM861 and TP830 – Technical data (Continued)

Item	Value
Weight	1200 g (2.6 lb) (package PM861K01). 2800 g (6.1 lb) (package PM861K02).
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 32](#) on page 141.

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 36](#) on page 147.



The figures in [Table 36](#) on page 147 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 36. Back-up times for PM861

Source	Back-up time
Internal battery	Minimum 36 hours
External battery	Minimum 3 weeks ⁽¹⁾

(1) 3 weeks is valid for one PM861 processor unit.

[Table 34](#) on page 143 shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 193.

Electro-magnetic Compatibility and Electrical Safety

PM861/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

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

LED Indicators

See [Table 15](#) on page 109.

Performance Data

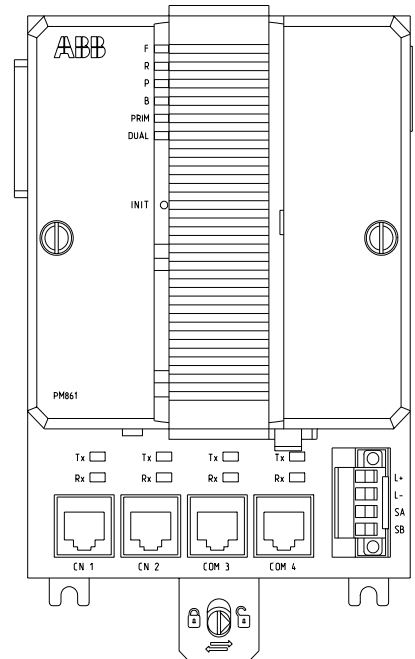
The PM861 processor unit, in single configuration, has the same performance data as the PM860. In redundant configuration the execution performance is somewhat lower than in single configuration.

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

PM864 and TP830 – Processor Unit

Key Features

- MPC862 Microprocessor running at 96 MHz.
- 32 MB RAM with internal or external battery back-up facility.
- 12 x S800 I/O units can be connected to the electrical ModuleBus.
- Four on-board communication ports:
 - CN1 + CN2, Ethernet ports (IEEE 802.3, 10 Base T)
 - COM3, serial port (RS232-C) with modem support
 - COM4, serial port (RS232-C) for service tool
- Basic communication is extendable by using additional communication interface units.
- Redundancy Control Link, for use in redundancy configuration.



Technical Data

For technical data on PM864 and TP830, see [Table 37](#) on page 150.

Table 37. PM864 and TP830 – Technical data

Item	Value
Memory	2 MB flash PROM (firmware storage). 32 MB of SDRAM (27 MB available for application program and 5 MB used for executable firmware).
Power Dissipation	6.9W typical 11.9W 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 - 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 37. PM864 and TP830 – Technical data (Continued)

Item	Value
Weight	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 32](#) on page 141.

Battery

The memory content is backed up with either an internal or external battery unit (SB821). For back-up time see [Table 38](#) on page 151.



The figures in [Table 38](#) on page 151 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 38. Back-up times for PM864

Source	Back-up time
Internal battery	Minimum 36 hours
External battery	Minimum 3 weeks ⁽¹⁾

(1) 3 weeks is valid for one PM864 processor unit.

[Table 34](#) on page 143 shows internal battery data. For external battery data, see [SB821 External Battery – AC 800M Memory Back-up](#) on page 193.

Electro-magnetic Compatibility and Electrical Safety

PM864/TP830 meets the requirements specified in EMC Directive 89/336/EEC.

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

LED Indicators

See [Table 15](#) on page 109.

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.

CI851 and TP851 – PROFIBUS DP Interface

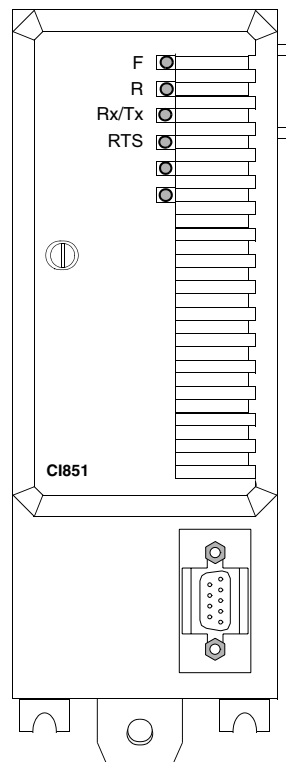
Key Features

- Provides one PROFIBUS DP port, (a DB9 female connector located on the TP851 Baseplate).
- Simple DIN-rail mounting
- The CI851 handles cyclic read and write messages to the slaves on the PROFIBUS DP. The minimum cycle time can be 1 ms, however, but this will depend on the baud rate used and the number of attached slaves.
- By using repeaters it is possible to connect a maximum of 124 nodes to one PROFIBUS DP (32 nodes are permitted on one segment).
- Pre-set, two-letter Alpha code locking device installed in unit base prevents mounting of incompatible components.

Description

The CI851 / TP851 is used for connecting to remote I/O. Via an external gateway on PROFIBUS DP, field instruments (on PROFIBUS DP) can be connected to AC 800M. The TP851 Baseplate has one female DB9 connector for connecting PROFIBUS DP. The baseplate has a code lock, see [Table 6](#) on page 54, that prevents the installation of an incorrect type of unit onto the TP851 Baseplate.

The CI851 expansion unit contains the CEX-bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24V supply, via the CEX-bus. The PROFIBUS DP must always be terminated at the two outer nodes. ABB recommends the use of connectors with built-in termination since the fieldbus will always be terminated even if fully disconnected from the unit.



Functional Block Diagram

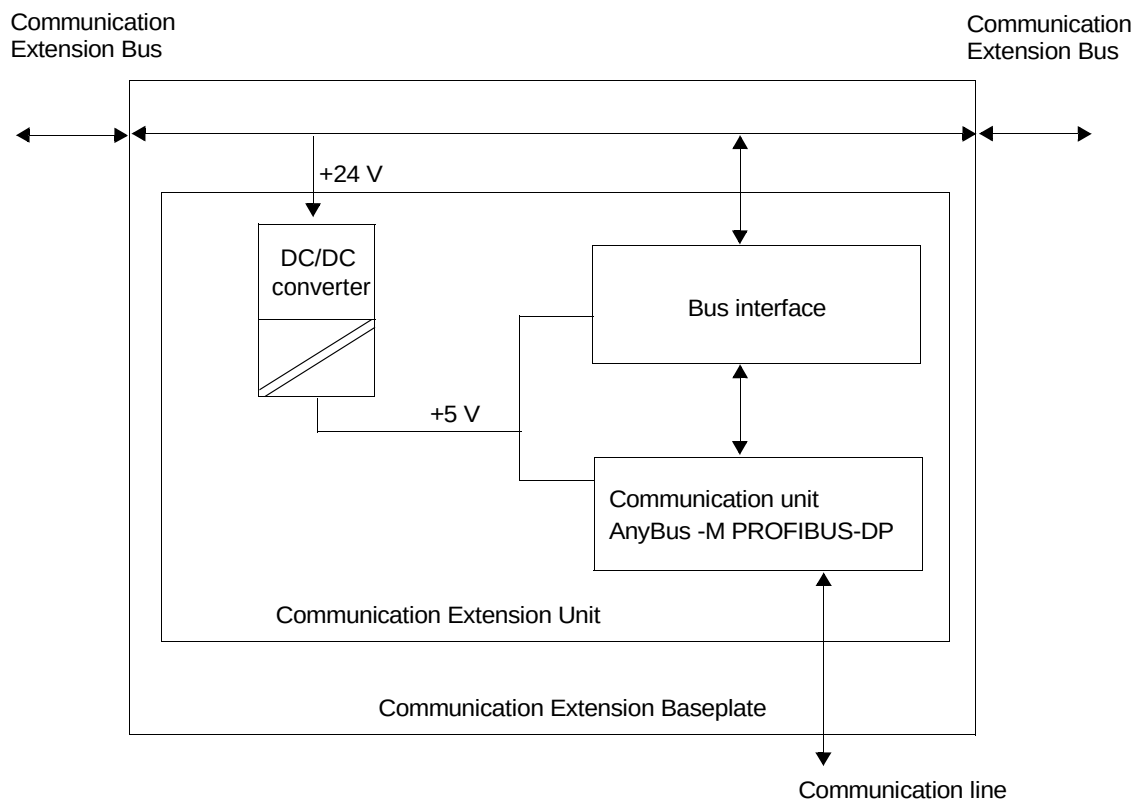


Figure 36. Block Diagram – CI851

Indicators

Table 39. CI851 – PROFIBUS DP 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.
Rx/Tx /Yellow	Transmission to or from the unit.
RTS /Yellow	Request to transmit from the unit.

Technical Data

Table 40. CI851 PROFIBUS DP Interface Specifications

Item	Value
Type	DP Master Class I
Protocol	PROFIBUS DP
Communication speed	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 kbit/s
Galvanic isolation	Yes
Status indicators	Run normally green, Fault exceptionally red, the two traffic indicators RTS and Rx/Tx are yellow flashing controlled by the traffic pace.
Connector	DB9, female
Current consumption (from CEX-bus 24 V DC)	150 mA typical (200 mA max.)
Power dissipation	3.6W typical

Table 40. CI851 PROFIBUS DP Interface Specifications (Continued)

Item	Value
Capacity	Max 32 loads
Protection Rating	IP20 according to EN60529, IEC 529
Weight	700 g (1.5 lb) (package CI851K01 with CI851 and TP851).
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in)

CI852 and TP852 – FOUNDATION Fieldbus H1 Interface

Key Features

- One FOUNDATION Fieldbus port provides a communication speed of 31.25 kbit/s (FF H1)
- Transformer isolated
- No power consumed from the FF H1 bus
- No power is supplied to the FF H1 bus
- Simple DIN-rail mounting
- Pre-set, two letter Alpha code lock, see [Table 6](#) on page 54, installed in unit base to prevent incorrect mounting of non-compatible components.

Description

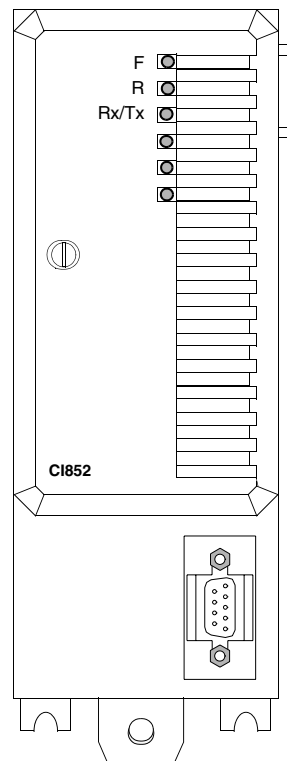
The CI852, connects the FOUNDATION Fieldbus H1 (FF H1) to the AC 800M. The FF H1 has a communication speed of 31.25 kbit/s and is intended for remote connection of field instruments. The CI852 is connected to the bus via a transformer, and as such neither supplies nor consumes bus electrical power.

