

IndustrialIT[™] AC 800M and S800 I/O

Getting Started



Industrial^{IT} **AC 800M and S800 I/O**

Getting Started

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About This Book

General

This manual is intended to give the reader a general knowledge about AC 800M, S800 I/O and S800L hardware. It includes a general product overview, guidance for installation, configuration examples, information valuable during operation and maintenance considerations. Several other manuals forms the complete documentation of AC 800M, S800 I/O and S800L hardware which are listed in the subsection [Related Documentation](#). However, this manual should give all needed knowledge to get started with the use of the hardware.

Document Conventions

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

Warning, Caution, Information, and Tip Icons

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



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



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



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



Information icon alerts the reader to pertinent facts and conditions.



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

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

Related Documentation

Document ID	Title
3BDS009029Rxxxx	IndustrialIT 800xA - Control and I/O, PROFIBUS DP, Wiring and Installation
3BSE020923Rxxxx	IndustrialIT 800xA - Control and I/O, S800 I/O, General Information and Installation
3BSE020924Rxxxx	IndustrialIT 800xA - Control and I/O, S800 I/O, Modules and Termination Units
3BSE020927Rxxxx	IndustrialIT 800xA - Control and I/O, S800 I/O, Modules and Termination Units with Intrinsic Safety Interface
3BSE036351Rxxxx	IndustrialIT 800xA - Control and I/O, AC 800M Controller Hardware, Hardware and Operation
3BSE041880Rxxxx	IndustrialIT 800xA - Control and I/O, Getting Started, Introduction and Basic Operation

Section 1 Product Overview

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 a removable module attached with screws.

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

- Central Processor unit (CPU)
- Communication interface modules for different protocols
- S800 I/O modules
- Power supply modules

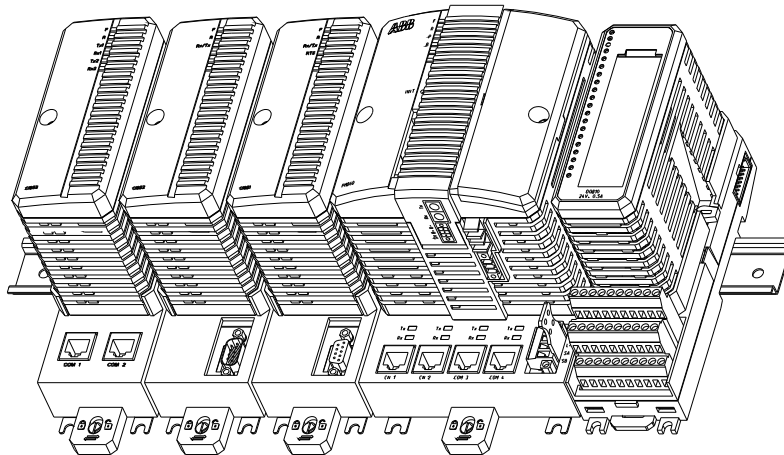


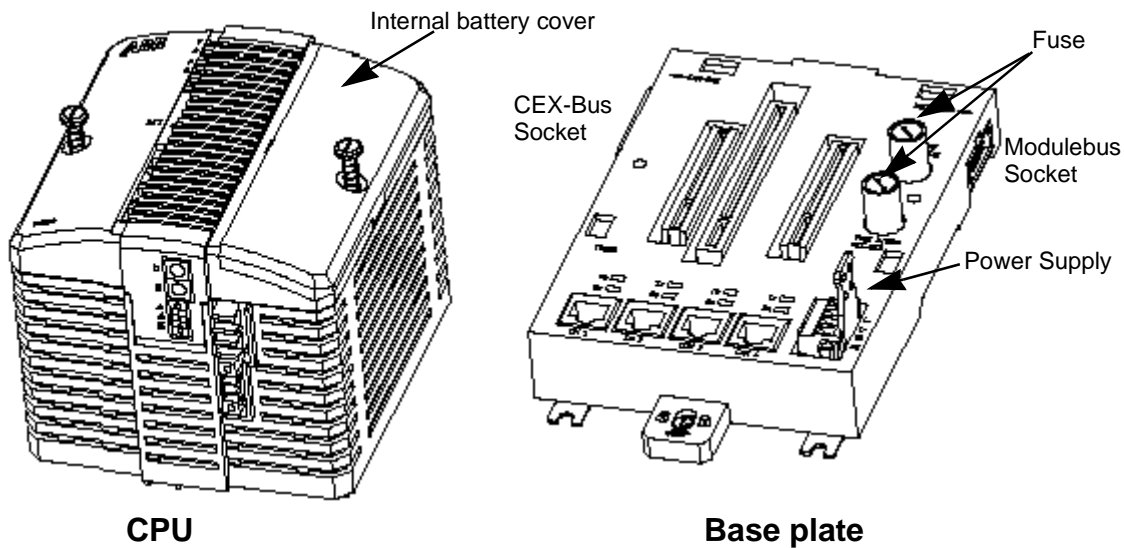
Figure 1. Example of an AC 800M Controller with an S800 I/O Unit

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

Central Processing Unit (CPU)

The CPU consist of a base plate TP830 (Terminal Plate) and a processor module PM8XX with various speed and memory combinations.

The base plate TP830 carries the majority of the connections to processor, the power supplies and communication interfaces, as well as to external buses.



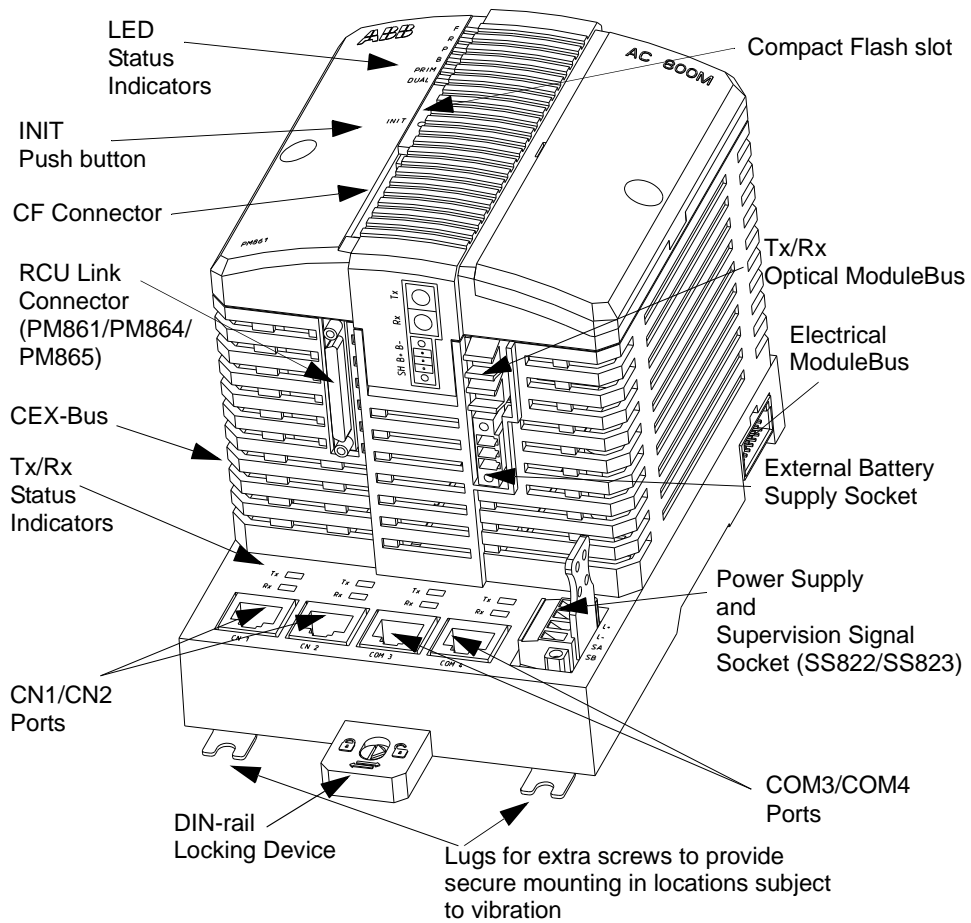


Figure 2. Processor Unit - General View (here shown with PM861)

Communication Interface

A number of communication modules can be connected to the controller. See [Appendix A, IndustrialIT System 800xA AC 800M Controller - Data Sheet](#) for more information on the various modules.

Communication Interface connected with CEX bus:

Up to 12 communication units can be placed on Communication Expansion Bus (CEX) bus.

The CEX bus must be terminated if a communication unit is connected. A CEX bus termination is delivered with the e CPU: tb850 (male) or TB851 (female).

An extension cable TK850 with connector DB25P with metal housing and a length of 0.7meter (1.3') can be used for extending the CEX bus to a second din rail.

S800 I/O

S800 I/O is a distributed and modular I/O system that communicates with controllers over PROFIBUS-DP/DPV1 or direct (via Modulebus).

The S800 I/O system is DIN rail mounted and consists of Fieldbus Communication Interfaces, Modulebus Modems, S800 I/O modules and Module Termination Units (MTU). S800 I/O modules (not S800L) are mounted on MTU's, this makes them hot-swappable. Depended on the mounting requirement (horizontal or vertical) and on the field termination needs (powering, fusing etc.) there are numerous of MTU's to choose from.

The S800 I/O system supports fully redundant applications, redundancy can be built in on both communication level and I/O module level.

S800 I/O connected with PROFIBUS- DP/DPV1:

- Field Communication Interface CI801 or CI840 is the I/O station master
- Maximum 24 I/O modules per I/O station
- 1 base I/O cluster with up to 12 I/O modules (connected via electrical Modulebus)
- 1-7 additional I/O clusters with up to 12 I/O modules per cluster (connected via optical Modulebus using Modulebus Modems)

S800 I/O connected with Modulebus:

- **Connection via Electrical Modulebus (single controller only)**
 - Up to 12 I/O modules
- **Connection via Optical Modulebus**
 - 1-7 I/O clusters with up to 12 I/O modules per cluster (connected using Modulebus Modem TB820 or TB840A)



PM851 is restricted to one optical Modulebus cluster.

Section 2 Installation

Mounting AC 800M and S800 I/O Units onto DIN-Rail

AC 800M and S800 I/O units are DIN-rail mountable. Each unit has a DIN rail locking mechanism that achieve mechanical locking and effective grounding. The additional screw lugs, located in the lower part of the units are used to provide extra fastening in environments subject to excessive vibrations. AC 800M units (CPU and communication interfaces) must be mounted on horizontal DIN rails. S800 I/O units can be mounted on both horizontal and vertical DIN rails.

There are two ways of mounting AC 800M and S800 I/O in cabinets, open rack or other types of installations:

- Mounting on DIN rail attached to a metal sheet
- Mounting on prefabricated aluminium profile with DIN rail

All conductive structural components of the installation must be bonded together with good and permanent connections for electrical safety and EMC reasons. The bonding should preferably be made with self-tapping cutting head screws. On painted surfaces where fastening is done by screw and nut, the paint must be removed from the contact surfaces. Apply conductive grease on surfaces to ensure a permanent connection. The cabinet/rack shall be properly connected to protective earth/ground.

Mechanical Installation - Metal Sheet

The DIN-rail is mounted on an unpainted metal sheet with fastening screws every 100 mm to ensure good mechanical stability and a good chassis ground connection in the cabinet or an open rack, see [Figure 3](#).

The metal sheet shall at least be 2.5 mm thick and at least 180 mm high with preferably one side bend 90 degrees to increase the stability. The metal sheet shall be mechanically fastened at least every 500 mm to the cabinet or rack with a minimum of four screws. The fastening to the cabinet frame shall be performed with self-tapping screws to get a good grounding connection.

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

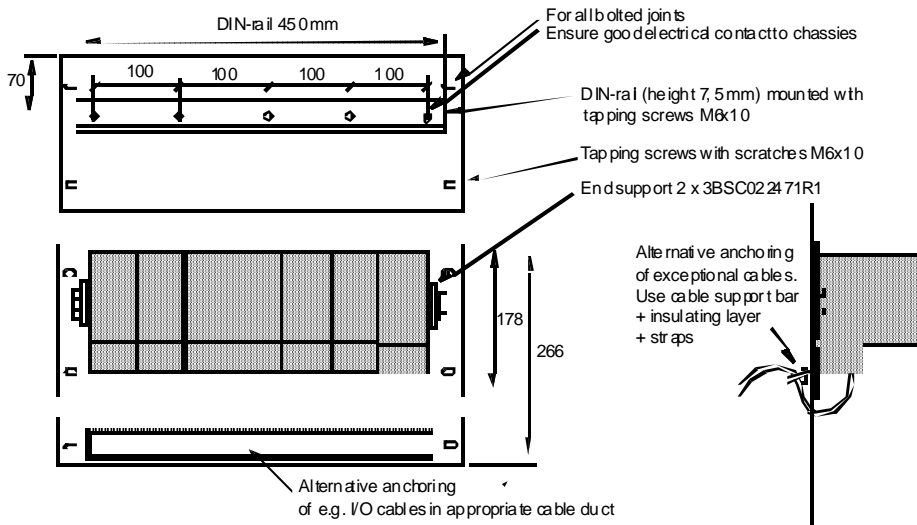


Figure 3. Mechanical Installation



Figure 4. Cabinet with Controller and I/O on metal sheet

Mechanical Installation - Prefabricated Aluminum Profile

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

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

The aluminum profiles have one DIN-rail and one cable duct.