The number of field instruments that can be connected via the CI852 depends on the physical limitations of the FF H1 network, together with any software limitations (refer to the software documentation).

The FF H1 bus allows reuse of existing cabling for 4-20 mA analog signals. This means the cables often become the dominant dimensioning factor.

An FF configurator tool can be connected directly to the FF H1 bus.

See also [Related Documentation](#) on page 17.



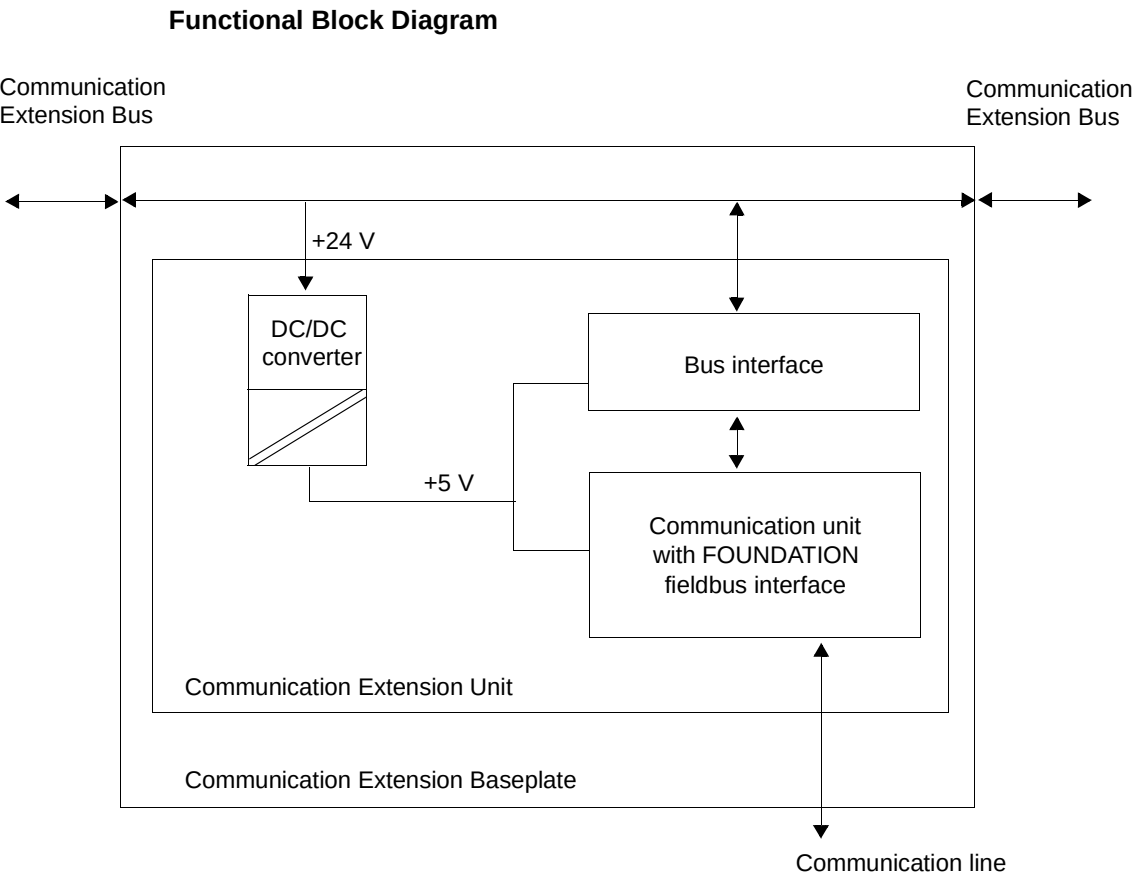


Figure 37. Block Diagram – CI852

Indicators

The CI852 FOUNDATION Fieldbus H1 interface has the following LED indicators.

Table 41. CI852 FOUNDATION Fieldbus H1 – LED Indications

Indication/Color	Function
F(ault) /Red	Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset.
R(un) /Green	Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.
Rx/Tx /Yellow	Transmission to or from the unit.

Technical Data

Table 42. CI852 Foundation Fieldbus Interface Specifications

Item	Description
Type	– Foundation Fieldbus H1 master and link schedule. – Note the complete controller has a HW capability necessary for a Foundation Fieldbus linking device.
Number of channels	Single channel Foundation Fieldbus H1 (31.25 kbit/s).
Protocols	Foundation Fieldbus H1 via port on CI852.
Communication speed	31.25 kbit/s (FF H1)
Allowed node address	20 – 247
Galvanic isolation	By means of transformer.

Table 42. CI852 Foundation Fieldbus Interface Specifications (Continued)

Item	Description
Status indicators	Red LED for error Green LED for run Yellow LED for traffic
Connector	Male 9-pin D-type connector.
Current consumption from CEX-bus 24 V	140 mA typical (200 mA max.).
Power dissipation	3.4W typical
Protection Rating	IP20 according to EN60529, IEC 529.
Weight	700 g (1.5 lb) (package CI852K01 with CI852 and TP852)
Dimensions	W 59 x H 185 x D 127.5 mm (W 2.9 x H 7.3 x D 5.0 in). See Mounting Dimensions for proper Ventilation on page 90.

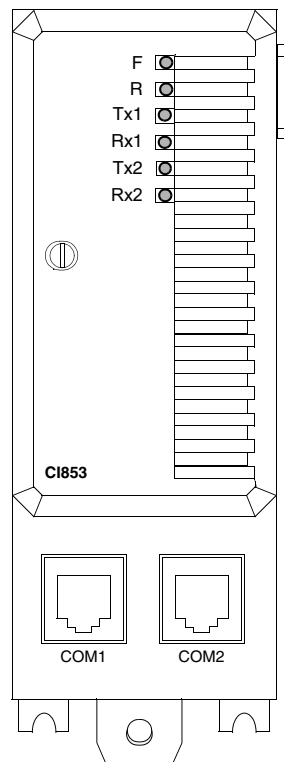
CI853 and TP853 – RS232-C Interface

Key Features

- Two RS232-C ports implemented with RJ45 connectors, located on the TP853 Baseplate, (act as an extension of the onboard RS232-C port on PM8xx should more RS232-C ports be required).
- Modem support
- Simple DIN-rail mounting
- Transmission speed selectable between 75 baud and 115200 baud.
- Ready-made Software options for several protocols
- Pre-set, two-letter Alpha code locking device see [Table 6](#) on page 54, installed in unit base, prevents mounting of incompatible components.

Description

Provides an RS232-C 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 15m.



Functional Block Diagram

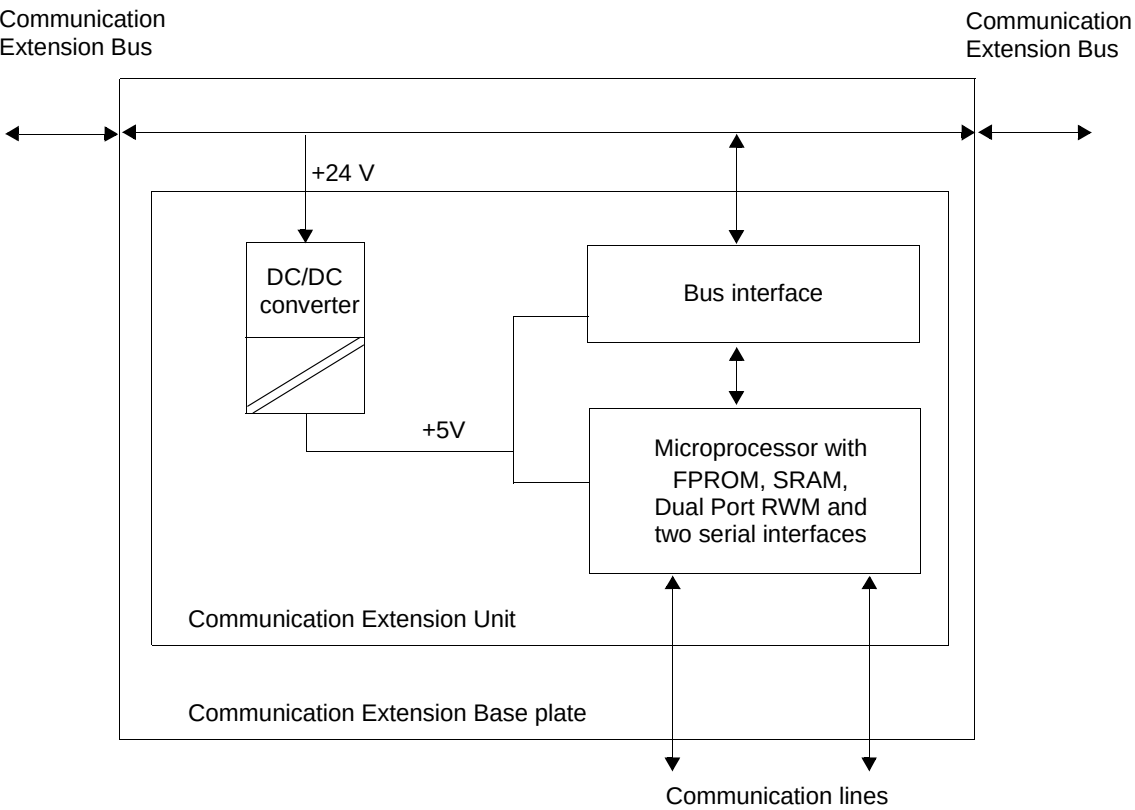


Figure 38. Block Diagram – CI853

Indicators*Table 43. CI853 RS232-C – 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	Lit if transmission to the COM1 port.
Rx1 /Yellow	Lit if receiving from the COM1 port.
Tx2 /Yellow	Lit if transmission from the COM2 port.
Rx2 /Yellow	Lit if receiving from the COM2 port.

Technical Data*Table 44. CI853 – RS232-C Communication Interface Specifications*

Item	Description
Type	Double unisolated RS232-C 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.

Table 44. CI853 – RS232-C Communication Interface Specifications (Continued)

Item	Description
Communication speed	Selectable in steps from 75 to 115200 baud. 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 9600, 19200, 38400, 115200 baud. This range of transmission rates may be limited by the communication protocol used. See the communication protocol documentation.
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	2.4W typical
Protection Rating	IP20 according to EN60529, IEC 529.
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 90.

CI854 and TP854 – PROFIBUS DP-V1 Interface

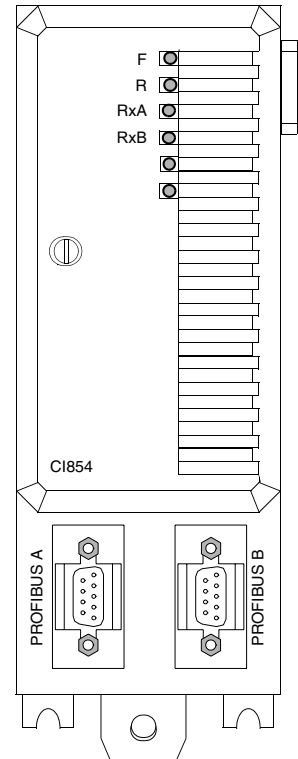
Key Features

- PROFIBUS DP with redundant line interface (two DB9 female connector located on the TP854 Baseplate).
- Simple DIN-rail mounting.
- In addition to the cyclic data transfer the CI854 supports acyclic DP-V1 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.

Description

The CI854 / TP854 is used for connecting to remote I/O. Via an external gateway on PROFIBUS DP, field instruments (on PROFIBUS DP) can be connected to AC 800M. The TP854 Baseplate has two female DB9 connectors for connecting PROFIBUS DP with support of line redundancy. The baseplate has a code lock that prevents the installation of an incorrect type of unit onto the TP854 Baseplate.

The CI854 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. ABB recommends the use of connectors with built-in termination since the fieldbus will always be terminated, even if fully disconnected from the unit.



Functional Block Diagram

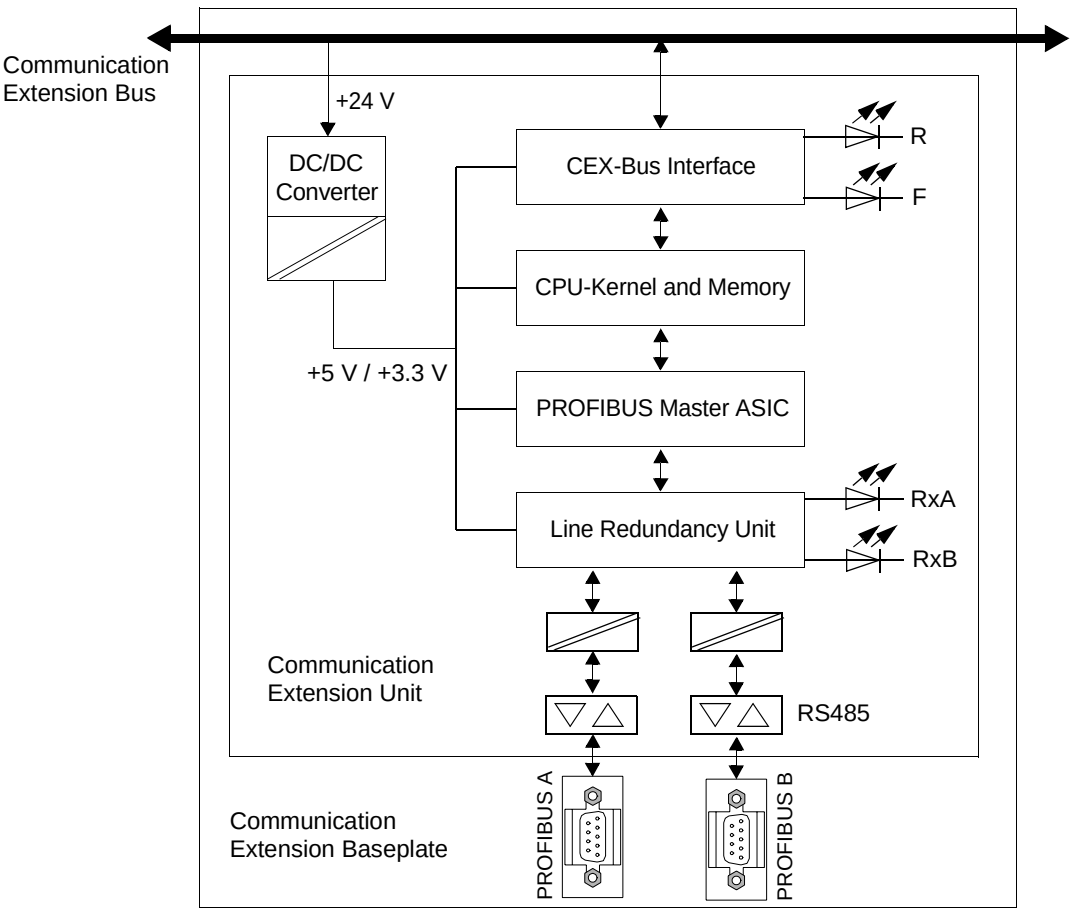


Figure 39. Block Diagram – CI854

Indicators

Table 45. CI854 – PROFIBUS DP-V1 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.
RxA /Yellow	Receive Data on Line A. For each telegram received the LED flashes approximately 150ms.
RxB /Yellow	Receive Data on Line B. For each telegram received the LED flashes approximately 150ms.

Technical Data

Table 46. CI854 PROFIBUS DP-V1 Interface Specifications

Item	Value
Type	DP Master Class 1 and 2 for DP-V0 Services DP Master Class II for DP-V1 Services
Protocol	PROFIBUS DP-V0 and DP-V1.
Communication speed	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, or 12000 kbit/s
Galvanic isolation	Yes
Status indicators	Running normally: Green. Exceptional fault: Red. Two traffic indicators - RxA and RxB - controlled by traffic pace: Flashing yellow.

Table 46. CI854 PROFIBUS DP-V1 Interface Specifications (Continued)

Item	Value
Connectors	Two DB9, female on TP854.
Current consumption (from CEX-bus 24 V DC)	190 mA typical (max. 240 mA).
Power dissipation	4.6W typical.
Capacity	Max 32 loads.
Protection Rating	IP20 according to EN60529, IEC 529.
Weight	700 g (1.5 lb) (package CI854K01 with CI854 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)

CI855 and TP853 – Ethernet Interface for MasterBus 300

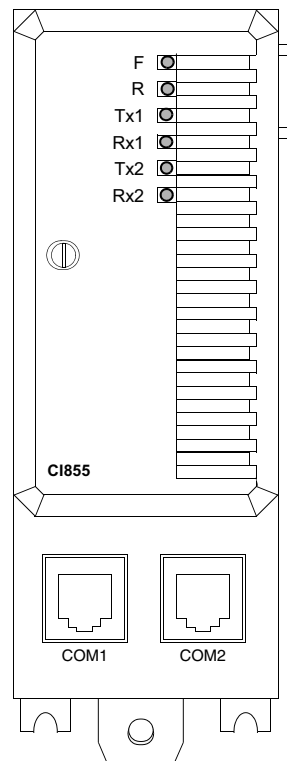
Key Features

- 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.

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 6](#) on page 54, that prevents the installation of an incorrect type of unit onto the TP853 Baseplate.

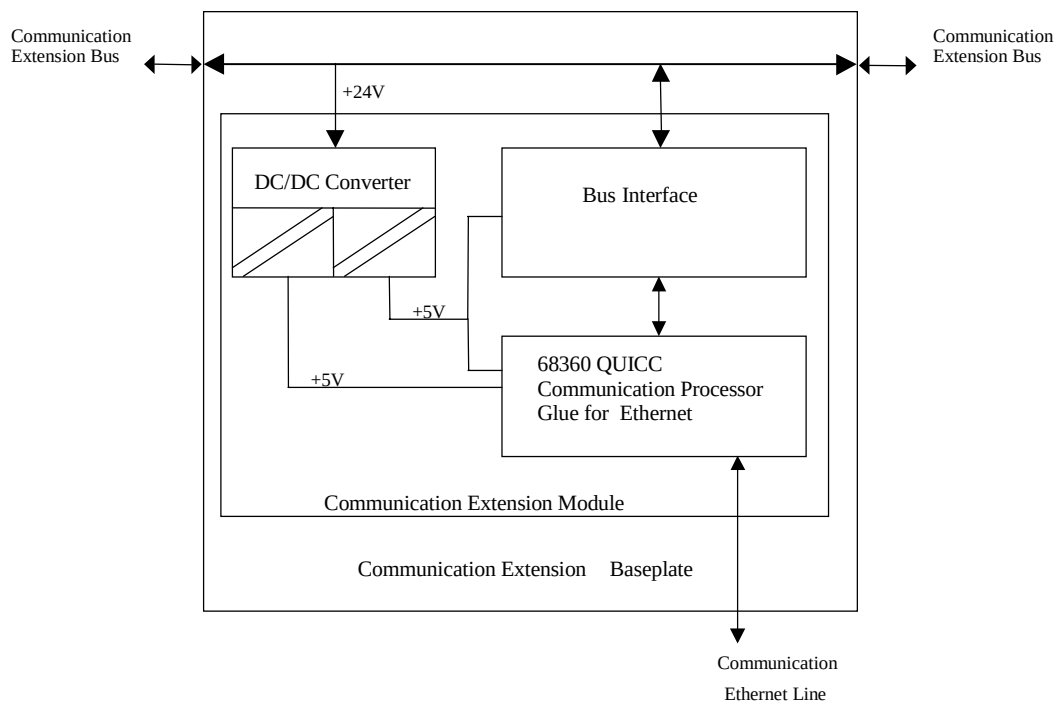
The CI855 expansion unit contains the CEX-bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24V supply, via the CEX-bus. The Ethernet cable must be connected to the main network through an Ethernet HUB.



Indicators

Table 47. CI855 – MasterBus 300 LED Indicators

Designation/Color	Function
F(ault) /Red	Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset.
R(un) /Green	Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.
Tx1 /Yellow flashing	A yellow LED indicating transmission from the communication unit COM1 port.
Rx1 /Yellow flashing	A yellow LED flashes when data is being received from the COM1 port.
Tx2 /Yellow flashing	A yellow LED indicating transmission from the communication unit COM2 port.
Rx2 /Yellow flashing	A yellow LED flashes when data is being received from the COM2 port.