The aluminum profiles are available in different sizes. For horizontal mounting use 3BSE022255R1 (465 mm, 19") or 3BSE022256R1 (592 mm, 24") or 3BSE022257R1 (719 mm, 28.31"). For vertical mounting use 3BSE049768R1 (1800 mm, 71").



Figure 5. Cabinet with Controller on prefabricated aluminium profiles

Mounting and Removing PM8xx, CI8xx and S800L Units

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 base plate 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 locking screw (1 mm slot).

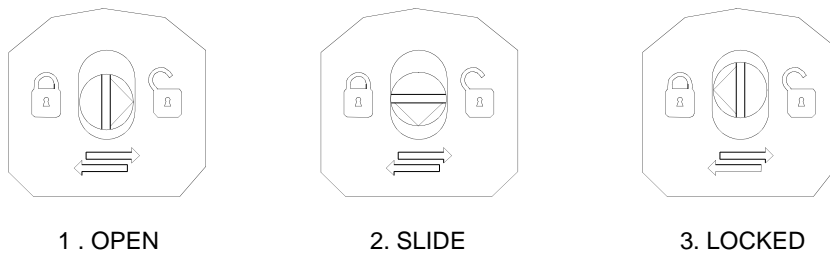


Figure 6. Base plate Locking Device



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



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



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

When disconnecting units from each other, use a screw driver according to [Figure 7](#)

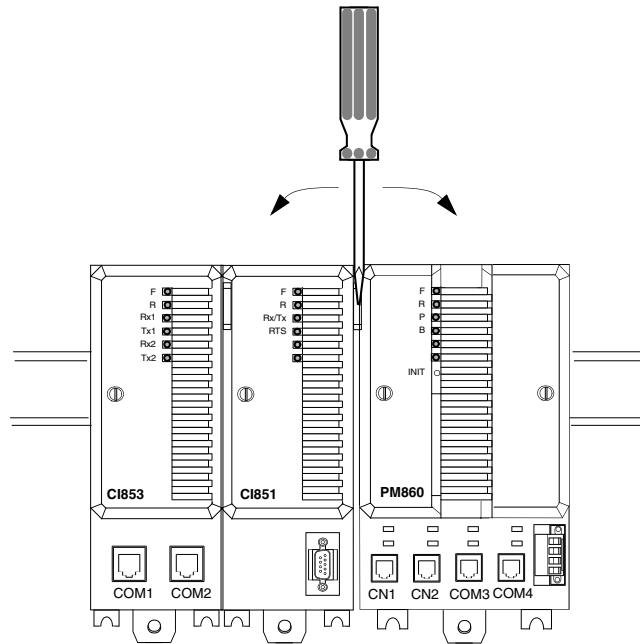


Figure 7. Separating the Base Plates

Mounting and Removing S800 I/O Units

The S800 I/O is mounted on a standard DIN-rail according to EN 50022 NS35/7,5. The DIN-rail is mounted in a cabinet or on an enclosure wall to a metal sheet with fastening screws every 100 mm to ensure a good chassis ground connection in the cabinet or an open rack. The ModuleBus master, ModuleBus Modem, MTUs and S800L I/O modules are mounted to the DIN rail. In environments with major vibrations, the MTUs shall also be screwed on the metal sheet. The FCI, ModuleBus Modem and MTUs have a snap locking device that attaches it to the mounting rail.

It is possible to mount the FCI, ModuleBus Modem, MTUs and S800L I/O modules both vertically and horizontally.

To mount the FCI, ModuleBus Modem or MTU, place it on the top edge of the DIN rail, release the rail latch with a flat blade screw driver and snap the bottom mechanism into place. When the unit is in place on the DIN rail and in position, take away the screw driver and the rail latch will fix the unit in position on the DIN rail. Release the unit from the DIN rail in a similar way.

A flat blade screw driver can be used to release the latch to allow easier movement along the DIN rail or removal of the unit (Figure 8).

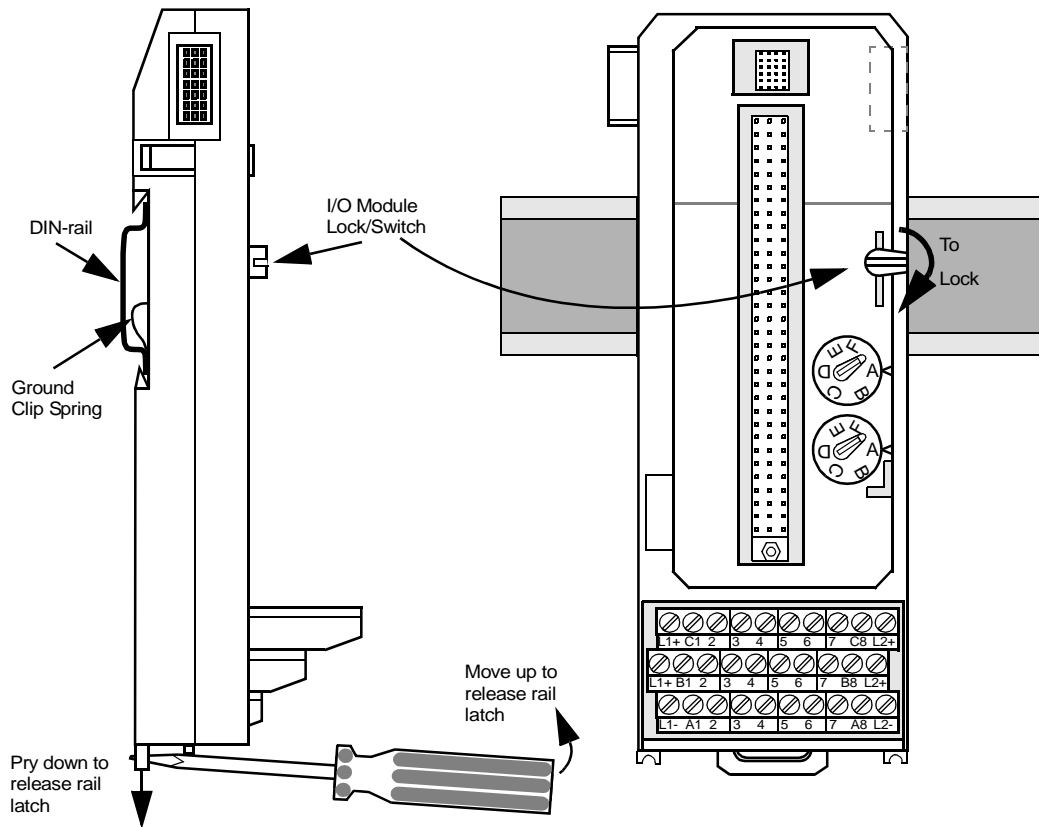


Figure 8. MTU Latching System

Snapping the FCI, ModuleBus Modem or MTU to the DIN-rail makes contact by a grounding spring with the chassis.

Connection of the MTU, or S800L module, ModuleBus connector to the FCI, ModuleBus Modem, next MTU or S800L module is made by sliding the MTU or the S800L module along the mounting rail and then locking it in place (Figure 9).

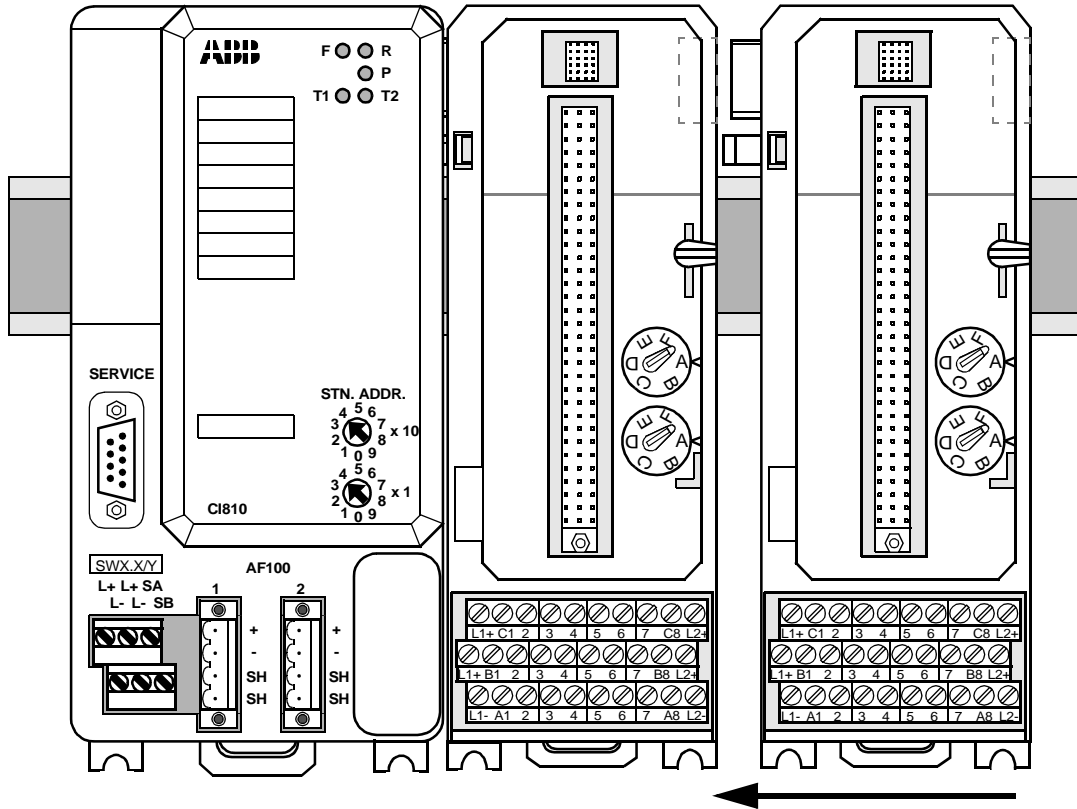


Figure 9. I/O Station Installation Diagram

The MTU and S800L module (locking screw in position) can be disconnected from the FCI, ModuleBus Modem, another MTU or S800L module by using a screw driver and pressing it between the two items.

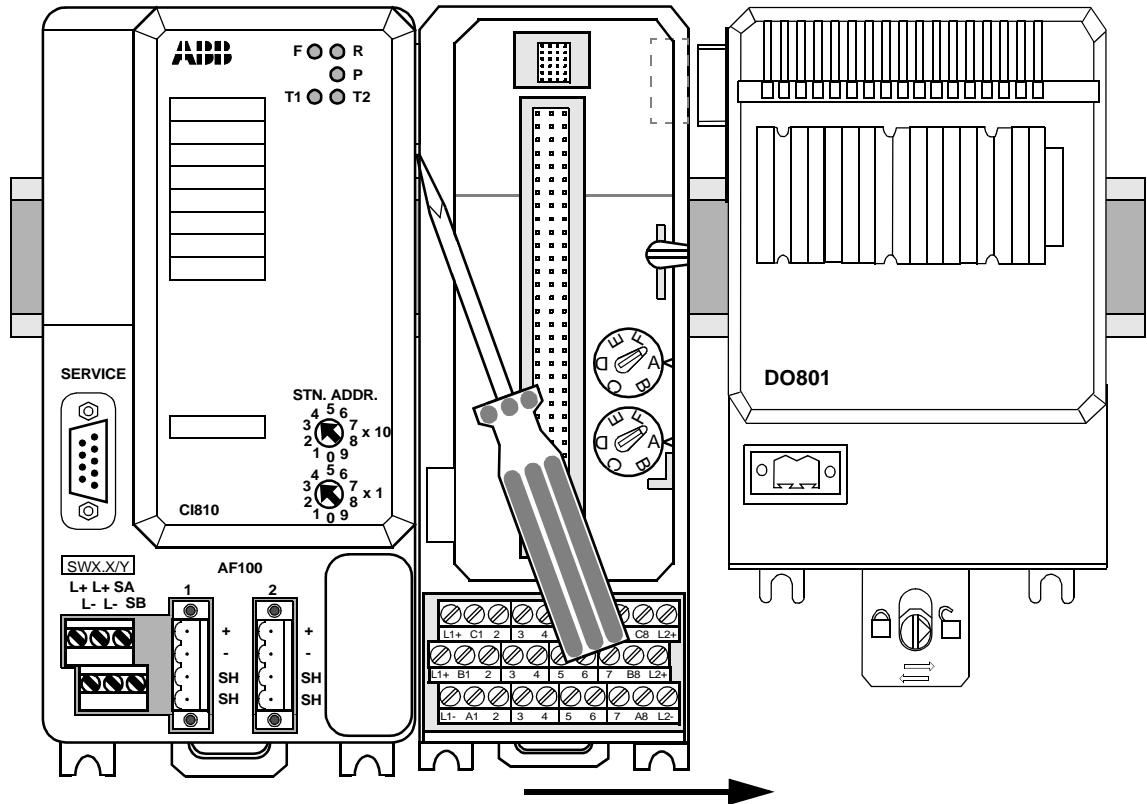


Figure 10. Module Release

I/O Module Installation on Module Termination Unit

Connection of the I/O module to the MTU is made by setting the I/O Module Keys #1 and #2 to the correct setting, place the I/O Module Lock/Switch to the unlock position and then push the I/O module straight onto the MTU. The I/O module is locked and electrically connected to the MTU by the I/O Module Lock/Switch.