Functional Block Diagram*Figure 40. Block Diagram – CI855*

Technical Data

Table 48. 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	3.6W 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)

CI856 and TP856 – S100 I/O Interface

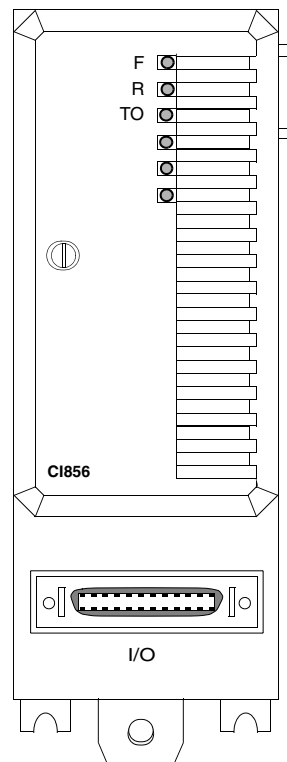
Key Features

- 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.

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 6](#) on page 54, that prevents installation of an incorrect type of unit onto the TP856 Baseplate.

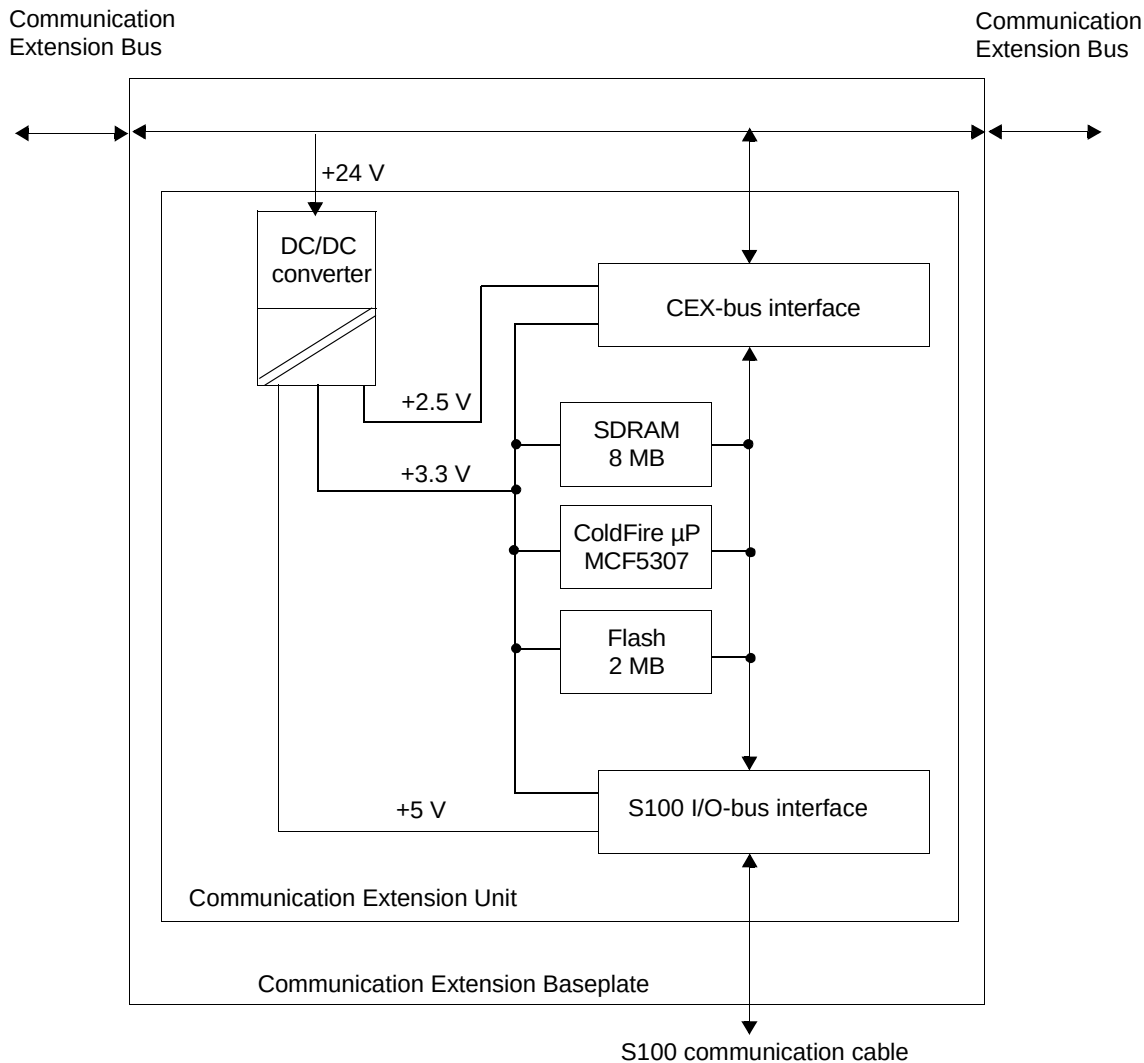
The CI856 expansion unit contains the CEX-bus logic, S100 I/O-bus logics, CPU and a DC/DC converter that supplies appropriate voltages from the +24V supply, via the CEX-bus.



Indicators

Table 49. 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.

Functional Block Diagram*Figure 41. Block Diagram – CI856*

Technical Data

Table 50. 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	2.9W 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)

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.

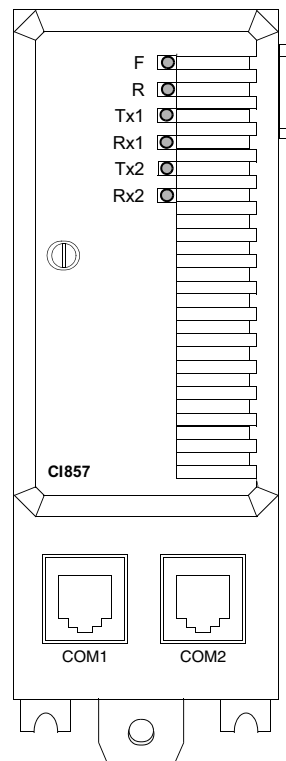
Description

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 6](#) on page 54, that prevents the installation of an incorrect type of unit onto the TP853 Baseplate.

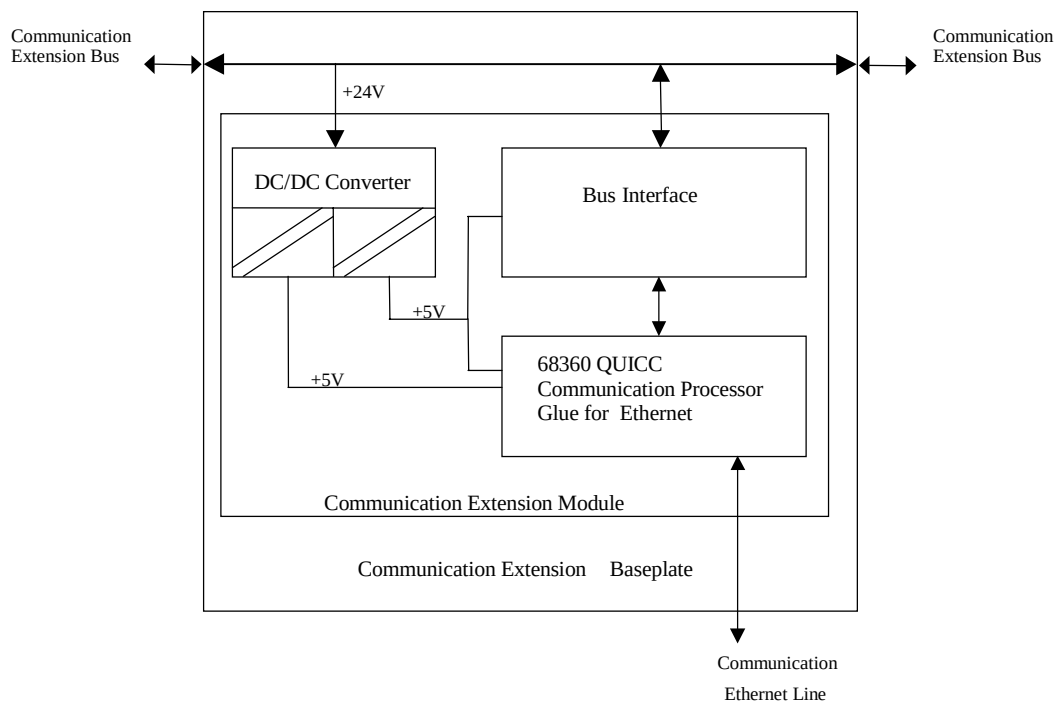
The CI857 expansion unit contains the CEX-bus logic, a communication unit and a DC/DC converter that supplies appropriate voltages from the +24V supply via the CEX-bus. The Ethernet cable must be connected to the main network through an Ethernet hub.



Indicators

Table 51. CI857 – INSUM Interface LED Indicators

Designation/Color	Function
F(ault) /Red	Unit error detected. Controlled by Control Software. Set and cleared by the Hardware during controller Reset.
R(un) /Green	Operating. Controlled by the Control Software. Cleared by the Hardware during controller Reset.
Tx1 /Yellow flashing	A yellow LED indicating transmission from the communication unit COM1 port.
Rx1 /Yellow flashing	A yellow LED flashes when data is being received from the COM1 port.
Tx2 OFF	Not used.
Rx2 OFF	Not used.

Functional Block Diagram*Figure 42. Block Diagram – CI857*

Technical Data

Table 52. CI857 INSUM Interface Specifications

Item	Value
Type	Ethernet unit.
Protocol	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	3.6W 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)

Power Supply Units – Types SD821, SD822 and SD823

Key Features

- Simple DIN-rail mounting
- Parallel connection permitted for load sharing
- 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 @ 10A
 - SD822 = 24 Volts DC regulated @ 5A
 - SD821 = 24 Volts DC regulated @ 2.5A
- Accepted for SELV and PELV applications

Safety Classification

The Power Supply Units (PSU) are designed to meet all applicable electrical safety data in accordance with EN 50178 harmonized European Standard Publication, and the additional safety and function data required by EN 61131-2 and UL 508.

The secondary output circuitry is accepted for SELV or PELV applications.

SELV according to EN 50178, EN 60950 and VDE 0100 Part 410.

For PELV applications; in accordance with EN 50178.