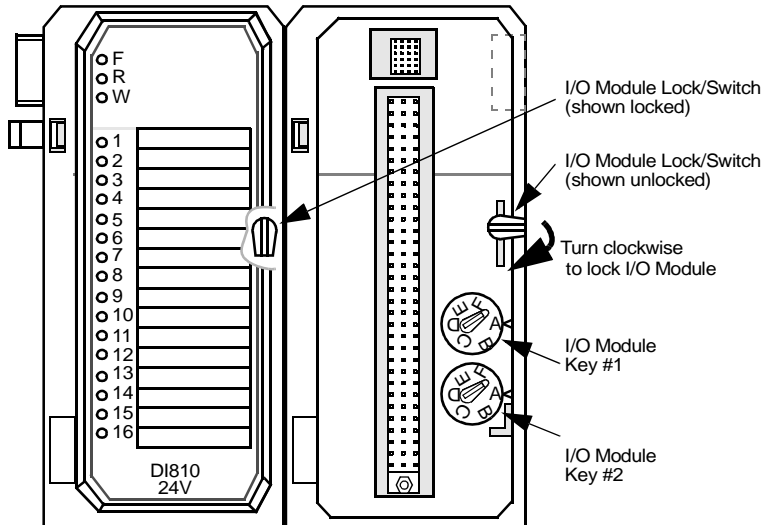


Figure 11. MTU Mechanical Keys for I/O Module and Module Lock

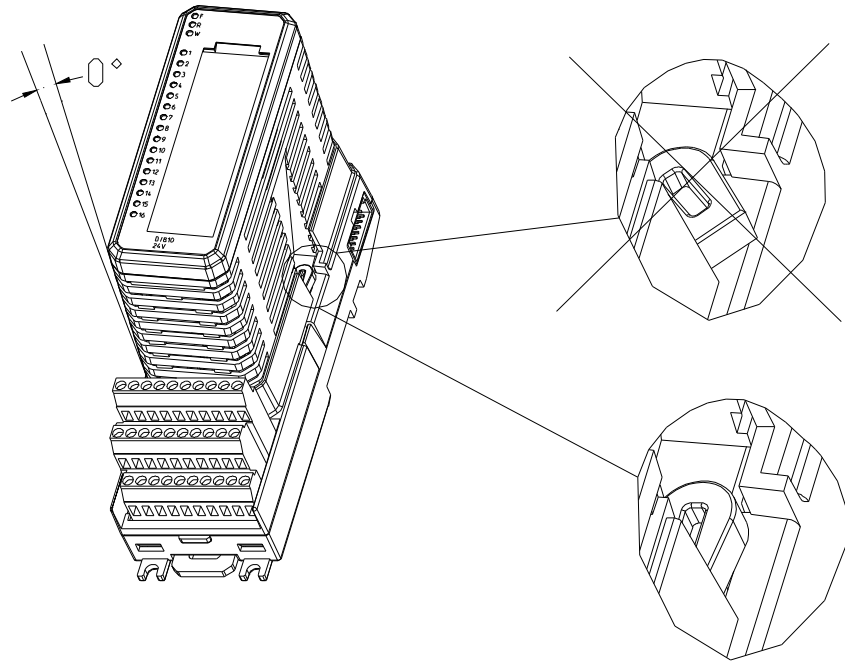


Figure 12. Mounting of I/O module on MTU



At the mounting of a S800 I/O Box on a Termination Unit the following should be observed:

Press the Box straight and right on to stop into the Termination Unit. Above shown angle shall be 0° .

Turn the Locking Device clockwise to its end position. Above shown state with the Locking Device in a position before end position shall not exist for an active module.



Do **not** turn the I/O Module Lock/Switch counter-clockwise from the unlocked position. This will cause it to break and will make the MTU and the I/O module inoperative.

Power Supply

It is recommended to feed the system components and field equipment from different power supplies. Example of system components are Controllers, Communication Modules, Fieldbus Communication Interfaces and Modulebus Modems, (for instance PM864A, CI854A, CI840A and TB840A). Example of field equipment is transmitters, actuator as well as the field side of the S800 I/O modules (terminals on MTU and S800L marked L+ and L-).

The power supplies can also be configured in a redundant configuration using independent voting units.

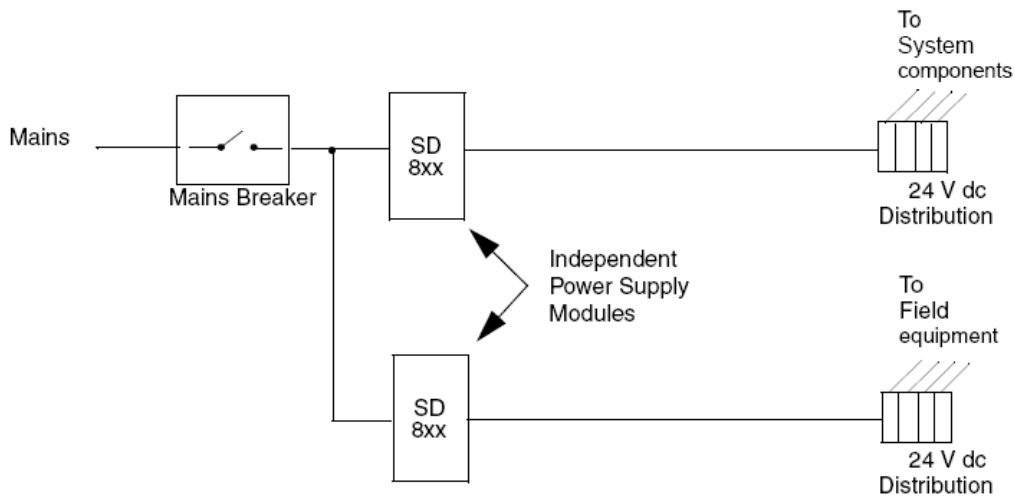


Figure 13. Recommended Power Supply Concept

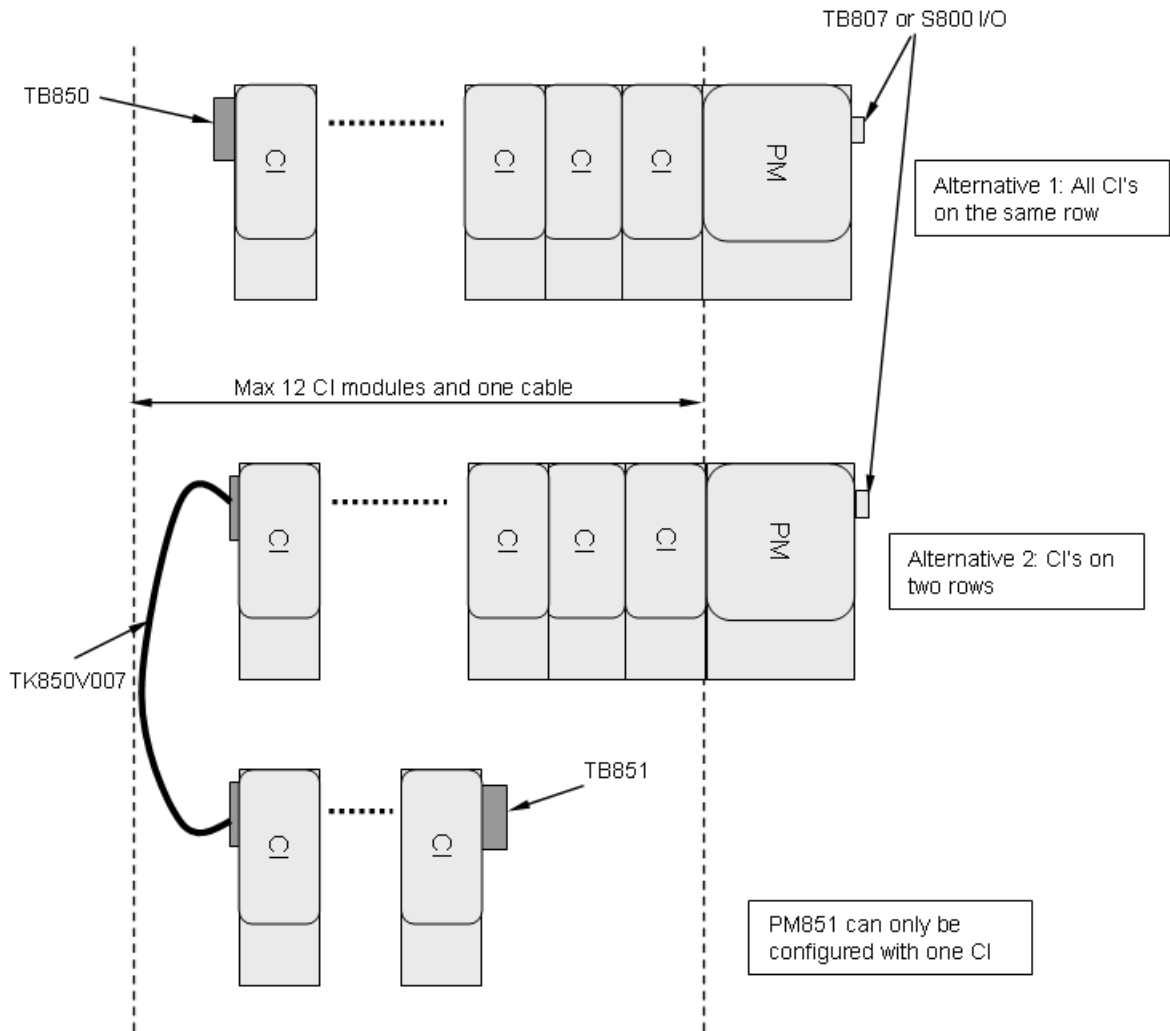
Section 3 Configuration

Controller Configuration - Basic Rules and Examples

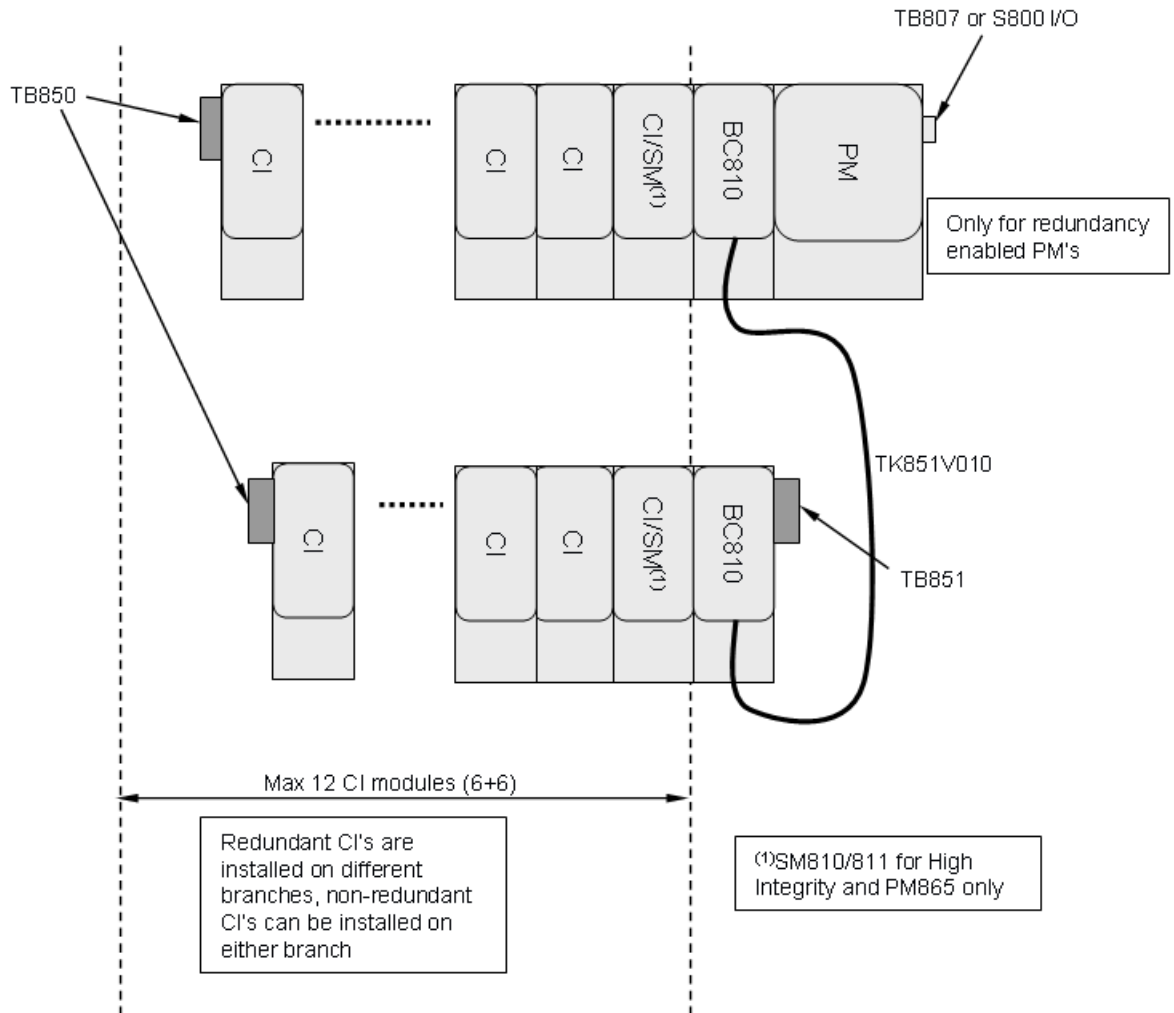


Information regarding limitations for the different controllers can be found in *IndustrialIT 800xA - Control and I/O, AC 800M Controller Hardware, Hardware and Operation (3BSE036351Rxxx)*.

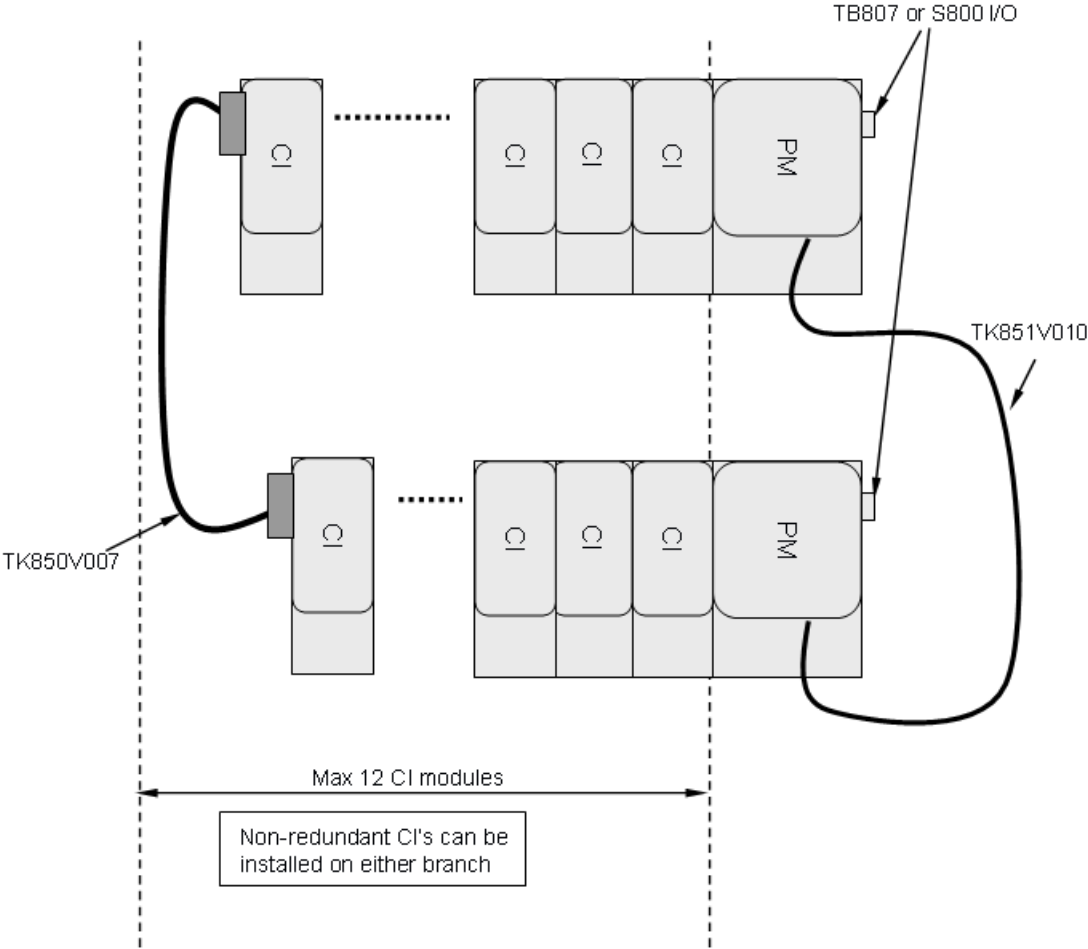
Single CPU Configuration



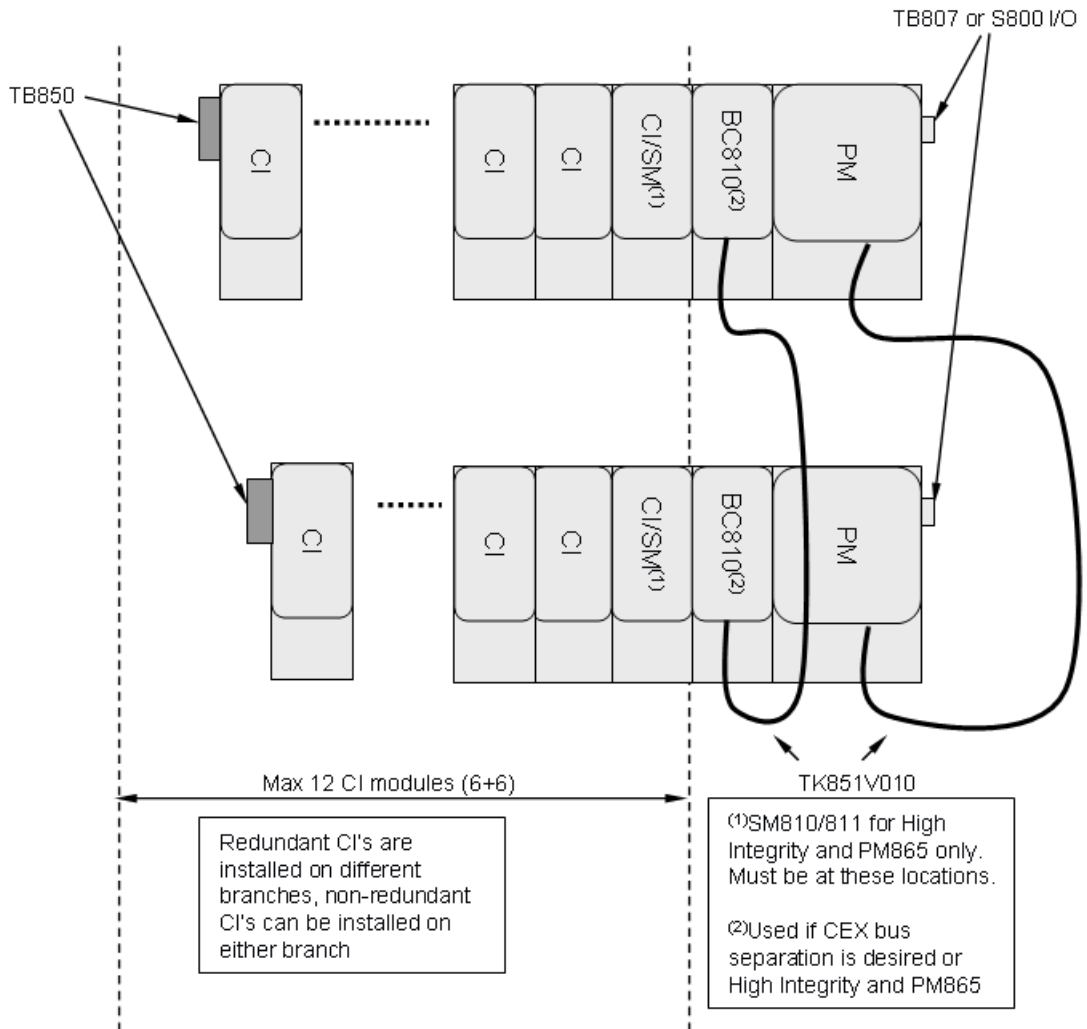
Single CPU with Redundant CI Configuration



Redundant CPU with Non-Redundant CI Configuration



Redundant CPU with Redundant CI Configuration

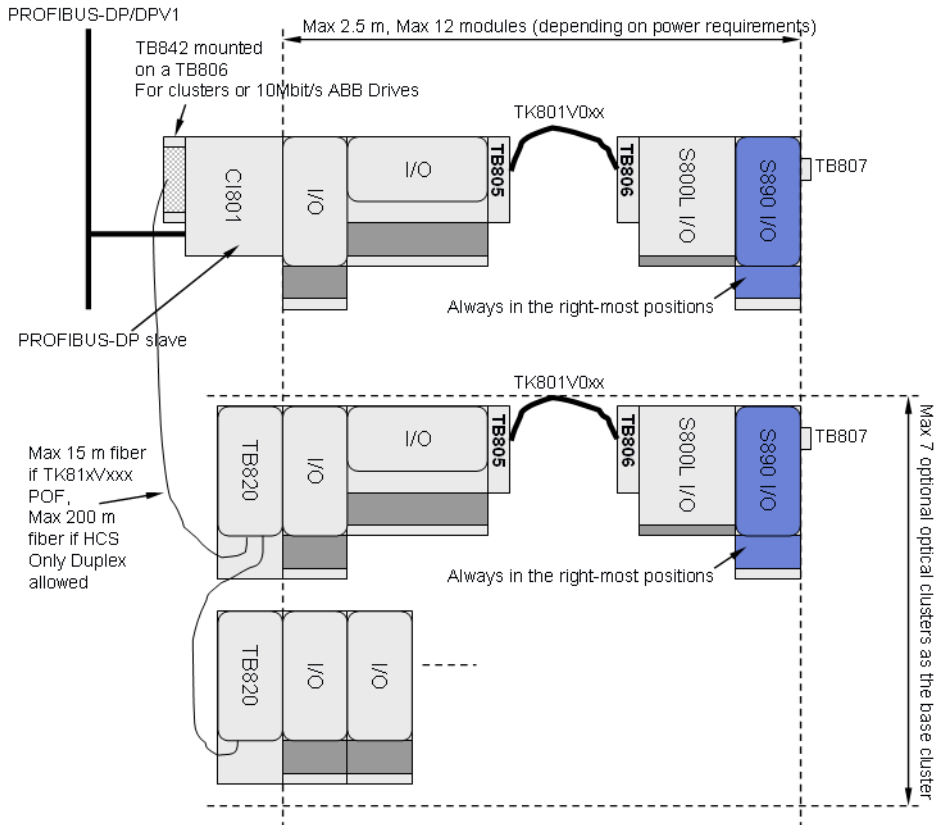


S800 I/O Configuration - Basic Rules and Examples



Information regarding limitations for the different I/O modules can be found in *IndustrialIT, Control and I/O, S800 I/O, General Information and Installation (3BSE020923Rxxxx)*.