Protection Rating

IP20 according to EN 60529, IEC 529

Protective Class I according to EN 50718; 3.56

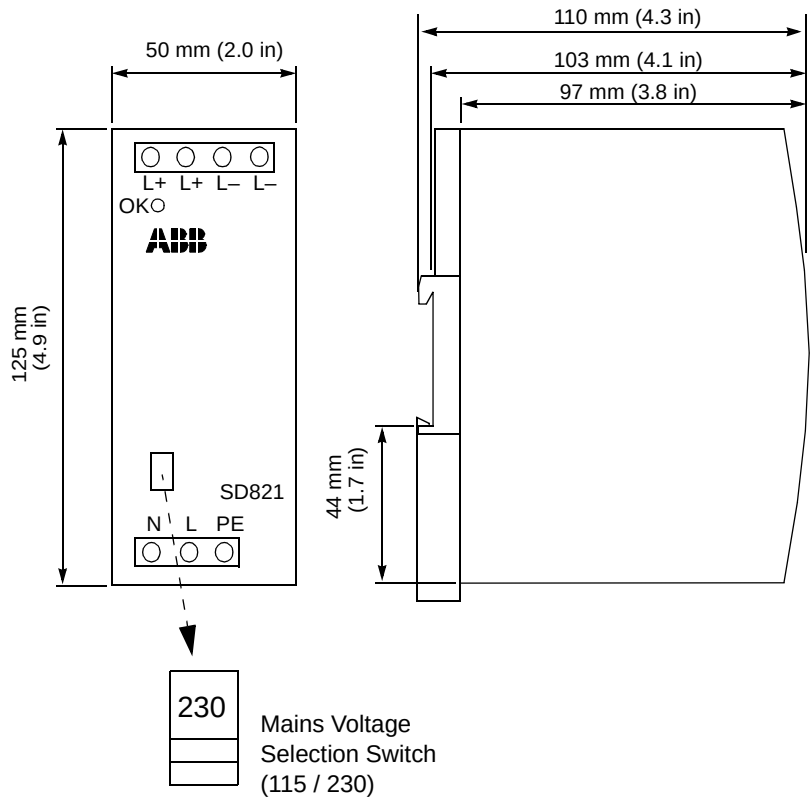


Figure 43. SD821 Connections for 2.5A Power Supply

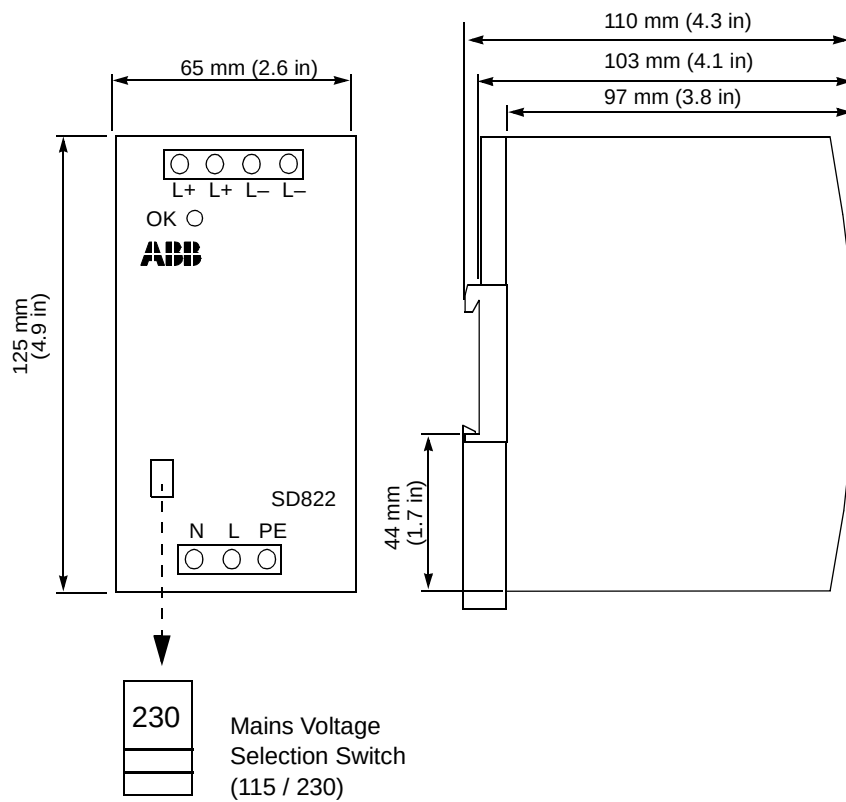


Figure 44. SD822 Connections for 5A Power Supply

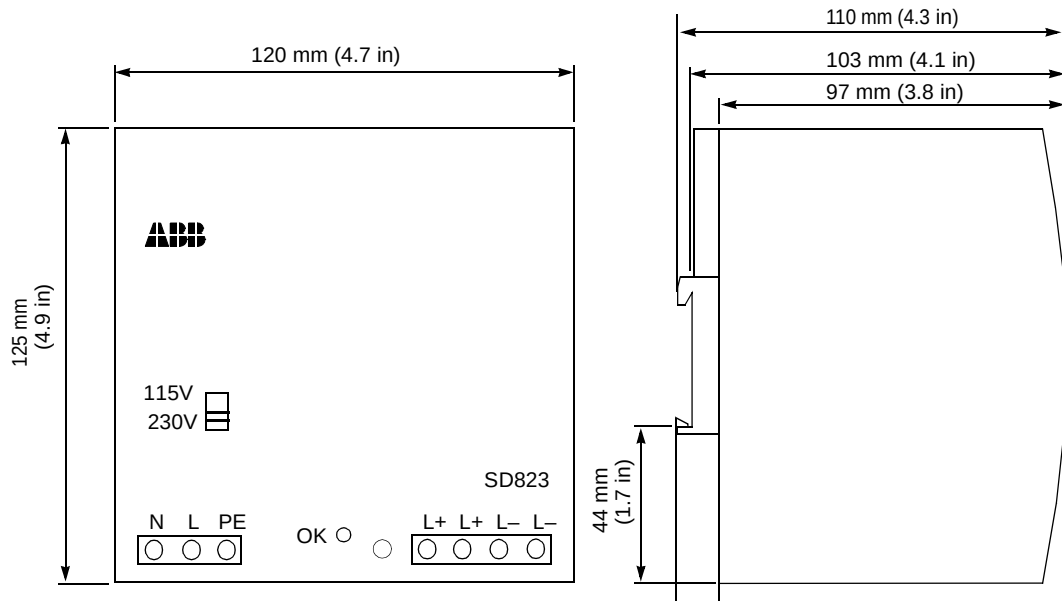


Figure 45. SD823 Connections for 10A Power Supply

Power Supply Units Types SD821/822/823 – Description

ABB recommends the use of these robust and reliable power supply units (PSUs) for providing power to the AC 800M Controller when connected to an industrial mains network of installation category III. All three PSUs can be used for both non-redundant and redundant applications, as well as load sharing functions.

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 230V by means of a switch mounted on the face of the unit. The factory default position for this switch is 230V.

The output voltage of all three PSUs is a regulated, low noise, 24V 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 24V 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.

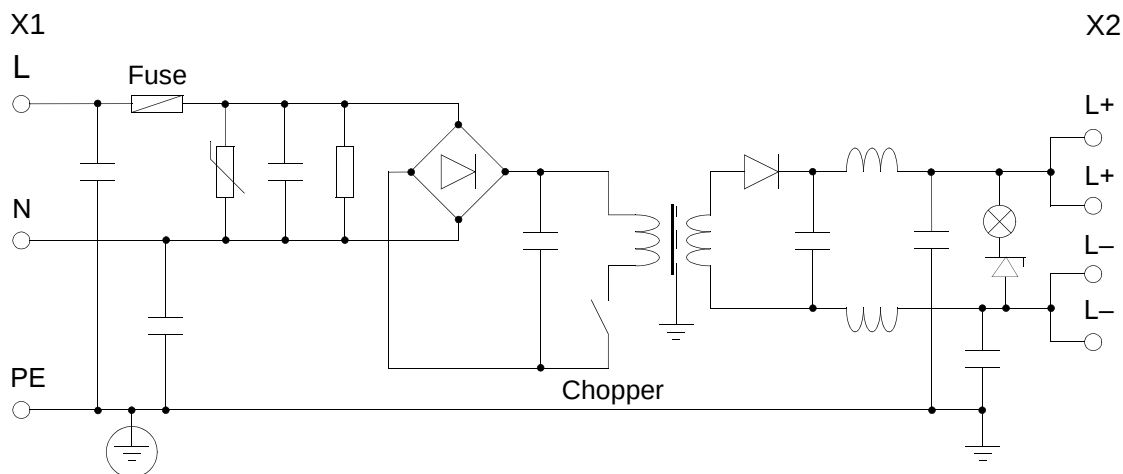


Figure 46. PSU's SD821, 822 and 823 – Block Diagram

Insulation of Power Supply Units (PSU)

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

Rated insulation voltage, Primary to Secondary 300V AC.

Dielectric test voltage 3000V AC (EN 60950).

Fuses and Protective Devices

Internal primary main fuses are arranged to meet the requirements of electrical safety publications for connection to the Phase – Neutral terminals of the primary main network; TN network, 1 (one) fuse. Recommended primary external fuse:

- Micro Circuit Breaker (MCB) 10 Amperes, characteristic B.

Table 53. Power Supply Units – Fuses and Protective Devices

Fuse	SD821	SD822	SD823
Primary: Internal fuse	3.15AT	4AT	6.3AT
Primary: Recommended external fuse ⁽¹⁾	10A ⁽¹⁾	10A ⁽¹⁾	10A ⁽¹⁾
Secondary: Short circuit	<5A	<10A	<20A
Secondary: Over-load protection	3A> I I <5A	6A< I I< 10A	12A< I I<20A
Secondary: Over-Voltage protection	32V typ	29V typ	35V typ

(1) Microcircuit Breaker (MCB), Characteristic B

Technical Data*Table 54. 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	85–110%	85–110%	85–110%
Mains/input voltage, max. a.c.= 45–65 Hz	138/275 V AC	138/275 V AC	138/275 V AC
Surge; Primary peak current at power on	25 A	15 A	30 A
Power Factor (at rated output power)	0.47 typ	0.5 typ	0.5 typ
Heat dissipation	8.6 W	13.3 W	26.7 W
Efficiency factor	87% typ	90% typ	90% typ
Output voltage regulation at max. current	±2%	±2%	±2%
Ripple (peak to peak)	25 mV	25 mV	30 mV
Secondary voltage holdup time at mains blackout	>20 ms	>20 ms	>20 ms
Maximum output current	5 A	10 A	20 A

Table 55. 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)

SS822 Voting Unit – (for Redundant Power Supply)

Redundant Power Supply Configurations

The SS822 Voting Unit has been specifically designed for utilization as a control unit within a redundant power supply configuration. The output connections from two identical Power Supply Units (PSUs) are connected to the SS822, see [Figure 31](#) on page 106 and [Figure 32](#) on page 107.