Non-redundant PROFIBUS Node



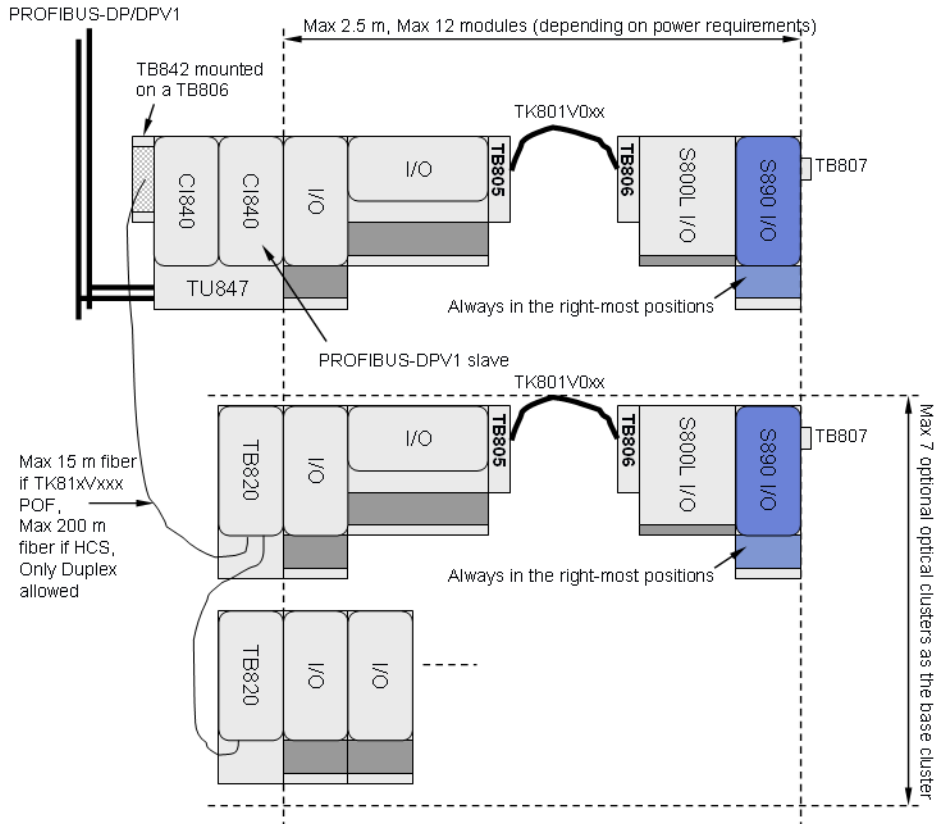
In total max 24 modules per CI801 but limited by:

- PROFIBUS data capability.
- CI801/TB820 Power supply capability.
- Required scan cycle time.

Modules not supported:

DI825, DO880, AI880A, DI830, DI831, DI880, DI885.
 5 Mbit/s ABB Drives and SOE on DI840 are not supported.

Line/Master-redundant PROFIBUS Node



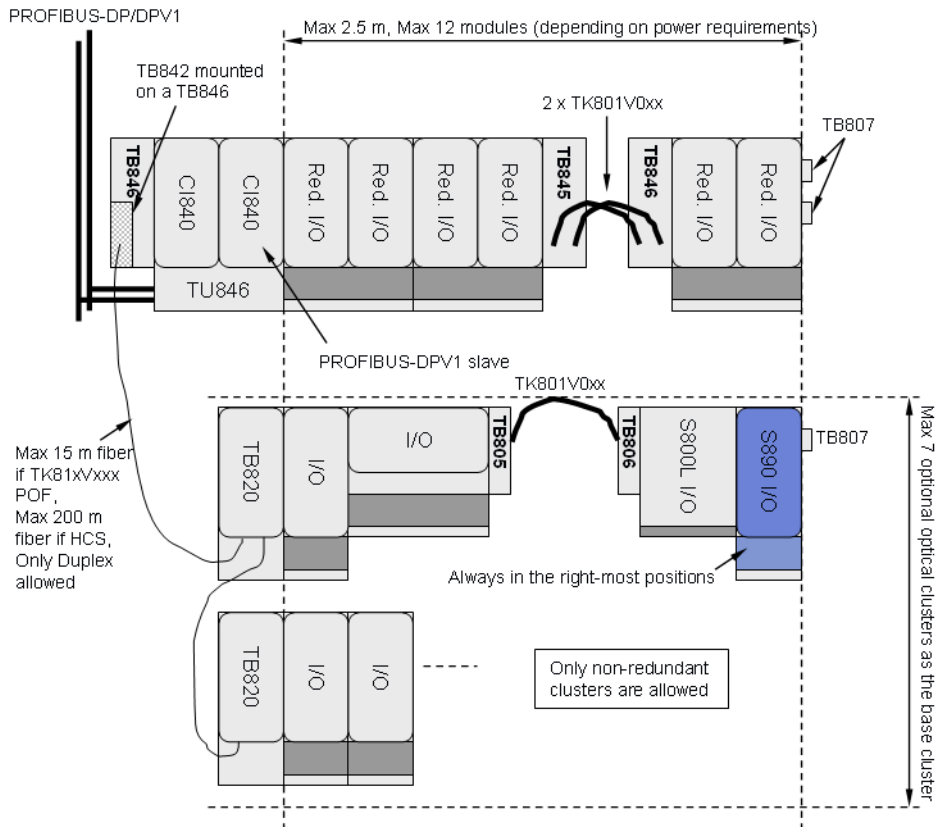
In total max 24 modules per CI840A but limited by:

- PROFIBUS data capability.
- CI840A/TB820 Power supply capability.
- Required scan cycle time.

Modules not supported:

DI825, DO880, AI880A, DI830, DI831, DI880, DI885.
ABB Drives and SOE on DI840 are not supported.

Line/Master-redundant PROFIBUS Node with Redundant I/O



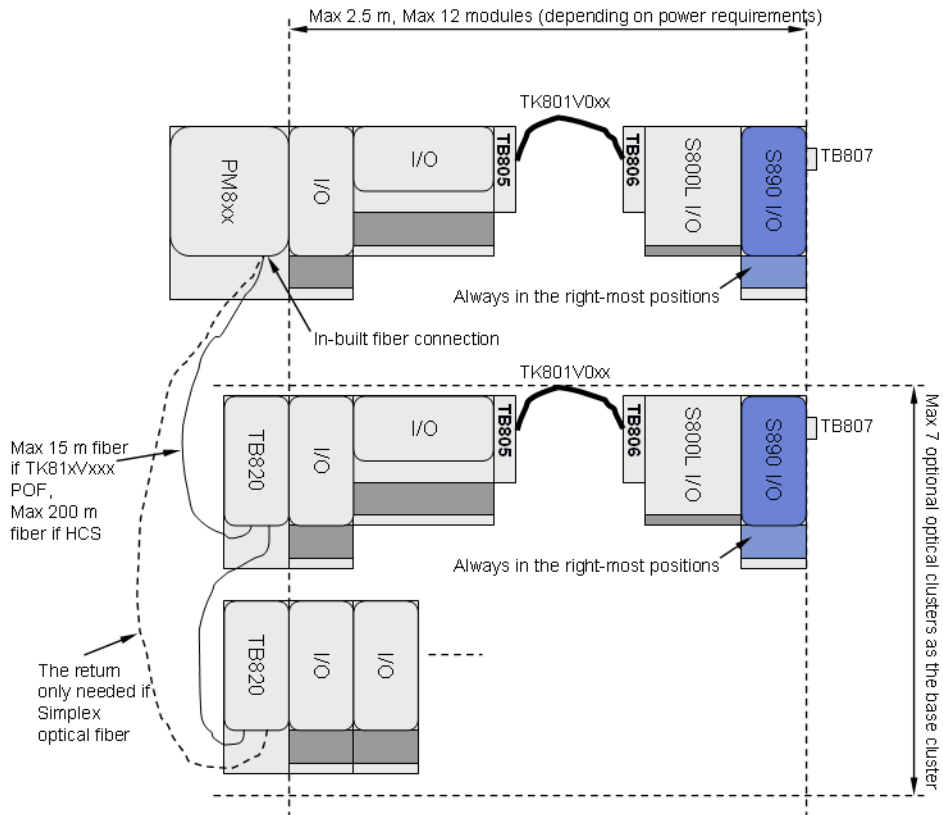
In total max 24 modules per CI840A (a redundant pair is 2 modules) but limited by:

- PROFIBUS data capability.
- CI840A/TB820 Power supply capability.
- Required scan cycle time.

Modules not supported:

DI825, DO880, AI880A, DI830, DI831, DI880, DI885.
 ABB Drives and SOE on DI840 are not supported.

Direct I/O to non-redundant AC 800M Controller



In total max 96 modules but limited by:

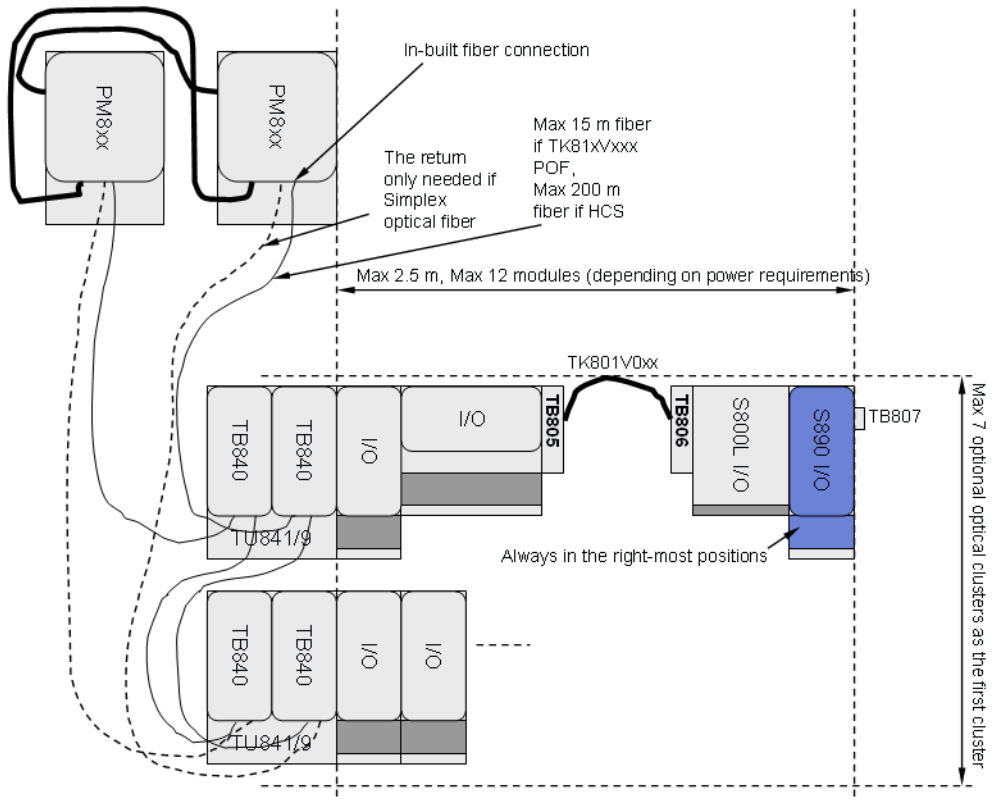
- PM8xx and TB820 Power supply capability.
- Required scan cycle time.
- Required CPU load.

Supported modules:

DI880, DO880, AI880A are supported **if** PM865 and TB840A (instead of TB820).

The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42.

Direct I/O to redundant AC 800M Controllers



In total max 84 modules but limited by:

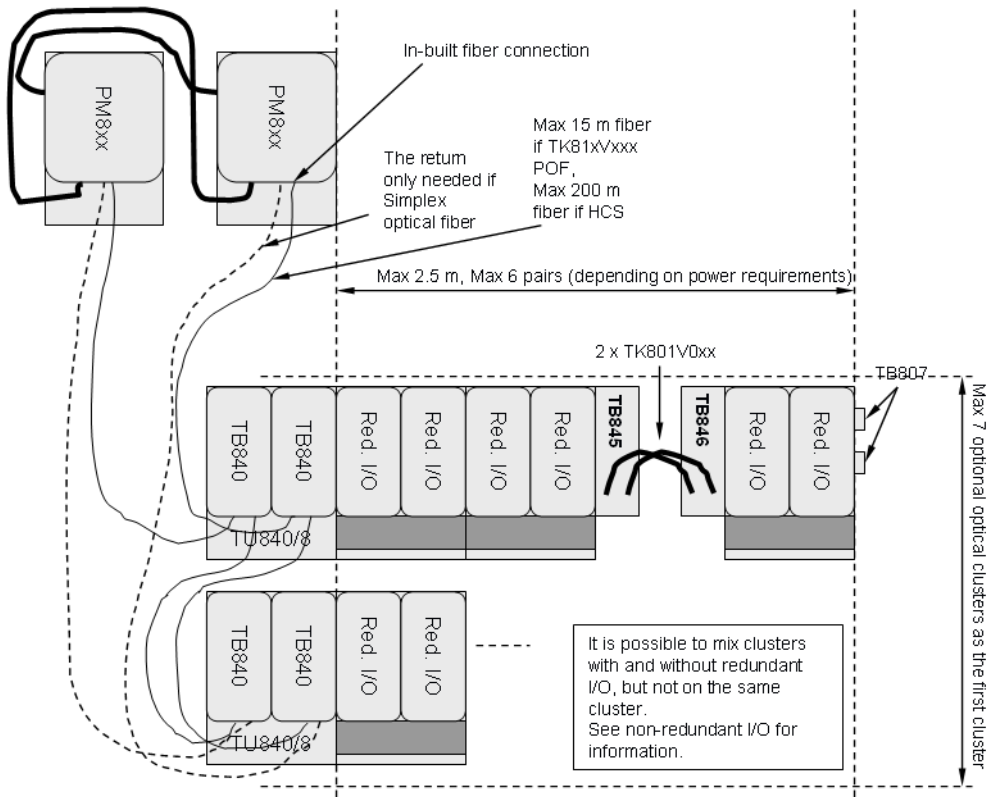
- TB840A Power supply capability.
- Required scan cycle time.
- Required CPU load.

Supported modules:

AI880A, DI880, DO880 are supported **if** PM865.

The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42.

Direct redundant I/O to redundant AC 800M Controllers



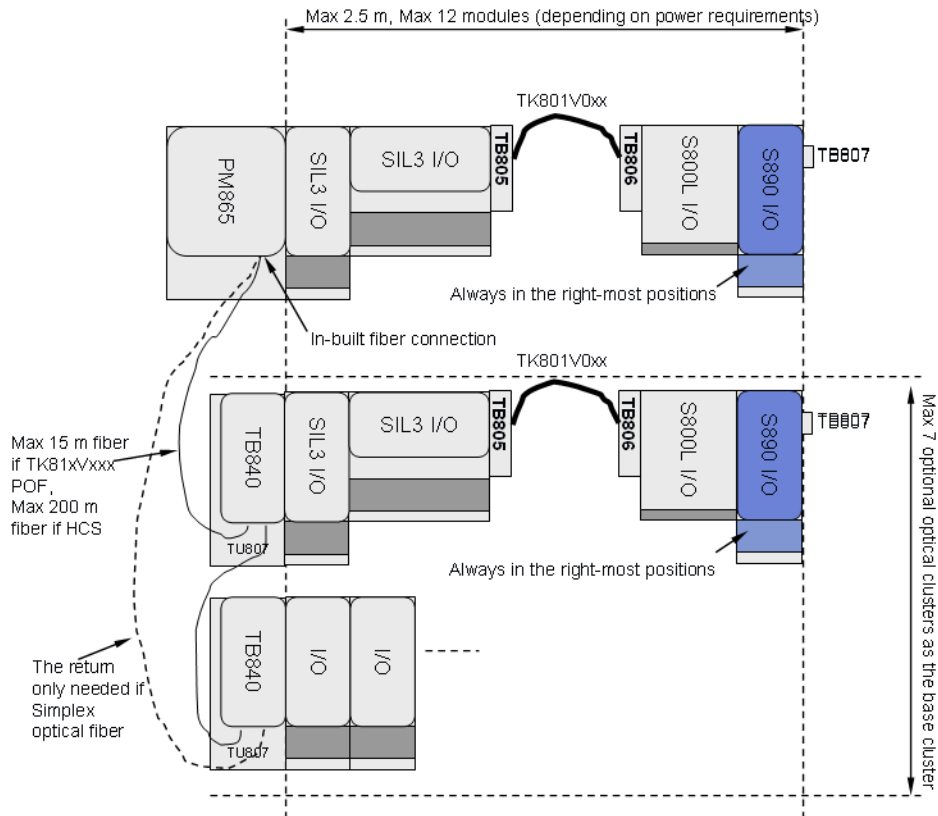
In total max 42 pairs of modules but limited by:

- TB840A Power supply capability.
- Required scan cycle time.
- Required CPU load.

Supported redundant modules:

DI840, DO840, AI843, AO845, DP840, AI845. AI880A, DI880, DI880 are supported **if** PM865. The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42. It is possible to mix clusters with and without redundant I/O, but not on the same cluster. See non-redundant I/O for information.

High Integrity I/O to non-redundant High Integrity Controller

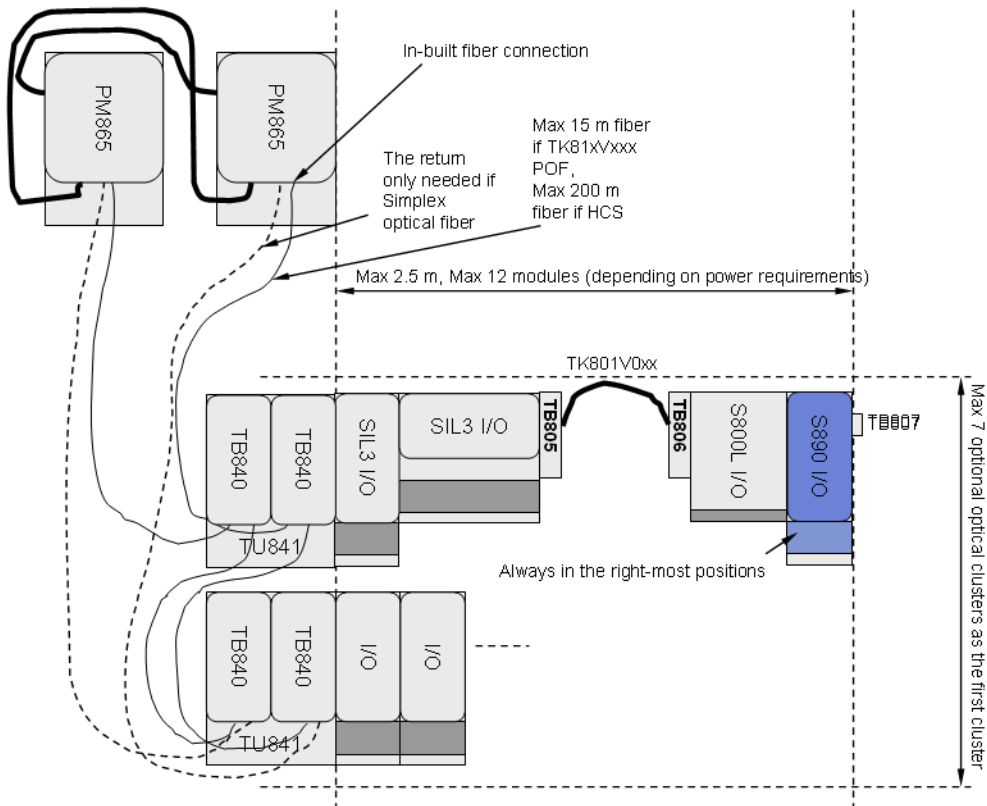


In total max 96 modules but limited by:

- PM8XX and TB840A Power supply capability.
- Required scan cycle time.
- Required CPU load.

The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42.

High Integrity I/O to redundant High Integrity Controllers



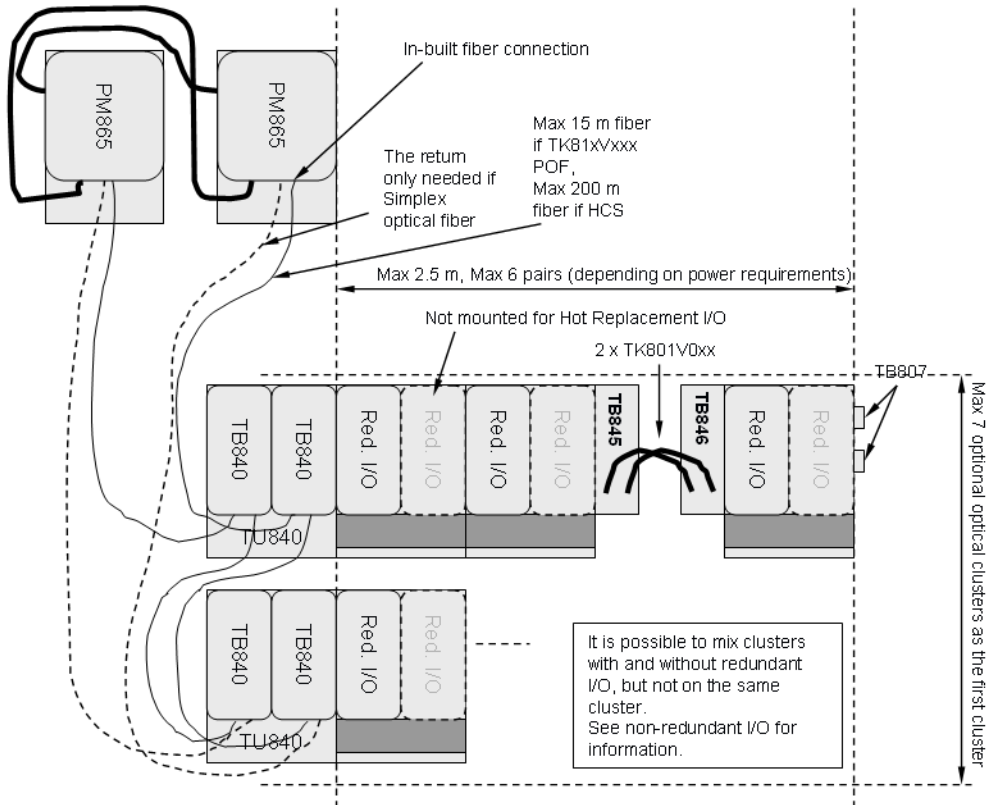
In total max 84 modules but limited by:

- TB840A Power supply capability.
- Required scan cycle time.
- Required CPU load.

The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42.

NOTE! In a configuration with redundant CPUs, COM3 and the electrical ModuleBus cannot be used.

HI redundant or hot replacement I/O to redundant PM865



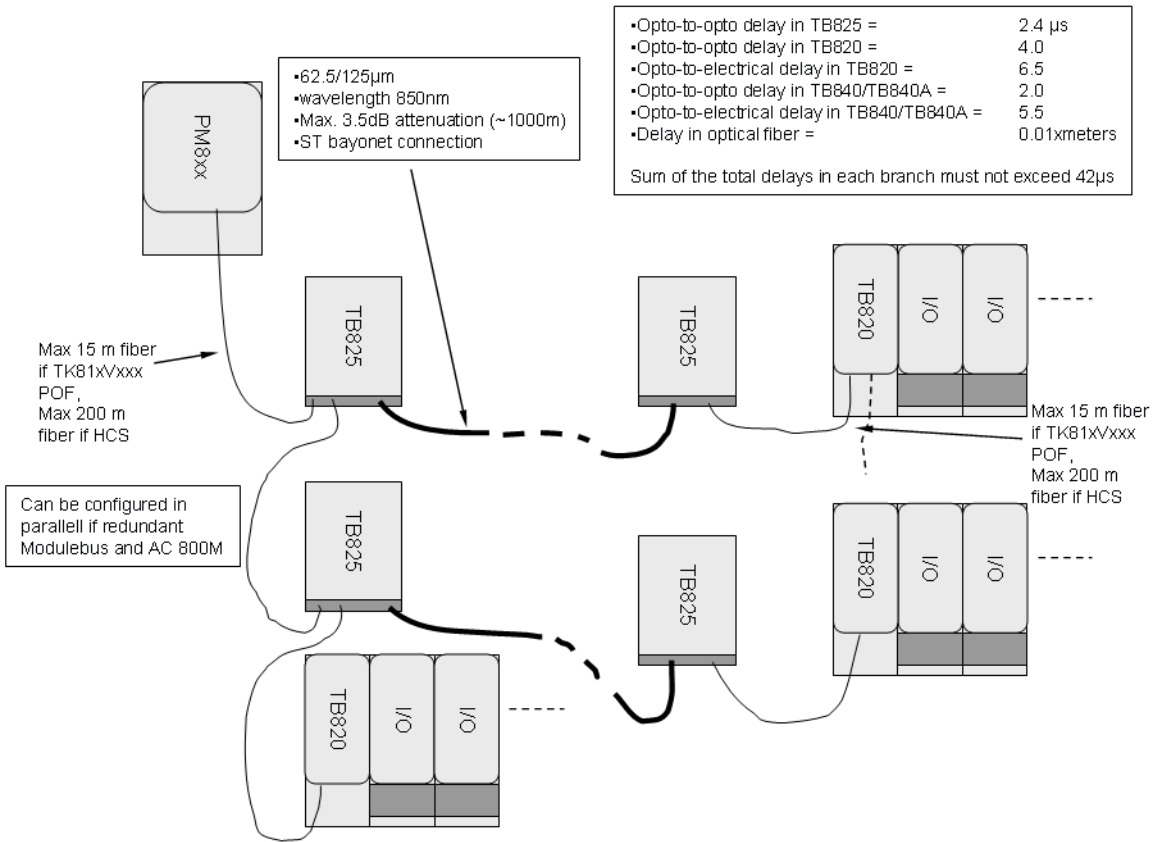
In total max 42 pairs of modules but limited by:

- TB840A Power supply capability.
- Required scan cycle time.
- Required CPU load.