The SS822 Voting Unit separates the redundant PSUs, supervises the voltage supplied and generates supervision signals to be connected to the computer system. Green LEDs, mounted on the SS822 front panel, provide a visual indication that the correct output voltage is being delivered. Immediately the green LED lights up, a voltage-free contact closes the path to the corresponding "OK connector". The SS822 trip levels (2 off), are factory preset. For details see [Table 56](#) on page 190 SS822 Voting Unit – Supervision Data.

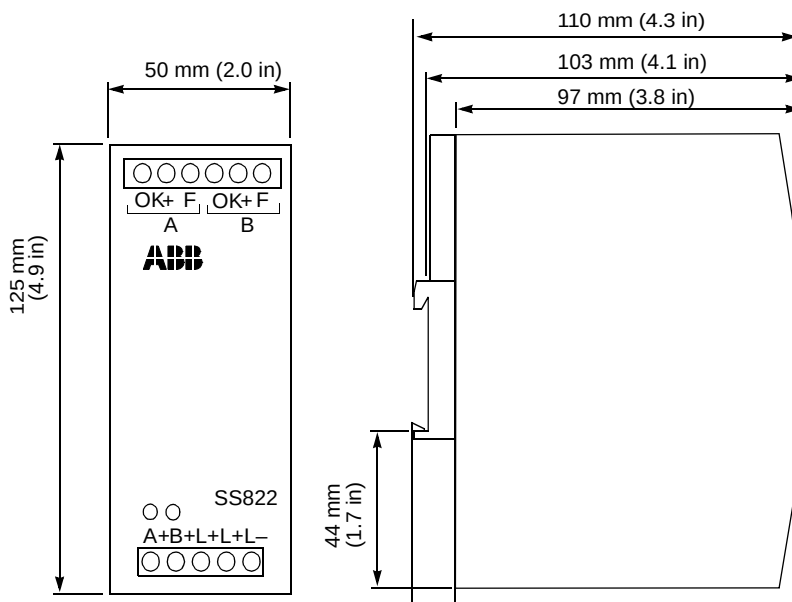


Figure 47. SS822 Voting Unit Connections

Table 56. SS822 Voting Unit – Supervision Data

Supervision Data	SS822
Voltage, low trip level (for decreasing voltage)	22V
Voltage, low trip hysteresis	0.7V
Voltage, high trip level for rising voltage	30V
High trip hysteresis	0.7V
Contact rating a.c.	Max. 120V and max. 0.5A
Contact rating d.c.	Max. 28V and max. 1A; min. 1mA, recommended min. 5mA

Table 57. SS822 – Technical Data and Mounting Dimensions

Parameter	SS822
Rated output current (A)	20A
Rated output voltage	24V
Rated input power	500W
Mains/input voltage, nominal	2 x 24V d.c.
Mains/input voltage, max	35V d.c
Heat dissipation	10W
Output voltage regulation at max. current	0.5V lower than input
Maximum output current	35A (Overload)
Protection Rating	IP20 according to EN60529, 7IEC 529
Dimensions, Width HxD = 125 x 110mm (4.9 x 4.3 inches)	50mm (2.0")

Table 57. SS822 – Technical Data and Mounting Dimensions (Continued)

Parameter	SS822
Mounting spacing W mm	10mm (0.4")
Mounting spacing H mm	25mm (1.0")
Weight (lbs)	800g (1.8lb)

TC562 Modem Unit – (Westermo MD-12DC)

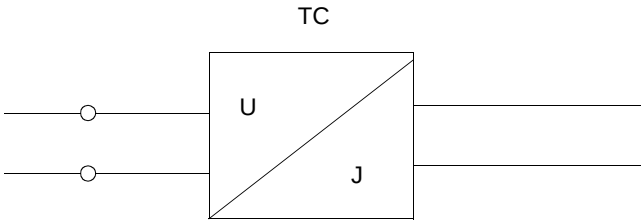


Figure 48. TC562 (MD-12DC) Modem

Description

The TC562 Short Distance Modem unit can be used both for point-to-point communication and for communication over a distance between pieces of equipment or units, for example a computer and printer or a robotic device. ABB recommends their use when the distance between units/equipment exceeds 15m. For further details refer to the manufacturer’s documentation (Westermo).

Using a modem allows distances between pieces of equipment to be as much as 18000m, and, depending on the distance, can provide a data transmission speed of up to 38400bit/s. The modems are manufactured for simple mounting onto a standard 35mm 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 0.2mm² with a capacitance of 40-80pF/m within an industrial environment.

For an office environment, ABB recommends a minimum cable gauge of 0.14mm², and a capacitance of 40-100pF/m. Use a shielded cable in a heavy industrial environment and an unshielded cable in an office environment. A shielded cable is often given a higher capacitance and will therefore provide a higher data transmission speed.

Technical Data

Table 58. 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 128mm (2.2 x 3.9 x 5.0 in.)
Weight	400 g (0.9 lb)

Table 59. 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

SB821 External Battery – AC 800M Memory Back-up

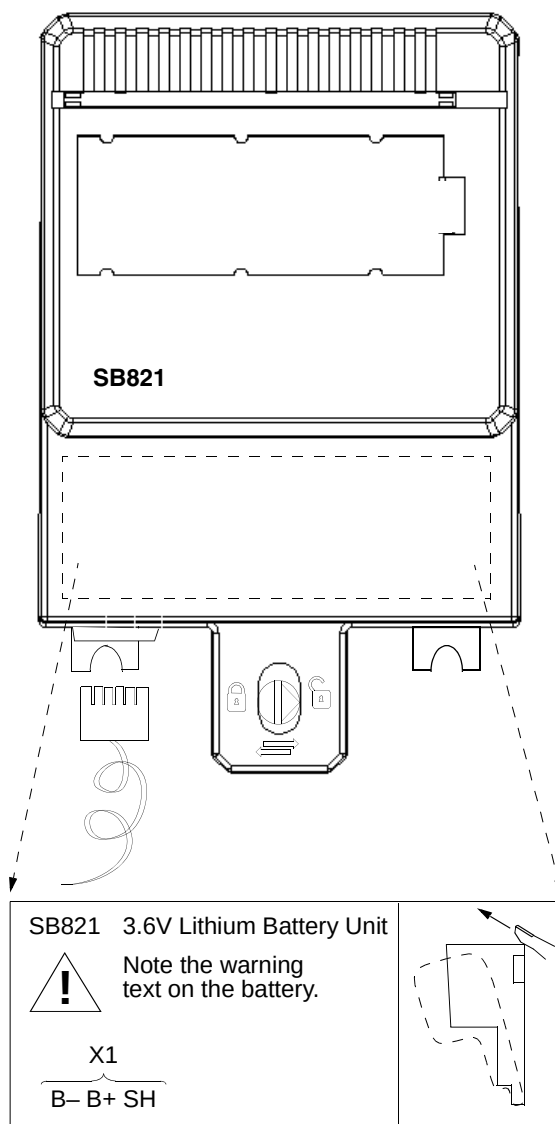
Description

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

Technical Data

Table 60. SB821 – External battery data

Item	Value
Battery Type	Low rate lithium, 3.6V, 16Ah
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)



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 2m (6.6ft.) (to standard DIN 46 277, EN 50 022).

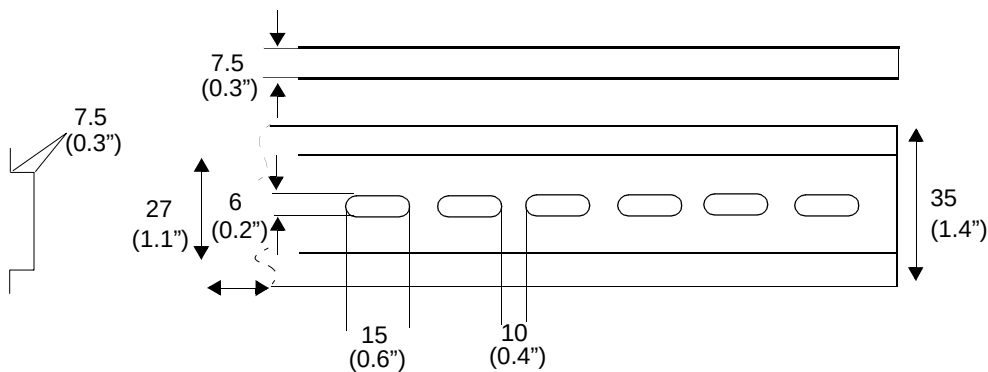


Figure 49. DIN-rail TS 35/7.5 – Dimensions

Miscellaneous Equipment

TB850 Terminator for CEX-bus (Male)

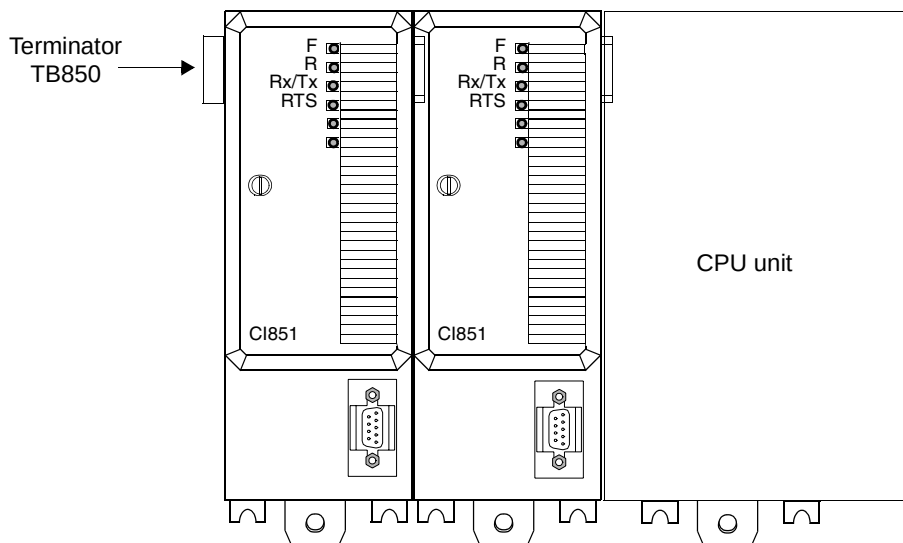


Figure 50. TB850 Terminator for CEX (male)

TB851 Terminator for CEX-bus (Female)

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

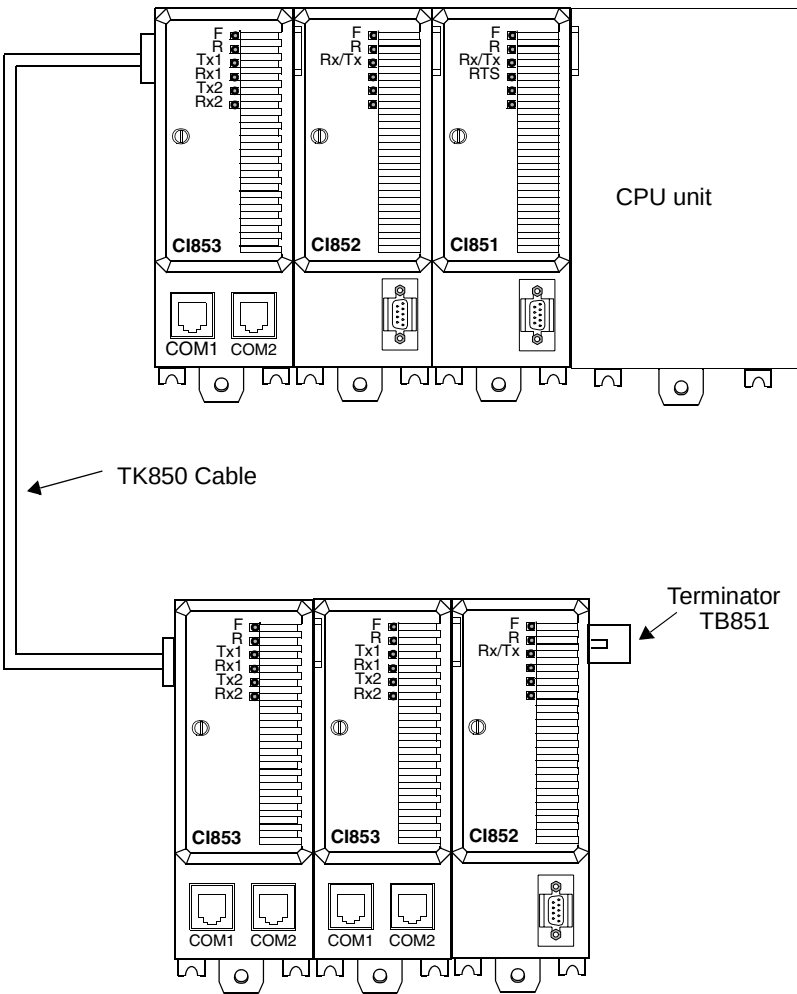


Figure 51. TB851 Terminator for CEX (female)

TB807 ModuleBus Terminator Plug

The Terminator plug must always be mounted on the last I/O unit of the ModuleBus. If no units are used on the ModuleBus, no bus termination is required. No ModuleBus termination is required in redundant CPU configuration.

TB852 RCU Link Terminator Plug

The RCU Link Terminator Plug is required when the PM861/PM864 processor unit operates in single configuration.

TK850 CEX-bus Extension Cable

A 0.7m (2.3ft.) extension cable, complete with connector (type DB25P-metal housing) provides connectivity to Communication Interface units between adjacent DIN-rails. It is always used in redundant CPU configuration for connecting the CEX-bus between the two processor units.

TK851 RCU Link Cable

The Redundant Control Unit Link Cable is used to transfer log data from the Primary CPU to the Backup CPU, and to exchange status and control information between the Primary and Backup CPUs. The RCU Link uses 68-pole connectors, one of which is labeled "UPPER". The CPU connected to this connector will be defined as the upper CPU in the Control Builder and Operator Station.

TK853

Technical Data

Table 61. TK853 – Technical Data

Item	Value
Connectors	- 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)

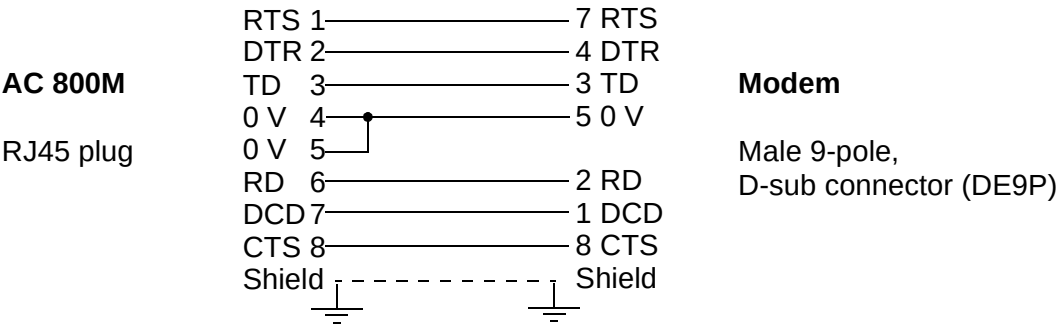


Figure 52. TK853 – Cable Characteristics

TK212 Tool Cable

Technical Data

Table 62. TK212 Tool Cable – Technical Data

Item	Value
Connectors	- One 9-pin female D-type - One 8-pole RJ45 plug
Weight	125 g (0.3 lb)
Length	3.0 m (9.84')

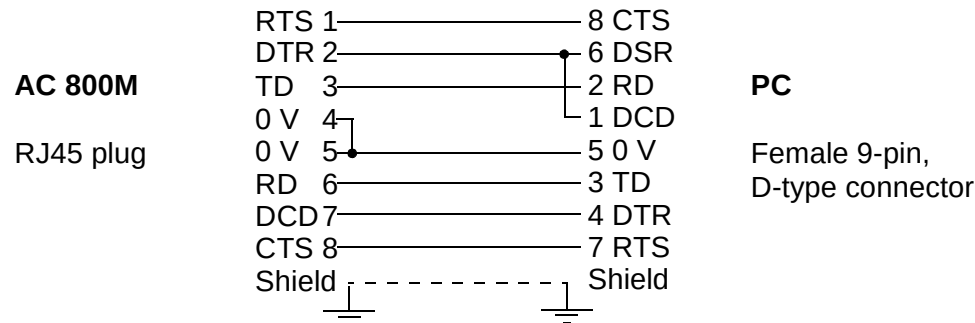
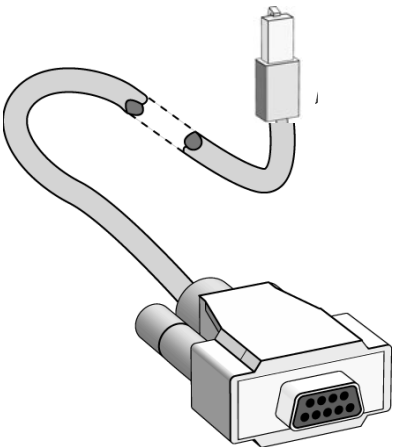


Figure 53. TK212 – Cable Characteristics

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 54](#) on page 200). Refer to price list for additional information.

Key features of the AI-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 9](#) on page 51.
- Rigid construction.
- Easy-fit, press-in cable-retaining duct.

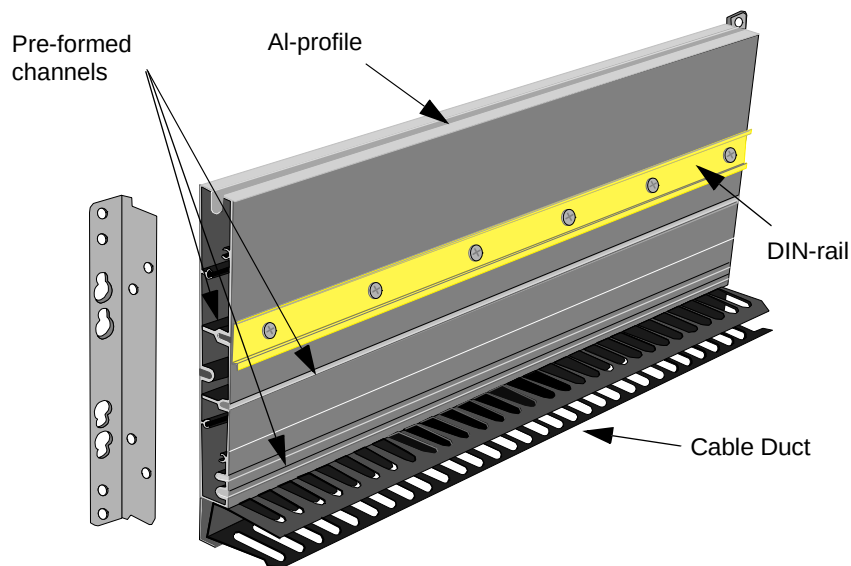


Figure 54. AI-Profile for DIN-rail Support

Appendix B Power Consumption

General

At an ambient temperature of 40°C (104°F) it is considered unnecessary to calculate the heat dissipation requirements for a standard AC 800M Controller with S800 I/O configuration, mounted within ABB floor-mounted or wall-mounted cabinets.

For a standard AC 800M Controller configuration housed within a floor-mounted or wall-mounted cabinet, the recommended fuse rating for the external mains supply is:

Table 63. AC 800M Mounted in ABB Cabinet – Fuse Requirements

Fuse Rating	Fuse Type
10A	Slow to Rupture

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:

- dimensioning the supply requirements of an AC 800M and S800 I/O configuration.
- calculating cabinet-generated power loss.

The values given in the tables are typical and adapted to these applications. It is assumed that 70% of unit channels are active simultaneously.

Current Consumption and Power Dissipation

Current Consumption and Power Dissipation

See [Table 64](#) on page 202 for typical current consumption and power dissipation data for AC 800M units.

Table 64. Current Consumption and Power Dissipation Data for AC 800M Units

Unit	Current at 24 V		Power Dissipation		Remarks
	Typical	Max	Typical	Max	
PM856	180 mA	300 mA	5.0 W	8.0 W	(1)
PM860	180 mA	300 mA	5.0 W	8.0 W	(1)
PM861	250 mA	430 mA	6.0 W	10.3 W	(1)
PM864	287 mA	487 mA	6.9 W	11.4 W	(1)
CI851	150 mA	200 mA	3.6 W	5.0 W	
CI852	140 mA	200 mA	3.4 W	5.0 W	
CI853	100 mA	150 mA	2.4 W	3.6 W	
CI854	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	

(1) These figures apply only to the PM8xx. For current-consumption data relating to the CEXbus and the ModuleBus units, see [Table 65](#) on page 203.

The CPU supplies current, via TP830, to units on the CEX-bus and ModuleBus, see [Table 65](#) on page 203.

Table 65. CPU Current Supply to CEX-bus and ModuleBus

Bus	+5 V	+24 V
ModuleBus	max. 1.5 A ⁽¹⁾	max. 1.0 A
CEX-bus	Not Applicable	max. 2.4 A

(1) Corresponds to additional 0.5 A on +24 V.