Supported modules:

DI840, DO840, AI843, AO845, DP840, DI880, DO880, AI845, AI880A. The optical ModuleBus can be configured for long distances and in star configurations using TB825 see [Long distance distribution in star as Direct I/O to AC 800M](#) on page 42. It is possible to mix clusters with and without redundant I/O but not on the same cluster. See non-redundant I/O for information.

Long distance distribution in star as Direct I/O to AC 800M



Calculation of the ModuleBus delay for the configuration in the figure above:

$$\text{ModuleBus delay} = (\text{total delay in optical fiber}) + 5 \times (\text{opto-to-opto delay in TB820}) + 2 \times (\text{delay in TB825}) + (\text{opto-to electrical delay in TB820}) = (4 \times 15 + 3 \times 1.5 + 1000) \times 0.01 + 5 \times 4 + 2 \times 2.4 + 6.5 = 42 \text{ s.}$$

Section 4 Operation

Hardware Indicators

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

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

Table 1. PM8xx - LED Indicators

Marking	Color	Function
F(ault)	Red	Normal state - OFF Re-start (INIT) temporarily lit F(ault). May also be operated by software program
R(un)	R(un)	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 1. PM8xx - LED Indicators (Continued)

Marking	Color	Function
B(attery)	Green	Normal state - ON Lit when internal or external battery voltage is above 3.1 V. The LED is controlled by a software battery voltage test ⁽¹⁾ .
Tx	Yellow	Data Transmission ⁽²⁾ , CN1 + CN2 and COM3 + COM4 Flashes in synchronization with Tx traffic
Rx	Yellow	Data Reception ⁽²⁾ , CN1 + CN2 and COM3 + COM4 Flashes in synchronization with Rx traffic
Valid for PM8xx in redundant operation		
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.s

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

Switches and Push Buttons

Table 2. PM8xx - Switches and Push Buttons

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

Communication Interface LEDs

[Table 3](#) and [Table 5](#) shows Indicators for the communication interface modules.

Table 3. Common LEDs for Communication Interfaces

Marking	Color	Description
F(Fault)	Red	Unit error detected
R(Run)	Green	Operating
Tx/Tx1/Tx2 (Transmit)	Yellow	Flashes if transmitting
Rx/Rx1/Rx2/RxA/RxB (Receive)	Yellow	Flashes if receiving
RxTx (Receive & Transmit)	Yellow	Flashes if transmitting or receiving

Table 4. Common LEDs for Communication Interfaces in Redundant operation

Marking	Color	Description
PRIM(Primary)	Yellow	Indicates the primary unit in redundant configuration. (LED is on in both single and redundant configuration).
DUAL	Yellow	Indicates when unit is running in redundant configuration.

Table 5. Special LEDs

Module	Marking	Color	Description
CI858	Tools	Yellow	Indicates reception / transmission of data frames on the PC Tool buss.
CI862	Com Error	Yellow	Indicates traffic.
CI856	TO	Yellow	Flashes at S100 I/O access time-outs.

S800 I/O Module LEDs

Figure 14 shows examples of front panels for different types of I/O modules. On the front of all I/O modules there are at least three LEDs (FAULT, RUN and WARNING) indicating the module status. Additionally some modules have LEDs indicating OSP or PRIMARY. Each digital channel also has one LED indicating current state (on/off). For more information see the tables below.

- **F** - The **FAULT LED** shall indicate when the I/O module detect a fatal error or before first access after power up.
- **R** - The **RUN LED** shall indicate when the I/O module is operational.

- **W** - The **WARNING LED** shall indicate when a non-fatal error is detected and the module continues to run.
- **O** - The **OSP LED** shall indicate when the I/O module is in OSP state, that is, when the module is commanded to OSP or when automatically set to OSP state due to communication error.
- **PRIM** - The **PRIMARY LED** shall indicate when the I/O module is primary (in a redundant pair). In a redundant configuration, the primary module is scanned at the specified cycle time to supply input values to the application, while the backup module is scanned at a low cycle for diagnostic purpose. The input values from the backup module are not used by the application.

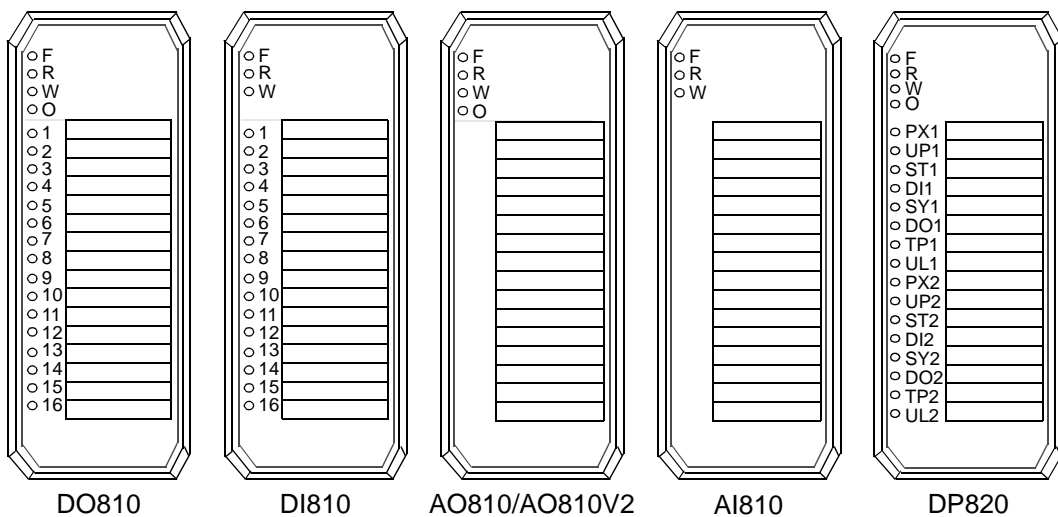


Figure 14. Examples of S800 I/O Modules LED Locations

Marking	Color	Description
F (Fault)	Red	Internal fault in the module affecting all channels ⁽¹⁾
R (Run)	Green	Operational state
W (Warning)	Yellow	External fault or internal channel error
O (OSP)	Yellow	OSP state (Outputs Set as Predetermined)
P (Primary)	Yellow	LED indicating that the module is operating as primary in a redundant pair
Channel status	Yellow (+red)	This LED shows both value (Yellow ON/OFF) and error (red)

- (1) Modules without self test function: The F-LED will switch on at power up or restart of the module and switch off after the first successful access to the module. Modules with self test function: The F-LED will switch on at power up, restart of the module or when the module goes to Error state. If the module has not gone to Error state it will switch off the F-LED after the first successful access to the module.

Module State	Run	Fault	Warning	OSP	Primary	Channel Status
Init	Off	On	Off	Off	Off	DI On/Off ⁽¹⁾ , DO Off
Not configured	Flashing/Off	On/Off ⁽²⁾	On/Off	Off	Off	DI On/Off ⁽¹⁾ , DO Off
Ready	Flashing/Off	Off	On/Off	Off	Off	DI On/Off, DO Off
Operational	On	Off	On/Off	Off	On/Off	On/Off
OSP	On	Off	On/Off	Off	On/Off	On/Off
Error	Off	On	On/Off	Off	Off	DI On/Off, DO Off

- (1) The DI signal status for module DI830, DI831, DI880, DI885, DP820 is only OFF0.

- (2) Will be switched off after the first successful access to the module.

S800L I/O Module LED

[Figure 15](#) shows examples of front panels for different types of I/O modules. On the front of each I/O module there is one LED indicating the module status. See the tables below for information on the meaning and indications for these modules. For modules with special LED indications see respectively module in [Appendix A, IndustrialIT System 800xA AC 800M Controller - Data Sheet](#).

The LED shall indicate:

- Red when the I/O module detect a fatal error or before first access after power up.
- Green when the I/O module is operational.

Each digital channel has one LED indicating current state (on/off).

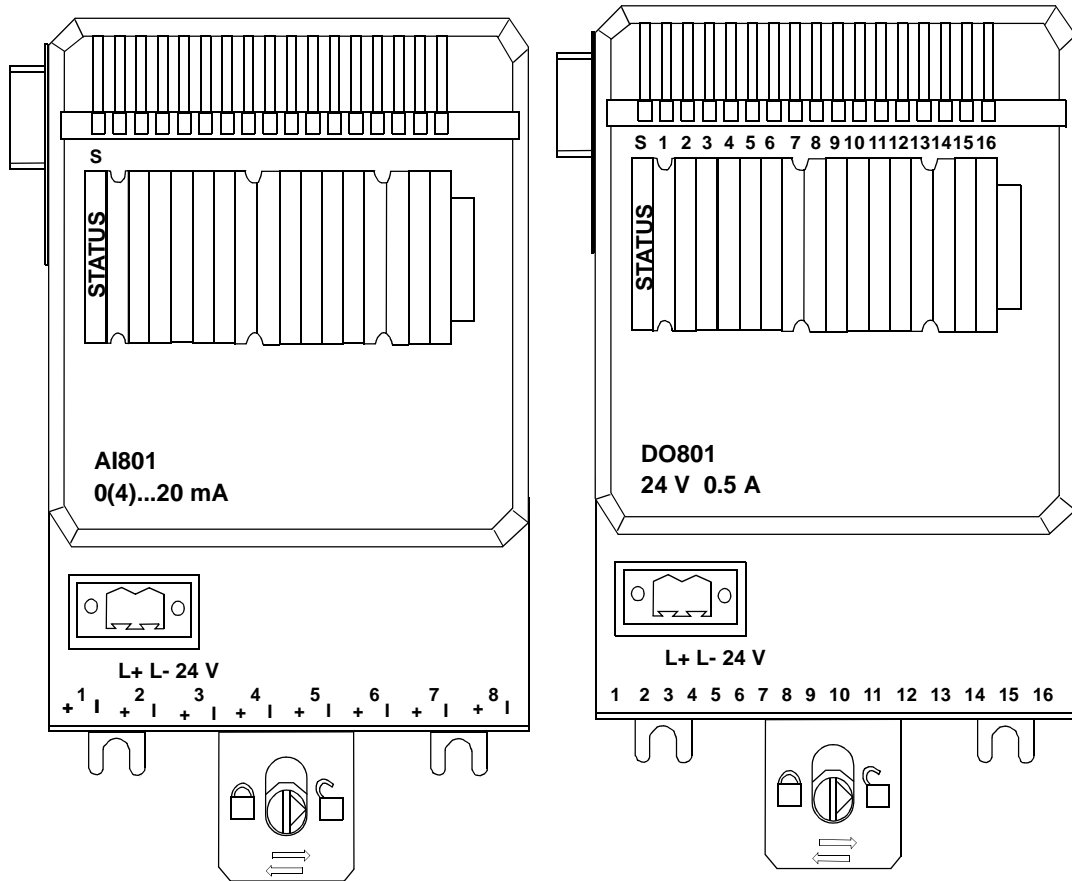


Figure 15. Example of S800L I/O Module LED Locations

Marking	Color	Description
S(Status)	Red	Fault in the module ⁽¹⁾
	Green	Operational state

- (1) Modules without self test function, for example, DI/DO modules: The S-LED will switch on to red at power up or restart of the module and switch off after the first successful access to the module. Modules with self test function for example, AI/AO modules: The S-LED will switch on to red at power up, restart of the module or when the module goes to Error state. If the module has not gone to Error state it will switch off the S-LED after the first successful access to the module.

Module State	Status	Channel Status
Init	Red	Off
Not configured	Red/Off ⁽¹⁾	Off
Ready	Off	DI On/Off, DO Off
Operational	Green	On/Off
OSP	Green	On/Off
Error	Red	DI On/Off, DO Off

- (1) Will be switched off after the first successful access to the module.

Start Modes

The controller may be started with the following start modes:

Warm init

- Power Off / On with a battery backed up CPU.
- Applications restart with retain values.

Cold init

- Press init <2.5 s.
- Applications restart with cold retain values.

Reset

- Press init >3 s or until RUN lead flashes.
- Applications are deleted in controller.

Section 5 Maintenance/Replacement of Faulty Units

Online Replacement of Unit

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

CEX-Bus

Communication interfaces ()	Can be removed or replaced online Restrictions apply; refer to the installation section for each interface.
Base plates for CI8xx (TP8xx)	It is not allowed to manipulate CEX bus base plates in a powered and running system. Before changing or removing a base plate, all CEX modules on that segment must be removed.

ModuleBus

S800 I/O units	Can be removed or replaced online. (Not S800L)
Module Terminal Units (MTUs)	Must not be replaced online

Redundant CPUs

Processor unit	Can be removed or replaced online by following a specified sequence (see the next following pages)
----------------	--

Appendix A Industrial^{IT} System 800xA AC 800M Controller - Data Sheet

CPUs/Features	PM851	PM856	PM860	PM861A	PM864A	PM865	PM866
Processor unit	PM851K01 incl: 1 PM851 CPU and required optional items	PM856K01 incl: 1 PM856 CPU and required optional items	PM860K01 incl: 1 PM860 CPU and required optional items	PM861AK0 1 incl: 1 PM861A CPU and required optional items PM861AK0 2 incl: 2 PM861A CPUs and required optional items	PM864AK0 1 incl: 1 PM864A CPU and required optional items PM864AK0 2 incl: 2 PM864A CPUs and required optional items	PM865AK0 1 incl: 1 PM864A CPU and required optional items PM864AK0 2 incl: 2 PM864A CPUs and required optional items	PM866AK0 1 incl: 1 PM864A CPU and required optional items PM864AK0 2 incl: 2 PM864A CPUs and required optional items
High Integrity Controller	No	No	No	No	No	Yes together with SM81x	No
Clock frequency	48 MHz	48 MHz	48 MHz	48 MHz	96 MHz	96 MHz	133 MHz

CPUs/Features	PM851	PM856	PM860	PM861A	PM864A	PM865	PM866
Memory (RAM)	8 Mb	8 Mb	8 Mb	16 Mb	32 Mb	32 Mb	64 Mb
CPU redundancy support	No	No	No	Yes	Yes	Yes	Yes
Performance Relation	1.0 ms	1.0 ms	2.0 ms	2.0 ms	3.1 ms	3.1 ms	4.3 ms
Cycle time per application programs	Down to 1 ms						
Comm. modules on CEX bus	1	12	12	12	12	12	12
I/O capacity on ModuleBus	modules max 24 I/O	modules max 96 I/O	modules max 96 I/O	modules max 96 I/O (84 in redundant configuration)	modules max 96 I/O (84 in redundant configuration)	modules max 96 I/O (84 in redundant configuration)	modules max 96 I/O (84 in redundant configuration)
Ethernet channels for Control Network	1	2	2	2	2	2	2
Dimensions	W 119 x H 186 x D 135 mm (4.7 x 7.3 x 5.3 in.)						

Supported Communication modules	PROFIBUS	Foundation Fieldbus	RS-232 C	MB300	INSUM	Drivebus	S100 I/O interface	TRIO I/O	Satt I/O	Modbus TCP	IEC 61850
Module	CI854A	CI860	CI853	CI855	CI857	CI858	CI856	CI862	CI865	CI867	CI868
Protocol	DP-V1 (PA via Linking Device)	HSE (H1 via Linking Device)	Modbus master, Comli-master/slave, Siemens master, User defined protocols	MB300	IEEE 802.3	Drivebus	S100 I/O	Trio I/O	Satt I/O	Modbus TCP	IEC 61850
Master or slave	master	master	master/slave	master/slave	master	master	master	master	master	master/slave	n/a
Number of channels	1	1	2	2	1	1 main, 2 aux	1	1	1	1 10/100 Mbps 1 10 Mbps	1
Max units on CEX bus	12	6	12	12	6	2	12	4	4	12	4
Cable redundancy	yes	no	no	yes	no	no	no	no	no	no	no

Supported Communication modules	PROFIBUS	Foundation Fieldbus	RS-232 C	MB300	INSUM	Drivebus	S100 I/O interface	TRIO I/O	Satt I/O	Modbus TCP	IEC 61850
Module redundancy	yes	yes	no	no	no	no	no	no	no	yes	no
Dimensions	W 58 x H 186 x D 135 mm (2.3 x 7.3 x 5.3 in.)										

Appendix B System 800xA S800 I/O System - Data Sheet

General specifications	
Power supply	24V d.c. (19.2 - 30V)
Temperature range	0...55°C (non-condensing) ⁽¹⁾
Protection class	IP20
Standards complied with: - Electrical safety - Hazardous locations (Class1 Zone 2 and Class 1 Division 2) - Corrosive gases	EN 3810, EN 50178, IEC 61131-2, UL508, CSA 22.2 No. 142-M1987 No. 213-M1987, FM 3600, FM 3611, UL 60079-15, CSA 22.2 No.213-M1987 CAN/CSA-E60079-15:02 ISA Class G2 or G3 (ISA-71.04)
Insulation test voltage	500/2000V a.c.
Communication media	
Profibus DP	Twisted pair screened/fiber-optic cable. Up to 99 stations per bus. Up to 32 per twisted-pair segment. Bus length: Up to 1200m (3937ft.) per twisted-pair segment.
Communication interfaces	
CI801	For PROFIBUD-DP/V1. Hot Configuration In Run & HART [®] pass-through. GSD-file provided.

TB820/825/842	Optical cluster modem/ports for ModuleBus/drives integration.
CI840A	For redundant PROFIBUS-DP/V1. Hot Configuration in Run & HART [®] pass through. GSD file provided.
TB840A	Optical cluster modem for redundant or single ModuleBus. Installed on TU807/TU840/TU841/TU848/TU849. Used with AC 800M.
Module Termination Units (MTU:s)	
Compact, 50V applications TU810 TU812 TU814	With screw terminals. With 25 pin D-sub connector. With 3 crimp snap-in connectors.
Compact, 250V applications TU811 TU813	With screw terminals. With 3 crimp snap-in connectors.
Compact for intrinsic safety TU89X	With screw terminals & isolated power supply.
Extended, 50V applications TU830/TU835/TU838/TU850 TU833 TU834	With screw terminal, pwr. distribution & fuse. With spring-cage term., pwr distribution & fuse. With screw terminals for shunt sticks.
Extended, 250V applications TU831/TU836/TU837/TU839	With screw terminals, pwr. distribution & fuse.
Redundancy, 50V applications TU842/843 TU844/845	(horiz./vert. mounting) With screw terminals. (horiz./vert. mounting) With screw terminals and shunt stick, TY80X.
Terminal Unit TU805	For DI801 & DO801. With field power distribution screw terminals.

S800 I/O modules	
Digital input modules	
DI810	16 channels, 2 groups of 8 ch., 24V d.c., current sink.
DI811	16 channels, 2 groups of 8 ch., 48V d.c., current sink.
DI814	16 channels, 2 groups of 8 ch., 48V d.c., current source.
DI820	8 channels, separate returns, 110V d.c., 120V a.c.
DI821	8 channels, separate returns, 220V d.c., 230V a.c.
DI825	With time tagging. 8 channels, sep. returns, 125V d.c.
DI830	With time tagging. 16 channels, 2 groups of 8 channels, 24V d.c., current sink. Resolution: <0.5ms.
DI831	With time tagging. 16 channels, 2 groups of 8 channels, 48V d.c., current sink. Resolution: <0.5ms.
DI885	With time tagging. 8 channels, common return, 24-48V d.c. current sink. Time tagging resolution: 1ms.
Pulse input module	
DP820	2 channels, separate returns, 0.25Hz -1.5MHz, signal voltage: 5 / 24V d.c.
Digital output modules	
DO810	16 channels, 2 groups of 8 channels, 24V, max 0.5A d.c., transistor, current source, short-circuit-proof.
DO814	16 channels, 2 groups of 8 channels, 24V d.c., max 0.5A, transistor, current sink, short-circuit-proof.
DO815	8 channels, 2 groups of 4 channels, 24V d.c., max 2A, transistor, current source, short-circuit-proof.
DO820	8 channels, separate returns, 5-250V, max 3A a.c./d.c., relay (N.O.).

DO821	8 channels, separate returns, 5-250V, max 3A a.c./d.c., relay (N.C.).
Analog input modules	
AI810	8 channels, single-ended, 0(4)-20mA, 0(2)-10V, 12bits.
AI815	8 channels, common return, 0(4)-20mA, 0(1)-5V, HART
AI820	Differential inputs, 4 channels, 0(1)-5V, $\pm 0(2)$ -10V, $\pm 0(4)$ -20mA, 14 bits+sign.
AI825	Galvanically isolated, 4channels, $\pm 0(2)$ -10V, $\pm 0(4)$ -20mA, 14 bits+sign.
AI830A	RTD inputs, 8 channels Pt100, Ni100, Ni120, Cu10, resistor 0-400 Ω , 14 bits, 3-wire.
AI835A	TC inputs, 8 channels, (7+ ref. junction), separate returns, TC types B, C, D, E, J, K, L, N, R, S, T, U, -30...75mV, 15 bits.
Analog output modules	
AO810V2	8 channels, common return, 0(4)-20mA, 14 bits, load: 850 Ω (short-circuit-proof).
AO815	8 channels, common return, 4-20mA, HART
AO820	Isolated output, 4 channels, separate returns, measuring range: $\pm 0(2)$ -10V, $\pm 0(4)$ -20mA, resolution:12 bits + sign, load: $\leq 500\Omega$ (current) $\geq 2k\Omega$ (voltage), short-circuit-proof.
S800 I/O modules for redundancy & SIL3	
DI840	16 channels, common return, 24V d.c., current sink, extended diagnostics.
DI880	16 channels, 24V d.c., current sink, SIL3, extended diagnostics.
DP840	8 channels, separate returns, freq. measurement or pulse counting, 0.5-20kHz, 12/24V d.c. or NAMUR.

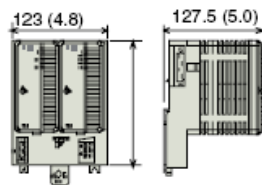
DO840	16 channels, common return, 24V d.c., max 0,5A, current source, short-circuit-proof, extended diagnostics.
DO880	16 channels, 24V d.c., max. 0.5A, current source, SIL3, short-circuit-proof, extended diagnostics.
AI843	TC input, 8 channels + ref. junction, TC types: B, C, E, J, K, L, N,R, S, T, U, -30...75mV, 16 bits, extended diagnostics.
AI845	8 channels, common return, 0(4)-20mA 0(1)-5V, extended diagnostics, HART support.
AI880A	8 channels, common return, 0(4)-20mA, SIL3, extended diagnostics, HART support.
AO845A	8 channels, common return, 4.20mA, extended diagnostics, HART support.
S800L I/O modules	
DI801	16 channels, 1 group, 24V d.c., current sink.
DI802	8 channels, 110V d.c., 120V a.c.
DI803	8 channels, 220V d.c., 230V a.c.
DO801	16 channels, common return, 24V, max 0.5A d.c., transistor, current source, short-circuit-proof.
DO802	8 channels, 5-250V, max 2A a.c./d.c., relay (N.O).
AI801	8 channels, single-ended, 0(4)-20mA, 12 bits.
AO801	8 channels, common return, 0(4)-20mA, 12 bits, load: <750Ω.
I/O modules with intrinsic-safety interface	
DI890	8 channels, separate returns, 24V d.c. current sink, with wire-fault detection
DO890	4 channels, separate returns, load 150-5000Ω, 11V @ 40mA, current source, short-circuit-proof, with wire-fault detection.

AI890	8 channels, single-ended, 0(4)-20mA, 12 bits, transmitter power supply.
AI893	8 channels, TV 7 + ref. junction, separate returns, TC types B, C, E, J, K, L, N, R, S, T, U, -10...80mV, RTD: Pt50-1000, Ni100-500, Cu10-100, resistor 0-4000Ω, 3-wire, 15 bits + sign., TC/RTD inputs.
AI895	8 channels, single-ended, 4-20mA, 12 bits, transmitter power supply, HART interface.
AO895	8 channels common return, 0(4)-20mA, 12 bits, load: 750Ω (short-circuit-proof), wire-fault detection
AO895	8 channels, common return, 4-20mA, 12 bits, load: 750Ω (short-circuit-proof), HART interface & wire-fault detection.

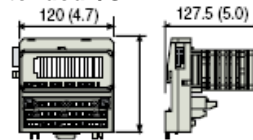
(1) Approvals are issued for +5 to +55°C.

Appendix C Dimensions

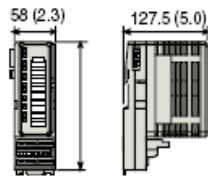
Redundant Comm. Modules



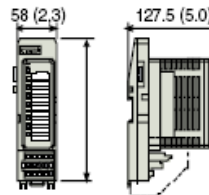
Extended I/O



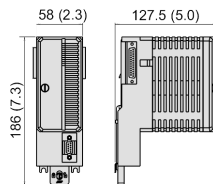
Compact I/O



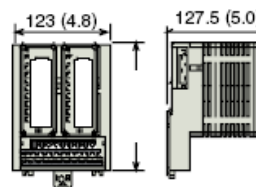
Intrinsic safety I/O



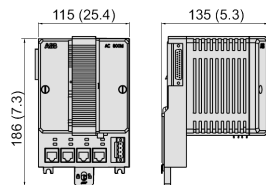
Communication Interface



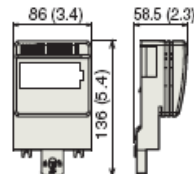
Redundant I/O



CPU



C1801, S800L I/O





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