Maximum current of the +24V supplied to the CPU (incl. ModuleBus and CEX-bus) is shown in [Table 66](#) on page 203:

Table 66. Maximum Current Supply to CPU incl. ModuleBus and CEX-bus (24 V)

CPU	Maximum Supply Current
PM856	4.2 A
PM860	4.2 A
PM861 (single)	4.3 A
PM861 (redundant pair)	3.3 A (no ModuleBus)
PM864 (single)	4.4 A
PM864 (redundant pair)	3.4 A (no ModuleBus)

Due to transfer or conversion losses in the CPU when full current supply to ModuleBus and CEX-bus is utilized, the CPU power dissipation increases by 5W in addition to the values given in [Table 64](#) on page 202.

Calculations

1. Calculate the current requirements for each bus (ModuleBus and CEX-bus). Be sure not to exceed the limits given in [Table 65](#) on page 203. Data relating to TB820, TB840 and CI830 is accessible from the *S800 I/O documentation*. See [Related Documentation](#) on page 17.
2. Calculate the current consumption at 24V, for each electrical ModuleBus, by adding::

$$I_m = I_{(24\text{ V})} + I_{(5\text{ V})} \times 0.3$$

3. To calculate the requirement for a specific power supply unit, total the results of the 24V current consumption calculations, as follows:

$$I_{\text{tot}} = I_{m1} + I_{m2} + \dots + I_{\text{units Table 64}} + I_{\text{CI830s}} + I_{\text{TB820s}} + I_{\text{TB840s}}$$

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

Appendix C Recommended Components

Recommended Components

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

Table 67. 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, see Related Documentation on page 17.
PROFIBUS DP-V1	No specific PROFIBUS DP-V1 components are recommended, see PROFIBUS DP above.

Table 68. Recommended Components – FOUNDATION Fieldbus

Component	Description
FOUNDATION Fieldbus	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. This statement covers all FOUNDATION Fieldbus equipment, including: - FOUNDATION Fieldbus filters. - FOUNDATION Fieldbus bus spur distribution terminals. - FOUNDATION Fieldbus termination. For further details refer to FOUNDATION Fieldbus documentation and the FOUNDATION Fieldbus Web Site, see Related Documentation on page 17.

Table 69. Recommended Components for Control Networks

Component	Description
HUBS (For Non-Industrial Environments)	3Com Hub, 8/TPO – (8 ports, RJ45) Suitable for smaller systems No supervision required. No configuration required. Plug and play capability. BayStack, 350/24 – (24 port, Star topology, RJ45) Suitable for larger systems Supervision required. Fiber optic capabilities No plug and play capability.
HUBS (Industrial Environments)	Hirschmann Rail Hub RH1-TP– (4 ports, RJ45) Suitable for small to medium systems No supervision required. Fiber optic capabilities High Mean Time Between Failures (MTBF) Rugged Design for high temp use Plug and play capability.

Table 69. Recommended Components for Control Networks (Continued)

Component	Description
SWITCHES (Industrial Environments)	Hirschmann Rail Switch RS2 (8 ports, Ring, Bus or Star topology RJ45) Suitable for larger systems Supervision required. Fiber optic capabilities High Mean Time Between Failures (MTBF) Rugged Design for high temp use No plug and play capability.
CABLES	Electrical – Class 5, STP Optical – As recommended by Manufacturer of HUBS and SWITCHES

Table 70. Recommended Components – Miscellaneous

Component	Description
DIN-rail	Phoenix: • 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 • 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 • 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 23 on page 87, Figure 24 on page 88 and Figure 25 on page 89.

Table 71. Recommended Components – Process Cables

Component	Description
Mains	Various Manufacturers, to Standard; • RKFK 3x1.5 mm²
RS232-C	Unitronic • CY 3 x 0.25 mm² • CY 7x 0.25 mm² Belden • Belden 8723 2 pair (0.34 mm²) • Belden 9729 2 pair (0.22 mm²) • Belden 9730 3 pair (0.34 mm²)
FOUNDATION Fieldbus	Unitronic • Suitable Commercially Available Cable. Belden • Suitable Commercially Available Cable.
PROFIBUS DP	Unitronic • Twisted pair, 0.34 mm² • Unitronic-Bus L2/F.I.P Belden • Twisted pair, 0.34 mm² • Belden 3079A

Appendix D Directive Considerations

Relevant products comply with EMC Directive 89/336/EEC and Low-Voltage Directive 73/23/EEC. The products are provided with a CE marking.

Electro-Magnetic Compatibility (EMC)

Modules mentioned in this document, for which the product or packing is CE marked, are tested and approved according to the following standards:

- EN 61131-2 Product Standard, Programmable Controller
- Industrial Environment
- EN 50081-2 EMC – Generic Emission Standard,
Part 2 – Industrial Environment
- EN 61000-6-2 EMC – Generic Immunity Standard,
Part 2 – Industrial Environment.

Low-Voltage Directive (LVD)

Modules mentioned in this manual, for which product or packing is CE marked, comply with the LVD where applicable.

To fulfill the LVD for AC 800M and S800 I/O, the power supplies shall provide a secondary safety extra low voltage (SELV) or a protected extra low voltage (PELV). The power supplies described in this manual, SD821, SD822 and SD823, fulfill these requirements, see [Power Supply Units – Types SD821, SD822 and SD823](#) on page 181.



If you use other power supplies, except SD821, SD822 or SD823, to provide the 24V d.c. for AC 800M we strongly recommend that they also are CE marked and fulfill the LVD (SELV, PELV).



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

Appendix E Standards

The information below is applicable to products approved for hazardous locations according to CSA and/or UL standards (UL1604).

Hazardous Location Approval

To comply with CSA and/or UL certification for use at hazardous locations, the following information becomes part of the product literature for CSA and/or UL-certified ABB industrial control products.

- Equipment labeled with reference to Class I, Groups A, B, C and D, Division 2, hazardous locations is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.
- The products having the appropriate CSA and/or UL markings (that is, Class I Division 2, Groups A, B, C, D), are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA and/or UL or the local inspection office having jurisdiction.



Explosion hazard - Substitution of components may impair suitability for Class I, Division 2.



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



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

Appendix F Environmental Data

Environmental Data for AC 800M Products

The immunity of products to environmental factors met during operation, transportation and storage is summarized in this section.

Industrial environment are supplied with power from a high-voltage or medium-voltage transformer dedicated to supplying installations feeding manufacturing or similar plants. The existence of industrial apparatus and heavy, frequently-switched inductive or capacitive loads characterize an **Industrial environment**. The associated magnetic fields are high..

Control products incl. I/O-systems are normally intended for **Industrial environment**.

Products manufactured by ABB and other companies are normally type-tested or evaluated to ensure compliance with the environmental standards specified below.

Environmental specifications applicable to peripheral equipment, for example printers, may differ. Please refer to the relevant product data sheets..

The degree to which the units resist environmental influence depends on their components and design. System enclosures, cable types and how these are routed determine the environmental specification of the entire system.

Climatic and Mechanical Environmental Conditions

Industrial Environment

Table 72. Industrial Environment

Environmental Specification				Compliance with Standard
	Environment Factor	Transportation and Storage	Operative Range	
Climatic Conditions	Temperature	-25 to +70°C -25 to +60°C ⁽³⁾	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 300 Angstrom ⁽⁴⁾ over 28 days	Copper corrosion of 300 Angstrom ⁽⁴⁾ over 28 days	ISA 71.04 class G1 ITF SSG 4251G1

Table 72. 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) 5 < f < 500 Hz, Continuous: 0.2 g acceleration ⁽³⁾		EN 61131-2
	Emitted noise	—	<55dB (A)	
	Shock, no package	150 m/s ² , 11 ms 20 g, 3 ms ⁽³⁾ DAT drives; 5 g, 3 ms	150 m/s ² , 11 ms 20 g, 3 ms ⁽³⁾ DAT drives; 5 g, 3 ms	EN 61131-2
	Fall in package	<10 kg: 1 m 10–40 kg: 0.5 m >40 kg: 0.25 m >100 kg: 0.025 m		EN 61131-2

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

(4) 1000 Angstrom for S800 I/O-family

CE Compliance

All products comply with EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC (relevant products also comply with the Teleterminal Directive). 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 89/336/EEC.
- EN 61131-2 Product standard, Programmable controllers.
- EN 50081-2 Generic emission standard.
- EN 61000-6-2 Generic immunity standard.
- Low Voltage Directive 73/23/EEC.
- EN 50178 for all new products; e.g. the S100 and S800 family, or good electrical safety practices based on EN 60950, EN 61010, EN 50178, EN60439 and IEC60255, depending on the product.
- Teleterminal Directive 91/263/EE.

Electromagnetic Compatibility and Main Voltage Conditions

Table 73. 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	EN 61000-4-3 ENV 50 204
	Immunity –Conducted RF field	10V	EN 61000-4-3
	Immunity –ESD (Electrical Discharge)	4 kV contact discharge 8 kV air discharge	EN 61000-4-2
	Immunity –EFT/B (Electrical Fast Transient/Burst)	2 kV, power ports 1 kV, other lines	EN 61000-4-4
	Immunity –Damped oscillatory wave	–	IEC 60255-22-1
	Immunity –Power frequency magnetic field	30A/m, cont. 3A/m for CRTs	EN 61000-4-8
	Immunity –Surge	2 kV, common 1 kV, differential	EN 61000-4-5

Table 73. Electromagnetic Compatibility and Main Voltage Conditions (Continued)

Environmental Specification			Compliance with Standard
	Environment Factor	Industrial Environment	
Electromagnetic Compatibility Conditions	Main voltage a.c	U _{nom} : –15% to +0%	
	Main voltage DC	–15% to 20% of rated value	
	Main frequency a.c.	47–63 Hz, ±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	

Installation Requirements

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

Laying Field Cables

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

Cables for short-distance communication without modems should always be routed at a distance of 10cm (4in.) from other cables.

All product-connected cables should be routed at a distance of 30cm (12in.) from non-product power cables (heavy current cables) and 10cm (4in.) from class 4 cables of relevant international immunity standards.

Types of Field Cable

Shielded cables are always necessary for:

- Communications (see product documentation for cable type)
- High-frequency pulse transmission (see product documentation for cable type)
- Low-level analog signals, e.g. Pt100 and thermocouples
- Analog application with a system accuracy ≥ 12 bits

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 must always be located on 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.

Additional lightning protection is always necessary when:

- Cables extend beyond the area covered by the ground line network
- Cables are located above ground
- Overhead cables are used.

Inductive Load Suppression

Inductive loads, such as relays and contactors connected directly to products, do not require suppression. The necessary suppression components (varistors or snubbers-RC units) are installed on the circuit boards.

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